

LAKE MYRA COUNTY PARK

PROJECT MANUAL Technical Specifications

RFB# 26-077

Owner:



County of Wake
Facilities Design & Construction
P.O. Box 550
Raleigh, NC 27602
Tel: 919-856-6369

Landscape Architect:

**Susan
Hatchell**
Landscape Architecture, PLLC

711 W. North Street
Raleigh, NC 27603
Tel. 919-838-9600

**Bid Documents
July 27, 2026**

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Section 017900	Demonstration and Training
Section 020050	Mobilization
Section 020100	Existing Conditions
Section 022220	Selective Demolition
Section 022300	Tree Protection, Trimming, and Removal
Section 031000	Concrete Forming and Accessories
Section 057300	Metal Fabrications

COUNTY OF WAKE

LAKE MYRA COUNTY PARK PHASE 1

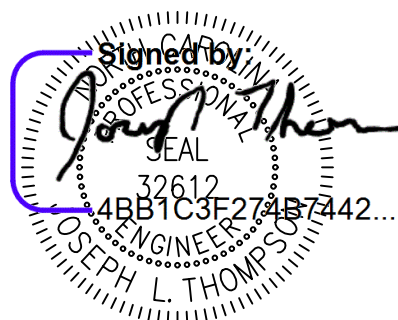
Section 069500	Timber Construction
Section 099000	Painting
Section 116800	Playground Equipment and Structures
Section 130000	Trail Building Subcontractor Qualification Requirements
Section 321816.13	Playground Protective Surfacing
Section 323113	Chain Link Fences and Gates
Section 323300	Site Furnishings
Section 329113	Soil Preparation
Section 329119	Landscape Grading
Section 329200	Turf and Grasses
Section 329300	Planting



This seal applies to the following specifications only:

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Section 221313	Facility Sanitary Sewers
Section 311000	Site Clearing
Section 312000	Earth Moving
Section 313116	Termite Control
Section 321216	Asphalt Paving
Section 321313	Concrete Paving
Section 321713	Parking Bumpers
Section 321723	Pavement Markings
Section 331010	Disinfection of Potable Water System
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Section 334200	Stormwater Conveyance
Section 463310	Sodium Hypochlorite System
Section 463338	Liquid Phosphate Feed System
Section 464117	Wafer Style Injection Mixer

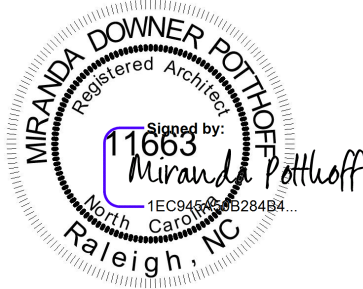
COUNTY OF WAKE
LAKE MYRA COUNTY PARK PHASE 1



July 27, 2026

This seal applies to the following specifications only:

Section 032000	Concrete Reinforcing
Section 033000	Cast-in-Place Concrete
Section 061000	Rough Carpentry – Site Structural
Section 061715	Engineered Structural Wood



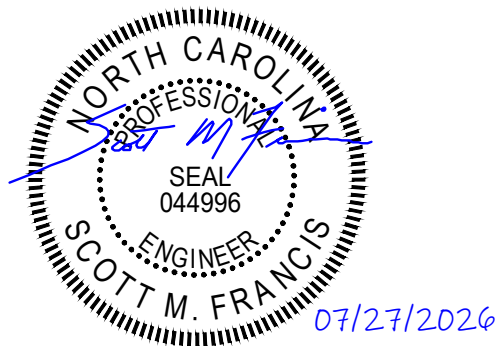
07/27/2026

This seal applies to the following specifications only:

Section 033543	Polished Concrete Finishing
Section 042200	Concrete Unit Masonry
Section 055000	Metal Fabrications
Section 055113	Metal Pan Stairs
Section 055213	Pipe and Tube Railings
Section 057300	Specialty Metal Railings
Section 061500	Rough Carpentry - Architectural
Section 061533	Composite Decking
Section 061600	Sheathing
Section 062013	Exterior Finish Carpentry
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Section 064116	Plastic Laminate Faced Architectural Cabinets
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Section 074114	Standing-Seam Metal Roof Panels
Section 074650	Fiber Cement Wall Panels
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Section 077100	Roof Specialties
Section 078100	Applied Fire Protection
Section 079200	Joint Sealants
Section 079219	Acoustical Joint Sealants
Section 081113	Hollow Metal Doors and Frames
Section 081416	Flush Wood Doors
Section 081613	Fiberglass Reinforced Plastic Doors
Section 083113	Access Doors and Frames

COUNTY OF WAKE
LAKE MYRA COUNTY PARK PHASE 1

Section 083323	Overhead Coiling Doors
Section 084113	Aluminum Framed Entrances and Storefronts
Section 085653	Aluminum Sliding Windows
Section 087100	Door Hardware
Section 088000	Glazing
Section 089119	Fixed Louvers
Section 092216	Non-Structural Metal Framing
Section 092900	Gypsum Board
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Section 099600	High-Performance Coatings
Section 101419	Dimensional Letter Signage
Section 102117	Plastic Toilet Compartments
Section 102239	Folding Panel Partitions
Section 102800	Toilet and Bath Accessories
Section 104415	Fire Protection Specialties
Section 105113	Metal Lockers
Section 113013	Residential Appliances
Section 122413	Roller Window Shades
Section 123619	Wood Countertops
Section 123663	Solid Surfacing Countertops
Section 123665	Quartz Agglomerate Countertops
Section 313116	Termite Control



This seal applies to the following specifications only:

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Section 032000	Concrete Reinforcing
Section 033000	Cast-in-Place Concrete
Section 051200	Structural Steel Framing
Section 053100	Steel Decking
Section 061000	Rough Carpentry – Structural
Section 061516	Wood Roof Decking

COUNTY OF WAKE
LAKE MYRA COUNTY PARK PHASE 1

Plumbing and Mechanical Specifications

I, Scott Ennis, P.E., hereby certify that Divisions 22 & 23 of the Lake Myra Park – Phase I Project Manual were prepared by me or under my direct supervision.



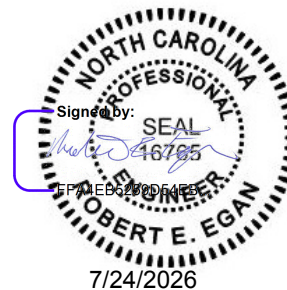
This seal applies to the following specifications only:

Section 220500	General Plumbing Provisions
Section 220501	Division of Work
Section 220509	Electrical Work
Section 220513	Common Motor Requirements for Plumbing Equipment
Section 220516	Expansion Fittings and Loops for Plumbing Piping
Section 220517	Sleeves and Sleeve Seals for Plumbing Piping
Section 220519	Meters and Gages for Plumbing Piping
Section 220523	General-Duty Valves for Plumbing Piping
Section 220529	Hangers and Supports for Plumbing Piping and Equipment
Section 220533	Heat tracing for Plumbing Piping
Section 220548	Vibration and Seismic Controls for Plumbing Piping and Equipment
Section 220553	Identification for Plumbing Piping and Equipment
Section 220570	Plumbing Coordination Drawings
Section 220716	Plumbing Equipment Insulation
Section 220719	Plumbing Piping Insulation
Section 220800	Plumbing Commissioning Requirements
Section 221005	Plumbing Piping
Section 221119	Domestic Water Piping Specialties
Section 221123	Domestic Water Pumps
Section 221319	Sanitary Waste Piping Specialties
Section 223000	Plumbing Equipment
Section 224000	Plumbing Fixtures
Section 224017	Bathtubs and Showers
Section 224500	Emergency Plumbing Fixtures
Section 230500	HVAC General Provisions
Section 230501	Division of Work
Section 230513	Common Motor Requirements for HVAC Equipment
Section 230517	Sleeves and Sleeve Seals for HVAC Piping
Section 230529	Hangers and Supports for HVAC Piping and Equipment
Section 230548	Vibration and Seismic Controls for HVAC
Section 230553	Identification for HVAC Piping and Equipment
Section 230570	Mechanical Coordination drawings/Model
Section 230593	Testing, Adjusting, and Balancing for HVAC
Section 230713	Duct Installation

Section 230716	HVAC Equipment Insulation
Section 230719	HVAC Piping Insulation
Section 230800	Mechanical Commissioning Requirements
Section 230934	Variable-Frequency Motor Controllers for HVAC
Section 232300	Refrigerant Piping
Section 233100	HVAC Ducts and Casings
Section 233300	Air Duct Accessories
Section 233423	HVAC Power Ventilators
Section 233700	Air Outlets and Inlets
Section 238126.13	Small-Capacity Split-System Air Conditioners
Section 238200	Convection Heating and Cooling Units
Section 238416.16	Indoor Mechanical Dehumidification Units

Electrical Specifications

I, Robert Egan, P.E., hereby certify that Divisions 26 & 28 of the Lake Myra Park – Phase I Project Manual were prepared by me or under my direct supervision.



This seal applies to the following specifications only:

Section 260500.02	General Provisions Related to Electrical Work
Section 260510	Temporary Electrical Facilities
Section 260519	Low-Voltage Electrical Power Conductors and Cables
Section 260526	Grounding and Bonding for Electrical Systems
Section 260529	Hangers and Supports for Electrical Systems
Section 260533.13	Conduit for Electrical Systems
Section 260533.16	Boxes for Electrical Systems
Section 260553	Identification for Electrical Systems
Section 260573	Power System Studies
Section 260923	Lighting Control Devices
Section 262100.01	Utility Service Entrance
Section 262416	Panelboards
Section 262726	Wiring Devices
Section 262816.16	Enclosed Switches
Section 263100	Photovoltaic Collectors
Section 264300	Surge Protective Devices
Section 265100	Interior Lighting
Section 265600	Exterior Lighting
Section 284600	Fire Detection and Alarm

NOTICE TO BIDDERS
RFB #26-077

Sealed proposals will be received by the County of Wake in the Purchasing Department, Suite 2900, Wake County Justice Center, 301 McDowell Street, Raleigh, NC 27601, up to **2:00 p.m., October 8, 2026**, and immediately thereafter publicly opened and read for providing labor, material and equipment entering into the construction of **Lake Myra County Park Phase I**, located in Wendell, NC. An electronic copy of the contract documents (PDF) may be obtained from Accent Imaging beginning August 24, 2026. Printed copies of the plans and specifications may be purchased from Accent Imaging online or at (919)782-3332. Plans may be accessed for viewing and download at <http://www.planscope.com/>.

A pre-bid conference will be held at 2:00 p.m. local time on September 10, 2026, at the General Services Center, 401 Capital Boulevard, Raleigh, NC, 27603 in the Training Room. Note that the parking lot is accessible only from Capital Boulevard. Attendance at the pre-bid conference is not mandatory but strongly encouraged.

Visiting both the Eastern and Western Parcels of the park is encouraged. See Appendix D - Lake Myra County Park Access Maps for information on park access points. The Eastern Parcel is accessible from the Raleigh Pump Station (10505 Poole Road, Wendell, NC 27591), and the Western Parcel is accessible via Amberstone Drive. Both parcels will be accessible only during the following dates and times:

Thursday, September 3, 9:00–11:30 a.m.
Tuesday, September 15, 9:00–11:30 a.m.
Thursday, September 17, 9:00–11:30 a.m.

Questions will be received **ONLY** in written form. The deadline to submit written questions to Susan Hatchell Landscape Architecture, PLLC, is 5:00 pm local time on September 24, 2026. A final addendum will be released no later than 5:00 PM on October 1, 2026.

Email all questions or substitution requests to: Jennifer Steed at Jennifer@SusanHatchell.com

A Bid Bond in the amount of five percent (5%) of the Bid must accompany each Bid and shall be subject to the conditions provided in the Instruction to Bidders. No bid may be withdrawn for ninety (90) days after the scheduled closing time for bids. The Owner reserves the right to reject any or all bids and to waive informalities.

Signed: COUNTY OF WAKE

By: Eric Staehle, Senior Facilities Project Manager
Facilities Design & Construction

DESIGNER:

Jennifer Steed, Project Manager
Susan Hatchell Landscape Architecture, PLLC

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INSTRUCTIONS TO BIDDERS

For a Proposal to be considered, it must be in accordance with the following instructions:

1. PROPOSALS

Proposals must be made on the Bid Proposal Forms provided herein, and all blank spaces for Bids, Alternates and Unit Prices, applicable to bidder's work, shall be properly filled in. When requested Alternates are not Bid, the Proposal may be considered non responsive. The Bidders agree that Bids submitted on the specified Bid Proposal Forms, which are detached from specifications, will be considered and will have the same force and effect as if attached thereto. Numbers shall be stated both in writing and in figures for the Base Bids and Alternates.

Any modification to the Bid Proposal Forms (including Alternates and/or Unit Prices) may disqualify the Bid and may cause the Bid to be rejected.

The Contractor shall fill in the Bid Proposal Forms as follows:

- A. If the documents are executed by a sole Owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person.
- B. If the documents are executed by a Partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.
- C. If the documents are executed on the part of a Corporation, they shall be executed by either the President or the Vice-President and attested by the Secretary or Assistant Secretary. In either case the title of the office of such person shall appear after their signatures. The seal of the Corporation shall be impressed on each signature page of the documents.
- D. If the Proposal is made by a Joint Venture, it shall be executed by each member of the Joint Venture in the above form for sole Owner, Partnership, or Corporation, whichever form is applicable.
- E. All signatures shall be properly witnessed or attested as applicable.
- F. Each proposal shall be addressed as indicated in the Advertisement for Bids and shall be delivered, enclosed in an opaque sealed envelope, marked "Proposal" and bearing the name of Project, name and address of the Bidder, the Bidder's license number and, if applicable, the designated portion of the Work for which Bid is submitted.
- G. It shall be the specific responsibility of the Bidder to deliver the Bid to the proper official at the appointed place and prior to the announced time for the opening of Bids. Later delivery of a Bid for any reason, including delivery by the United States Mail, shall disqualify the Bid.

- H. Modifications of previously deposited Bids or requests for withdrawal will be acceptable only if delivered in person or in writing to the place of the Bid opening prior to the time for opening Bids.
- I. Unit Prices quoted in the Proposal shall include overhead and profit and shall be the full compensation for the Contractor's cost involved in the work.

2. EXAMINATION OF CONDITIONS

It is understood and mutually agreed that by submitting a Bid the Contractor acknowledges his careful examination of the Bidding Documents pertaining to the work, the location, accessibility and general character of the site of the work and all existing buildings and structures within and adjacent to the site; and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, the character, quality and quantity of the materials to be encountered; the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the work; the general and local conditions; the construction hazards; and all other matters, including but not limited to, the labor situation which can in any way affect the work under the Contract; and including all safety measures required by the latest edition of the Occupational Safety Health Act and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a Proposal, the Contractor acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications, and other Contract Documents for the construction of the work and that he accepts all the terms, conditions and stipulations contained therein; and that he is prepared to work in cooperation with the Owner and all other Contractors performing work on the site.

Reference is made to the Contract Documents for the identification of those surveys and investigative reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by the Licensed Professional who prepared the documents. Copies of all such surveys and reports are available to the Bidders, upon request. All Bidders are responsible for reviewing these documents prior to submission of their Bid Proposal.

Each Bidder may, at his own expense, make such additional surveys and investigations, as he may deem necessary to determine his Bid price for the performance of the work. Any on-site investigation shall be done at the convenience of the Owner. The Owner will honor any reasonable request for access to the site.

3. SUBSTITUTIONS

Material substitutions will be considered during the bidding phase until seven (7) days prior to the receipt of bids. No substitutions will be considered after seven (7) days prior to the receipt of Bids.

For proposed material substitutions submit the following information to the Licensed Professional who prepared the bidding documents:

Name of manufacturer
Address of manufacturer
Phone number of manufacturer

Trade name
Model or catalogue designation
Manufacturer's data including:
 Performance and test data
 Reference standards
Detailed comparison with specified product including:
 Performance
 Test results
 Warranties
 Gauge, thickness or strength or material
 Finish
 Other pertinent data
Other information requested by the Licensed Professional
who prepared the bidding documents

Submittals relating to substitutions, which are not fully complete by seven (7) days prior to the receipt of bids, will not be reviewed.

If the Licensed Professional who prepared the bidding documents accepts a material substitution, Contractors will be notified by Addendum.

4. ADDENDA

Any Addenda to bidding documents issued during the time of bidding will be sent to each Bidder, and are to be considered covered in the Bid Proposal. It is the Contractor's responsibility to ascertain prior to Bid time, which Addenda have been issued and confirm that his Bid Proposal includes any changes covered by the Addenda.

Should the Bidder find discrepancies in, or omissions from, the drawings or documents or should he be in doubt as to their meaning, he shall at once notify the Licensed Professional who prepared said drawings or documents. Neither the Owner nor the Licensed Professional who prepared the bidding documents will be responsible for any oral instructions.

The Bidder on his Bid Proposal shall acknowledge all Addenda. Failure to do so may disqualify the Bid and may cause the Bid to be rejected.

5. BID SECURITY

Each Proposal shall be accompanied by a cash deposit, or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a Bid Bond in an amount equal to not less than five percent (5%) of the Proposal. Said deposit to be retained by the Owner (referred to as Obligee on the Bond Form) as liquidated damages in event of failure of the successful Bidder to execute the Contract within ten (10) days after the award or to give satisfactory Surety as required by law.

The Bid Bond shall be conditioned that the surety will, upon demand, forthwith make payment to the Owner (referred to as Obligee on the Bond Form) upon the said bond if the Bidder fails to execute the contract.

A Wake County Bid Bond form is included in the project manual. The language in the Bid Bond form is required. Your Bid may be considered non-responsive if your Surety uses a different Bid Bond form. Notify your Surety that the language in the Wake County Bid Bond form must be used.

6. RECEIPT OF BIDS

Bids and Bid Security shall be received in strict accordance with requirements of the North Carolina General Statutes. Prior to opening of any Bids on the Project, the Bidder will be permitted to change or withdraw his Bid as allowed by Item 1-H of these Instructions.

All copies of the Bid, the Bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and should be identified with the Project name, time and date of Bid Opening, the Bidder's name and address, Bidder's license number and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

7. OPENING OF BIDS

Upon opening, all Bids shall be read aloud. Once any Bid is opened, the Owner may return no Bids to any Bidder.

After Bids are opened, a Bidder may request that his Bid be withdrawn without forfeiting his Bid deposit in certain limited circumstances. Withdrawal after opening is permitted only if all of the following conditions specified in North Carolina General Statutes §143-129.1 are met:

- A. The Bid was submitted in good faith.
- B. The price Bid "was based upon a mistake, which constituted a substantial error".
- C. Credible evidence is submitted showing that the error (1) was clerical in nature, as opposed to a judgment error; and (2) was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor, material or services made directly in the compilation of the Bid.
- D. The error can be clearly shown by objective evidence drawn from inspection of the original work papers, documents, or materials used in the preparation of the Bid.
- E. The request to withdraw (1) is made in writing to the public agency that invited the Proposals, and (2) is made prior to the award of the Contract, but not later than seventy-two (72) hours after the opening of Bids.

8. REJECTION OF BIDS

The Owner reserves the unqualified right to reject any and all Bids. Reasons for rejection may include, but shall not be limited to, the following:

- A. If the Form of Proposal furnished to the Bidder is not used or is altered.
- B. If the Bidder fails to insert a price for all Bid items, Alternates and Unit Prices requested.
- C. If the Bidder adds any provisions reserving the right to accept or reject any award.
- D. If there are unauthorized additions or conditional Bids, or irregularities of any kind which tend to make the Proposal incomplete, indefinite, or ambiguous as to its meaning.
- E. If the Bidder fails to complete the Proposal forms where information is requested so the Bid may be properly evaluated by the Owner.
- F. If the Unit Prices contained in the Bid Schedule are unacceptable to the Owner.
- G. If the Bidder fails to comply with other instructions stated herein.

9. BID EVALUATION

The award of the Contract will be made to the lowest responsible Bidder as soon as practical. Should the successful Bidder default and fail to execute a Contract, the Contract may be awarded to the next lowest and responsible Bidder.

Before awarding a Contract, the Owner may require the apparent low Bidder to qualify himself to be a responsible Bidder by furnishing any or all of the following data:

- A. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the Owner.
- B. A listing of similar completed projects of similar size, with contact persons and telephone numbers.
- C. Permanent name and address of place of business.
- D. The number of regular employees of the organization and length of time the organization has been in business under present name and percentage of work typically performed by the contractor's firm.
 - (1) Qualifications of key employees assigned to this Project.
 - (2) References for key employees assigned to this Project.
- E. The name and home office address of the Surety proposed and the name and address of the responsible local claim agent.

- F. The names of members of the firm who hold appropriate trade licenses, together with license numbers.
- G. Complete list of all subcontractors and suppliers proposed.
- H. Any pending arbitration or mediation cases or lawsuits. This may include all arbitration, mediation and lawsuits settled or resolved within last ten (10) years.

Failure or refusal to furnish any of the above information if requested shall constitute a basis for disqualification of any Bidder.

In determining the lowest responsible Bidder, the Owner may consider the past performance of the Bidder on construction contracts for the County of Wake, Wake County Public School System, the State of North Carolina or other governmental agencies. Particular concern will be given to completion times, quality of work, cooperation with other Contractors, and cooperation with the Designer and Owner.

Should the Owner adjudge that the apparent low Bidder is not the lowest "responsible" Bidder by virtue of the above information, said apparent low Bidder will be so notified and his Bid Security shall be returned to him.

The Owner shall have the right to accept Alternates in any order or combination and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

The Owner reserves the right to reject any and all Bids, to waive all technicalities and irregularities, and to make the award as considered to be in the best interest of the Owner.

10. PERFORMANCE BOND

The successful Bidder, upon award of Contract, shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the Contract price.

11. PAYMENT BOND

The successful Bidder, upon award of Contract, shall furnish a Payment Bond in an amount equal to one hundred percent (100%) of the Contract price.

12. PRE-BID CONFERENCE

Bidders are requested to attend a Pre-Bid Conference at the time and place stipulated in the Bidding Documents.

13. PROPOSALS TO BE BID

General Construction Work

14. INFORMATION TO BIDDER

All questions concerning the plans and specifications should be directed to the Licensed Professional who prepared said documents.

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Facilities Design & Construction

☎ 919 856 6350

☎ 919 856 6355

Waverly F. Akins Wake County Office Building
P.O. Box 550 • Raleigh, NC 27602
336 Fayetteville St., Room 1100 • Raleigh, NC 27601
wake.gov

Notice of Wake County Electronic Contracting Processes for Construction Agreements

All Wake County contracts are now executed and processed electronically. The successful lowest responsive responsible bidder upon award of the construction contract must be a registered Wake County vendor to start the electronic contract process. Any company not registered as a Wake County vendor must register. The County will contact the low bidder and offer instructions on how to register as a vendor or update their existing vendor registration info if needed.

Upon notification of contract award, contractor will be issued instructions for processing Performance and Payment Bonds, Certificates of Insurance, and issuance of the Construction Agreement

Contracts will then be transmitted via DocuSign for signing, attesting, and execution.

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LAKE MYRA COUNTY PARK PHASE 1

Project No. RFB# 26-077

BID PROPOSAL FORM

SINGLE PRIME GENERAL CONSTRUCTION WORK
FORMAL CONTRACT

BIDDER'S NAME

_____ License Number: _____

BASE BID PROPOSAL

The undersigned, as Bidder, hereby declares that the only person or persons interested in this Proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Proposal or in the Contract to be entered into; that this Proposal is made without connection with any other person, company or parties making a Bid or Proposal; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the specifications for the work and the Contract Documents relative thereto, including addenda, if any, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees if this Proposal is accepted to contract with the County of Wake with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and Contract Documents, for the sum of:

Base Bid _____

_____ Dollars (\$_____).

SUBCONTRACTOR LISTING

PLUMBING CONTRACTOR

Name: _____ License Number: _____

\$ _____

HVAC CONTRACTOR

Name: _____ License Number: _____

\$ _____

ELECTRICAL CONTRACTOR

Name: _____ License Number: _____

\$ _____

SITE CONTRACTOR

Name: _____ License Number: _____

\$ _____

(OTHER CONTRACTOR)

Name: _____ License Number: _____

\$ _____

(OTHER CONTRACTOR)

Name: _____ License Number: _____

\$ _____

(OTHER CONTRACTOR)

Name: _____ License Number: _____

\$ _____

ALTERNATES

Should any of the alternates as described in the specifications be accepted, the amount written below shall be the amount to "add to" of "deduct from" the Base Bid. If to be "deducted from" Base Bid, put minus sign (-) in parentheses at head of alternate and plus sign (+) in parentheses if to be added. Refer to Section 012300 "Alternates" for description of alternates.

Alternate No. 1 Boardwalk A across Lake Myra ADD Dollars (\$ _____)

Alternate No. 2 Boating Access ADD Dollars (\$ _____)

Alternate No. 3 Fishing Pier ADD Dollars (\$ _____)

UNIT PRICES

Unit prices are complete for labor, equipment, material, overhead and profit. Base bid includes the stipulated allowance quantity of each item. Unused amount will be credited to the Owner by change order at the end of the project.

No.	Description	Unit Price	Unit Measure	Allowance Units
1	Access Door for Hard Ceilings		Each	
2	Exit Sign		Each	
3	Emergency Light		Each	
4	Fire Alarm Horn/Strobes		Each	
5	Fire Alarm Monitor Modules for Potential BDA System		Each	
6	Unsuitable Soil – On-Site Disposal and Backfill with On-Site Source Suitable Soils		CY	100
7	Unsuitable Soil – On-site disposal and Backfill with Off-Site Source Suitable Soils		CY	250
8	Unsuitable soil – Off-site disposal and Backfill with On-Site Source Suitable Soils		CY	50
9	Unsuitable Soil – Off-site disposal and Backfill with Off-Site Source Suitable Soils		CY	250
10	Mass Rock Excavation and Replacement with Imported Structural Fill		CY	200
11	Trench Rock Excavation and Replacement with Imported Structural Fill		CY	150
12	Erosion Control Matting		SY	500
13	Engineered Geotextile Fabric		SY	500
14	#57 Drainage Stone		CY	50
15	6" Perforated PVC Drainage Pipe (French Drain)		LF	50
16	Trail Pipe Crossing – 12 Inch RCP		LF	75
17	Trail Pipe Crossing – 15 Inch RCP		LF	50
18	Trail Pipe Crossing – 18 Inch RCP		LF	50

19	Clearing and Stump Removal		Acre	
20	Selective Tree Removal – 2"-6" caliper, cut stump flush		Each	
21	Selective Tree Removal – 6"-15" caliper, cut stump flush		Each	
22	Selective Tree Removal – greater than 15" caliper, cut stump flush		Each	
23	Silt Fence		LF	
24	Tree Protection Fence (TPF)		LF	
25	Concrete Paving – 4-inches thick		SY	
26	Concrete Paving – 6-inches thick		SY	
27	Concrete Curb and Gutter		LF	
28	Asphalt Paving		Ton	
29	Timber Pile (Add) – Longer Timber Pile		LF	
30	Timber Pile (Deduct) – Shorter Timber Pile		LF	
31	Trail Boardwalk – Wood (10' Clear)		LF	
32	Trail Boardwalk – Composite (10' Clear)		LF	
33	Trail Boardwalk 10' x 10' Crossing		LF	
34	Canopy Tree – 2" caliper, B&B		Each	
35	Understory Tree – 8' height, B&B		Each	
36	Seeding		SY	
37	Triple Shredded Hardwood Mulch		CY	

ALLOWANCES

Allowances indicated shall be included in the Total Base Bid Amount. Refer to Section 012100 for description of allowances

- A. Allowance No. 1: Include a lump sum allowance of **\$290,000.00** for Security Equipment and Installation
- B. Allowance No. 2: Include a lump sum allowance of **\$100,000.00** for Security Fiber Optic and Telecommunications Cabling Installation
- C. Allowance No. 3: Include a lump sum allowance of **\$40,000.00** for Raleigh meter permit fees
- D. Allowance No. 4: Include a unit cost allowance for providing and installing two (2) access doors for hard ceilings, per Unit Price No. 1 \$ _____
- E. Allowance No. 5: Include a unit cost allowance for providing and installing two (2) exit signs, two (2) emergency lights, two (2) fire alarm horn/strobes, and eight (8) fire alarm monitor modules for potential BDA System, per Unit Price No. 2, 3, 4, and 5 \$ _____
- F. Allowance No. 6: Include an allowance of 100 CY for unsuitable soil with on-site disposal and backfill with on-site source suitable soils, per Unit Price No. 6 \$ _____
- G. Allowance No. 7: Include an allowance of 250 CY for unsuitable soil with on-site disposal and backfill with off-site source suitable soils, per Unit Price No. 7 \$ _____

- H. Allowance No. 8: Include an allowance of 50 CY for unsuitable soil with off-site disposal and backfill with on-site source suitable soils, per Unit Price No. 8 \$ _____
- I. Allowance No. 9: Include an allowance of 250 CY for unsuitable soil with off-site disposal and backfill with off-site source suitable soils, per Unit Price No. 9 \$ _____
- J. Allowance No. 10: Include an allowance of 200 CY for mass rock excavation and replacement with imported structural fill, per Unit Price No. 10 \$ _____
- K. Allowance No. 11: Include an allowance of 150 CY for trench rock excavation and replacement with imported structural fill, per Unit Price No. 11 \$ _____
- L. Allowance No. 12: Include an allowance of 500 SY for erosion control matting, per Unit Price No. 12 \$ _____
- M. Allowance No. 13: Include an allowance of 500 SY for engineered geotextile fabric, per Unit Price No. 13 \$ _____
- N. Allowance No. 14: Include an allowance of 50 CY for #57 drainage stone, per Unit Price No. 14 \$ _____
- O. Allowance No. 15: Include an allowance of 50 LF for 6" perforated PVC drainage pipe (French Drain), per Unit Price No. 15 \$ _____
- P. Allowance No. 16: Include an allowance of 75 LF for 12" RCP trail pipe crossing, per Unit Price No. 16 \$ _____
- Q. Allowance No. 17: Include an allowance of 50 LF for 15" RCP trail pipe crossing, per Unit Price No. 17 \$ _____
- R. Allowance No. 18: Include an allowance of 50 LF for 18" RCP trail pipe crossing, per Unit Price No. 18 \$ _____
- S. Allowance No. 19: Include an allowance of **\$250,000.00** for Project Contingency Allowance.

CERTIFICATION OF PROPOSER:

The Bidder further proposes and agrees hereby to commence work under his Contract on a date to be specified in a written order of Wake County and shall fully complete all work thereunder within the number of consecutive calendar days stipulated in the Supplementary General Conditions. Applicable liquidated damages shall be as stated in Supplementary General Conditions.

The undersigned acknowledges receipt of the following addenda issued during the time of bidding and includes the changes therein in this Proposal:

Addendum Number _____, Dated _____

Addendum Number _____, Dated _____

Addendum Number _____, Dated _____

The undersigned agrees that this Proposal will not be withdrawn for a period of sixty (60) days.

The undersigned agrees to comply with the E-Verify requirements of the General Statutes of North Carolina, all contractors, including any subcontractors employed by the contractor(s), by submitting a bid, proposal or any other response, or by providing any material, equipment, supplies, services, etc., attest and affirm that they are aware and in full compliance with Article 2 of Chapter 64, (NCGS64-26(a)) relating to the E-Verify requirements.

The undersigned agrees not to discriminate in any manner on the basis of race, natural hair or hairstyles, ethnicity, creed, color, sex, pregnancy, marital or familial status, sexual orientation, gender identity or expression, national origin or ancestry, marital or familial status, pregnancy, National Guard or veteran status, religious belief or non-belief, age, or disability with reference to the subject matter of this Contract. The Parties agree to comply with the provisions and intent of Wake County Ordinance SL 2017-4. This anti-discrimination provision shall be binding on the successors and assigns of the Parties with reference to the subject matter of this Contract.

The undersigned further agrees that in the case of failure on his part to execute the said Contract and the Bond within ten (10) consecutive calendar days after written notice being given of the award of the Contract, the check, cash or Bid Bond accompanying this Bid shall be paid into the funds of Owner's Account set aside for this Project, as liquidated damages for such failure; otherwise the check, cash or Bid Bond accompanying this Proposal shall be returned to the undersigned.

Respectfully submitted this ___ day of _____, 20__

PROPOSER SIGNATURE PAGE

(Name of Firm or Corporation making Bid)

By: _____

WITNESS:

(Proprietorship or Partnership)



Affix Corporate Seal Above

Title: _____
(Owner, Partner, or Corporation President
or Vice President only)

Address: _____

License Number: _____

ATTEST:

By: _____

Title: _____
(Corporation Secretary or Assistant Secretary only)

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BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____,
(Bidder's Name)

_____, of _____
(Street Address) (City, State, Zip)

hereinafter called the Principal, and _____ of
(Surety's Name)

_____, a Corporation duly organized, and existing under the laws of the State of _____ and authorized to transact business in the State of North Carolina, as Surety, hereinafter called the Surety, are held and firmly bound unto the County of Wake as Owner, hereinafter called the Obligee, in the Penal sum of five percent (5%) of the amount bid, good and lawful money of the United States of America, for the payment for which the Principal and the Surety, bind ourselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents. This bid bond is submitted in lieu of submitting cash, a cashier's check, or a certified check pursuant to G.S. 143- 129.

WHEREAS, the Principal has submitted a Bid for the construction of _____.
(Project Name)

NOW THEREFORE, if the Obligee shall accept the Bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of said Bid, and give such bond or bonds as may be specified in the Bidding and Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and materials furnished in the prosecution thereof, then this obligation shall be null and void; but if the Principal fails to so execute such Contract and give such bonds as required by G.S. 143-129, this obligation shall otherwise remain in full force and effect and the Surety shall, upon demand, forthwith pay to the Obligee the full amount set forth in the first paragraph hereof.

SIGNED AND SEALED this __ day of _____, 20__ in the presence of:

Witness _____

Witness _____

Principal (SEAL)

Surety (SEAL)

Title

Title

******USE OF BOND FORM OTHER THAN THIS MAY RESULT IN DISQUALIFICATION OF THE BIDDER******

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CONSTRUCTION AGREEMENT

FOR

LAKE MYRA COUNTY PARK PHASE 1

THIS AGREEMENT, made as of the ____ day of _____, 20__, by and between _____, a corporation, hereinafter called the Contractor, and Wake County, a body corporate and politic and a political subdivision of the State of North Carolina, hereinafter called the Owner.

WITNESSETH:

That the Contractor and the Owner, for the consideration herein named, agree as follows:

1. SCOPE OF WORK - The Contractor shall furnish and deliver all of the materials, and perform all of the work required by this Agreement and the following enumerated documents, which are attached hereto and made a part hereof as if fully contained herein: General Conditions, Supplemental Conditions, Contract Construction Schedule, Specifications, Drawings entitled " _____ " which Drawings are listed in the Specifications, Performance Bond, Labor and Material Payment Bond, Insurance Certificates, and the following addenda:

Addendum No. _____ Dated _____
Addendum No. _____ Dated _____
Addendum No. _____ Dated _____

All of the documents listed, referenced or described in this paragraph, together with Modifications made or issued in accordance herewith are the Contract Documents, and the work, labor, materials and completed construction required by the Contract Documents and all parts thereof is the Work. The Contractor shall perform the Work in the time, manner and form required by the Contract Documents. The Contract Documents constitute the entire agreement between Owner and Contractor.

2. The Contractor agrees to commence work not later than three (3) days after the commencement date specified in the Notice to Proceed. The Contractor agrees to complete fully all Work hereunder on the dates specified in the Contract Documents, as may be adjusted in accordance with the terms thereof. Time is of the essence with respect to all dates specified in the Contract Documents as Completion Dates. Liquidated damages for failure(s) to complete in accordance

with the provisions of this paragraph shall be computed and assessed against the Contractor in accordance with the Contract Documents.

3. The Owner hereby agrees to pay to the Contractor for the faithful performance of this Agreement, and the Contractor hereby agrees to perform all of the Work, for the sum of _____ Dollars (\$_____) in the lawful money of the United States, subject to adjustments as provided for in the Contract Documents. Payment of the Contract Price shall be in accordance with Articles 20 and 21 of the General Conditions.

4. It is further mutually agreed between the parties hereto that if at any time after the execution of this Agreement and the Performance Bond and Labor and Material Payment Bond hereto attached for its faithful performance, the Owner shall deem the surety or sureties upon such Bonds to be unsatisfactory, or if, for any reason, such Bonds or either of them cease to be adequate to cover the performance of and payment for the Work, the Contractor shall, at its expense, within five (5) days after notice from the Owner so to do, furnish an additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the Owner. In such event no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of or payment for the Work shall be furnished in a manner and form satisfactory to the Owner.

5. Terms used in this Agreement which are defined in the Contract Documents shall have the meanings designated in those Contract Documents.

6. The Contractor agrees to indemnify and hold harmless the Owner against liability for damages arising out of bodily injury including death, or property damage, to any person or persons only to the extent that the fault of the Contractor or its derivative parties is a proximate cause of the loss, damage, or expense to be indemnified. This obligation to indemnify includes the obligation to pay any attorney's fees, litigation expenses, or court costs actually incurred by Owner to the extent that the fault of the Contractor or its derivative parties is a proximate cause of the fees, expenses, or cost to be indemnified. It is the intent of this provision to require the Contractor to indemnify the Owner to the fullest extent permitted by North Carolina law. The language and definitions in this section shall be construed consistent with N.C.G.S. 22B-1 et seq. as it may be amended. The indemnification obligation under this paragraph shall not be limited in any way by any limitation of the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers' compensation acts, disability benefits acts or other employee benefit acts.

7. The laws of the State of North Carolina shall apply to the interpretation and enforcement of this Agreement. Any and all suits or actions to enforce, interpret or seek damages with respect to any provision of, or the performance or nonperformance of, this Agreement shall be brought in the General Court of Justice of North Carolina sitting in Wake County, North Carolina, or the United States District Court sitting in Wake County, North Carolina, and it is agreed by the parties that no other court shall have jurisdiction or venue with respect to such suits or actions.

8. To ensure compliance with the E-Verify requirements of the General Statutes of North Carolina, all contractors, including any subcontractors employed by the contractor(s), by submitting a bid, proposal or any other response, or by providing any material, equipment, supplies, services, etc, attest and affirm that they are aware and in full compliance with N.C.G.S. Chapter 64, Article 2 (N.C.G.S. 64-26(a)) relating to the E-Verify requirements.

9. By signing this agreement; accepting this contract/purchase order; or submitting any bid, proposal, etc., vendors and contractors certify that as of the date of execution, receipt, or submission they are not listed on the Final Divestment List created by the NC Office of State Treasurer pursuant to NCGS 147 Article 6E, Iran Divestment Act, Iran Divestment Act Certification. Vendors and contractors shall not utilize any subcontractor that is identified on the Final Divestment List.

Any organization defined under NCGS 147-86.80(2), Divestment from Companies Boycotting Israel, shall not engage in business totaling more than \$1,000 with any company/business, etc. that boycotts Israel. A list of companies that boycott Israel is maintained by the NC Office of State Treasurer, pursuant to NCGS 147-86.81(a)(1). Any company listed as boycotting Israel is not eligible to do business with any State agency or political subdivision of the State.

10. If the source of funds for this contract is federal funds, the following federal provisions apply pursuant to 2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II (as applicable):

Equal Employment Opportunity (41 C.F.R. Part 60); Davis-Bacon Act (40 U.S.C. 3141-3148); Copeland “Anti-Kickback” Act (40 U.S.C. 3145); Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708); Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387); Debarment and Suspension (Executive Orders 12549 and 12689); Byrd Anti-Lobbying Amendment (31 U.S.C. 1352); Procurement of Recovered Materials (2 C.F.R. § 200.322); and Record Retention Requirements (2 CFR § 200.324).

11. In consideration of signing this Agreement, the Parties hereby agree not to discriminate in any manner on the basis of race, natural hair or hairstyles, ethnicity, creed, color, sex, pregnancy, marital or familial status, sexual orientation, gender identity or expression, national origin or ancestry, marital or familial status, pregnancy, National Guard or veteran status, religious belief or non-belief, age, or disability with reference to the subject matter of this Contract. The Parties agree to comply with the provisions and intent of Wake County Ordinance SL 2017-4. This anti-discrimination provision shall be binding on the successors and assigns of the Parties with reference to the subject matter of this Contract.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the day and date first above written in a number of counterparts, each of which shall, without proof or accounting for other counterparts, be deemed an original contract.

Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(President)

ATTEST: (CORPORATION)

By: _____

Title: _____
(Corporate Secretary)

(CORPORATE SEAL)

WITNESS:

(Proprietorship or Partnership)

WAKE COUNTY
P. O. Box 550
Raleigh, N.C. 27602

By: _____
County Manager or Designee

This instrument has been pre-audited in the manner required by the local Government Budget and Fiscal Control Act.

Wake County Finance Officer

This instrument has been reviewed by Wake County Facilities, Design & Construction

Mark Forestieri
Director, Facilities Design & Construction

The person responsible for monitoring the contract performance requirements is

_____. _____ Department Head Initials

PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal:
(Contractor) _____

Name of Surety: _____

Name of Contracting Body: County of Wake
P.O. Box 550
Raleigh, N.C. 27602

Amount of Bond: _____
Dollars (\$ _____)

Project: _____

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named owner, hereinafter called "Owner", in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into a certain Contract with the Owner identified as shown above and hereto attached:

NOW THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the Work provided for in said Contract, and any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modification to the Surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representatives, pursuant to authority of its governing body.

PAYMENT BOND

Executed in Four (4) Counterparts.

CONTRACTOR:

By: _____

Title: _____
(Corporation President or
Vice President Only)

ATTEST: (Corporation)

(Corporation Secretary or Assistant
Secretary Only)

(CORPORATE SEAL)

SURETY COMPANY:

WITNESS: By: _____

(Attorney in Fact)

Title: _____

(SURETY CORPORATE SEAL)

COUNTERSIGNED:

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal:
(Contractor) _____

Name of Surety: _____

Name of Contracting Body: County of Wake
P.O. Box 550
Raleigh, N.C. 27602

Amount of Bond: _____
Dollars (\$ _____)

Project: _____

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached:

NOW THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its countersigned representative, pursuant to authority of its governing body.

PERFORMANCE BOND

Executed in Four (4) Counterparts.

CONTRACTOR:

By: _____

Title: _____
(Corporation President or
Vice President Only)

ATTEST: (Corporation)

(Corporation Secretary or Assistant
Secretary Only)

(CORPORATE SEAL)

SURETY COMPANY:

WITNESS: By: _____

(Attorney in Fact)

Title: _____

(SURETY CORPORATE SEAL)

COUNTERSIGNED:

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

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ATTACHEMENT A
TO THE
LAKE MYRA COUNTY PARK PHASE 1

**MINORITY AND HISTORICALLY UNDERUTILIZED BUSINESS
PARTICIPATION REQUIREMENTS**

Session Law 2026-41, signed July 7, 2026, repealed N.C.G.S. §143-128.2, §143-128.3, §143-128.4, §143-48.4, §63A-19, §116D-4, and §143-131(b), and eliminated the Office for Historically Underutilized Businesses.

All provisions of the Contract Documents, including any document incorporated by reference and any prior addendum, that impose minority or historically underutilized business participation goals, good faith effort requirements, affidavit or documentation submissions, participation reporting, or related compliance obligations arising under the repealed statutes shall have no force or effect and shall not be enforced under this Agreement. The Contractor's failure to comply with any such provision shall not constitute a breach or default or a basis for withholding, reducing, or delaying payment. This Article controls over any conflicting provision of the Contract Documents.

Removal of the minority or historically underutilized business participation provisions does not alter the contract sum, the contract time, or any other term of this Agreement, and the Contractor waives any claim for adjustment arising from it. If the Project receives federal funding, Disadvantaged Business Enterprise requirements under 49 C.F.R. Part 26 and other applicable federal program requirements are unaffected by this Article.

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1.

DEFINITIONS

- 1.1 Agreement - The Construction Agreement, these General Conditions, and any Supplementary Conditions.
- 1.2 AIA - The American Institute of Architects.
- 1.3 ASTM - The American Society for Testing and Materials.
- 1.4 Beneficial Occupancy – The point at which the Project can be occupied by the Owner for its intended purpose, upon achievement of Substantial Completion, as defined in 1.40.
- 1.5 Change Order - A written order to the Contractor signed by the Owner and the Designer authorizing an addition, deletion, or revision in the Work and/or an adjustment in the Contract Price and/or the Contract Time issued after execution of the Construction Agreement. See paragraph 14.1.
- 1.6 Completion Date - Those dates identified as Completion Dates in the Contract Construction Schedule or elsewhere in the Contract Documents.
- 1.7 Construction Agreement – The document executed by the Contractor and the Owner to formally memorialize their consent to the terms of the Agreement.
- 1.8 Construction Change Directive – A written order to the Contractor signed by the Owner and the Designer directing an addition, deletion, or revision in the Work after execution of the Construction Agreement, in circumstances when the parties have been unable to agree on an adjustment to the Contract Price or the Contract Time, but the Owner requests that the Contractor proceed with said Work subject to adjustment of the Contract Price and/or Contract Time under the procedures described herein.
- 1.9 Construction Manager(s) - The person or firm designated as the Construction Manager in the Contract Documents, or their authorized representatives. The Construction Manager(s), as referred to herein, will be referred to hereinafter as if each were of the singular number, masculine gender.
- 1.10 Contract Construction Schedule - That schedule described in Article 13 hereof and identified as the Contract Construction Schedule.
- 1.11 Contract Documents - All of the documents that make up the Agreement, plus the Drawings and Specifications that describe the scope of the Work, plus allowable Modifications to the Contract Documents.
- 1.12 Contract Price - The total monies payable to the Contractor under the Contract Documents pursuant to paragraph 15.1 of the Agreement.
- 1.13 Contract Time - The number of calendar days stated in, or computed from, the Contract Documents for the completion of the Work, or any portion thereof. See, particularly, Article 13 hereof and the Contract Construction Schedule. Time of completion as specified therein is of the essence. The time used and referred to on the Project will be that time which is



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

observed in Raleigh, North Carolina, being Eastern Daylight Savings Time (EDT), Eastern Standard Time (EST), or other as designated by the Designer.

- 1.14 Contractor - The Contractor shall be that party identified as such in the Agreement.
- 1.15 Days - Unless otherwise indicated, the term "days" shall mean consecutive calendar days.
- 1.16 Daylight Hours - The hours or portions of hours between sunrise and sunset local time.
- 1.17 Designer(s) – The person or firm designated as the Designer in the Contract Documents, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect, landscape architect, and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.
- 1.18 Drawings - The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, and dimensions of the Work, and generally including plans, elevations, sections, details, schedules and diagrams. A list of the Drawings is contained in the Supplemental General Conditions.
- 1.19 Field Order - A written order issued by the Designer which clarifies or interprets the Contract Documents or orders minor changes in the Work in accordance with the Contract Documents. See paragraph 14.2.
- 1.20 Final Completion - The point at which the Contractor has, as determined by the Designer, completed the Work, with the exception of guaranty and warranty obligations, and becomes entitled, upon the recommendation of the Designer and determination by the Owner, to final payment.
- 1.21 The words "furnish," "furnish and install," "install," and "provide" or words with similar meanings shall be interpreted, unless otherwise stated, to mean furnish and install complete, in place and ready for service.
- 1.22 Liquidated Damages – See paragraph 13.18 of these General Conditions.
- 1.23 Modification - (A) a written amendment to the Contract Documents signed by the Owner and the Contractor and identified therein as such, (B) a Change Order, (C) Construction Change Directive, or (D) a Field Order. A Modification may only be issued after execution of the Agreement.
- 1.24 Notice of Award - The written notice by the Owner to the Contractor that the Contractor is the successful Bidder and that upon compliance with the conditions precedent to be fulfilled by the Contractor within the time specified, the Owner will execute and deliver the Agreement to him.
- 1.25 Notice to Proceed - See paragraph 13.3.
- 1.26 Owner - The Owner is the person designated as such in the Agreement.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

- 1.27 Owner's Authorized Representative - A person, or persons, employed by the Owner and designated from time to time by written notice to the Contractor to administer the Contract Documents, and to observe and monitor the Work on behalf of the Owner with authority and responsibility as herein specified.
- 1.28 Notice - The term "notice" or "written notice" as used herein shall mean and include all written notices, demands, instructions, and claims approvals and disapprovals furnished by the Owner or the Designer to obtain compliance with the requirements of the Contract Documents, as well as all written notices, demands, instructions and claims furnished by the Contractor as required by the Contract Documents. Where notice is required under the terms of the Contract Documents written notice shall always be required, and oral or "constructive" notice shall be insufficient and ineffective as notice. Email or other electronic delivery shall be insufficient and ineffective as notice unless specifically allowed by the Supplementary Conditions or a Modification to the Agreement. Written notice shall be deemed to have been duly served on the date that it is delivered in person to the individual or to a member of the firm, to an officer of the corporation for whom it is intended, to an authorized representative of such individual, firm, or corporation, or on the date that it is mailed by registered or certified mail, return receipt requested, addressed to the last business address of such individual, firm, or corporation known to the person giving the notice. Written notice may also be given by facsimile transmission, provided that proof of delivery is obtained. In the case of delivery in person, such delivery shall not be effective unless and until a written and signed receipt showing the date and time of delivery is obtained.
- 1.29 Project - The total construction of which the Work performed under the Contract Documents may be the whole or a part.
- 1.30 Project Expediter – As used herein, is an entity stated in the Contract Documents, designated to effectively facilitate scheduling and coordination of Work activities. For the purpose of a single prime contract, the single prime contractor is designated as the Project Expediter. For the purpose of a project involving separate prime contracts, the Contractor for general work shall be designated as the Project Expediter unless otherwise indicated in the Supplementary General Conditions. See paragraph 7.27.
- 1.31 Project Manager - That person designated by the Contractor in accordance with paragraph 7.2 who shall be in general charge of the Work and its performance and who shall have the authority set forth in the last sentence of paragraph 7.2.
- 1.32 Request for Information - A written communication from the Contractor to the Designer for any interpretation of, or information needed, required, or desired under the Contract Documents. The Owner reserves the right to determine the reasonable format and contents required for a Request for Information. In any Request for Information, the Contractor shall state a reasonable date by which a response is necessary in order to avoid delay in progress on the Work and shall make such request sufficiently in advance of such date as to avoid any such delay. The Designer shall respond in writing to the Request for Information by the date stated by the Contractor unless he cannot reasonably do so, in which case he shall prior to that date notify the Contractor of the date by which he can reasonably respond. The Contractor shall not be entitled to any additional time for the completion of the Work or any portion thereof by reason of the Designer's failure to respond



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

if he has not submitted his Request for Information sufficiently in advance to allow the Designer a reasonable time within which to respond.

- 1.33 Request for Payment - The form, in the form of AIA Document G702 (latest ed.) or other published document approved by Owner, which is to be used by the Contractor in requesting progress payments and which is to include a Schedule of Values as required by the Contract Documents and an affidavit of the Contractor that progress payments theretofore received from the Owner on account of the Work have been applied by the Contractor to discharge in full all the Contractor's obligations incurred in connection with Work covered by all prior applications for payment. See paragraph 20.2.
- 1.34 Resident Superintendent - That person designated by the Contractor in accordance with paragraph 7.2 who has day-to-day responsibility for the prosecution of the Work and the obtaining of proper materials and equipment, and adequate labor and who shall have the authority set forth in the last sentence of paragraph 7.2.
- 1.35 Schedule of Values - Any breakdown of the Contract Price which may be required by the Contract Documents, and designated as such. See paragraph 20.1.
- 1.36 Specifications - That portion of the Contract Documents consisting generally of the written requirements for materials, equipment, construction systems, standards, and workmanship for the Work and performance of related services.
- 1.37 Subcontractor - A person, firm, or corporation who has entered into a direct contract with the Contractor to perform any of the Work at the Project.
- 1.38 Submittal - Shop drawings, product data, samples, and other documents required by the Contract Documents to be submitted by the Contractor to the Designer.
- 1.39 Submittal Register - See paragraph 13.2 of these General Conditions.
- 1.40 Substantial Completion - The point at which the Work, and Work by other Contractors on or in connection with the Project, as determined by the Designer, is sufficiently complete in accordance with the Contract Documents that it can be beneficially occupied by the Owner, and the Work can be utilized by the Owner for its intended use, and all necessary permits and permissions for Beneficial Occupancy and utilization having been obtained by the Contractor. All operations and maintenance manuals, Owner training, and as-built drawings must be submitted prior to Substantial Completion being achieved.
- 1.41 Sub-subcontractor - A person or entity that has a direct or indirect contract with a Subcontractor to perform any of the Work at the Project.
- 1.42 Work - The construction and services required by the Contract Documents, including all labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations.
- 1.43 All references in the Contract Documents to the masculine shall be interpreted as including the feminine or neuter and all references in the Contract Documents to the singular or the



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

plural shall be interpreted as including the other, as may be appropriate in the reasonable interpretation of the Contract Documents.

ARTICLE 2. CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS

- 2.1 It is the intent of the Specifications and Drawings and other Contract Documents to describe a complete Project in accordance with the Contract Documents.
- 2.2 The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If the Contractor finds a conflict, error or discrepancy in the Contract Documents, the Contractor shall notify the Designer in writing before proceeding with the Work affected thereby. In resolving such conflicts, errors and discrepancies, the Contract Documents shall be given preference in the following order: Construction Agreement, Modifications, Addenda, Supplemental Conditions, General Conditions, Specifications, and Drawings. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings. Any Work that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which, so applied, have a well known technical trade meaning shall be deemed to refer to such meaning and to incorporate any recognized standards which are a part of such meaning.
- 2.3 Miscellaneous items, accessories and work which are not specifically mentioned, but which are essential to produce a complete and properly operating installation, or useable structure or plant providing the indicated function shall be furnished and installed without change in the Contract Price. Such miscellaneous items and accessories shall be of the same quality standards, including material, style, finish, strength, class, weight and other applicable characteristics, as specified for the major component of which the miscellaneous item or accessory is an essential part, and shall be approved by the Designer before installation. This requirement is not intended to include major components not covered by or inferable from the Contract Documents.
- 2.4 The Work of all trades under the Contract Documents shall be coordinated by the Contractor in such a manner as to obtain the best workmanship possible for the entire Project and all components of the Work shall be installed or erected in accordance with the best practices of the particular trade.
- 2.5 The Contractor shall fully complete the Work and shall be responsible for all of the Work under the Contract Documents to which the Construction Agreement applies. If the Contractor is prevented from doing so by any limitation of the Contract Documents, the Contractor shall immediately give notice thereof to the Designer and the Owner in writing before proceeding with the construction in the area where the problem or limitation exists.
- 2.6 Standard specifications or manufacturers' literature, when referenced, shall be of the latest revision or printing unless otherwise stated and is intended to establish the minimum requirements acceptable.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

- 2.7 For those materials specified without the use of brand names, the Contractor shall submit within thirty (30) days after his receiving the Construction Agreement for signatures, any product that meets the express requirements of the Specifications.

Such Submittal shall include manufacturer's data, test reports, performance data and certifications, samples, erection details, and other applicable information as required to permit determination by the Designer whether such proposed products are suitable. The Designer shall be the sole judge as to the suitability of any proposed product. The burden of proof of quality rests with the Contractor.

- 2.8 The Contractor is required to examine and read the complete set of Contract Documents for information concerning the Work, because some of the Work for which the Contractor will be responsible may be indicated on or in documentation applying primarily to the Work of one or more other separate prime contractors. No allowance will be made for the Contractor's failure to become familiar with the complete set of project documents.

- 2.9 Contractor's requests for clarification or information shall clearly define the cause(s) of Contractor's request and, as appropriate, shall include Contractor's interpretation and Contractor's proposed solution.

ARTICLE 3. FAMILIARITY WITH WORK, CONDITIONS AND LAWS

- 3.1 The Contractor has investigated prior to bidding and is satisfied with all conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electrical power, roads and uncertainties of weather, or similar physical conditions at the Project site, and the character of equipment and facilities needed prior to and during prosecution of the Work. The Contractor is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from inspection of the Project site, including all exploratory work done by the Owner, as well as from information presented by the Contract Documents, or any other information made available to the Contractor prior to receipt of bids. Any failure by the Contractor to become acquainted with the available information shall not relieve the Contractor from the responsibility for estimating properly the difficulty or cost of successfully performing the Work.

- 3.2 The Contractor shall be entitled to rely upon all information furnished to the Contractor in writing by the Owner with respect to the Project site and to make all inferences from it that would reasonably be made by a contractor having knowledge and experience with similar work; however, the Contractor shall not be entitled to infer from Owner-supplied information any fact or condition which would not be inferred by a contractor having knowledge and experience with similar work and, if the Owner-supplied information is inadequate or insufficient in any respect, the Contractor shall be required to obtain independently such other information as a knowledgeable and experienced contractor would prudently obtain in order to evaluate any such condition.

- 3.3 The Contractor specifically acknowledges familiarity with all Federal, State, and local laws, ordinances, rules, and regulations which may in any manner affect those engaged or



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

employed in the Work, or the materials or equipment in or about the Work, or in any way affect the conduct of the Work and agrees that the Contractor and the Contractor's employees, subcontractors, and suppliers will, at all times, comply with same. If the Contractor shall discover any provisions in the Contract Documents which are contrary to or inconsistent with any such law, ordinance, rule, or regulation, the Contractor shall immediately give notice thereof to the Designer and the Owner in writing, identifying any items of Work affected, and the Contractor shall not proceed until the Contractor has received written direction from the Designer with respect to these items. If the Contractor performs contrary to or inconsistently with any such law, ordinance, rule, or regulation without giving such notice, the Contractor shall bear all costs which are a consequence of such performance.

- 3.4 At times selected by the Designer after execution by the Contractor of the Construction Agreement, a pre-construction conference shall be scheduled and conducted for the benefit of the Project.

ARTICLE 4. BONDS

- 4.1 A performance bond in the full amount of the Contract Price shall be required of the Contractor to guarantee the faithful performance of the Work in compliance with the Contract Documents, in such form as may be required by law and approved by the Owner. The bond shall be dated the same date as the Construction Agreement and must be accompanied by a current copy of the power of attorney for the attorney-in-fact executing such bond on behalf of a surety company licensed to do business in the state of North Carolina.
- 4.2 A payment bond in the full amount of the Contract Price shall be required of the Contractor to guarantee the payment of all labor and material costs or claims in connection with compliance with the Contract. The payment bond shall be in such form as may be required by law and approved by the Owner. Said bond shall be dated and executed in the same manner as the performance bond in paragraph 4.1.

ARTICLE 5. INSURANCE AND INDEMNITY

5.1 CONTRACTOR PROVIDED INSURANCE

The Contractor shall, without limiting its obligations or liabilities, procure, pay for and maintain such insurance as is required by law and as is required by this Agreement to protect the Contractor and the Owner from claims for damages for bodily injury, including death, and from claims for property damage which may arise from the Contractor's or its representatives', consultants', Subcontractors', agents', or employees' operations under this Agreement. Such insurance shall be of the kinds and have limits of liability and coverages not less than the minimum limits hereinafter specified or required by law, whichever is greater. The Owner makes no representation as to the adequacy or sufficiency of such coverages. The following requirements shall in no way be construed to limit or eliminate the liability of the Contractor, which arises from performance of Work under the Agreement. The Contractor is strictly responsible for any losses, claims, and costs of any kind which exceed the Contractor's limits of liability, or which may be outside the coverage scope of the policies.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The insurance specified shall be provided by an insurer approved by the Owner, authorized to do such business in the State of North Carolina, and on terms approved by the Owner. Insurance companies utilized shall have a minimum rating of A- and Class VII as evaluated by the most current A.M. Best Rating Guide. If the insurer has a Best Rating less than A- and Class VII, the Contractor must receive specific written approval from the Owner prior to proceeding with any Work under the Agreement. All agents and brokers shall hold valid licenses from the State of North Carolina. Before commencing mobilization to the Project site and not later than 7 days after the receipt of the Construction Agreement by the Contractor for signatures, the Contractor shall furnish to the Owner a certificate or certificates of insurance in a form satisfactory to the Owner. Upon request of the Owner, the Contractor shall provide the Owner with certified copies of the insurance policies required by this Article, including without limitation declaration pages, conditions, exclusions and endorsements, and confirmation that each policy premium has been paid for the required term of this Agreement. A copy of the umbrella policy shall be provided to the Wake County Finance Department. Certificates shall be signed by a person authorized by that insurer to bind coverage on its behalf. In the event of any such cancellation, non-renewal, reduction, restriction, or change in any insurance, the Contractor is obligated to replace such insurance within 7 days without a gap in coverage and file accordingly such notice with the Owner, and other interested parties. Failing immediate receipt of evidence of such replacement of insurance the Owner reserves the right to procure such insurance as the Owner considers desirable and the Contractor shall pay or reimburse the cost of the premium in respect thereof. It is expressly provided, however, that any action or inaction on the part of the Owner in this respect shall in no way change or reduce the Contractor's responsibilities and liabilities under this Agreement. Self-funded, policy fronting, or other non-risk transfer insurance mechanisms are not acceptable without prior written approval of the Owner. Full disclosure of such a program must be made prior to commencing mobilization to the Project site. Failure to make a full disclosure constitutes a material breach of the Agreement, justifying termination for default.

The Contractor shall name the Owner, the Designer, the Designer's consultants, and the Construction Manager as additional insureds under all its insurance contracts (except workers' compensation) with respect to and including without limitation liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor, and automobiles owned, hired, leased, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to additional insureds.

For any claims related to this Project, the Contractor's insurance or self insurance shall be primary and noncontributory with respect to the Owner's insurance. Any insurance or self-insurance maintained by the Owner shall be excess and noncontributory with respect to the Contractor's insurance.

All policies of insurance shall contain a clause waiving rights of subrogation against the Owner, unless the Owner approves otherwise in writing.

Limits of coverage are not to be amended by deductible clauses of any nature without the express written consent of the Owner. The Contractor shall be solely responsible for any deductible assumptions that may exist in any insurance policies required under this



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

Agreement. In addition, the Contractor shall be responsible and shall not be reimbursed for any losses arising from any risk or exposure not insured as required herein, or not covered as a result of a normal policy exclusion or that falls within the self insured retention, if Contractor self insured.

The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

The claim provisions in the Contractor's insurance policies must specifically state the insurance company or Contractor's Third Party Administrator, if self insured, has both the right and duty to adjust a claim and provide defense.

The policies shall not contain any provision or definition which would serve to exclude or eliminate from coverage third party claims, including exclusions of claims for bodily or other injury to shareholders, partners, officers, directors, or employees of the insured, the premises owner, real estate manager, or the insured's Subcontractor, or any family relative of such persons.

If the policies contain any warranty stating that coverage is null and void (or words to that effect) if the Contractor does not comply with the most stringent regulations governing the Work, it shall be modified so that coverage shall be afforded in all cases except for the Contractor's willful or intentional noncompliance with applicable government regulations.

Any failure by any person to comply with reporting or other provisions of the policy including breach of warranties, shall not affect coverage provided to the Owner and its representatives, officials, and employees.

The insolvency or bankruptcy of the Insured or of the Insured's estate shall not relieve the insurance companies of their obligations under these policies. Any clauses to the contrary are unacceptable and must be stricken.

Failure to comply with these requirements shall be a material breach of this Agreement justifying termination for default.

5.1.1 Worker's Compensation and Employers' Liability Insurance

The Contractor and its Subcontractors shall procure and maintain Workers' Compensation Insurance in the amount and type required by the State of North Carolina and federal law for all employees employed under the Agreement who may come within the protection of Workers' Compensation Laws and covering all operations under the Agreement whether performed by the Contractor or by his Subcontractors. In jurisdictions not providing complete Workers' Compensation protection, the Contractor and his Subcontractors shall maintain employers' liability insurance in an amount, form, company, and agency satisfactory to the State of North Carolina and the Owner for the benefit of all employees not protected by Workers' Compensation Laws and covering all operations under the Agreement whether performed by the Contractor or by his Subcontractors.

The Contractor shall pay such assessments as will protect the Contractor and the Owner from claims under the Workers' Compensation Laws, workers' or workmen's compensation



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

disability benefits, and other similar employee benefit acts. The current Experience Modification Factor shall be indicated on the Certificate of Insurance.

Coverage under this section shall be as required by federal and state Workers' Compensation and Occupational Disease Statutes, and shall have minimum limits as follows:

Coverage A:	Statutory, State of North Carolina
Employers' Liability:	Each Accident \$1,000,000
	Disease - Policy Limit \$1,000,000
	Disease - Each Employee \$1,000,000

Such insurance shall include Voluntary Compensation coverage, a Waiver of Subrogation in favor of the Owner as well as other endorsements that may be required by applicable jurisdictions, i.e. United States Longshoremen and Harbor Workers Act and maritime coverage (Jones Act).

5.1.2 Automobile Liability Insurance

The Contractor shall procure and maintain automobile insurance against liability for bodily injury and property damage as described below, that may arise with respect to the Work being performed under the Agreement, and as will provide protection from claims which may arise out of or result from the Contractor's performance of the Work and the Contractor's other obligations under the Agreement, whether such performance of the Work is by the Contractor, by any representative or Subcontractor, by anyone, both officially and personally, directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

This policy of insurance shall carry the following minimum Limit of Liability:

Combined Single Limit	\$1,000,000
-----------------------	-------------

The policy of insurance shall contain or be endorsed to include the following:

- a) owned, hired, and non-owned automobile liability.
- b) If the policy contains a warranty stating that coverage is null and void (or words to that effect) if the transporter does not comply with the most stringent regulations governing the Work, it shall be modified so that coverage shall be afforded in all cases except for the transporter's willful or intentional noncompliance with applicable government regulations.

Any failure by any party to comply with reporting or other provisions of the policy including breach of warranties, shall not affect coverage provided to the Owner and its representatives, officials, and employees.

No subcontracting of waste hauling shall be permitted without prior, written approval of the Owner.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

5.1.3 General Liability

This policy must be written on an Occurrence basis, with the following minimum Limits of Liability:

General Aggregate per project	\$2,000,000.00
Products/Completed Operations Aggregate	\$2,000,000.00
Bodily Injury and Property Damage csl/each occurrence	\$1,000,000.00
Personal Injury and Advertising Injury	\$2,000,000.00

The policy of insurance shall contain or be endorsed to include the following:

- a) Blanket Contractual Liability covering Contractor's indemnification obligations under this Agreement, in accordance with ISO policy form CG 00 01. Modifications to the standard provision will not be acceptable if they serve to reduce coverage.
- b) Premises/Operations Liability.
- c) Explosion, collapse, and underground fault.
- d) Independent Contractors and Independent Subcontractors coverage.
- e) Broad Form Property Damage.
- f) Personal Injury
- g) Cross Liability/Severability of Interest clause.
- h) Employer's Stop-Gap Liability endorsement, if applicable.
- i) Amendment of the Pollution Exclusion Endorsement to allow coverage for bodily injury or property damage caused by heat, smoke, or fumes from a hostile fire.
- j) Designated General Aggregate Limit Endorsement if required by the Supplemental General Conditions.

Coverage shall remain continuously in effect and without interruption for at least 6 years from the date of the Notice of Award and shall include coverage for exposures arising from operations that have been completed. The Contractor shall furnish the Owner and each other additional insured listed in the Agreement to whom the Certificates have been issued, evidence satisfactory to the Owner of continuation of such insurance at the date of Preliminary Acceptance and each year thereafter.

5.1.4 Pollution Legal Liability (PLL)

Pollution Legal Liability coverage will be provided if required by the Supplementary General Conditions.

5.1.5 Umbrella Liability



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The Contractor shall maintain an occurrence basis (as distinguished from a "claims made" basis) Umbrella Liability policy (true follow form) over the underlying General Liability, Automobile Liability, and Employer's Liability, with the following limits of liability:

Each Occurrence	\$3,000,000
Aggregate	\$3,000,000

On a fully insured basis such coverage will be subject to a deductible no greater than \$10,000 per occurrence where coverage is not provided by the underlying insurance, but is provided by the Umbrella Liability policy.

The Contractor may use any combination of primary and umbrella insurance policies to comply with the insurance requirements, provided the resulting insurance is equivalent to the insurance stated herein.

All Occupational Disease exclusions must be deleted. Any Pollution Exclusion must be amended to allow coverage for bodily injury or property damage caused by spill, upset, overturn, heat, smoke, or fumes from a hostile fire.

5.1.6 Property Insurance

The Contractor shall purchase All Risk Property Insurance on a Completed Value Form in the names of the Owner, Contractor, Subcontractors, and sub-subcontractors as their interests may appear with limits as follows:

- a) Full insurance value of the Work, or
- b) Amount equal to the Contract Price for the Work, whichever is higher.

The Contractor is responsible for all physical damage to owned or rented machinery, tools, equipment, forms, and other items owned, rented or used by the Contractor and/or Subcontractor(s) in the performance of the Work. The insurance coverage evidencing such shall include a waiver of subrogation in favor of the Owner.

5.1.7 Valuable Papers And Records

The Contractor shall provide valuable papers and records insurance with coverage in an amount commensurate with project scope and set forth in the Supplementary General Conditions.

5.1.8 Claims

The Contractor shall notify the Owner within 24 hours of any claims or alleged claims received by the Contractor covered by any of the policies of insurance required in this Agreement. The Contractor shall provide a written copy of the claim or alleged claim to the Owner within 3 days of the Contractor's receipt of the claim or alleged claim. If a claim is



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settled to the satisfaction of the claimant, the Contractor shall submit a copy of the claimant's release to the Owner.

If a claim or alleged claim is rejected by the Contractor and/or its insurance company, the Contractor shall immediately report this fact to the Owner.

Should 30 days elapse after the claim or alleged claim has been received by the Contractor, and the Contractor is not able to report a settlement or rejection of the claim, it shall report to the Owner the steps being taken with respect to the claim.

Without limiting the foregoing, the Contractor shall notify in writing the county risk manager of any paid or incurred claims which may impair annual aggregate or general liability.

5.1.9 Deductibles and Self-insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the insurer shall reduce to a maximum of \$250,000 or eliminate such deductibles or self-insured retentions with respect to the Owner, or the Contractor shall provide evidence of collateral provided to insurers or procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses within the deductible or self-insured retention amount. Any self-insured retention or deductible amount on the policy shall not reduce the amount of collectible limits or liability.

5.1.10 Subcontractors

The Contractor shall include all Subcontractors as Insureds under its policies, or shall furnish separate certificates, policies, and endorsements for each Subcontractor the Contractor intends to use. If a Subcontractor does not take out insurance in his own name and the Contractor wishes to provide insurance protection for such Subcontractor and such Subcontractor's employees, the Contractor shall either (a) procure appropriate policies in the name of the Subcontractor, or (b) cause a rider or riders to be attached to the Contractor's policies which shall identify the Subcontractor thereby covered; provided, however, in the case of the latter option, such a rider need not be attached to the Contractor's workers' compensation policy if such policy by its terms is sufficiently broad to cover the employees of all Subcontractors performing Work under the Contract Documents. Except as otherwise approved by the Owner in writing, Limits of Liability and coverage scope must be at a minimum as stringent as required of the Contractor by the Contract Documents. All Work performed for the Contractor by any Subcontractor shall be pursuant to an appropriate agreement between the Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance as provided herein. Insurance monies received from any loss shall be divided as the respective interest of the parties affected shall appear.

5.2 OWNER CONTROLLED PROJECT SPECIFIC INSURANCE



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In the event the Owner elects to purchase project-specific insurance affording coverage to the Contractor and Subcontractors, the terms and conditions of such coverage shall be set forth in the Supplementary Conditions.

5.3 CONTRACTOR AS JOINT VENTURE

If the Contractor is completing this Project on a joint venture basis, both joint venture partners retain all liabilities assumed by this Agreement, individually and collectively. This may include, but is not limited to, all premiums due, deductibles/self-insured retentions, coinsurance provisions, claim provisions, insurance policy conditions, and indemnification provisions hereunder.

Evidence of a Blanket Joint Venture Endorsement must be obtained from the General Liability and Contractor's Pollution Legal Liability carriers of each joint venture partner for a period of 6 years after completion of the Project, substantially as follows:

With respect to "your work", and the "products-completed operations hazard", you are an insured for your liability arising out of the conduct of any partnership or joint venture of which you were a partner or member, even though this partnership or joint venture is not shown as a Named Insured in the Declarations. This coverage is excess over any available liability purchased specifically to insure the partnership or joint venture. This coverage will not inure to the benefit of any other party except you."

5.4 INDEMNIFICATION

The Contractor, to the fullest extent not expressly prohibited by law, shall defend, indemnify, and save harmless the Owner, the Designer, the Construction Manager and their respective officials, officers, employees, and agents from and against any and all liabilities (foreseeable or unforeseeable), penalties, fines, forfeitures, demands, claims, causes of actions, suits, judgments, and costs and expenses incidental thereto, (including, without limitation, amounts paid pursuant to investigations, defense or settlements, and reasonable attorneys' fees), which any or all of them may hereafter suffer, incur, be responsible for, or pay out as a result of but not limited to:

- a) bodily injury (including sickness, disease, or death) to any person including but not limited to, the Contractor's employees or its representatives while on the site of the Project; or
- b) actual or alleged damage (including loss of use) to any property (public or private, including the Project or other property on the Project site); or
- c) contamination of or adverse effects on the environment arising directly or indirectly out of or in connection with the performance of the Work, including but not limited to any hazardous or toxic waste, substance, or constituent of any substance subject to regulation under CERCLA, RCRA, TSCA, and other Federal and state authorities that is spilled, released, threatening to release, or disposed of or destroyed by the Contractor or its Subcontractors on or off the site of the Project or while in transport to or from the site; or



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- d) any violation or alleged violation of laws and regulations, arising out of or in any way connected with the Work,

caused in whole or in part by the Contractor, any Subcontractor or supplier or any representatives of the Contractor. The Contractor shall not be required to indemnify the Owner against losses resulting from a breach of this Agreement by the Owner or its other agents and contractors, or resulting from negligence, misconduct or violation of laws on the part of the Owner or its other agents and contractors.

The Contractor further agrees to obtain, maintain, and pay for such liability insurance coverages and endorsements as will insure the provisions of this paragraph. Furthermore, the Contractor agrees to be liable for and to indemnify and reimburse the Owner for all legal fees and disbursements paid or incurred to enforce the provisions of this paragraph. The indemnification obligations under this paragraph shall not be limited in any way by the amount or type of damages, compensation or benefits payable under worker's compensation acts, disability benefit acts, other employment benefit acts, or the amount of insurance carried or recovered.

The Owner acknowledges that hazardous or toxic waste, material, chemicals, compounds or substances, or other environmental hazards, contamination or pollution, (referred to hereinafter as "environmental hazards") may be present at the Project site that were not created, generated, or released at the Project site by the Contractor or its Subcontractors, agents or employees, acting alone or in concert with others. Unless the remediation, abatement or handling of such environmental hazards is part of the scope of the Work under this Agreement, then upon the discovery of such environmental hazards, the Contractor shall immediately, and in no event more than three days later, give notice to the Owner of the environmental hazards before they are disturbed. The Owner and the Designer shall thereupon promptly investigate the environmental hazards, and make such changes in the Drawings and/or Specifications as they may find necessary to abate, remediate, isolate or handle the environmental hazards. Any increase or decrease in the Contract Price or the Contract Time resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional Work and changes. It is agreed that the Contractor shall have no liability under this Agreement for any environmental hazards existing prior to the date that Work commences under this Agreement unless the Contractor or its Subcontractors, agents or employees, acting alone or in concert with others, by their own negligence or misconduct, release or expose the Owner or third parties to the environmental hazards.

The provisions of this paragraph shall survive the termination or cancellation or completion of this Agreement.

ARTICLE 6. OTHER RECORD DOCUMENTS AND SUBMITTALS

- 6.1 The Designer shall furnish to the Contractor the number of copies of Drawings and Specifications stated in the Supplementary General Conditions. Additional copies of Drawings and Specifications may be obtained at the cost of reproduction and handling.



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- 6.2 The Contractor shall submit to the Designer all Submittals required by the Contract Documents. The Contractor shall submit three (3) reproducible prints of all shop drawings plus the number of copies sufficient for his requirements. The Contractor shall submit samples in quantities required by the Contract Documents. The Contractor shall submit product data in five (5) copies, plus the number of copies sufficient for the Contractor's requirements. All shop drawings shall be reviewed by the Contractor and shall bear the Contractor's stamp of approval before being forwarded to the Designer. Submittals shall be submitted in such time as to cause no delay to the Work or any part thereof and in accordance with the Contract Construction Schedule and Submittal Register. The Designer shall review the submittal with reasonable promptness, noting desired corrections, if any. The Designer shall retain two (2) copies of the submittal and shall return the balance of the reviewed submittal to the Contractor for action. The Contractor shall furnish any corrected submittal to the Designer. The Designer shall retain two (2) copies of the corrected submittal and will return the balance of the reviewed submittal to the Contractor.

No substitutions will be accepted after the bids have been received. All substitutions prior to the receipt of bids shall be in accordance with the Contract Documents. Refer to Instructions to Bidders, Paragraph 3, Substitutions.

The Contractor acknowledges that the processing of shop drawings and other submittals is directly impacted by the clarity, completeness, and accuracy of said documents and that it is the Contractor's responsibility to (i) review and coordinate each submittal with all other related or affected Work and (ii) approve each submittal before submitting same to the Designer for approval.

- 6.3 No substitutions and no deviations from any requirement of the Contract Documents shall be deemed allowed unless the Contractor has specifically informed the Designer and the Owner in writing of such deviations at the time of submittal and the Designer and the Owner have given written and specific approval to the substitutions or deviations. In proposing a deviation or substitution the Contractor warrants to the Owner, notwithstanding any review, allowance or approval by the Designer or the Owner that the deviation or substitution is at least equal to or better in quality and for the purpose intended, and that Contractor shall not by reason of any such review, allowance or approval be relieved from any obligation or responsibility contained in the Contract Documents.
- 6.4 Review of submittal by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with terms or designs of the Contract Documents nor from responsibility for errors of any sort in the submittal.
- 6.5 The Contractor shall keep one record copy marked "As-Built" of all Specifications, Drawings, Addenda, Modifications, and Submittals at the Project in good order and annotated at least monthly to show all changes made during the construction process. Such monthly annotations and their approval by the Designer shall be a condition precedent to approval by the Designer of each monthly Request for Payment. Said record copy shall be stored at the Project and fully protected from damage by fire or other hazard. This record copy shall be available to the Designer and Owner for inspection at all times and shall be delivered to the Designer for the Owner's purposes prior to the Designer's certifying Substantial Completion of the Work.



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- 6.6 At completion of the Project and before Final Payment, the Contractor shall assemble and deliver to the Owner one complete set of all as-built drawings and one complete set of all approved submittals, product data, and samples which were reviewed by the Designer. These drawings and submittals shall be on paper, or in electronic or other media if required by the Supplementary Conditions. These drawings and submittals shall be categorized and packaged as directed by the Designer.

ARTICLE 7. CONTRACTOR

- 7.1 The Contractor shall supervise and direct the Work efficiently and with the Contractor's best skill and attention. Except as may be set forth specifically in the Contract Documents, the Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs in connection with the Work. The Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.

- 7.2 The Contractor shall appoint a Project Manager and shall keep on the Project at all times during its progress a competent Resident Superintendent and necessary assistants who shall not be replaced without prior written approval by the Owner except under extraordinary circumstances, in which event immediate written notice shall be given to the Designer and the Owner. The Project Manager and the Resident Superintendent may be the same person or different persons. At any time, the Owner, in its sole and absolute discretion, may require the Contractor to replace the Project Manager or Resident Superintendent with an experienced and competent person or persons upon seven (7) days written notice from the Owner to the Contractor. Such replacement shall be at the Contractor's expense and at no cost to the Owner.

Both the Project Manager and the Resident Superintendent shall have authority to act on behalf of the Contractor, and instructions, directions or notices given to either of them shall be as binding as if given to the Contractor.

- 7.3 The Contractor shall provide sufficient competent and suitably qualified personnel, equipment, and supplies to lay out the Work and perform construction as required by the Contract Documents. The Contractor will at all times maintain good discipline and order at the site, and will comply with all applicable OSHA standards.

Any person employed by the Contractor, any Subcontractor, or any sub-subcontractor who, in the opinion of the Designer or the Owner, does not perform his Work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Owner or Designer, be removed forthwith by the Contractor, Subcontractor, or sub-subcontractor employing such person without cost to the Owner, and shall not be employed again in any portion of the Work without the written approval of the Owner or Designer.

Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work within three (3) days after written order, the Owner may withhold further payment by written notice until compliance with such order.



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- 7.4 If, in the opinion of the Designer or the Owner, any Subcontractor on the Project is incompetent or otherwise unsatisfactory, he shall be replaced by the Contractor with no increase in the Contract Price if and when directed by the Designer or the Owner in writing.
- 7.5 The Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools appliances, fuel, light, heat, and all other facilities and incidentals necessary for the execution, maintenance, initial operation, and completion of the Work, other than those specifically excluded by the Contract Documents and to be furnished by the Owner or others. When use or storage of hazardous materials or equipment or methods of more than ordinary risk are necessary in accomplishing the Work, the Contractor shall give the Owner and Designer reasonable advance notice.

If any materials are to be furnished or installed by the Owner or others under the terms of the Contract Documents, said materials shall be made available to the Contractor at the location(s) specified in the Contract Documents. All costs of handling, transportation from the specified location to the Project, storage, and installing of Owner-furnished materials shall be included in the Contract Price. The Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies which may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner shall deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good any such damage, loss, or deficiency.

All equipment which is proposed to be used in the Work shall be of sufficient size and in such mechanical condition as to meet the requirements of the Work and produce a satisfactory quality of work. Equipment used on any portion of the Work shall be such that no injury to previously completed Work, adjacent property, or existing facilities shall result from its use.

When the methods and equipment to be used by the Contractor accomplishing the Work are not prescribed in the Contract Documents, the Contractor shall be free to use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract Documents.

When the Contract Documents specify the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Designer. If the Contractor desires to use a method or type of equipment other than specified in the Contract Documents, the Contractor may request authority from the Designer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it shall be on the condition that the Contractor shall be fully responsible for producing Work in conformity with the requirements of the Contract Documents. If, after trial use of the substituted methods or equipment, the Designer determines that the Work produced does not meet the requirements of the Contract Documents, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining Work with the specified methods and equipment at no additional cost to the Owner. The Contractor shall remove any deficient Work and replace it with Work of specified quality, or take such other corrective action as the Designer may direct. No change in the Contract Price or in Contract Time shall be made as a result of authorizing a change in methods or equipment under this paragraph.



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- 7.6 All materials and equipment shall be new, except as otherwise provided in the Contract Documents. When special makes or grades of material which are normally packaged by the supplier or manufacturer are specified or approved, such materials shall be delivered to the Project site in their original packages or containers with seals unbroken and labels intact.
- Materials shall be so stored as to assure the preservation of their quantity, quality and fitness for the Work. Stored materials, even though approved before storage, may again be inspected by the Designer or Owner prior to their use in the Work and shall meet the requirements of the Contract Documents at the time they are incorporated into the Work. Stored materials shall be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Designer and the Owner. Materials to be stored at the Project or on the Owner's property shall not create an obstruction to the Owner's or other contractor's reasonable activities. Private property shall not be used for storage purposes without written permission of the owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Owner a copy of the property owner's permission. All storage sites on private or the Owner's property shall be restored to their original condition by the Contractor at his entire expense, except as otherwise agreed to (in writing) by the owner or lessee of the property.
- 7.7 All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, or processor, except as otherwise provided in the Contract Documents.
- 7.8 The Contractor will be fully responsible for all acts and omissions of his Subcontractors and of persons directly or indirectly employed by them and of persons for whose acts any of them may be liable to the same extent that the Contractor is responsible for the acts and omissions of the Contractor's own employees. Nothing in the Contract Documents shall create any contractual relationship between any Subcontractor or supplier and the Owner or the Designer, or any obligation on the part of the Owner or the Designer to pay or see to the payment of any money due any such Subcontractor or material furnisher except as may otherwise be required by law. The Owner or the Designer may furnish to any Subcontractor or supplier, to the extent practicable, evidence of amounts paid to the Contractor on account of specific Work done.
- 7.9 The divisions and sections of the Specifications and the identifications of any Drawings shall not control the Contractor in dividing the Work among Subcontractors.
- 7.10 The Contractor agrees to bind specifically every Subcontractor to the terms and conditions of the Contract Documents for the benefit of the Owner and to furnish written evidence thereof to the Designer and the Owner within seven (7) days after written request by the Owner.
- 7.11 The Contractor shall attend job progress conferences and all other meetings or conferences as directed by the Designer. The Contractor shall be represented at these job progress conferences by a representative having the authority of the Project Manager and by such other representatives as the Designer may direct. Job progress conferences shall



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be open to Subcontractors, suppliers and any others who may contribute beneficially toward maintaining required job progress, and such personnel shall be encouraged by the Contractor to attend. It shall be the principal purpose of job progress conferences to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the Project on schedule and to complete the Work and the Project by the specified Completion Dates. The Contractor shall be prepared to assess progress of the Work as required in the Contract Documents and to recommend remedial measures for correction of progress as may be appropriate. The Designer shall preside as chairman and arrange for minutes to be taken and circulated.

In the event that the prosecution of the Work is discontinued for any reason, the Contractor shall notify the Designer and the Owner at least forty-eight (48) hours in advance of resuming operations.

Should the terms of the Contract Documents require completion of one or more portions of the Work for the Beneficial Occupancy of the Owner prior to completion of the entire Work, the Contractor shall complete such portion(s) of the Work on or before the date specified. Such completion shall include the obtaining of all government or other permits, permission, and/or approvals necessary to occupancy. The Contractor shall independently estimate the difficulties involved in arranging the Work to permit such Beneficial Occupancy and shall not claim any additional compensation or time extension by reason of any delay or increased cost due to completing such portion(s) of the Work. The Owner's possession and use of such portion(s) of the Work shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents. The Owner shall be responsible for the security, maintenance, utilities, and insurance of all portions of the Work completed and beneficially occupied by the Owner.

- 7.12 The Contractor shall pay all license fees and royalties, and assume all costs incident to the use of any invention, design process, or device which is the subject of patent rights or copyrights held by others, except for inventions, design processes, or devices specified by the Designer in the Contract Documents. The Contractor shall indemnify and hold harmless the Owner, the Designer, and anyone directly employed by either of them, from and against all claims, damages, losses and expenses, including attorney's fees and costs of defense, arising out of any infringement or alleged infringement of such rights during or after completion of the Work, and shall defend all such claims in connection with any actual or alleged infringement of such rights.
- 7.13 The Contractor shall secure and pay for all permits, including without limitation construction permits and licenses, and will pay all governmental charges and inspection fees necessary for the prosecution of the Work.
- 7.14 The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the Work and shall protect and indemnify the Owner and the Owner's officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or by the Contractor's employees, Subcontractors, sub-subcontractors, or their employees.



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- 7.15 The Contractor shall be responsible for the entire site of the Project and for its reasonable and necessary protection and security, as required by laws or ordinances governing such conditions, or by custom or sound construction practices, and shall share such responsibilities as may be agreed upon among them, or in the absence of such agreement, as may be directed by the Contract Documents, Owner, or Designer. The Contractor shall be responsible for any damage to the Owner's property, or that of others, by the Contractor or the Contractor's employees, Subcontractors, sub-subcontractors, or their employees or agents, and shall make good such damages. The Contractor shall be responsible for and pay for any such claims against the Owner.
- 7.16 The Contractor shall protect all landscaping designated to remain in the vicinity of the operations and barricade all walks, roads, and areas as necessary to keep the public away from the construction.
- 7.17 The Contractor shall provide cover and/or protect all portions of the Work and provide all materials necessary to protect the Work whether performed by the Contractor or any of the Subcontractors or sub-subcontractors. Any Work damaged through the lack of proper protection, or from any other cause, shall be repaired or replaced without extra cost to the Owner or extension to the Contract Time.

The Contractor shall maintain the Work during construction and until the Work is accepted. This maintenance shall constitute continuous and effective effort prosecuted day by day, with adequate equipment and forces so that the Work is maintained in satisfactory condition at all times. All costs of maintenance shall be included in the Contract Price and the Contractor will not be paid an additional amount for such effort. Should the Owner or Designer observe that the Contractor at any time has failed to maintain the Work as provided herein, the Designer may immediately notify the Contractor of such non-compliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. Should the Contractor fail to properly respond to the Designer's notification, the Owner may, at the Contractor's expense, take such action as it may deem appropriate to remedy the defective maintenance, including suspension of the Contractor's Work or any part thereof. Any such expense incurred by the Owner shall be deducted from monies due or to become due the Contractor.

Parking lots, streets, and walks connecting to the Project area shall be protected by the Contractor from deposits of mud, sand, stone, litter, or debris in any form.

Pedestrian traffic areas around the construction limits must be maintained in a clean and safe condition at all times with required barricades and covered walkways. When excavation or other operations outside the Project limits is required, the Contractor shall, immediately following that work, return the area to its original condition.

All catch basins and storm drain lines in the vicinity of the Project site shall be protected at all times from entry of dirt, rubble and other debris. The residue from the cleaning of trucks, wheelbarrows, concrete buggies, etc. must be prevented from entering the drainage system, and if cleaning is done, the residue must be contained and removed from the Project site with other refuse.



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- 7.18 No burning of refuse or debris shall be allowed inside or around the Project during the course of construction without written authority from authorities having jurisdiction and the Owner.
- 7.19 The Contractor shall provide for and maintain necessary safety measures and safety programs for the protection of all persons involved with the Work. Such measures and programs shall include the requirements of the most current edition of the CAGC Safety and Health Manual [or the AGC Accident Prevention Manual in Construction], or equivalent requirements, and shall fully comply with all Federal, State, and local laws, rules, regulations, and building code requirements relating to the prevention of accidents or injuries to persons on or about the location of the Work.
- All trenches, excavations, or other hazards in the vicinity of the Work shall be well barricaded, and properly lighted at night. When Work requires closing of an area normally used by the Owner or the public, the Contractor shall furnish, erect, and maintain temporary barricades, and properly light the area. The Contractor shall comply with any directions and public authorities in this respect.
- 7.20 The Contractor shall designate a responsible officer or employee as safety inspector, whose duties shall include accident prevention on the Project as well as implementation of the Contractor's safety measures and safety programs on the Project. The name of the safety inspector shall be made known to the Designer and the Owner at the pre-construction conference.
- 7.21 In emergencies affecting the safety of persons, the Work, or property at the Project site or adjacent thereto, the Contractor is obligated to act in the Contractor's discretion to prevent threatened damage, injury, or loss. As soon as practicable, the Contractor shall notify the Designer and Owner of such emergency. The Contractor shall give the Designer and the Owner prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused by such emergency. If the Contractor believes that additional work done in an emergency entitles the Contractor to an increase in the Contract Price or an extension of the Contract Time, the Contractor may make a claim therefore as provided in Articles 14 and/or 15.
- 7.22 The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Work. At least weekly and at the completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the Project. At the completion of the Work, the Contractor shall remove all tools, construction equipment, machinery, and surplus materials. The Contractor shall leave the Work in condition for occupancy by the Owner such that no cleaning or other operations are required. Material cleared from the Project and deposited on adjacent property shall not be considered as having been disposed of satisfactorily. If the Contractor fails to keep the Project clean of waste materials or rubbish, fails to satisfactorily clean-up weekly or at the completion of the Work, the Owner may do so and the costs thereof may be deducted from any amounts due the Contractor.
- 7.23 Utilities, temporary facilities, and signs shall be provided as described in the Contract Documents. Absent a contrary direction in the Supplementary Conditions, the Contractor shall pay all bills for water, electricity, or other public utility service to the Project site.



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- 7.24 The Contractor shall indemnify and hold the Owner, the Designer, the Designer's consultants, and their officers, agents, and employees harmless against all costs, damages, and expenses, including attorney's fees and costs of defense, arising out of claims by any separate contractor or by any Subcontractor, sub-subcontractor, or supplier engaged by or employed by the Contractor or employed by any of the Subcontractors claiming through him, including without limitation damages, losses, and expenses arising out of or relating to any inconvenience, delay, interference, or other action or non-action of the Contractor or the Contractor's Subcontractors on the Project.

The Contractor acknowledges that should the Contractor or any of the Contractor's Subcontractors be damaged by any breach of contract by any other separate prime contractor on the Project, the Contractor may invoke applicable dispute resolution procedures with said other separate prime contractor or bring a direct civil action against said other separate prime contractor. The Contractor hereby expressly agrees that neither the Owner nor its officers, agents, or employees shall have any liability of any kind or nature whatsoever to the Contractor, its Subcontractors, sub-subcontractors, or suppliers arising out of or relating to any breach, inconvenience, delay, interference, or other action or non-action by any other separate prime contractor. The Contractor covenants not to sue the Owner for any loss or damage caused by any breach, inconvenience, delay, interference, or other action or non-action by any other separate prime contractor, notwithstanding whatever rights at law the Contractor might have to bring a civil action against the Owner for any breach, inconvenience, delay, interference, or other action or non-action of any other separate prime contractor. The Contractor agrees to look exclusively to the other prime contractor for relief or remedy.

Nothing contained herein or appearing anywhere in the Contract Documents shall obligate or require the Owner to exercise any right or privilege, or to take any action or to refrain from taking any action under any contract it may have with any other prime contractor or party to the Project for the benefit of the Contractor or any Subcontractor, sub-Subcontractor, or supplier claiming through the Contractor.

- 7.25 Prior to completion of the Work and Final Payment of the Contract Price, excepting only those portions of the Work deemed accepted in accordance with the Contract Documents, the Contractor shall have charge and care of the Work, and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the Work. The Contractor shall as required by the Owner replace, rebuild, repair, restore, and make good all injury or damage to any portion of the Work occasioned by any of the above causes before Final Completion and shall bear the expenses thereof.
- 7.26 In the event that the Work, or any portion thereof, is suspended at any time pursuant to an order of the Owner, the Contractor shall obey all instructions of the Owner regarding storage of materials, drainage, protection of the Work, and erection of temporary structures during the suspension period.
- 7.27 The Project Expediter for the Project shall be responsible for the coordination of the Work of itself and any other separate contractors, both as to space and time. The Project Expediter shall coordinate the implementation of the Contract Construction Schedule, all



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construction activities and close-out of the Project, including but not limited to all testing, inspection, certifications, and approvals required by public agencies.

The Contractor and the Project Expediter shall each be required to notify the Designer and the Owner promptly of any event or condition which could affect the conduct or progress of the Work and shall cooperate fully with all other contractors on the Project site.

- 7.28 The Owner hereby delegates to the Project Expediter all of its duties to coordinate and to expedite the Work not expressly reserved to the Owner by other provisions of the Contract Documents.
- 7.29 All Work performed pursuant to the Contract Documents shall conform in all respects to the North Carolina State Building Code and all other state, local, and national codes in effect at the time of and applicable to this Work.
- 7.30 The Contractor shall provide for and maintain necessary safety measures and safety programs for the protection of all persons at the Project site, and shall comply at all times with the requirements of the most current edition of the CAGC Safety and Health Manual [or the AGC Accident Prevention Manual in Construction], or the equivalent requirements of the Contractor's safety program, and shall fully comply with all Federal, State, and local laws, rules, regulations, and building code requirements so as to prevent accidents or injuries to persons on or about the Project site. The Contractor shall clearly mark or post signs warning of existing hazards, and shall barricade excavations, elevator shafts, stairways, and similar hazards. The Contractor shall protect against damage or injury resulting from falling materials, and shall maintain all protective devices and signs throughout the progress of the Work.
- 7.31 The Contractor shall adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor's Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926 as adopted in 13 NCAC 07F.0201, including 29 CFR Part 1910 General Industry Safety and Health Standards applicable to construction) and N.C. Gen. Stat. §95-126 through 155 (Occupational Safety and Health) as well as all revisions and amendments to such standards or statutes as may occur throughout the performance of the Work.
- 7.32 Any land disturbing activity performed by the Contractor in connection with the Project shall comply with all erosion control measures set forth in the Contract Documents and any additional measures which may be required in order to ensure that the Project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15 North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 NCAC 4A, 4B, and 4C), and as may be revised or amended in the future. Upon receipt of notice that a land-disturbing activity is in violation of said Act, the Contractor shall be responsible for ensuring that all steps or actions necessary to bring the Project in compliance with said Act are promptly taken. The Contractor shall be responsible for all penalties assessed pursuant to N.C. Gen. Stat. 113A-64 with respect to its Work, and shall indemnify and hold harmless the Owner from all costs and expenses, including attorney's fees and costs of defense arising out of or related to the enforcement of the Act against any party or person described in this Article.



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- 7.33 Any mechanical or electrical work such as sleeves, inserts, chases, etc. located in the Work of the Contractor for general work shall be built in by that Contractor. On multiple prime projects, the mechanical and electrical contractors shall set all sleeves, inserts, and other devices built into the structure in cooperation and under the supervision of the Contractor for general work. The responsibility for exact location of such items shall be that of the mechanical, plumbing, or electrical prime contractor.
- 7.34 The Contractor shall be responsible for permanently fixed service facilities and systems in use during progress of the Work and shall strictly adhere to the following procedures:
- a) Prior to acceptance of the Work by the Owner, the Contractor shall remove and replace any part of the permanent building systems damaged through use during construction.
 - b) Temporary filters shall be installed in each of the heating and air conditioning units, return air grilles, and other locations to prevent intrusion of dust, dirt, and debris during construction. Temporary filters shall be removed and replaced with new filters immediately prior to Substantial Completion.
 - c) Extra effort shall be maintained to keep the building clean and under no circumstances shall air systems be operated if finishing operations are creating dust in excess of what would be considered normal if the building were occupied.
 - d) When the permanent lighting system is used during construction, lamps shall be replaced and shall be new on the date of Substantial Completion.

ARTICLE 8. OWNER

- 8.1 The Owner shall issue communications and notices to the Contractor through the Designer to the extent contemplated by the Contract Documents.
- 8.2 In case of termination of the employment of the Designer, the Owner shall appoint as Designer a qualified person who shall have and assume all rights and duties held by the original Designer.
- 8.3 The Owner shall have the right to take possession of and use any portion of the Work notwithstanding the fact that the time for completion of such portion of the Work may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.
- 8.4 A waiver on the part of the Owner of any breach of any part of the Contractor shall not be held to be a waiver of any other or subsequent breach.
- 8.5 The Owner shall pay all permanent acreage fees, governmental impact fees, and meter deposits for permanent utilities.

ARTICLE 9. CONSTRUCTION MANAGER



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- 9.1 The Owner may employ one or more Construction Managers for the purpose of assisting the Owner, Designer, and Contractor in developing and administering budgets and cost controls, in evaluating constructability and value engineering proposals, in establishing and maintaining a critical path method (CPM) schedule, in coordinating and/or expediting the Work with other projects being constructed by the Owner or others adjacent or near the Work, or for such other purposes as the Owner may deem appropriate. From time to time the Owner may identify such Construction Managers(s) to the Contractor in writing identifying any tasks assigned to such Construction Managers(s).

ARTICLE 10. DESIGNER

- 10.1 The Designer is charged with the responsibility of interpretation of the Contract Documents. The Designer's decisions relating to aesthetic matters shall be final.
- 10.2 All Work completed under the Contract Documents shall be subject to review by the Designer. No Work is to be covered without the Designer's review or prior authorization. Any Work so covered without the Designer's review or prior authorization shall be uncovered at the Contractor's expense. The Contractor shall notify the Designer in writing at least twenty-four (24) hours in advance of covering any Work.
- 10.3 The Designer shall not be responsible for the construction means, methods, techniques, sequences, procedures, or the safety precautions and programs incident thereto, and shall not be responsible for the Contractor's failure to perform the Work in accordance with the Contract Documents, but shall be entitled to enforce any requirements in the Contract Documents specifying particular means, methods, techniques, sequences, or procedures.
- 10.4 The Designer shall be an Owner's representative during the construction period. The duties, responsibilities and authority of the Designer as the Owner's representative during construction are as set forth in the Contract Documents.

ARTICLE 11. TESTING AND SURVEYING

- 11.1 Laboratory and field tests to determine compliance of construction with the Contract Documents shall be made by the Owner or testing consultants employed by the Owner except those required elsewhere in the Contract Documents to be paid for by the Contractor. The costs and expenses of providing samples for and assistance in any testing shall be borne by the Contractor and are included in the Contract Price. Any Work in which untested materials are used without approval or written permission of the Designer shall be removed and replaced at the Contractor's expense. Work found to be unacceptable or unauthorized will not be paid for and, if directed by the Designer shall be removed and replaced at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of ASTM or other generally recognized or specifically authorized methods which are current on the date of advertisement for bids shall be made at the expense of the Owner; provided, however, in the event that after such testing any Work is found to be defective or does not meet the requirements of the Contract Documents, the costs of retesting such Work and the costs of inspection services shall be paid by the Contractor. Samples shall be taken by a testing laboratory employed by the Owner. All materials being used are subject to inspection, tests, or rejection at any time prior to or during incorporation into the Work. Copies of all Owner test reports will be



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furnished to the Contractor at his written request. Copies of Contractor test reports shall be furnished to the Designer upon written request.

11.2 The Owner shall have the right to deduct the costs of additional testing as described in paragraph 11.1 from any money due the Contractor; or if no money is due the Contractor, the Owner shall have the right to recover these costs from the Contractor, from its sureties, or from both.

11.3 All layouts and surveying shall be accomplished by properly qualified personnel duly licensed in the State of North Carolina.

ARTICLE 12. SEPARATE CONTRACTS

12.1 It is expressly understood that the Owner may deploy the Owner's own employees or engage other separate prime contractors to perform Work as a part of the Project whose work will be performed simultaneously and sequentially with the performance of the Work by the Contractor. It shall be necessary for the Contractor to coordinate construction activities with such other contractors, particularly with respect to access to work areas, storage of materials, and use of elevators and other common facilities. The Contractor shall diligently and in good faith cooperate with the Owner, the Designer, and all other contractors with respect to such matters and shall regularly and faithfully attend any and all meetings called by the Owner or the Designer with respect to such matters. Any disputes between the Contractor and any other separate prime contractor with respect to such matters shall be resolved in accordance with the claim and dispute resolution procedures in the Agreement.

ARTICLE 13. CONTRACT TIME

13.1 Within fourteen (14) days after receipt of the Construction Agreement by the Contractor for signatures, the Project Expediter shall prepare and submit to the Designer and Owner for review and approval a preliminary progress schedule for the Work pursuant to the requirements stated in the Contract Documents.

13.2 Within fourteen (14) days after initial receipt of the Construction Agreement for signatures the Contractor shall submit to the Designer a Submittal Register listing all Submittals the Contractor is required to make or proposes to make under the Contract Documents, the dates on which the Contractor proposes to make such Submittals and the dates by which the Contractor reasonably requires a response from the Designer with respect to each Submittal. The dates submitted shall be incorporated into the Contract Construction Schedule as Completion Dates when they have been approved or modified by the Owner. The Designer shall not be required to review any Submittal from the Contractor until a Submittal Register acceptable to and approved by the Owner has been submitted by the Contractor.

13.3 Not later than thirty (30) days following execution and delivery of the Construction Agreement by Owner to Contractor, the Owner shall deliver to the Contractor a Notice to Proceed. The Notice to Proceed shall state a commencement date on which it is expected that the Contractor will begin the Work to be performed under the Agreement. The Contract Time shall be measured from said specified commencement date. The commencement



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date stated in the Notice to Proceed shall not be earlier than three (3) days after the Notice to Proceed is served on the Contractor.

If, other than by mutual agreement, said specified commencement date is more than thirty (30) days after the date of execution and delivery of the Agreement from Owner to Contractor and the Contractor believes said delay justifies an increase in Contract Price and/or an extension of Contract Time, the Contractor may make a claim therefore as provided in Article 14 and/or Article 15.

No Work shall be done prior to the date specified in the Notice to Proceed.

A final Contract Construction Schedule shall be submitted for approval by the Contractor, Designer, and Owner no later than fourteen (14) days after Notice to Proceed. No payments shall be due the Contractor until this schedule is approved by all parties.

- 13.4 The Contract Construction Schedule is a Contract Document. The Contractor represents that the Contract Construction Schedule has been reviewed in detail, that the Contractor participated in its preparation, that all of the activities which impact, limit, or otherwise affect the time of completion of the Work are shown in the Contract Construction Schedule and that all of the activities of others which impact, limit, or otherwise affect the start, duration, or completion of the Contractor's activities are also shown. The Contractor further represents that the Contractor can and will complete each activity within the time shown for that activity. Time is of the essence with respect to each such activity and Completion Date.
- 13.5 If the Contractor submits a construction schedule, progress report, or any other document that indicates or otherwise expresses an intention to achieve completion of the Work prior to any Completion Date required by the Contract Documents or prior to expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.
- 13.6 If the Contractor, for reasons beyond the Contractor's control, is delayed in beginning any activity, the Contractor shall, nevertheless, have the same number of days as is shown in the Contract Construction Schedule for the activity, and the affected activity and any succeeding activity that is dependent upon that activity shall be adjusted accordingly; provided that at any time the Owner, by means of a Change Order, may require the Contractor to work overtime, to increase labor forces or to take any necessary or appropriate action to decrease the time required for any activity, and the Contractor shall be entitled to an adjustment in the Contract Price computed in accordance with Article 15 of these General Conditions.
- 13.7 At any time, the Owner may order the Contractor, on seven (7) days written notice, to begin any activity earlier than the starting date shown on the Contract Construction Schedule.
- 13.8 Should the Contractor fail to start any activity on the start date shown in the Contract Construction Schedule or as it may have been adjusted in accordance with paragraphs 13.5 or 13.6 above, or become delayed, the Contractor shall, without being entitled to any increase in the Contract Price or other compensation, work overtime, increase labor forces or take such other action as may be necessary or appropriate to complete the activity by



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the Completion Date shown on the Contract Construction Schedule, or as such Completion Date may have been adjusted.

- 13.9 The Designer and Owner or his Construction Consultant shall monitor progress of the Work at all times and the Contractor shall cooperate with such monitoring and provide any and all information with respect to the progress of the Work and scheduling as the Owner may reasonably require.
- 13.10 On a monthly basis, the Contractor shall revise the Contract Construction Schedule, showing any adjustments made in accordance with paragraphs 13.5 or 13.6, above, by any Change Order, the progress of the Work, and any days gained or days lost with respect to any activity, and shall furnish copies thereof to the Owner and Designer.
- 13.11 Should any monthly revision of any Contract Construction Schedule show that the Contractor is behind on any activity, the late completion of which could delay Substantial Completion of the Work, the Owner shall be entitled to withhold from the next Progress Payment due the Contractor an amount not exceeding the amount the Owner would be entitled to in Liquidated Damages, should Substantial Completion be delayed by the same number of days that the Contractor is currently behind schedule. If, subsequently, the Contractor's progress, as shown by any succeeding monthly revision to the Contract Construction Schedule, is such that the anticipated delay no longer exists, the Owner shall pay with the Progress Payment next due to the Contractor such amounts as have been withheld in accordance with this paragraph.
- 13.12 The Owner shall have the right to perform Work, hire and employ labor and craftsmen, rent equipment, subcontract with other parties, or do anything that the Owner deems necessary or appropriate to remedy or cure any delay by the Contractor in the progress of the Work. Such action by the Owner shall not, in any way, affect, void or limit any warranty, guaranty or other responsibility of the Contractor under the Contract Documents. Such action may be taken by the Owner only after three (3) days written notice to the Contractor. All costs incurred by the Owner in taking any such action shall be charged to the Contractor and deducted from any amounts remaining due under the Agreement.
- 13.13 The Contractor may be entitled to an extension of the Contract Time (but no increase in the Contract Sum) for delays arising from unforeseen causes beyond the control and without the fault or negligence of the Owner, the Contractor or the Contractor's Subcontractors as follows:
- a) Labor disputes and strikes that directly impact the critical path activities of the Contract Construction Schedule;
 - b) Acts of God, tornado, fire, hurricane, blizzard, earthquake, typhoon, or flood that damage completed Work or stored materials.
 - c) Acts of the public enemy; acts of the State, Federal, or local government in their sovereign capacities.
 - d) Abnormal inclement weather as defined in Article 13.14.



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- 13.14 On any day that the Contractor considers that the Project is delayed by adverse weather conditions, the Contractor shall identify in writing to the Designer and the Owner the adverse weather conditions affecting each activity, the specific nature of the activity affected, the number of hours lost, and the number of and identity (by responsibility or trade) of workers affected and shall obtain from the Designer written recognition of the delay. The time for performance of this Contract includes an allowance for a number of calendar days which may not be suitable for construction Work by reason of adverse weather. The Contract Time will be extended only if the number of calendar days of adverse weather recognized by the Designer exceeds the number of inclement weather days set forth below, and the Contractor demonstrates how this adverse weather impacts activities on the critical path of the Contract Construction Schedule.

<u>Month</u>	<u>Number of Inclement Weather Days</u>
January	10
February	10
March	10
April	9
May	10
June	9
July	11
August	10
September	8
October	7
November	8
December	9

- 13.15 If the Contractor believes that the progress of the Work has been adversely affected by adverse weather recognized by the Designer during a particular month, the Contractor shall submit a written request for extension of time to the Designer. Such a request for time extension of the Contract Time shall be submitted by the tenth (10th) day of the month following that month in which the adverse weather is encountered. The request shall include, but is not limited to, the following information:

- a) Detailed description of weather's effect on scheduled activities and its net effect on the critical path of the Project, and
- b) Weather records from the official weather station nearest the Project site and records of actual observation as contained in daily reports, correspondence, or other documentation.

- 13.16 The Contractor specifically recognizes that a delay by the Contractor in achieving any Completion Date can have the effect of delaying the Substantial Completion of the Project, that such delay in Substantial Completion of the Project will necessarily cause damages, losses, and expenses to the Owner, including, but not limited to and by way of illustration only, increased capitalized costs and interests for the Project, increased and extended Project overhead, Designer's and Consultant's fees, increased costs of construction, increased and extended operation costs of other facilities, and inefficiency and loss of productivity, and that such damages, losses, and expenses may not be readily identifiable or ascertainable at the time they are incurred or at any time. Therefore, and in recognition



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of these factors and the likelihood that actual damages from his delay will not be readily ascertainable, the Contractor agrees to pay to the Owner, as Liquidated Damages and not as a penalty, the sum identified in the Supplemental Conditions hereto as the Liquidated Damages per Day, for each day by which the failure to meet any Completion Date shown in the Contract Construction Schedule, adjusted in accordance with this Article, delays the Substantial Completion of the Project.

- 13.17 The Contractor shall not be entitled to any adjustment in the Contract Price or other compensation from the Owner for any delay in the completion of or progress on the Work that is caused by a force majeure condition or is otherwise not caused by the sole and direct act or omission of the Owner and the Owner's employees or agents.
- 13.18 The sum for Liquidated Damages is the amount stipulated in the Supplementary General Conditions per day per Prime Contractor as Liquidated Damages reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor(s) to complete the Work within the time specified, such time being in the essence of this contract and a material consideration thereof.

ARTICLE 14. CHANGES IN THE WORK

- 14.1 Without invalidating the Contract Documents, the Owner may, at any time, or from time to time order additions, deletions, or revisions in the Work. Said additions, deletions, or revisions shall be authorized only by written Change Orders, Construction Change Directives or Field Orders. Upon receipt of a Change Order, Construction Change Directive or Field Order, the Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any change causes an increase or decrease in the Contract Price and/or an extension or shortening of the Contract Time, adjustments shall be made as provided in Article 14 and/or Article 15.

In order to expedite the Work and avoid or minimize delay in the Work that might affect the Contract Price or Contract Time, the Designer may issue a Change Order in the form of a Construction Change Directive which when signed by the Owner and Designer, directs the Contractor to proceed promptly with the Work involved. Any claim for an adjustment in Contract Price or Time, if not defined in the Construction Change Directive, shall be promptly made in writing in accordance with the procedures defined in Article 15.2.

- 14.2 The Designer may authorize minor changes or alterations in the Work not involving change in the Contract Price or in the Contract Time and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. Such alterations shall not invalidate the Contract Documents nor release the surety. If the Contractor believes that any minor change or alteration authorized by the Designer entitles him to an increase in the Contract Price and/or an extension of Contract Time, he may make a claim therefore as provided in Article 14 and/or Article 15.
- 14.3 Except in an emergency endangering life or property, no change shall be made by the Contractor except upon prior written Change Order, Directive or Field Order authorizing such Change.



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- 14.4 Increases in the Contract Price and/or extensions of the Contract Time for additional Work performed by the Contractor shall only be in accordance with a written Change Order signed by the Owner and Designer. The Contractor shall not be entitled to additional time or to additional compensation for any Work performed or material supplied which is claimed to have been authorized or settled by an "oral" change, or by a "constructive" or "implied" change, or by a course of conduct, or by any action or non-action by the Owner, Designer, or any other persons, or by any means whatsoever other than by a written Change Order for such Work or material signed by the Owner and the Designer.
- 14.5 Changes in the Work resulting from emergency shall not invalidate the Contract Documents nor release the surety.
- 14.6 Neither the Owner nor the Designer shall be responsible for verbal instructions which have not been confirmed in writing, and in no case shall such instructions be interpreted as permitting a departure from the Contract Documents unless such instruction is confirmed in writing and supported by a proper Change Order, Construction Change Directive or Field Order, whether or not the cost is affected.
- 14.7 The Owner, in its sole discretion, may require that the Contractor notify the Contractor's sureties of any changes affecting the general scope of the Work or change in the Contract Price, and that the amount of applicable bonds shall be adjusted accordingly. If this requirement is exercised, the Contractor shall furnish proof of such adjustment to the Designer and the Owner.
- If this requirement is exercised, the Change Orders shall require written consent of the Contractor's surety. At the time of signing a Change Order, the Contractor shall be required to certify as follows:
- "I certify that all sureties have been notified that my contract has been altered by the amount of this Change Order, and that a copy of the approved Change Order will be mailed to all sureties upon its receipt by me."
- If this requirement is exercised, no payment to the Contractor on account of any Change Order shall become due or payable until written evidence of the surety's consent to the Change Order has been furnished to the Designer and to the Owner, and the furnishing of such written consent is a condition precedent to such payment.
- 14.8 The Contractor shall support all requests for Change Orders with a detailed cost breakdown showing cost of materials, labor, equipment, transportation, other items, Contractor's overhead and profit, and total cost, in accordance with methods defined in this Article, and, if the request seeks an extension of the Contract Time, with a time-related diagram which demonstrates specifically why an increase in construction time is needed.
- 14.9 When a request for a Change Order involves a Subcontractor, the Contractor shall provide quotation from same on Subcontractor's letterhead. The Subcontractor's quote shall list materials, equipment, and labor separately, and show overhead and profit in the manner provided in paragraph 14.8.

ARTICLE 15. CHANGE OF THE CONTRACT PRICE



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15.1 The Contract Price constitutes the total compensation payable to the Contractor for performing all Work under the Contract Documents. All duties, responsibilities, and obligations assigned to or undertaken by the Contractor shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order.

15.2 Any claim for an adjustment in the Contract Price shall be in writing and written notice of any event, action, or non-action which may become the basis of a claim shall be delivered to the Owner and the Designer within three (3) days of the occurrence, or the beginning of the occurrence, of any such event, action or non-action giving rise to the claim. Such written notice is a condition precedent to the making of a claim, and such notice shall describe the basis of the potential claim with reasonable detail and clarity.

A claim shall be made in writing and shall be delivered to the Designer and the Owner no later than fourteen (14) days after such notice. The claim shall describe in detail the basis for the claim, with specific reference to any provisions of the Contract Documents, by paragraph, drawing number, or other specific identification, and shall state the amount claimed and how it is calculated. If the Contractor, at the time the claim is made, is unable to state the amount claimed with accuracy, the Contractor shall so state and provide the estimated amount and the basis on which the amount is to be calculated. At the earliest date practicable, but in no event more than thirty (30) days after Contractor's notice of claim, the Contractor shall supplement the claim with an accurate statement of the amount claimed and how it has been calculated. The Contractor shall provide, in writing, in support of the claim all such explanations, arguments, data, receipts, expert opinions, or other documents or information as the Contractor deems appropriate to be considered in support of the claim. A claim may properly be rejected by the Owner by reason of the Contractor's failure to submit adequate or accurate documentation or information, except that within seven (7) days after being given notice that the claim has been rejected on this basis, the Contractor may submit additional documentation or information. No claim for a change of the Contract Price shall be considered or granted (except solely at the discretion of the Owner) unless a claim is so made, nor shall the Contractor be entitled to any increase in the Contract Price unless the Contractor has given notice and made such a written claim within the times required. The Owner shall decide, after obtaining the advice of the Designer, whether an increase in Contract Price is warranted, and the amount of such increase shall be determined as provided in paragraph 15.4 through 15.5, below. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

The Owner shall advise the Contractor of its decision with respect to the claim within fourteen (14) days of its receipt, or of the receipt of additional documentation or information if the absence of such has previously been the basis of rejection of the claim; provided, however, that if, in its sole discretion, the Owner deems that review or consideration of any part of the claim or any matter related thereto by its governing Board is necessary or appropriate, it shall so advise the Contractor and shall provide its decision to the Contractor within seven (7) days after such Board consideration, review or action. Any claim on which the Owner has not provided its decision to the Contractor within the applicable time period shall be deemed denied.



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If the Contractor is not satisfied with the decision of the Owner, the Contractor may within seven (7) days of receipt of the Owner's decision initiate the mediation process as described in Appendix A to the General Conditions of the Contract for Construction.

- 15.3 In determining the amount of a Contract Price adjustment, the parties shall apply the following methods, as appropriate:

(A) Change in Work: The Owner and Contractor shall negotiate in good faith and attempt to agree upon the value of any change (extra or decrease) in Work prior to the issuance of a Change Order covering said Work. Such Change Order shall set forth the corresponding adjustment to the Contract Price. In the event the Owner and the Contractor are unable to agree, the Owner shall grant an equitable adjustment in the Contract Price.

(B) Emergency Work: In the event of emergency endangering life or property, the Contractor may be directed by the Designer to proceed on a time and material basis, whereupon the Contractor shall so proceed and keep accurately, in such form as may be required by the Designer, a correct account of costs together with all proper invoices, payrolls, and supporting data therefore.

- 15.4 Where the Contract Price is to be adjusted, the following limitations shall apply in determining the amount of adjustment:

(A) In the case of extra or emergency work, the Contract Price shall not be increased by more than the reasonable, actual, and documented net cost of the extra or emergency work plus ten percent (10%) of such net cost on Work performed by the Contractor and five percent (5%) thereof on any subcontracted Work for overhead and profit combined.

(B) In the case of a decrease in Work, the Contract Price shall not be decreased by less than the net cost of the deleted Work plus five percent (5%) of such direct net cost for profit and overhead.

The term 'net cost' as used herein shall include, as applicable, and shall be limited to, all direct labor, direct material, direct equipment, labor burden, sales taxes, shipping and handling charges, permits and fees, and insurance and bond premium adjustments, if any, attributable to the change. All other items of cost shall be considered as overhead and covered by the percentages allowed in sections A and B of this paragraph.

The Contractor shall provide worksheets or tabulations describing the method by which the direct net cost was calculated, and shall provide all data needed to support the calculation of the direct net cost, all in a form acceptable to the Owner.

- 15.5 Where the Contract Price is to be adjusted by negotiation, the Owner may authorize and designate the Designer to negotiate with the Contractor on behalf of the Owner; provided, however, any agreement reached between the Contractor and Designer shall be subject to approval by the Owner.



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ARTICLE 16. UNFORESEEN CONDITIONS

- 16.1 Should the Contractor encounter unforeseen conditions at the Project site materially differing from those shown on the Drawings or indicated in the Specifications or differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Agreement, the Contractor shall immediately, and in no event more than three days later, give notice to the Owner of such conditions before they are disturbed. The Owner and the Designer shall thereupon promptly investigate the conditions and if they find that they materially differ from those shown on the Drawings or indicated in the Specifications, they shall at once make such changes in the Drawings and/or Specifications as they may find necessary. Any increase or decrease in the Contract Price resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional Work and changes. However, neither the Owner nor the Designer shall be liable or responsible for additional work, costs, or changes to the Work that could have been reasonably determined from any reports, surveys, and analyses made available for the Contractor's review or that could have been discovered by the Contractor through the performance of its obligations pursuant to the Contract Documents.

ARTICLE 17. CORRECTION OF WORK BEFORE FINAL PAYMENT

- 17.1 The Owner has the authority to stop or suspend work, and the Designer has the authority to order Work removed or to order corrections of defective Work or Work not in compliance with the Contract Documents where such action may be necessary to ensure successful completion of the Work.

Any work, materials, fabricated items, or other parts of the Work which have been found by the Designer to be defective or not in accordance with the Contract Documents shall be condemned and shall be removed from the Project by the Contractor, and immediately replaced by new Work in accordance with the Contract Documents at no additional cost to the Owner. Work or property of the Owner or others damaged or destroyed by virtue of such condemned Work shall be made good at the expense of the Contractor.

Correction of condemned Work described above shall be commenced by the Contractor within twenty-four (24) hours after notice from the Designer or the Owner and shall be pursued to completion. Should the Contractor fail to proceed reasonably with the above-mentioned corrections, the Owner may, three (3) days after the notice specified in the preceding sentence, proceed with correction, paying the cost, including costs of uncovering such condemned Work, of such corrections from amounts due or to become due to the Contractor.

Condemned Work removed shall be the property of the Contractor and shall be removed from the Project by him within ten (10) days after notice to remove it, and if not then removed, thereafter may be disposed of by the Owner without compensation to the Contractor and the cost of such disposal shall be deducted from amounts due or to become due to the Contractor.



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Should the cost of correction of the Work and, if applicable, disposal of the condemned Work by the Owner exceed amounts due or to become due the Contractor, then the Contractor and the Contractor's sureties shall be liable for and shall pay to the Owner the amount of such excess.

ARTICLE 18. CORRECTION OF WORK AFTER SUBSTANTIAL COMPLETION; WARRANTIES AND GUARANTIES

- 18.1 Neither the final certificate, Final Payment, occupation of the premises by the Owner, nor any provision of the Contract Documents, nor any other act or instrument of the Owner or the Designer shall relieve the Contractor from responsibility for negligence, defective material or workmanship, or failure to comply with the Contract Documents.
- 18.2 The Contractor shall, at the Contractor's sole cost and expense, make all necessary repairs, replacements, and corrections of any nature or description, interior or exterior, structural or non-structural, that shall become necessary by reason of defective workmanship or materials which appear within a period of one (1) year from the date of Substantial Completion; provided, however that notwithstanding the preceding, if any longer guarantee period is specified for any particular materials or workmanship under the Contract Documents, or under any subcontract, or in connection with any manufactured unit which is installed in the Project, or under the laws of the State of North Carolina, the longer guarantee period shall govern.
- 18.3 If, within any guarantee period, repairs or changes are required in connection with the Work, which are rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents, the Contractor shall, promptly upon receipt of notice from the Designer and without expense to the Owner:
- a) Completely repair or replace the Work so that it conforms to the Contract Documents;
 - b) Correct all defects therein;
 - c) Make good all damage which, in the opinion of the Designer, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents; and
 - d) Make good any Work or material, or any equipment or contents disturbed in fulfilling any such guarantee.

If, in fulfilling the requirements of the Contract Documents or of any guarantee embraced therein or required thereby, the Contractor disturbs any work, facility, premises, or construction belonging to the Owner, the Contractor shall restore such disturbed work to a condition satisfactory to the Owner, and shall guarantee such restored work to the same extent as if it were Work under the Contract Documents.

If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected, and the Contractor and the



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

Contractor's sureties shall be liable for all expenses incurred. "Promptly" is defined as within twenty-four (24) hours for systems necessary to normal operation of the building and within seventy-two (72) hours for all other items. All special guarantees applicable to definite parts of the Work that may be shown in or required by Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee. Manufacturer's standard guarantees or warranties which do not comply with the time limit specified herein shall be extended by the Contractor automatically without further action on the part of the Owner or the Designer.

- 18.4 In the eleventh calendar month after the date of Substantial Completion, and at the request of the Owner, the Contractor, the Owner and the Designer shall make an inspection of the Work for the purpose of identifying defective workmanship and/or materials. If the Contractor, having been requested to do so by the Owner, fails to participate in such inspection, the Contractor shall be conclusively bound by any decision or ruling by the Designer as to any defective workmanship or material and as to the Contractor's responsibility for its repair or replacement.

ARTICLE 19. OWNER'S RIGHT TO DO WORK

- 19.1 If, during the progress of the Work or during any period of guarantee, the Contractor fails to prosecute the Work properly or to perform any provision of the Contract Documents, the Owner, after three (3) days written notice to the Contractor from the Designer, or from the Owner after Final Payment, may perform or have performed that portion of the Work and may deduct the cost thereof from any amounts due or to become due the Contractor. Notwithstanding any action by the Owner under this paragraph, all warranties and bonds given or to be given by the Contractor shall remain in effect or shall be given by the Contractor.
- 19.2 Should the cost of such action by the Owner exceed the amount due or to become due the Contractor, the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of such excess.

ARTICLE 20. PARTIAL PAYMENTS

- 20.1 Within thirty (30) days after his initial receipt of the Construction Agreement for signatures, the Contractor shall submit to the Designer a Schedule of Values. The Schedule of Values shall indicate the value of the Work, including applicable overhead and profit, for each Division and section of the Project Specifications. The Designer and Owner shall be provided with the Contractor's estimate papers, Subcontractor agreements, supplier quotes, or other documents substantiating these values if so requested in writing by the Designer. The Contractor shall provide the requested documentation within seven (7) days after receipt of the Designer's written request. The Schedule of Values shall be subject to approval by the Owner, and if the Owner and the Contractor cannot agree upon the Schedule of Values, the Designer shall prepare it, and the Schedule of Values as prepared by the Designer shall be binding on the Owner and the Contractor. No Request for Payment shall be certified by the Designer until the Designer has issued approval of said Schedule of Values.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

20.2 Not later than the fifth (5th) day of each calendar month the Contractor shall submit to the Designer a Request for Payment for Work done during the previous calendar month. The Request for Payment shall be in form of AIA Document G702 (latest edition) and shall show substantially the value of Work done (including the value of material delivered to the Project or stored by the Contractor at another site, subject to the conditions hereinafter set forth) during the previous calendar month, and shall sum up the financial status of the Work with the following information:

- a) Total Contract Price, including any adjustment thereto made pursuant to the Contract Documents.
- b) Value of Work completed and materials properly stored to date.
- c) Less amount retained.
- d) Less previous payments.
- e) Current amount due.
- f) Balance remaining.

The Contractor, upon request of the Designer, shall substantiate the request with invoices, vouchers, payrolls, or other evidence.

20.3 When payment is requested or made on an account of stored materials, such materials must be stored on the Owner's property at such places and in such a manner as may be designated by the Designer. However, in the sole discretion of the Owner, with permission in writing from the Designer and Owner and under such circumstances as may be determined by the Owner, such materials may be stored in a bonded warehouse. The location and conditions for storage of such materials away from the Owner's property in a bonded warehouse shall be within the sole discretion of the Owner. Requests for Payment on account of stored materials shall be accompanied by paid invoices, bills of sale, warehouse receipts, or other documentary evidence establishing Owner's title to such materials, evidence that the stored materials are insured against loss and damage, and such other documentation as required by the Designer. Responsibility for the quantity, quality, and condition of such stored materials, whether stored on the Owner's property or away from the Owner's property, shall remain with the Contractor regardless of ownership or title. No payment shall be made on account of materials stored in a bonded warehouse unless the Contractor has acquired written permission from the Designer for such storage of materials and has complied with all conditions set forth in such permission regarding such storage of materials in a bonded warehouse.

20.4 Any Request for Payment received by the Designer on or before the fifth (5th) of the calendar month shall be certified for payment or returned for re-submission to the Contractor on or before the fifteenth (15th) of the calendar month. The Designer's certification shall be for the amount which was requested or that which the Designer has decided was justly due, and shall state in writing to the Contractor and Owner the reasons for withholding payment of any or all of the amount requested.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

- 20.5 The Designer may fail to certify all or part of any payment requested for any of the following reasons:
- a) Defective Work not corrected.
 - b) Suits, actions, or claims of any character filed against the Contractor, or due to the operations of the Contractor, or information or notice that a suit, action, or claim will be filed or has been made.
 - c) Information or notice that a Subcontractor or a supplier has not received payment.
 - d) The balance unpaid of the Contract Price is insufficient to complete the Work in the judgment of the Designer or Owner.
 - e) Damage to the Owner or another contractor.
 - f) Inability of the Contractor to meet a Completion Date, including an anticipated failure to meet a Completion Date entitling the Owner to withhold anticipated Liquidated Damages in accordance with paragraphs 13.16 and 13.18 hereof.
 - g) Failure to furnish Submittal as required by the Contract Documents on a timely basis in accordance with the Submittal Register.
 - h) Such other reason as to the Designer may appear prudent, proper, or equitable.

When grounds for withholding certification have been corrected, the Designer shall so certify to the Owner and the Owner shall make any payment due with respect to such certification as a part of his next payment after such certification.

- 20.6 No certificate issued or progress payment made shall constitute an acceptance of the Work or any part thereof.
- 20.7 The amount certified by the Designer for payment shall be ninety-five percent (95%) of the value of Work completed and materials stored since the Designer's last certification as shown on the Request for Payment, less any amounts not certified in accordance with paragraph 20.4, and this amount shall be paid by the Owner on or before the last business day of the month, but payment shall not be past due until not paid within fifteen (15) days thereafter.
- 20.8 After certification by the Designer that the Work is fifty percent (50%) complete, based on a determination that the Contractor's gross project invoices, excluding the value of materials stored off-site, equal or exceed fifty percent (50%) of the value of the Contract, (except the value of materials stored on-site shall not exceed twenty percent (20%) of the Contractor's gross project invoices for the purpose of determining whether the Project is fifty percent (50%) complete) and the Contractor has provided to the Owner the written consent of its sureties to the cessation of further percentage retention, the amount certified for payment with respect to subsequent Requests for Payment shall be one hundred percent (100%) of the value of Work completed and materials stored since the Designer's last certification as shown on the Request for Payment, less any amounts not certified in accordance with



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paragraphs 20.4 and 20.5; provided, however, that the aggregate of periodic payments shall not exceed ninety-seven and one half percent (97.5%) of the Contract Price. If the Owner determines that the Contractor's performance under the Contract is unsatisfactory, the Owner may resume withholding percentage retention from each subsequent periodic payment application up to the maximum amount of five percent (5%) of the Contract Price.

ARTICLE 21. FINAL PAYMENT

- 21.1 If the Work of the Contractor is limited to demolition, pilings, caissons and/or structural steel, the remaining unpaid balance of the Contractor's Contract Price, less a sum equal to five-tenths percent (0.5%) of the Contract Price, shall be paid within sixty days following receipt of the following documents, all of which must be received before payment shall become due: (i) request for payment from the Contractor; (ii) receipt of consent from the Contractor's surety to the payment; and (iii) approval or certification from the Designer that the work performed by the Contractor is acceptable and in accordance with the Contract Documents.
- 21.2 Except as set forth in paragraph 21.1, within forty five days after Substantial Completion of the Project, the remaining unpaid balance of the Contract Price shall be paid to the Contractor, less an amount equal to two and one-half times the value of punch list work or other work remaining to be completed or corrected, as reasonably estimated by the Owner.
- 21.3 Upon Substantial Completion, the Designer shall prepare and submit to the Contractor a deficiency list identifying all portions of the Work which are known by the Designer at that time to be incomplete or defective. Within thirty (30) days of receipt of this deficiency list, the Contractor shall complete and correct all items on that list along with all other Work required to achieve Final Completion of the Work. At any time prior to completion of the period of warranty, the Designer may submit to the Contractor a supplemental deficiency list, in which case the Contractor shall complete or correct any and all new items identified on the Supplemental deficiency list within the time period stipulated in paragraph 18.3.
- 21.4 Final Payment of any remaining balance of the Contract Price shall not be due to the Contractor until the Contractor achieves Final Completion of the Project.
- 21.5 The making and acceptance of Final Payment shall constitute a waiver of all claims by the Owner except:
- a) Claims arising from unsettled liens or claims against the Contractor.
 - b) Defective Work or materials appearing after Final Payment.
 - c) Failure of the Contractor to perform the Work in accordance with the Contract Documents.
 - d) As conditioned in the Performance Bond.
 - e) Claims made prior to Final Payment which remain unsettled.
 - f) Amounts due arising under Articles 18 and 28.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

- g) Claims for recovery of overpayment based upon incorrect measurement, estimate, or certificate.
- 21.6 The making and acceptance of Final Payment shall constitute a waiver of all claims by the Contractor except those claims previously made in writing pursuant to paragraph 15.2 and not finally resolved.
- 21.7 The Designer shall not authorize Final Payment until all of the Work under the Contract Documents has been certified by the Designer as completed, proper and suitable for occupancy and use, and has been approved by all federal, state and local agencies having jurisdiction.
- 21.8 The final Request for Payment shall be identified on its face as such and shall be presented by the Contractor to the Designer within thirty (30) days of completion of the Work. Final payment of the retained amount due the Contractor shall be made by the Owner within thirty (30) days after the later of (i) full and Final Completion of all Work required by the Contract Documents, and certification of such Work in accordance with paragraph 20.4; (ii) submission of the affidavits of other documentation required by Article 22; (iii) submission by the Contractor of a Request for Payment identified on its face as final and including the Designer's certification.

ARTICLE 22. CONTRACTOR, SUBCONTRACTOR AND SUPPLIER AFFIDAVIT

- 22.1 The Final Payment due the Contractor on account of the Contract Documents shall not become due until the Contractor has furnished to the Owner through the Designer: (A) an affidavit by the Contractor signed, sworn, and notarized to the effect that all payments for materials, services, or for any other reason in connection with the Work or performance of the Contract Documents have been satisfied and that no claims or liens exist against the Contractor in connection with the same; (B) affidavits from each Subcontractor and supplier signed, sworn, and notarized to the effect that (i) each such Subcontractor or supplier has been paid in full by the Contractor for all Work performed and/or materials supplied by him in connection with the Project, and (ii) that all payments for materials, services, and for any other reason in connection with the subcontract or supply contract have been satisfied and that no claims or liens exist against the Subcontractor or supplier in connection therewith; and (C) the written consent of the Contractor's sureties to Final Payment. In the event that the Contractor cannot obtain an affidavit, as required above, from any Subcontractor or supplier, the Contractor shall state in the Contractor's affidavit that no claims or liens exist against such Subcontractor or supplier to the best of the Contractor's knowledge, and that if any appear afterwards, the Contractor shall save the Owner harmless for all costs and expenses, including attorneys fees, on account thereof.

ARTICLE 23. ASSIGNMENTS AND SUBCONTRACTS

- 23.1 The Contractor shall not assign any portion of this Agreement nor subcontract the Work in its entirety without the prior written consent of the Owner. Except as may be required under terms of the bonds required by the Contract Documents, no funds or sums of money due or to become due to the Contractor under the Contract Documents may be assigned.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 24. MEASUREMENTS

- 24.1 Before ordering material or doing Work which is dependent for proper size or installation upon coordination with building conditions, the Contractor shall verify all dimensions and shall be responsible for the correctness of same. No consideration will be given for any claim based on differences between the actual dimensions and those indicated in the Contract Documents. Any discrepancies between the Contract Documents and the existing conditions shall be referred to the Designer for adjustment before any Work affected thereby is begun.

ARTICLE 25. CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

- 25.1 Within thirty (30) days after initial receipt of the Construction Agreement for signatures the Contractor shall submit to the Designer and Owner for acceptance a current list of the names of Subcontractors and such other persons and organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for any and all portions of the Work. The Contractor shall provide this list at this time even if the Contractor was required to submit a list of proposed Subcontractors with the Contractor's bid. The Designer shall promptly reply to the Contractor in writing stating whether or not the Owner or the Designer, after due investigation, has objection to any such proposed person or entity or if it needs additional information to evaluate the persons on the list. Failure of the Designer to reply within ten (10) days after the Contractor has furnished all required information shall constitute notice of no objection.

The Contractor shall not contract with any such proposed person or entity to whom the Owner or the Designer has made reasonable objection. If the Designer or Owner has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner and the Designer have no reasonable objection. The Contractor shall make no substitution for any Subcontractor, person, or entity previously allowed without first notifying the Designer and Owner in writing and no substitution may be made if the Owner or Designer makes a reasonable objection to such substitution.

- 25.2 The Contractor agrees that the terms of the Contract Documents, including all portions thereof, shall apply to all Subcontractors of the Contractor as if they were the Contractor, and that the Subcontractors of the Contractor shall, by means of their subcontracts, be bound by all the terms of the Contract Documents including, but not limited to, Article 26 of these General Conditions.
- 25.3 Payments to Subcontractors shall be made in accordance with the provisions of N.C. Gen. Stat. §143-134.1.

ARTICLE 26. USE OF PREMISES

- 26.1 The Contractor shall confine apparatus, the storage of materials, the operations of workers, and the disposal of material to limits indicated by law, ordinances, permits, and directions of the Designer, if any.
- 26.2 The Contractor shall not load or permit any part of the Work to be loaded with a weight that will endanger its safety, intended performance, or configuration.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

- 26.3 The Contractor shall enforce all of the Designer's instructions, including, but not limited to, those regarding signs, advertisements, fires, and smoking.

ARTICLE 27. CUTTING, PATCHING AND FITTING

- 27.1 The Contractor shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly and fit it to receive or to be received by Work shown in or which can be reasonably implied from the Contract Documents.

ARTICLE 28. DISPUTE RESOLUTION

- 28.1 The laws of the State of North Carolina shall apply to the interpretation and enforcement of this Agreement. Any and all suits or actions to enforce, interpret, or seek damages with respect to any provision of, or the performance or nonperformance of, this Agreement shall be brought in the General Court of Justice of North Carolina sitting in Wake County, North Carolina, and it is agreed by the parties that no other court shall have jurisdiction or venue with respect to such suits or actions. Appendix A shall be a part of the Contract Documents. Prior to initiating an action under this Article, any party to this Agreement shall initiate the mediation process as provided in Appendix A to these General Conditions of the Contract for Construction.
- 28.2 Any person or firm that expressly or impliedly agrees to perform labor or services or to provide material, supplies, equipment, work, performance or payment bonds, insurance or indemnification for the construction of the Project or the Work shall be deemed a party to this Agreement solely for the purpose of this Article 28. The Contractor, by means of its subcontracts, shall specifically require its Subcontractors to be bound by this Article.

ARTICLE 29. TAXES

- 29.1 The Contractor has included in the Contract Price and shall pay all taxes assessed by any authority on the Work or the labor and materials used therein. The Contractor shall maintain all tax records during the life of the Project and furnish the Owner with a complete listing of all taxes paid by taxing authority, invoice number, date, amount, etc. in a form acceptable to the Owner. The Contractor is required to maintain a file showing taxes paid on the Project for three (3) years after Final Payment or turn said documents over to the Owner for his files.
- 29.2 The following is a list of requirements to be followed by the Contractor in maintaining proper records and reporting the North Carolina Sales and Use Tax and Local Sales and Use Tax. The Contractor shall comply fully with the requirements outlined below, in order that the Owner may recover the amount of the tax permitted under the law.
- a) It shall be the Contractor's responsibility to furnish the Owner documentary evidence showing the materials used and sales and use tax paid by the Contractor and each of his Subcontractors. Such evidence shall be transmitted to the Owner with each pay request regardless of whether taxes were paid in that period.



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

- b) The documentary evidence shall consist of a certified statement by the Contractor and each of the Contractor's Subcontractors individually, showing total purchases of materials from each separate vendor and total sales and use taxes paid to each vendor. Certified statements must show the invoice number, or numbers, covered, and inclusive dates of such invoices.
- c) Materials used from Contractor's or Subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices.
- d) The Contractor shall not be required to certify the Subcontractor's statements.

ARTICLE 30. OPERATION OF OWNER'S FACILITIES

- 30.1 The Contractor agrees that all Work done under the Contract Documents shall be carried on in such a manner so as to ensure the regular and continuous operation of the adjoining or adjacent facilities. The Contractor further agrees that the sequence of operations under the Contract Documents shall be scheduled and carried out so as to ensure said regular and continuous operation. The Contractor shall not close any areas of construction until so authorized by the Designer. The Contractor shall control operations to assure the least inconvenience to the public. Under all circumstances, safety shall be the most important consideration.

ARTICLE 31. THIRD PARTY BENEFICIARY CLAUSE

- 31.1 It is specifically agreed between the parties executing the Agreement that, with the specific exception set forth paragraph 7.24 hereof, and that exception only, the Contract Documents and the provisions therein are not intended to make the public, or any member thereof, a third-party beneficiary of the Agreement, or to authorize anyone not a party to the Contract Documents to maintain a suit for personal injuries or property damage pursuant to the terms of provisions of the Contract Documents.

ARTICLE 32. MEASUREMENT OF QUANTITIES

- 32.1 All Work completed under the Contract Documents shall be measured by the Contractor using United States customary units of measurement. The method of measurement and computations to be used in determination of quantities of material furnished and of Work performed under the Contract Documents shall be those methods set forth in the Contract Documents or, if not specifically set forth therein, the method generally recognized as conforming to good engineering practice.

ARTICLE 33. TERMINATION BY THE OWNER FOR CAUSE

- 33.1 If the Contractor fails to begin or complete the Work under the Contract Documents within the time specified, or fails to perform the Work with sufficient labor and equipment or with sufficient materials to insure the prompt completion of said Work, or shall perform the Work unsuitably or shall discontinue the prosecution of the Work for three (3) days, or if the Contractor shall become insolvent, be declared bankrupt, commit any act of bankruptcy or insolvency, allow any final judgment to stand against the Contractor or its affiliated



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companies unsatisfied for a period of forty-eight (48) hours, make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the Work in an acceptable manner, the Owner may give notice in writing to the Contractor and the Contractor's sureties of such delay, neglect, or default, specifying the same, and if the Contractor within a period of three (3) days after such notice shall not proceed in good faith and with reasonable speed to correct such delay, neglect, or default in accordance with such notice, the Owner shall have full power and authority, to the extent permitted by law, without violating the Contract Documents, to take the prosecution of the Work out of the hands of the Contractor, to appropriate or use any or all materials and equipment at the Project as may be suitable and acceptable, and may enter into an agreement for the completion of the Work or pursue such other methods as in the Owner's opinion shall be necessary or appropriate for the completion of the Work in an acceptable manner. All costs and charges incurred by the Owner in proceeding in accordance with the preceding sentence, including attorney's fees, and all costs incurred by the Owner in completing the Work shall be deducted from any money due or which becomes due the Contractor. If such costs and expenses incurred by the Owner shall be less than the sum which would have been payable under Contract Documents if it had been completed by the Contractor, then the Contractor shall be entitled to receive the difference, but if such costs and expenses shall exceed the sum which would have been payable under the Contract Documents, the Contractor and the Contractor's surety shall be liable to the Owner for and shall pay to the Owner the amount of such excess.

ARTICLE 34. TERMINATION OR SUSPENSION BY THE OWNER FOR CONVENIENCE

- 34.1 The Owner may, without cause, order the Contractor to terminate, suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.
- 34.2 If the Contractor is subsequently ordered by the Owner to resume the Work, any cost or expenses to which the Contractor may be entitled by reason of the suspension, delay, or interruption shall be recovered by means of a Change Order in accordance with Articles 13 and 14 hereof and the Contract Construction Schedule shall be adjusted in accordance with Article 13 hereof.
- 34.3 The Owner shall terminate the Work or portion thereof by written notice when the Contractor is prevented from proceeding with the Work as a direct result of an executive order of the President with respect to the prosecution of war or in the interest of national defense.
- 34.4 In the event of termination by the Owner under this Article, the Contractor shall be entitled to receive the reasonable and documented direct costs incurred prior to termination, including the cost of materials purchased for the Work which purchases cannot be canceled or which material cannot reasonably be used by the Contractor on other work, and the cost of closing down the Project in a safe and efficient manner, plus ten percent (10%) thereof for overhead and profit, subject to the following conditions:
 - a) When the Contract is terminated before completion of all items of Work, payment shall be made for the actual number of units or items of Work completed at the applicable contract prices, or as mutually agreed for items of Work partially complete. If a mutual agreement cannot be reached, the Owner shall have the



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

authority to make such equitable adjustment as it deems warranted and the Final Payment shall be made accordingly.

- b) Reimbursement for organization of any Work and moving equipment to and from the job shall be considered when not otherwise provided for in the Contract Documents where the volume of completed Work is too small to compensate the Contractor for those expenses under unit prices. If a mutual agreement cannot be reached, the Owner will have the authority to make such equitable adjustments as it deems warranted and the Final Payment will be made accordingly.
- c) Materials obtained by the Contractor for the Work that have been inspected and accepted by the Designer and that are not incorporated in the Work shall, at the request of the Contractor, be purchased from the Contractor at the Contractor's actual cost as shown by receipted bills and actual costs records at such points of delivery as may be determined by the Owner.
- d) No payment shall be made by Owner to Contractor except as herein above provided. No claim for loss of anticipated profits shall be considered or allowed.
- e) Termination of the Contract shall not relieve the Contractor of his responsibilities for any completed portion of the Work nor shall it relieve his sureties of their obligation for and concerning any just claims arising out of the Work performed.

The Contractor shall not be entitled to any other compensation, including compensation for lost profit, lost opportunity, or any other direct or consequential cost, loss, or damage.

~~ARTICLE 35. MINORITY BUSINESS ENTERPRISE PROGRAM~~

- ~~35.1 The Contractor shall at all times comply with the latest edition of the Wake County Minority Business Enterprise Policy. All documentation substantiating compliance with the requirements of this program shall be delivered to the Owner as stipulated in the Contract Documents. A copy of the Wake County Minority Business Enterprise Policy is included in the Project Manual.~~

ARTICLE 36. GENERAL

- 36.1 If any provision of the Agreement shall be declared invalid or unenforceable, the remainder of the Agreement shall continue in full force and effect.
- 36.2 The titles to Articles herein are for convenience only, are not substantive parts of the General Conditions, and are not to be considered in interpreting the Contract Documents.

END OF GENERAL CONDITIONS OF THE
CONTRACT FOR CONSTRUCTION

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**APPENDIX A
TO GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION**

**DISPUTE RESOLUTION PROCEDURES FOR WAKE COUNTY BUILDING CONSTRUCTION
RENOVATION AND REPAIR PROJECTS**

Table of Rules

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SUPPLEMENTARY GENERAL CONDITIONS

GENERAL

These Supplementary Conditions contain changes and additions to the project "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION", as published herein. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of the Article, Paragraph, Subparagraph or Clause shall remain in effect.

ARTICLE 1 - DEFINITIONS

Paragraph 1.13: At the end of the existing paragraph, add the following:

The Contract Time is **540** consecutive calendar days, beginning on the Date of Commencement as specified in the written Notice-to-Proceed.

Paragraph 1.18: Delete the last sentence in its entirety and substitute the following in lieu thereof:

“A list of the Drawings is contained in the “Supplementary General Conditions.”

The Drawings applicable to this Contract are as follows:

SITE/CIVIL SETS:

LAKE MYRA COUNTY PARK EAST PARCEL

COVER SHEET

EX-001 – EXISTING CONDITIONS

SITE

L-001 – EAST (EP) AND WEST (WP) PARCELS

L-002 – EP DEMOLITION PLAN NORTH

L-003 – EP DEMOLITION PLAN SOUTH

L-101 – EP SITE LAYOUT KEY SHEET

L-102 – EP SITE LAYOUT NORTH

L-103 – EP SITE LAYOUT SOUTH

L-104 – EP SITE LAYOUT PLAZA ENLARGEMENT

L-105 – EP SITE LAYOUT MAINTENANCE FACILITY

L-106 – EP SITE LAYOUT FISHING AND BOAT ACCESS ENLARGEMENT

L-107 – EP SITE SIGNAGE PLAN

L-201 – EP PLAYGROUND EQUIPMENT

L-202 – EP PLAYGROUND SURFACING AND DETAILS

L-203 – EP PLAYGROUND DETAILS

L-301 – EP TRAILS NORTH

L-302 – EP TRAILS SOUTH
L-401 – EP BOARDWALK A ACROSS LAKE MYRA
L-402 – EP BOARDWALKS B, C, AND D
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L-502 – EP PLANT SCHEDULE AND NOTES
L-503 – EP PLANTING PLAN NORTH
L-504 – EP PLANTING PLAN SOUTH
L-505 – EP PLANTING MAINTENANCE FACILITY
L-601 – EP SITE DETAILS
L-602 – EP SITE DETAILS
L-603 – EP SITE DETAILS
L-604 – EP SITE DETAILS
L-605 – EP SITE DETAILS
L-606 – EP SITE DETAILS
L-607 – EP SITE DETAILS

CIVIL/SITE STRUCTURAL
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CE-202 – ENTRANCE DRIVE ENLARGEMENT
CE-300 – UTILITY PLAN EAST
CE-301 – UTILITY DETAILS
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CE-303 – UTILITY DETAILS
CE-304 – UTILITY DETAILS
CE-400 – GRADING PLAN EAST
CE-401 – GRADING ENLARGEMENT EAST
CE-402 – GRADING ENLARGEMENT EAST
CE-402.5 – GRADING ENLARGEMENT EAST
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ARTICLE 3. FAMILIARITY WITH WORK, CONDITIONS AND LAWS

Paragraph 3.3: At the end of the existing paragraph, add the following paragraph:

“To ensure compliance with the E-Verify requirements of the General Statutes of North Carolina, all contractors, including any subcontractors employed by the contractor(s), by submitting a bid, proposal or any other response, or by providing any material, equipment, supplies, services, etc., attest and affirm that they are aware and in full compliance with Article 2 of Chapter 64, (NCGS64-26(a)) relating to the E-Verify requirements.”

“By signing this agreement; accepting this contract/purchase order; or submitting any bid, proposal, etc., vendors and contractors certify that as of the date of execution, receipt, or submission they are not listed on the Final Divestment List created by the NC Office of

State Treasurer pursuant to NCGS 147 Article 6E, Iran Divestment Act, Iran Divestment Act Certification. Vendors and contractors shall not utilize any subcontractor that is identified on the Final Divestment List.” “Any organization defined under NCGS 147-86.80(2), Divestment from Companies Boycotting Israel, shall not engage in business totaling more than \$1,000 with any company/business, etc. that boycotts Israel. A list of companies that boycott Israel is maintained by the NC Office of State Treasurer, pursuant to NCGS 147-86.81(a)(1). Any company listed as boycotting Israel is not eligible to do business with any State agency or political subdivision of the State.”

“If the source of funds for this contract is federal funds, the following federal provisions apply pursuant to 2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II (as applicable): Equal Employment Opportunity (41 C.F.R. Part 60); Davis-Bacon Act (40 U.S.C. 3141-3148); Copeland “Anti-Kickback” Act (40 U.S.C. 3145); Contract Work Hours and Safety Standards Act (40 U.S.C. 3701- 3708); Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387); Debarment and Suspension (Executive Orders 12549 and 12689); Byrd Anti-Lobbying Amendment (31 U.S.C. 1352); Procurement of Recovered Materials (2 C.F.R. § 200.322); and Record Retention Requirements (2 CFR § 200.324).”

“In consideration of signing this Agreement, the Parties hereby agree not to discriminate in any manner on the basis of race, natural hair or hairstyles, ethnicity, creed, color, sex, pregnancy, marital or familial status, sexual orientation, gender identity or expression, national origin or ancestry, marital or familial status, pregnancy, National Guard or veteran status, religious belief or non-belief, age, or disability with reference to the subject matter of this Contract. The Parties agree to comply with the provisions and intent of Wake County Ordinance SL 2017-4. This anti-discrimination provision shall be binding on the successors and assigns of the Parties with reference to the subject matter of this Contract.”

Add the following paragraph:

“3.5 A Pre-Bid Conference will be held at the General Services Center, 401 Capital Boulevard, Raleigh, NC, 27603 in the Training Room at 1:30 PM to 2:30 PM, local prevailing time, on August 18, 2026. Purpose of conference is for prospective Bidders to familiarize themselves with the site and to ask questions pertaining to the Contract Documents. Bidders are reminded that no oral interpretations of meaning of Drawings and Specifications can be made. Conflicts in documents, if any, will be resolved by written addendum. (Reference “Instructions to Bidders, Paragraph 4 for formal).”

ARTICLE 5. INSURANCE AND INDEMNITY

Paragraph 5.1.2: In addition to all other endorsements required by the General Conditions, if the Contractor is required to transport, dispose of or otherwise handle hazardous or toxic waste, material, chemicals, compounds or substances, the policy of insurance shall be further endorsed to include the following:

Insurance Service Office (ISO) Form #CA 00 01 06 92 or its equivalent, amending exclusion 11 in the following manner:

- i. Delete section a. (1) a.: (Pollution) "being transported or towed by, or handled for movement into, onto or from, the covered auto."
- ii. Delete section a. (1) b.: "Otherwise in the course of transit by the insured."

The Contractor and transporter must comply with all applicable DOT and EPA requirements.

Paragraph 5.1.4: Add the following Paragraph:

“Pollution Legal Liability (PLL)

A PLL policy must be provided for the Project. Coverage must be sudden and non-sudden, and include:

- a) Bodily injury, sickness, disease, mental anguish, or shock sustained by any person, including death;
- b) property damage including physical injury to or destruction of tangible property including the resulting loss of use thereof, cleanup costs, and the loss of use of tangible property that has not been physically injured or destroyed; and
- c) Defense including costs, charges, and expenses incurred in the investigation, adjustment, or defense of claims for such compensatory damages.

The Owner must be named as Additional Insured, and a Non-Owned Disposal Site Endorsement must be provided, scheduling the appropriate landfill.

Minimum PLL limits of coverage shall be:

Per Loss	\$1,000,000
All Losses	\$2,000,000”

ARTICLE 7. CONTRACTOR

Paragraph 7.13: Amend with the addition of the following paragraph:

“The General Contractor shall secure and pay for all building permits, including plumbing, electrical, HVAC and for the permit from the office of the Fire Marshall. The Cost for the Express Permit Review, if necessary, will be paid by others and is not the responsibility of the Contractor.”

ARTICLE 10. DESIGNER

Add the following paragraphs:

“10.5 As a part of its Basic Services under the Owner-Designer Agreement, the Designer will conduct a single site visit to determine Substantial Completion of the Work. If, after the performance of said site visit, the Designer determines that the Work is not substantially complete, successive site visits to determine Substantial Completion will be deemed Additional Services under the Owner-Designer Agreement. The Contractor shall be liable to the Owner for any Designer’s fees incurred as a result of any such Additional Services of the Designer. Any funds due under this paragraph may be deducted by the Owner from the amounts due the Contractor for such additional Designer’s fees and paid directly to the Designer. Should the cost for such Additional Services of the Designer exceed the amount due or to become due to the Contractor, then the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of any such excess.”

“10.6 As a part of its Basic Services under the Owner-Designer Agreement, the Designer will conduct a single site visit to determine Final Completion of the Work. If, after the performance of said site visit, the Designer determines that the Work is not complete, successive site visits to determine Final Completion of the Work will be deemed Additional Services under the Owner-Designer Agreement. The Contractor shall be liable to the Owner for any Designer’s fees incurred as a result of any such Additional Services of the Designer. Any funds due under this paragraph may be deducted by the Owner from the amounts due the Contractor for such additional Designer’s fees and paid directly to the Designer. Should the cost for such Additional Services of the Designer exceed the amount due or to become due to the Contractor, then the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of any such excess.”

ARTICLE 13 - CONTRACT TIME

Paragraph 13.18: Add the following:

“If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents, the Owner shall be entitled to retain or recover from the Contractor, as Step One Liquidated Damages and not as a penalty, the following per diem amount commencing upon the first day following expiration of the Contract Time and continuing until the actual date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable pre-estimate of damages the Owner will incur as a result of delayed Substantial Completion of the Work:

Five Hundred Dollars (\$500) per consecutive calendar day

If the Contractor fails to achieve Final Completion of the Work within thirty (30) consecutive calendar days of the actual date of Substantial Completion of the Work, the Owner shall be entitled to retain or recover from the Contractor, as Step Two Liquidated Damages and not as a penalty, the following per diem amount commencing upon the first day following the actual date of Substantial Completion and continuing until the actual date of Final Completion. Such liquidated damages are hereby agreed to be a reasonable pre-estimate of damages the Owner will incur as a result of delayed Final Completion of the Work:

Five Hundred Dollars (\$500) per consecutive calendar day

The Owner may deduct liquidated damages described above from any unpaid amounts then or thereafter due the Contractor under this Agreement. Should the amount of any liquidated damages exceed the amount due or to become due to the Contractor, then the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of any such excess.”

ARTICLE 29 – TAXES

Paragraph 29.1: Add the following to the existing paragraph:

“The Contractor is to use the Sales Tax Reporting Form attached to the contract documents for reporting taxes paid.”

Add the following paragraph:

“29.3 This project is considered a “Capital Improvement” with respect to Real Property Contracts, and the collection of State sales and use tax, as referenced in North Carolina General Statutes and further clarified in sales and use tax bulletins issued by the North Carolina Department of Revenue. It shall be the responsibility of the Contractor to issue any affidavits of capital improvement to their subcontractors as necessary.”

ARTICLE 36. GENERAL

Add the following paragraph:

“36.3 Any specific requirement in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and is also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor’s responsibilities or obligations shall not be construed to diminish, abrogate, or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.”

END OF SUPPLEMENTARY GENERAL CONDITIONS

INTENTIONALLY LEFT BLANK

**APPENDIX A
TO GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION**

**DISPUTE RESOLUTION PROCEDURES FOR WAKE COUNTY BUILDING CONSTRUCTION
RENOVATION AND REPAIR PROJECTS**

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RULE 1 INITIATING MEDIATED SETTLEMENT CONFERENCES

A Purpose of Mandatory Settlement Conferences. Pursuant to G.S. §143-128(f1) and 143-135.26(11), these Rules are promulgated to implement a mediated settlement program designed to focus the parties' attention on settlement rather than on claim preparation and to provide an opportunity for orderly settlement negotiations to take place. Nothing herein is intended to limit or prevent the parties from engaging in settlement procedures voluntarily at any time prior to or during commencement of the dispute resolution process.

B Initiating the Dispute Resolution Process

Any party to a County public construction contract (referred to herein generally as the "Contract") governed by Article 8. Ch. 143 of the General Statutes and identified in G.S. § 143-128(f1) and who is a party to a dispute arising out of the Contract and the construction process in which the amount in controversy is at least \$15,000 may submit a written request to the County for mediation of the dispute.

Prior to submission of a written request for mediation to the County, the parties should give notice of any and all claims in accordance with their respective contracts, obtain decisions on the claims as required or allowed by their respective contracts, and attempt to resolve the dispute according to the terms and conditions in their respective contracts. The Mediator may adjourn any mediated settlement conference if the Mediator believes, in his or her sole discretion, that the parties have not satisfied all of the terms and conditions of their respective contracts and that doing so will enhance the prospects for a negotiated settlement.

C Condition Precedent to Litigation. Before any party to a Contract may commence a civil action against the County seeking remedies for breach or non-performance of the Contract by the County, said party must first initiate the dispute resolution process under these rules and attend the mediated settlement conference.

RULE 2 SELECTION OF MEDIATOR

A Mediator Listing. A list of Mediators acceptable to the County is attached to and incorporated by reference into these Rules. The party requesting mediation shall select a Mediator from the designated list. If the County fails to provide a list of acceptable mediators, the list of Mediators shall be deemed to be the list of mediators certified by the North Carolina Dispute Resolution Commission to conduct mediated settlement conferences in the North Carolina Superior Courts.

B Selection of a Mediator. The party requesting mediation shall select a Mediator from the County's list of Mediators and shall file, with the County, a Notice of Selection of Mediator within 21 days of the request for mediation. Such notice shall state the name, address, and phone number of the Mediator selected. If the Mediator selected is not available or declines to participate for any reason, the requesting party shall select

another person from the County's list of Mediators. If the party requesting mediation does not select and designate a mediator within 21 days of the request for mediation, the County shall have the right in its absolute discretion to appoint a mediator from its list of Mediators.

- C Disqualification of Mediator.** Any party may request replacement of the Mediator for good cause. Nothing in this provision shall preclude Mediators from disqualifying themselves.

RULE 3 THE MEDIATED SETTLEMENT CONFERENCE

- A Where Conference is to be Held.** Unless all parties and the Mediator otherwise agree, the mediated settlement conference shall be held in Wake County. The Mediator shall be responsible for reserving a place, making arrangements for the conference, and giving timely notice of the time and location of the conference to all attorneys, unrepresented parties and other persons or entities required to attend.
- B When Conference is to be Held.** The mediation shall be completed within 90 days after selection of the Mediator.
- C Request to Accelerate or Extend Deadline for Completion.** Any party or the Mediator may request the County to accelerate or extend the deadline for completion of the conference. Such request shall state the reasons the extension is sought and shall be served by the moving party upon the other parties and the Mediator. Objections to the request must be promptly communicated to the County and to the Mediator.

The County, with the concurrence of the designated Mediator, may grant the request by adjusting the time for completion of the conference.

- D Recesses.** The Mediator may recess the mediation conference at any time and may set times for reconvening. If the Mediator determines the time and place where the conference is to reconvene before the conference is recessed, no further notice is required to persons present at the conference.
- E Project Delay.** The mediated settlement conference that results from a construction contract dispute shall not be cause for the delay of the construction project.

RULE 4 DUTIES OF PARTIES AND OTHER PARTICIPANTS IN FORMAL DISPUTE RESOLUTION PROCESS

A Attendance

1. All parties to the dispute must designate an official representative to attend the mediation.

2. "Attendance" means physical attendance, not by telephone or other electronic means. Any attendee representing a party must have authority from that party to bind it to any agreement reached as a result of the mediation.
3. Attorneys representing parties may attend the mediation, but are not required to do so.
4. Sureties and insurance company representatives are required to physically attend the mediation unless the Mediator and all of the other parties to the mediation excuse their attendance or consent to their attendance by telephone or other electronic means.
5. The parties who attend a duly scheduled mediation conference shall have the right to recover their share of the Mediator's compensation from any party or parties who fail to attend the conference without good cause.

B Finalizing Agreement. If an agreement is reached in the conference, the terms of the agreement shall be confirmed in writing and signed by all parties.

C Mediation Fees charged by the Mediator shall be paid in accordance with G.S. § 143-128(f1).

D Failure to compensate Mediator. Any party's failure to compensate the Mediators in accordance with G.S. § 143-128(f1) shall subject that party to a withholding of said amount of money from the party's monthly payment by the County.

Should the County fail to compensate the Mediator, it shall hereby be subject to a civil cause of action from the Mediator for the 1/3 portion of the Mediator's total fee as required by G.S. § 143-128(f1).

RULE 5 AUTHORITY AND DUTIES OF MEDIATORS

A Authority of Mediator

1. **Control of Conference.** The Mediator shall at all times be in control of the conference and the procedures to be followed.
2. **Private Consultation.** The Mediator may communicate privately with any participant or counsel prior to and during the conference. The fact that private communications have occurred with a participant shall be disclosed to all other participants at the beginning of the conference.
3. **Scheduling the Conference.** The Mediator shall make a good faith effort to schedule the conference at a time that is convenient with the participants, attorneys and Mediator. In the absence of agreement, the Mediator shall select the date for the conference.

4. Determining good cause for a party's failure to appear at a scheduled mediation conference.

B Duties of Mediator

1. The Mediator shall define and describe the following at the beginning of the conference:
 - a. The process of mediation.
 - b. The difference between mediation and other forms of conflict resolution.
 - c. The costs of the mediated settlement conference.
 - d. That the mediated settlement conference is not a trial, the Mediator is not a judge, and the parties retain their legal rights if they do not reach settlement; however, the Mediator will advise all parties that failure to appear at mediation without good cause may result in imposition of sanctions and may be asserted as a bar to lawsuits by claimants who have failed to exhaust this administrative remedy.
 - e. The circumstances under which the Mediator may meet and communicate privately with any of the parties or with any other person.
 - f. Whether and under what conditions communications with the Mediator will be held in confidence during the conference.
 - g. The inadmissibility of conduct and statements as provided by GS §7A-38.1(1).
 - h. The duties and responsibilities of the Mediator and the participants.
 - i. That any agreement reached will be reached by mutual consent.
2. Disclosure: The Mediator has a duty to be impartial and to advise all participants of any possible bias, prejudice or partiality.
3. Declaring Impasse: The Mediator may determine at any time during the mediation conference that an impasse exists and that the conference should end.
4. Reporting Results of Conference. The Mediator shall submit a written report to the County and the other parties within 10 days of the conference stating whether or not the parties reached an agreement. The Mediator's report shall indicate the absence of any party from the mediated settlement conference without permission or good cause.
5. Scheduling and Holding the Conference. It is the duty of the Mediator to schedule the conference and conduct it prior to the deadline of completion set by the rules. The Mediator shall strictly observe deadlines for completion of the conference unless said time limit is changed by agreement of the parties.

RULE 6 COMPENSATION OF THE MEDIATOR

- A** The parties shall compensate the Mediator for mediation services at the rate proposed by the Mediator and agreed to by the parties at the time the Mediator is selected.

RULE 7 RULE MAKING

- A** These Rules may be amended by the County at any time. Amendments will not affect mediations where claims and/or requests for mediation have been filed at the time the amendment takes effect

RULE 8 DEFINITIONS

- A** “County” shall mean the County of Wake, North Carolina
- B** “Project Designer” is that person or firm stipulated as project designer in the Contract Documents for the project.
- C** “Claim” is a demand or assertion by a party seeking adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term “Claim” also includes other disputes and matters in question between the parties to a Contract involved in the County’s building construction renovation and repair projects arising out of or relating to the Contract or the construction process. Claims must be initiated by a written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.
- D** “Good Cause” generally includes any circumstance beyond the control of a party, which prevents that party from meeting obligations. When good cause is asserted as an excuse for a party’s failure to appear at a mediation conference or to otherwise comply with the requirements of these Rules, the Mediator, in his or her sole discretion, will determine whether good cause exists to excuse the party’s failure to appear or otherwise comply with these rules.

RULE 9 TIME LIMITS

- A** Any time limit provided for by these Rules may be waived or extended at the sole discretion of the County if no Mediator has been selected and at the discretion of the County with concurrence of the Mediator if a Mediator has been selected.

MEDIATOR LIST

Name	Bar #	Address	Phone	Fax	Email
David M. Barnes	12854	PO Box 10096 Raleigh, NC 27605	919-783-2812	919-783-1075	dmbarnes@poynerspruill.com
Robert Beason	5502	PO Box 52270 Durham, NC 27717	919-419-8979	919-403-8533	rbeason@beasonellis.com
William A. Blancato	12729	633 W. 4 TH Street, Suite 150 Winston-Salem, NC 27101	336-725-9416	336-725-5129	blancato@bdl-law.com
Richard T. Boyette	7623	PO Box 27808 Raleigh, NC 27611	919-828-5100	919-828-2277	rtb@cshlaw.com
Jacqueline R. Clare	10277	1011 Vance Street Raleigh, NC 27608	919-755-9979	919-755-9512	jclare@mindspring.com
Thomas C. Duncan	1255	PO Box 989 Greensboro, NC 27402	910-379-1390	910-379-1198	duncan@hillevans.com
Sidney Smith Eagles	1271	PO Box 27525 Raleigh, NC 27611	919-755-8771	919-755-8800	sid.eagles@smithmoorelaw.com
Rene Stemple Ellis	DC/P A	PO Box 52270 Durham, NC 27712	919-417-9979	919-403-8533	rellis@beasonellis.com
Marshall Gallop	6626	PO Box 7100 Rocky Mount, NC 27804	252-937-2200	252-937-8100	mgallop@bwsb.com
Allen Holt Gwyn		PO Box 20744 Greensboro, NC 27420	336-691-9222	336-691-9259	ahgwyn@cgspllc.com
Jonathan R. Harkavy	5238	PO Box 29269 Greensboro, NC 27429	336-370-4200	336-274-8490	jharkavy@aol.com
Joseph R. John	2361	11800 Black Horse Run Raleigh, NC 27613	919-676-8796	919-676-8796	jo638sr@aol.com
J. Anderson Little	6730	PO Box 16205 Chapel Hill, NC 27514	919-967-6611	919-967-3212	jandersonlittle@nc.rr.com
James D. Llewellyn	2732	PO Box 567 Atlantic Beach, NC 28512	252-559-2714	252-726-1973	judgelew@embarqmail.com

Name	Bar #	Address	Phone	Fax	Email
Charles K. McCotter		PO Box 12800 Newbern, NC 28561-2800	252-635-1005	252-635-5050	ckm@justice.com
Peter M. McHugh	6269	915 Country Club Drive Reidsville, NC 27320	336-361-9557	336-361-9569	pmchugh@triad.rr.com
Charles E. Nichols	10448	PO Box 20389 Raleigh, NC 27619-0389	919-787-8800	919-781-0811	nichols@manningfulton.com
Jeffrey B. Parsons	16006	PO Box 30933 Raleigh, NC 27622	919-789-9242	919-789-9242	jparsons@cgspllc.com
J. Dickson Phillips	8941	PO Drawer 4825 Chapel Hill, NC 27515	919-967-8989	919-419-1429	dphillips@lapgh.com
Lacy M. Presnell	7272	PO Box 10867 Raleigh, NC 27605	919-782-1441	919-782-2311	lpresnell@bdppa.com
John L. Shaw	3950	PO Box 10096 Raleigh, NC 27605	919-783-6400	919-783-1075	jshaw@poynerspruill.com
Edwin M. Speas	4112	PO Box 10096 Raleigh, NC 27607	919-783-6400	919-783-1075	espeas@poynerspruill.com
Odes L. Stroupe	4983	3105 Glenwood Ave., Suite 300 Raleigh, NC 27612	919-881-0338	919-881-9548	stroupe@bcs-law.com
Arthur A. Vreeland	6899	4 Parkmont Court Greensboro, NC 27408	336-288-7500	336-288-7500	aavreeland@aol.com
Charles P. Younce	4891	PO Box 3486 Greensboro, NC 27402	336-379-0123	336-379-9894	cyounce@jymmlaw.com
Julia F. Youngman	21320	PO Box 33550 Raleigh, NC 27636	919-865-7000	919-865-7010	julie_youngman@elliswinters.com

APPENDIX B

NAME OF COUNTY
WHERE GOODS
WERE RECEIVED

I hereby certify that, during the period stated above, North Carolina sales and use taxes were paid as listed above, with respect to building materials, supplies, fixtures, and equipment which have become a part of, or annexed to, a building or structure erected, altered or repaired for the County of Wake, and that the vendors from whom the property was purchased, the dates and numbers of the invoices covering the purchases, the total amount of the invoices of each vendor, the North Carolina sales and use taxes paid to the State and the cost of property withdrawn from warehouse stock and North Carolina sales or use taxes paid thereon are as set forth above.

By: _____

Notary

Title: _____

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REPORT OF SUBSURFACE EXPLORATION

Lake Myra Site

Wendell, North Carolina

ESP Project Number: E4A: 24-00661-002-GEO

Prepared For:

Wake County
337 S Salisbury Street
Raleigh, NC 27601

Prepared By:

ESP Associates, Inc
2200 Gateway Centre Boulevard.
Suite 216
Morrisville, NC 27560

August 29, 2025



August 29, 2025

Mr. Eric Staehle
eric.staehle@wake.gov
Wake County
337 S Salisbury St
Raleigh, NC 27601

Reference: **REPORT OF SUBSURFACE EXPLORATION**
 Lake Myra Site
 Wendell, North Carolina
 ESP Project No. E4A: 24-00661-002-GEO

Dear Mr. Staehle:

ESP Associates, Inc. (ESP) has completed a subsurface exploration for the proposed Lake Myra Park Center in Wendell, North Carolina. This exploration was performed in general accordance with our Proposal No. 24-00661-002, dated March 28, 2025, as authorized by Mark Forestieri with Wake County.

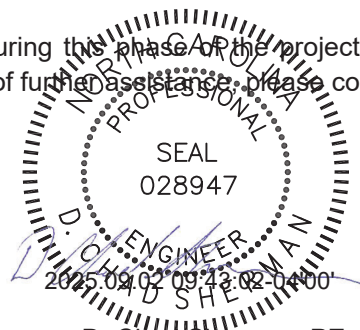
ESP appreciates the opportunity to assist you during this phase of the project. If you should have any questions concerning this report, or if we may be of further assistance, please contact us.

Sincerely,

ESP Associates, Inc.

A handwritten signature in blue ink, appearing to read "Benjamin R. Long".

Benjamin R. Long, PE
Project Manager



D. Chad Sherman, PE
N.C. Registration No. 28947

Electronic submission (1)



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APPENDIX

Field Exploration Procedures
 Laboratory Procedures
 Boring Location Plan With Site Vicinity Map, Figure 1 through 6
 Atterberg Limits' Results (1 sheet)
 Standard Moisture Density Relationship (1 sheet)
 3 Point CBR Test (5 sheets)
 Moisture-Density Relationship (2 sheets)
 Plots Of The Deflection, Shear, And Moment Verses Depth (3 sheets)
 Legend To Soil Classification And Symbols
 Test Boring Records (B-1 through B-17, B-19 through B-21, B-23, B-24, B-26 through B-36, BA-08, LB-02, and LB-03)

1.0 INTRODUCTION

1.1 Purpose of Services

The purpose of the exploration was to evaluate the general subsurface conditions within the proposed building, retaining wall, boardwalk, piers, shelters, and pavement areas. This report contains a brief description of the field and laboratory testing procedures performed for this study and a discussion of the soil conditions encountered at the site. Our findings, conclusions and recommendations for foundation and pavement design, as well as construction considerations for the proposed foundations and paved areas are presented within this report.

1.2 Site Description

The site is located to the east and west side of Lake Myra in Wendell, NC located in Wake County. The site consists of Tax Parcel Identification Numbers (PIN) #1763519788 and 1763841077. The western parcel generally slopes east towards Lake Myra with relief on the order of 80 feet. The eastern parcel generally slopes west towards the lake with relief on the order of 20 feet. The western parcel consists of farmland on the western side and is wooded on the eastern side. The eastern parcel is wooded with a sewer easement extending north along the edge of Lake Myra. The eastern parcel is bordered by Poole Road along the southeast portion and Elk Falls Drive on the eastern side.

1.3 Project Description

We understand that Wake County plans to construct a new park on the property including a boat dock, fishing pier, boardwalk, two-story park center, playground, restrooms, park shelters, maintenance buildings, associated parking and drive areas, and retaining walls. The boat dock, fishing pier, and boardwalk will be supported on driven timber piles, and the boardwalk will span Lake Myra in the northern portion of the site.

Based on the provided bridge plan and profile, the boardwalk bridge extends over Lake Myra from Station 10+87.08 to 16+95.21. Structural loading, pile type, and top of pile elevations for the boardwalk were provided via email from Jody Thompson and Kim Mott (NV5) to Ben Long (ESP) on 6/24/2025 and 7/22/2025 and a Teams call on July 21, 2025. Axial pile loads range from 9 to 16 kips per pile and lateral loads consist of 530 pounds at the top of the pile and 19.8 psf on the face of each pile. 8-inch tip timber piles are the preferred structural support, and the top of pile elevation is 200 feet (datum unknown). Structural loading was not provided for the boat dock and fishing pier.

We understand the building structures will be lightly loaded, supported by shallow foundations and have slab-on-grade floor systems. Structural loading for the buildings and walls was provided via email from Ms. Jennifer Steed (Susan Hatchell) to Mr. Long on 8/15/2025 and range from 18 to 45-kip column loads and 3 kips per linear foot (klf) wall loads.

The retaining walls are planned to be cast-in-place concrete walls founded on shallow foundations. Structural loading for the retaining walls has not been provided; however, ESP understands that anticipated wall heights will be on the order of 6 feet or less. ESP has assumed wall loads of 1 to 2 kips per linear foot for site retaining walls.

2.0 EXPLORATION PROCEDURES

2.1 Field

The following methods were used to evaluate the subsurface conditions of the site. Additional descriptions of the field exploration procedures are also presented in the Appendix. The test locations were located in the field by a representative from our office using a Hand Held global positioning system (GPS). While in the field and where applicable, a representative of the geotechnical engineer visually examined the samples obtained or subsurface material encountered to evaluate the type of soil, soil plasticity, moisture condition, organic content, presence of lenses and seams, colors and apparent geological origin using general guidance from “ASTM D 2488 Standard Practice for Description and Identification of Soils (Visual Manual Procedures).” Clearing by a hydroaxe was required to gain access to the test locations excluding B-33 through B-36. Test locations are shown on the attached “Test Location Plan,” Figure 1.

2.1.1 Soil Test Borings

Thirty-six soil test borings (Borings B-01 through B-17, B-19 through B-21, B-23, B-24, B-26 through B-36, BA-08, LB-02, and LB-03) were extended to depths ranging between 8.6 and 33.6 feet below the existing ground surface using a GeoProbe 7822DT and a barge mounted Diedrich D-25 drill rig. Hollow-stem, continuous flight augers were used to advance the borings into the ground. Standard Penetration Tests were performed within the soil test borings using an automatic hammer. The Standard Penetration Test provides the Standard Penetration Resistances (N-values) reported in blows per foot (bpf) as outlined in the Field Exploration Procedures section located in the Appendix. Water level measurements were attempted at, and up to 1 day after, the termination of drilling.

The results of the visual soil classifications for the borings, as well as field test results and N-values, are presented on the individual “Test Boring Records,” included in the Appendix. Similar soils were grouped into strata on the records. The strata lines represent approximate boundaries between the soil types; however, the actual transition between soil types in the field may be gradual in both the horizontal and vertical directions.

2.2 Laboratory

Select samples of the on-site soils obtained during the field testing program were tested in the laboratory. Tests performed included:

- Atterberg Limits
- Grain size distribution by Wash #200 Sieve
- Standard Proctor Moisture-Density Relationship
- California Bearing Ratio

The results of the laboratory tests performed for this study are attached in the Appendix. A brief description of the procedures used are also presented in the Appendix.

3.0 SUBSURFACE CONDITION

3.1 Site Geology

The referenced property is located in Wendell, North Carolina which is in the Piedmont Physiographic Province. The Piedmont Province generally consists of hills and ridges which are intertwined with an established system of draws and streams. The Piedmont Province is predominately underlain by igneous rock (formed from molten material) and metamorphic rock (formed by heat, pressure and/or chemical action), which were initially formed during the Precambrian and Paleozoic eras.

The residual soils encountered in this area are the product of in-place chemical weathering of rock which was similar to the rock presently underlying the site. In areas not altered by erosion or disturbed by the activities of man, the typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands. The boundary between soil and rock is not sharply defined. This transitional zone termed “partially weathered rock” is normally found overlying the parent bedrock. Partially weathered rock is defined, for engineering purposes, as residual material with Standard Penetration Resistances in excess of 100 blows per foot (bpf). Weathering is facilitated by fractures, joints and by the presence of less resistant rock types. Consequently, the profile of the partially weathered rock and hard rock is quite irregular and erratic, even over short horizontal distances. Also, it is common to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

3.2 Subsurface Findings

Subsurface conditions as indicated by the borings generally consist of topsoil and alluvium underlain by residual soils. The generalized subsurface conditions at the site are described below and are graphically depicted in the Appendix. For more detailed soil descriptions and stratifications at a particular test location, the attached “Test Boring Record” should be reviewed.

3.2.1 Surface

A topsoil/grass/rootmat layer approximately 3 to 14 inches thick was encountered at Borings B-01 through B-17, B-19 through B-21, B-23, B-24, B-26 through B-36, BA-08.

3.2.2 Alluvium

Alluvial soils are the accumulation of material transported and deposited by water. Alluvial soils were encountered at Borings LB-02 and LB-03. The alluvium generally consists of very soft clays. N-values in the alluvium varied between weight of hammer (WOH) and 3 bpf. The alluvium extends to depths ranging between 3.5 and 6 feet below the existing ground surface.

3.2.3 Fill

Fill soils are either site soils or imported soils that were manipulated and placed on the site previous to this exploration. Underlying the topsoil in Borings B-32, B-33 and B-34, fill soils were encountered. The fill consists of loose clayey sands and firm to stiff sandy silts. N-values in the fill ranged from 1 to 11 blows per foot (bpf). The fill extended to depths ranging between 2.5 and 3.5 feet below the existing ground surface.

3.2.4 Residuum

Residual soils are mineral material accumulated by the in-place chemical weathering of the underlying parent rock. Beneath the fill in Borings B-32 through B-34, underlying the surface materials in Borings B-01 through B-17, B-19 through B-21, B-23, B-24, B-26 through B-31, B-35, B-36, BA-08, and underlying the alluvial soils in LB-02 and LB-03, residual soils were encountered. The residuum generally consists of silty sands and sandy silts. N-values in the residuum varied between WOH and 60 bpf. The residuum extends to depths ranging between 6 and 38.5 feet below the existing ground surface. Soil Test Borings B-01, B-03 through B-12, B-14, B-15, B-26, B-27, and B-32 through B-36 were terminated in the residual soils at depths ranging between 10 and 30 feet below the existing ground surface.

3.2.5 Partially Weathered Rock (PWR)

Partially weathered rock is defined, for engineering purposes, as residual material with Standard Penetration Resistances in excess of 100 blows per foot. Underlying the residuum in Borings B-02, B-13, B-16 through B-21, B-23, B-24, B-29 through B-31, BA-08, LB-02, and LB-03, partially weathered rock (PWR) was encountered. When sampled, the PWR generally breaks down into sandy silts and silty sands with rock fragments. Borings B-02, B-13, B-16 through B-21, B-23, B-24, B-29 through B-31, BA-08, LB-02, and LB-03 were terminated in the PWR at depths ranging between 6.95 and 38.8 feet below the existing ground surface.

3.2.6 Auger Refusal

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project. Auger refusal material may consist of large boulders, rock ledges, lenses, seams or the top of parent bedrock. Core drilling techniques would be required to evaluate the character and continuity of the refusal material. Borings B-17 through B-21, B-31, BA-08, LB-02 and LB-03 were terminated in the PWR upon auger refusal at depths ranging between 6.9 and 34 feet below the existing ground surface.

3.3 Subsurface Water

The generalized subsurface water conditions encountered during our exploration are described below. For more detailed information, the attached "Test Boring Records" should be reviewed. Test Locations B-01 through B-09, B-11 through B-17, B-19, B-21, B-23, B-24, B-30, and B-32 through B-36, were backfilled upon completion of the field test boring due to safety concerns.

Test Location	Water Depth at Time of Testing	Water Depth at 1 Days	Cave-In Depth at 1 Days
B-10	12.1	16.8	17
B-16	10.9	-	-
B-17	11	-	-
B-19	10	-	-
B-20	9	7.4	9.2
B-26	11	4	10



Test Location	Water Depth at Time of Testing	Water Depth at 1 Days	Cave-In Depth at 1 Days
B-27	7.2	3.5	5
B-28	5	3.5	5
B-29	12	9	10
B-31	Dry	8	12

Note: Hole cave-in depths may provide an indication of water presence.

Subsurface water levels tend to fluctuate with seasonal and climatic variations, as well as with some types of construction operations. Therefore, water may be encountered during construction at depths not indicated during this study.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Geotechnical Considerations

Based on the project information previously discussed, the data obtained from the field and laboratory testing program and our analysis, the following conditions should be considered and addressed in the proposed development and are further discussed in the following sections of this report.

- Existing Fill
- High Plasticity Clay/Elastic Silts
- Low-Consistency Soils
- Difficult Excavation
- Dewatering

Our conclusions and recommendations are based on the project information previously discussed and on the data obtained from the field and laboratory testing program. If the structural loading, geometry or proposed structure locations are changed or significantly differ from those discussed, or if conditions are encountered during construction that differ from those encountered by the borings, ESP requests the opportunity to review our recommendations based on the new information and make any necessary changes.

4.2 Site Development

4.2.1 Existing Fill

The exploration and evaluation of the subsurface conditions indicate that fill soils are present in Borings B-32, B-33 and B-34. The fill extends to depths ranging between 2.5 and 3.5 feet below the existing ground surface. N-values obtained in the fill ranged from 8 to 11 bpf. Based on our visual observations of the split-spoon samples recovered and our field observations, the fill encountered in the soil test borings appeared clean of concentrated organics, debris and other deleterious materials.

Concentrated organics, debris and other deleterious materials were not observed in the soil test borings performed by ESP. However, due to the limited testing performed and the wide spacing of the borings, the possibility of deleterious inclusions and variable density material in or under the existing fill cannot be completely ruled out. If the fill contains wood fragments, trash, organics, voids or soft lenses, excessive settlement could result causing building and slab-on-grade distress. Also, the presence of the existing fill beneath pavement areas present the risk of increased settlement and subsequently possible increased long term maintenance of the pavement areas. If the owner is not willing to accept the risk, then ESP recommends removing the existing fill soils.

To reduce the risk imposed by the existing fill, additional evaluations including test pit excavations, hand auger borings with Dynamic Cone Penetrometer tests, proofrolling and additional soil test borings could be performed to further evaluate the character and continuity of the fill. If the owner chooses to allow the existing fill to remain in place beneath the buildings, a thorough field evaluation should be performed by a representative of the geotechnical engineer while monitoring construction activity.

4.2.2 High Plasticity Clay/Elastic Silt

Laboratory tests were performed on select samples obtained from the split spoon samples. Laboratory testing consisted of Atterberg Limits and grain size testing. Typically, soils with a Plasticity Index (PI) less than 30 are considered to be low to moderate plasticity material. A summary of the laboratory test results are presented in the table below:

Sample Location	Depth (feet)	USCS Classification	Percent Fines (%)	Liquid Limit (%)	Plasticity Index
B-01	1-2.5	MH	97.3	80	33
B-04	1-2.5	MH	97.4	68	29
B-07	0-10	ML	80.2	47	16
B-32	3.5-5	SC	39.9	40	18
B-36	1-2.5	SC	49.8	52	39

In addition to the laboratory testing, manual manipulation of recovered samples in the field indicates that high plasticity clays were encountered in Boring B-04 to depths ranging from approximately 8.5 to 24.5 feet below the existing ground surface. Our experience indicates that these soils can undergo significant change in volume (shrink/swell) with changes in their moisture content. If high plasticity clay and/or elastic silt soils such as those encountered on the site become wet during or after construction, there may be an increase in their volume (swelling) and/or a reduction in their strength. In addition, if these materials are in-place during construction and subsequently dry out, there may be a decrease in their volume (shrinking) resulting in settlement. While swell testing was beyond the scope of our services, the presence of soils with plasticity indices greater than 30 within the near surface (upper 2 to 3 feet) soil profile may present an increased risk of distress to the proposed foundations, slabs-on-grade or pavements due to swell or shrinkage of these materials with variations in moisture content.

Foundations, slabs, and/or pavements may not be sufficiently weighted to reduce the potential for swell and/or heave, if bearing directly on high plasticity clay and/or elastic silt soils. In addition, our past experience indicates that high plasticity clay and/or elastic silt soils may exhibit reduced long-term stability for support of flexible pavements. To reduce the risk, imposed by these materials, to the proposed foundations, slabs and pavements, ESP recommends removing high plasticity clay and/or elastic silt soils with a PI greater than 30 in the upper 3 feet of the proposed subgrade or bearing elevations, whichever is deeper, and replacing them with properly compacted, low elasticity/plasticity fill soils.

A more detailed exploration and laboratory testing should be performed, once site layout and grading plans are developed, to evaluate the potential for swell of the high plasticity clay and elastic silt soils and to provide detailed recommendations for remediation.

A thorough field evaluation should be performed by a representative of the geotechnical engineer at the time of construction to further determine the presence of high plasticity clay or elastic silt soils that may adversely affect the performance of the proposed structures and pavements.

In addition, it should be noted that, based on our previous experience, high plasticity clays and elastic silts are typically very sensitive to moisture variations and tend to break down under construction traffic when left exposed at proposed subgrades. Therefore, we recommend providing and maintaining proper site

drainage during and after construction and limiting construction traffic in areas where these materials are present at or near the proposed subgrade elevations. Excessive construction traffic on these soils prior to construction of the proposed structures or pavements may result in damage to the subgrade and the need for undercutting and/or repairs. We also recommend that grading operations take place during the typically drier, warmer periods of the year, if practical.

4.2.3 Low-Consistency Soils

Results from the soil test borings performed at the site indicate that lower consistency (N-values less than 7 bpf) residual soils are present in Borings B-01, B-04, B-07 through B-17, B-23, B-26, B-27, B-29, B-32, B-33, B-35, BA-08, LB-02, and LB-03. The lower consistency soils were encountered at various depths below the existing ground surface. N-values obtained in the lower consistency soils ranged from weight of hammer (WOH) to 6 bpf. Depending on the final design grades, if the lower consistency residual soils are present in the near-surface, some undercutting, re-working, or stabilization may be required. Remediation recommendations can typically be developed at the time of construction through routine engineering evaluations.

The presence of lower consistency soils may lead to excessive settlement and long term structure, slab-on-grade, and/or pavement distress. The presence and depth of the lower consistency soils were considered in the development of recommendations provided in subsequent sections of this report.

4.2.4 Difficult Excavation

Based on the results of the soil test borings, it appears that the majority of the general excavation will be in firm to hard and medium dense to dense residual soil. We anticipate that the residual soils can be excavated using pans, scrapers, backhoes and front end loaders. Borings B-02, B-13, B-16 through B-21, B-23, B-24, B-29 through B-31, BA-08, LB-02, and LB-03 indicated that PWR was encountered at depths ranging from approximately 6 to 38.5 feet below the existing ground surface. In addition, auger refusal was encountered in Borings B-17 through B-21, BA-08, LB-02 and LB-03 at depths between approximately 6.95 and 34 feet below existing ground surface. Therefore, we anticipate that partially weathered rock, intermittent rock lenses, bedrock and/or boulders will be encountered during general site grading and excavation for the installation of footings and utilities.

The depth to, and thickness of, PWR and rock lenses or seams, can vary dramatically in short distances and between boring locations; therefore, PWR or bedrock may be encountered during construction at locations or depths between boring locations, not encountered during this exploration. Additional information regarding excavation conditions and definitions are included in Section 5.4 of this report.

4.2.5 Dewatering

Considering the relatively shallow water level in several of the borings performed at the site and the presence of Lake Myra, it is our opinion that groundwater could be encountered. We recommend that stabilized groundwater levels be considered when establishing final site grades. If final grades are set near existing elevations where water encountered, a permanent underdrain system will be required.

4.2.6 Site Preparation

The entire structure and pavement areas should be stripped of all topsoil, high plasticity near surface soils, trash, debris and other organic materials to a minimum of 10 feet and 5 feet beyond the structural and pavement limits, respectively. It has been our experience that stripping depths of topsoil may vary from the

depths recorded on the Test Boring Records due to variability between boring locations. Deeper stripping may be required to adequately remove rootmat and stumps from wooded sites and may be dependent on surface conditions at the time of grading, such as wetter conditions during winter months. It is often desired by project owners to place topsoil/strippings in non-structural areas of the site, such as in over-built slopes or buried in on-site borrow pits. If on-site topsoil disposal is considered, the geotechnical engineer should be consulted to provide additional analysis and recommendations, as needed in this regard.

Upon completion of the stripping operations, the exposed subgrade in areas to receive fill should be proofrolled with a loaded dump truck or similar pneumatic tired vehicle (minimum loaded weight of 20 tons) under the observation of a representative of the geotechnical engineer. The proofrolling procedures should consist of complete passes of the exposed areas, with half of the passes being in a direction perpendicular to the preceding ones. After excavation of the site has been completed, the exposed subgrade in cut areas should also be proofrolled as previously described. Any areas which deflect, rut or pump excessively during proofrolling or fail to improve sufficiently after successive passes should be undercut to suitable soils and replaced with structural fill.

As previously mentioned, low consistency residual soils were encountered in the Soil Test Borings. ESP recommends the removal or reworking of any low consistency near surface soils with blow counts less than 6 bpf. High elasticity silts and high plasticity clays were also encountered. ESP recommends the removal of these soils within 3 feet of foundations and pavement subgrades.

Unsuitable soils may be encountered between the borings during site grading or excavation for foundations. Some undercutting of the soft near surface soils in various portions of the site, as well as the areas where high plasticity clay or elastic silt soils are present within the upper 3 feet of subgrade or the bearing surface should be anticipated. The extent of the undercut required should be evaluated in the field by an experienced representative of the geotechnical engineer while monitoring construction activity. The evaluation should consist of a comprehensive proofrolling program and thorough field evaluation during construction. After the proofrolling operation has been completed and approved, final site grading should proceed immediately. If construction progresses during wet weather, the proofrolling operation should be repeated with at least one pass in each direction immediately prior to proceeding with site grading. If unstable conditions are exposed during this operation, then undercutting should be performed.

4.2.7 Fill Material and Placement

All fill used for site grading operations should consist of a clean (free of organics and debris), low plasticity soil (Plasticity Index less than 30). The proposed fill should have a maximum dry density of at least 90 pounds per cubic foot as determined by a Standard Proctor Moisture-Density Relationship test, ASTM D 698. All fill should be placed in loose lifts not exceeding 8 inches in thickness and compacted to a minimum of 95 percent of its Standard Proctor maximum dry density, with at least 100 percent achieved in the upper 12 inches. We recommend that field density tests, including one-point Proctor verification tests, be performed on the fill as it is being placed at a frequency determined by an experienced geotechnical engineer to verify the compaction criteria. Any fills that may be constructed greater than 15 feet in height should be evaluated with regard to long term settlement, consolidation and slope stability. This analysis should be requested of the geotechnical engineer once grading plans are complete and available.

Based on the results of the soil test borings and our past experience with similar type materials, the residual soils encountered, except for the high plasticity clay and elastic silt soils, appear suitable for re-use as structural fill. High plasticity clay and elastic silt soils may be used in deep fill areas (more than 5 feet of fill)

or in landscaped areas provided they can be manipulated and properly compacted. As with any grading operation, moisture conditioning of the fill soils may be required.

4.2.8 Cut and Fill Slopes

For landscaping and mowing concerns, final project slopes should be designed to be 3 horizontal to 1 vertical or flatter. Slopes can be designed as steep as 2 horizontal to 1 vertical; however, soil erosion, slope sloughing and slope maintenance should be expected. If designing slopes steeper than 3 horizontal to 1 vertical, a slope stability analysis should be performed to verify stability of the slope. The tops and bases of all slopes should be located a minimum of 10 feet from structural and 5 feet from pavement limits. The fill slopes should be adequately compacted as outlined within this report, and all slopes should be seeded and maintained after construction.

4.2.9 Temporary Excavations

Excavations greater than four feet in depth should be sloped or shored in accordance with local, state, and federal regulations, including OSHA "Construction Standard for Excavations" (29 CFR Part 1926.650-652). The contractor is usually solely responsible for site safety. This information is provided only as a service and under no circumstances should ESP be assumed to be responsible for construction site safety.

4.3 Foundation Support

For satisfactory performance, the foundation for any structure must satisfy two independent design criteria. First, it must have an acceptable factor of safety against bearing failure of the foundation soils under the maximum design loads. Second, the settlement of the foundations due to consolidation of the underlying soils should be within tolerable limits for the structures.

4.3.1 Shallow Foundation Support

The results of the soil test borings indicate that the proposed buildings, retaining walls, and playground can be adequately supported on shallow foundations bearing on the low-plasticity residual soils, or newly placed structural fill, provided the site preparation and fill placement procedures outlined in this report are implemented. A net allowable bearing pressure of up to 2,500 pounds per square foot (psf) can be used for design of the building foundations bearing on residual soils exhibiting N-values of 7 bpf or greater, or on suitable structural fill compacted to at least 95 percent of the Standard Proctor maximum dry density. A net allowable bearing pressure of 1,500 psf can be used for the design of retaining wall foundations bearing on residual soils exhibiting N-values of 5 bpf or greater, or on suitable structural fill compacted to at least 95 percent of the Standard Proctor maximum dry density.

Soft soils were also encountered in retaining wall locations at B-07, B-10, and B-13. Soft soils were encountered at depths ranging from 1 to 25 feet below the existing ground surface. Some undercutting and replacement may be required depending on final wall grades.

Based on the general stratigraphy in the structure areas, past experience with similar projects and the anticipated magnitude of the loads, it is our opinion that the total and differential settlement potentials for the structures should be on the order of 1 inch and ½ inch, respectively. This conclusion is contingent upon compliance with the site preparation and fill placement recommendations outlined in this report.

Minimum wall and column footing dimensions of 18 and 24 inches, respectively, should be maintained to reduce the possibility of a localized, punching-type shear failure. Exterior foundations and foundations in unheated areas should be designed to bear at least 18 inches below finished grade for frost protection.

We recommend that the subgrade soils be observed by a representative of the geotechnical engineer prior to foundation installation. This is to assess their suitability for foundation support and confirm their consistency with the conditions upon which our recommendations are based.

The subgrade materials can be sensitive to moisture variations; therefore, foundation excavations should be opened for a minimum amount of time, particularly during inclement weather. Soils exposed to moisture variations may become highly disturbed and require undercutting prior to placing foundations.

4.3.2 Deep Foundations

Based on conversations with NV5, driven 8-inch diameter tip timber piles are preferred to support the proposed dock, pier, and boardwalk. Structural loading was not provided for the dock and pier; therefore, the following recommendations apply to the boardwalk only. We understand that the structural design will not include seismic analyses.

Based on the provided bridge plan and profile, the existing ground elevation ranges from approximately 200 to 196 feet (unknown datum) from the beginning of bridge to station 12+00, approximately 196 to 192 feet from stations 12+00 to 14+00, approximately 192 to 187 feet from stations 14+00 to 16+25, and approximately 177 to 204 feet from stations 16+25 to the end of bridge.

At the approximate location of the proposed boardwalk west approach (Boring B-28), the exploration encountered loose to dense residual silty sand to a depth of approximately 34 feet (approximate elevation 161 feet, unknown datum) and is underlain by very dense partially weathered rock. At the east approach (Boring B-29), the exploration encountered loose to very dense residual silty sand to a depth of approximately 24 feet (approximate elevation 174 feet) and is underlain by very dense PWR. Borings in the lake (Borings LB-02 and LB-03) encountered very soft to stiff sandy clay and very loose to dense silty sand to depths ranging from approximately 6 to 14 feet below the mudline (approximate elevations 177 to 185 feet) and is underlain by very dense PWR.

Based on the relatively shallow depths to PWR encountered in the lake borings, we anticipate hard driving conditions at relatively shallow depths below the mudline. Therefore, predrilling and/or jetting will likely be required to advance the piles to the recommended tip elevations in the lake from approximate stations 12+00 to 16+25.

4.3.3 Axial Pile Analysis

We performed axial compressive pile capacity calculations for standard 12-inch diameter butt, approximate 8-inch diameter tip cross section timber piles. We performed axial compressive pile capacity calculations for the cross-section timber piles summarized in Table 3-1.

Our analyses predict the timber piles bearing at the tip elevations presented in Table 3-1 will support the maximum axial loads with an adequate factor of safety. The factor of safety is at least 2.5; therefore, load testing is not required. Driving criteria is to install the piles in one, continuous operation to the design tip elevations.

Table 3-1 – Timber Piles, Axial Pile Capacity

Approximate Station Range	Tip (in)	Butt (in)	Length (ft)	Tip Elev (ft, unknown datum)
Begin to 12+00	8.6	12	25	175
12+00 to 14+00	8.3	12	30	170
14+00 to 16+25	8.6	12	25	175
16+25 to End	8.6	12	25	175

Prior to the start of pile driving, a wave equation analysis should be performed to document that the proposed pile driving hammer is capable of driving the piles without damage. ESP should observe pile driving to document that the piles are driven to the minimum design depth and to note damage or other concerns during installation.

Predrilling and/or jetting may be used to aid in the installation of the piles. The diameter of the auger to be used for predrilling should not exceed the minimum diameter of the piles. The jetting system used must be sufficient to freely erode and remove the soil material immediately adjacent to the pile without creating a crater around the pile causing it to drift.

The structural capacity and design of the piles was not considered in our analyses and is the responsibility of the project Structural Engineer. Piles should be spaced at least three pile diameters center-to-center to prevent vertical capacity reductions due to pile interaction effects.

4.3.4 Lateral Pile Response

Lateral pile analyses was performed using the provided pile loads, subsurface data, and the software LPILE 2022. The piles were modeled with free top boundary condition, and loads were applied at the top of the piles. The piles were modeled with a nonlinear bending stiffness using a modulus of elasticity of 1,500,000 psi for each of the load cases. A summary of the lateral analyses is presented in following tables, and plots of the deflection, shear, and moment verses depth are included in the Appendix. The piles are widely spaced; therefore, no reduction factors are required for group effects.

Based on analysiss of the soil profile and depth to PWR estimations, we expect a minimum pile embedment of at least 13 feet below the mudline to maintain fixity of the piles. Shallow PWR was encountered in LB-02 and LB-03 within Lake Myra. Based on Borings B-28, B-29, and B-30 LB-02, and LB-03, this depth may not be achieved from approximately STA 15+00 to STA 17+00. Jetting may be required to reach a depth to maintain fixity in these areas.

Table 3-2 –Timber Piles, Free-Head Condition

Approximate Station Range	Tip (in)	Butt (in)	Length (ft)	Applied Lateral Load (lbs)	Applied Axial Load (kips)	Pile Head Deflection (in)	Maximum Shear in Pile (kips)	Maximum Moment in Pile (in-kips)
Begin to 12+00	8.6	12	25	530	16	6.9	4.1	230.7
12+00 to 14+00	8.3	12	30	530	16	7.9	3.5	231.3
14+00 to 16+25	8.6	12	25	530	16	7.4	7.3	240.3
16+25 to End	8.6	12	25	530	16	6.9	4.1	230.7

Our analyses indicate lateral pile response controls the recommended pile tip elevations in Lake Myra from approximate stations 14+00 to 16+25. At these locations where pile driving meets refusal on PWR prior to reaching the recommended tip elevations listed in Table 3-1, minimum pile penetration should be at least 12 feet below the mudline.

4.4 Seismic Considerations

Based on the soil test borings performed at the site and our review of the current North Carolina Building Code, with reference to Chapter 20 of the American Society of Civil Engineers (ASCE) Standard 7, "Minimum Design Loads for Buildings and Other Structures," the site is identified as Seismic Site Class C.

4.5 Slab-On-Grade

The slab-on-grade floor systems can be adequately supported on the low-plasticity residual/native soils or newly compacted fill, provided the site preparation and fill placement procedures outlined in this report are implemented. Based on our experience on the subject site and on our observation of the potential cut soils to be used as fill for the site grading, we recommend a preliminary modulus of subgrade reaction (k_s) of 100 pounds per square inch per inch (pci) for point load conditions. This assumes the slab subgrade soils are determined to be suitable or any disturbed slab subgrade soils are reworked or stabilized prior to slab construction. We recommend the structural engineer provide the implied slab stresses to ESP after initial design and the modulus of subgrade reaction can be modified in an iterative process with the structural engineer to optimize the slab-on-grade design. If a stone base material is used, an adjusted (composite) modulus of subgrade reaction may be appropriate for slab design.

The need for a base material between the soil subgrade and the slab-on-grade is dependent on subgrade soil strength characteristics, variability of subgrade soil constituents and the free draining characteristics of the subgrade soils. The inclusion of a water vapor retarder beneath the floor slab is a design element based on the subgrade constituents and design use of the structure and floor covering systems. For design guidance, refer to ACI 360R Design of Slabs on Grade, ACI 302.1R-15 Guide for Concrete Floor and Slab Construction and ASTM E1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

Immediately prior to constructing the floor slabs, we recommend that the areas be proofrolled or otherwise evaluated to detect unstable, low consistency/relative density areas or areas that may have been exposed to wet weather or construction traffic. Areas that are found to be unstable or indicate low consistency/relative density during the evaluation should be undercut and replaced with adequately compacted structural fill. The evaluation should be performed by a representative of the geotechnical engineer.

4.6 Pavements

We recommend that special care be given to providing adequate drainage away from pavement areas to reduce infiltration of surface water to the base course and subgrade materials in these areas. This is very important on this site due to the presence of high plasticity clay/elastic silt soils that have a high shrink/swell potential. If these materials are allowed to become saturated during the life of the pavement section, then there will be a strength reduction of the materials that could result in a reduced life of the pavement section. All water should be routed away from the pavement areas and adequate slopes provided to maintain drainage off site. Pavement areas should be proofrolled prior to placing structural fill and/or base course. Proofrolling procedures are outlined in subsequent sections of this report.

General Design Basis. ESP has utilized the “AASHTO Guide for Design of Pavement Structures,” dated 1993 as guidance for the analysis and design process and for selection of subgrade soil support values, structural coefficient for pavement layers and selection of recommended pavement components. The recommendations presented herein assume that the production and placement of the bituminous and base course as well as the bituminous concrete meet the requirements of the current NCDOT “Standard Specifications for Roads and Structures.”

Subgrade Soil Conditions. Subsurface conditions along the proposed roadway generally consist of soft to very hard sandy clayey silt underlain by loose to dense silty sands with depth. However, the majority of the roadway section will be in fill.

Serviceability Index and Regional Factor. A terminal serviceability index of $P_t=2.0$ and initial serviceability index of $P_o=4.2$ were used for the pavement design analysis in conjunction with a regional factor of 1.

Design Traffic Volumes. The traffic volumes have been assumed based on the proposed number of parking spaces. ESP has assumed A traffic volume of 350 passenger vehicles, 2 panel trucks, 6 buses, garbage, or recycle trucks per day.

Design of New Flexible Pavement Sections. The pavement sections required were established based on the above stated design parameters and traffic using a CBR value of 2. Several combinations of base, binder and surface coarse thicknesses were calculated for the subgrade and traffic conditions. The recommended sections are presented below.

Section Type	Bituminous Concrete Surface Course, Type, 9.5X (Inches)	Bituminous Concrete Binder Course, Type, 119.0C (Inches)	Bituminous Concrete Base Course, Type, B25.0C (Inches)	Aggregate Base Course, (Inches)
Light Duty:	2	0	0	8
Heavy Duty:	2	3	0	8

Design of New Rigid Pavement Sections. Based on the analysis for concrete pavement design, we recommend using the minimum concrete sections shown below. Saw joints should be provided at a 12-1/2 foot spacing or less. The subgrade materials should be prepared as indicated above. The concrete compressive strength (fc) should be at least 4000 psi, with air entrainment of 4 to 6 percent. The slab should be reinforced with a minimum 6x6-W1.4/W1.4 welded wire mesh or properly designed fiber glass reinforcement.

Section Type	Concrete Thickness (Inches)	Aggregate Base Course, (Inches)
Heavy Duty:	6	6

4.7 Below Grade Walls/Site Retaining Walls

Cast in place walls, such as for the eastern parcel portion of the site, should be designed with regard to the lateral earth's pressure. We recommend that all column and wall foundations in the vicinity of below grade/cast in place walls be located below the plain projected upward from the bottom exterior edge of the wall foundation on a 1 horizontal to 1 vertical slope. We recommend that the below grade walls be designed with regard to the lateral pressure exerted by the compacted fill. We recommend that the "At rest" lateral earth pressure coefficient be used if the wall is restrained from rotation and that the "Active" lateral earth pressure coefficient be used if rotation is not restrained. The lateral earth pressure coefficient is based on a conservatively estimated angle of internal friction for compacted backfill and the on-site soils. The following table provides soil parameters and earth pressure coefficients to be considered for use in the preliminary wall designs. These parameters are based on our experience with similar soils; however, no detailed laboratory testing has been performed to verify the soil parameters.

Effective Angle of Internal Friction, ϕ' (degrees)	At Rest Lateral Earth Pressure, K_0	Active Lateral Earth Pressure, K_a	Wet Unit Weight (pcf)	Equivalent Fluid Unit Weight (Level Backfill)	Sliding Friction Coefficient (soil/concrete) (pcf)
26	.56	.39	110	56	.32

Foundation drains should be installed behind the below grade walls for removing water to provide drainage and reduce build-up of hydrostatic forces. A free draining granular material or manufactured product such as Mirafi® G-Series Drainage Composite or approved equivalent should be placed directly against the below



grade walls and tied to the foundation drains. Foundation drain pipes should be connected to a storm drain located near the building and positive drainage should be provided at all times.

In backfilling against the wall, care should be taken to prevent the backfill from being over-compacted, as this could result in excessive lateral stresses against the wall. In the same regard, heavy equipment should not be used for the compaction of the fill or operated adjacent to the wall. A free drainage granular material should be used for backfilling behind the wall. The upper 2 feet of backfill materials should consist of a clayey silty soils to reduce surface water infiltration behind the wall. We recommend that proper surface drainage be provided to route surface water away from the wall.

5.0 OTHER CONSIDERATIONS

5.1 Drainage

Soil strength and settlement potential is highly dependent upon the moisture condition of the supportive soil. Soil characteristics can change dramatically when moisture conditions change. As such, building pads, roadways, structures and surrounding grades should be properly designed and constructed to properly control water (surface and subsurface). Building pads should be designed to shed surface water prior to building construction. Grades surrounding structures should be adequately sloped away from the structure to promote positive drainage and prevent water from ponding near or against the structure. Swales and/or storm drainage structures should be constructed to collect and remove all surface water run-off. All roof drain downspouts should be connected to drain leaders that are properly daylighted or connected to storm drainage structures such that water is removed from structural areas. Foundation drains should be designed and constructed to properly protect foundations from changing moisture conditions. Foundation drains constructed should be properly daylighted or connected to storm drain structures to remove all water from foundation areas. Roof drain lines and foundation drain lines should always remain independent of each other. Any subsurface water that may rise near structural grades should be controlled by adequately constructed subsurface drainage mechanisms.

5.2 Effects of Construction Methods

Several aspects of construction at this site could adversely affect the adjacent streets, utilities and nearby facilities. Therefore, proper design and special care during construction will be needed to protect the adjoining properties. These items are discussed below.

Jackhammering, blasting, pile driving and other construction activities can generate vibrations that travel off-site. These vibrations can cause damage to adjacent structures if not properly controlled. Care must be taken to prevent damage of newly placed structures, especially fresh concrete. Any blasting charges that are used must be properly sized and timed to prevent structural damage. We recommend that vibration monitoring be performed for structures located nearby during the construction activities that generate a large amount of vibration. This will reduce the potential for large magnitude vibrations and subsequent damage claims.

General site dewatering can sometimes cause settlement of adjacent structures due to an increase in effective stresses which can consolidate soils. Based on the available data, we anticipate that this will generally not be a problem at this site. However, pumping of fine soil particles due to improper dewatering techniques can result in unwanted subsidence. Therefore, proper dewatering systems, if required, should be implemented to reduce these effects.

5.3 Excavation Conditions and Definitions

It has been our past experience in this geologic area that materials having Standard Penetration Resistances of less than 50 blows per 0.4 foot can generally be excavated using pans and scrapers by first loosening with a ripper attached to a suitable sized dozer such as a Caterpillar D-8. On earthwork projects requiring ripping, questions sometimes develop as to whether the materials can be removed by ripping or whether blasting is required. It should be noted that ripping is dependent upon finding the right combination of equipment and techniques used, as well as the operator's skill and experience. The success of the ripping

operation is dependent on finding the proper combinations for the conditions encountered. Excavation of the weathered rock is typically much more difficult in confined excavations. Jackhammering or blasting is anticipated to be required for materials having Standard Penetration Resistances in excess of 50 blows per 0.2 foot.

We recommend that materials requiring blasting or hammering to remove be well defined in the project specifications and/or construction contract documents. Below are recommended definitions for “rock.” Please note the definition below for boulders regarding difficult excavation is different to the USCS definition of boulders regarding soil classification.

Mass Rock: Material that cannot be dislodged by a Caterpillar D-8 Bulldozer, or equivalent, equipped with a single tooth ripper.

Trench Rock: Material that cannot be dislodged by a Caterpillar 320 hydraulic backhoe, or equivalent, equipped with a rock bucket.

Boulders: Masses of rock exceeding 1 cubic yard in volume for mass excavations and ½ cubic yard in volume for trench excavations shall also be considered mass or trench rock, respectively, during excavation.

These classifications are for information purposes only and are not considered contractual definitions unless referenced as such by the project plans and/or contract documents. The classifications do not include materials such as loose rock, concrete, or other materials that can be removed by means other than impact hammering, but which for any reason, such as economic reasons, the contractor chooses to remove by impact hammering.

We also recommend that quantification guidelines for payment purposes be established prior to removal of materials defined above. These guidelines should include the following measurements to be used during quantity calculations:

- The depth below proposed subgrade for mass rock.
- The depth below proposed utility design depth for trench rock.
- The width on each side of the utility for trench rock.

These guidelines should establish a base line for payment and should be completely independent of the means and methods of the contractor.

6.0 LIMITATIONS OF REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practice with regard to the specific conditions and requirements of this site. The conclusions and recommendations contained in this report were based on the applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analysis and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations between the borings will not be known until construction is underway. If variations appear evident, then we request the opportunity to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the structures are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by ESP.

In order to verify that earthwork and foundation recommendations are properly interpreted and implemented, we recommend that ESP be provided the opportunity to review the final plans and specifications. Any concerns observed will be brought to our client's attention in writing.

Our conclusions and recommendations are based on the project information previously discussed and on the data obtained from the field and laboratory testing program. If the structural loading, geometry or proposed structure locations are changed or significantly differ from those discussed, or if conditions are encountered during construction that differ from those encountered by the borings, ESP requests the opportunity to review our recommendations based on the new information and make any necessary changes.

APPENDIX



FIELD EXPLORATION

Soil Test Boring: Thirty-eight (38) soil test borings were drilled at the approximate locations shown on the attached Boring Location Plan, Figure 1 to 6. Soil sampling and penetration testing were performed using general guidance from ASTM D 1586.

The borings were advanced with hollow-stem augers and, at standard intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated six (6) inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches with the exception of penetration restrictions. The sum of the last foot of hammer blows is designated the "Standard Penetration Resistance." Standard Penetration Tests were performed within the soil test borings utilizing an automatic hammer attached to the referenced drill rig(s) utilized in this exploration. The Standard Penetration Test values shown on the "Test Boring Records" have not been corrected for theoretical energy or depths adjustments. When properly evaluated, the Standard Penetration Resistances provide an index to soil strength, relative density, and ability to support foundations.

Select portions of each soil sample were placed in sealed containers and taken to our office. The samples were examined by a representative of the geotechnical engineer for classification. Test Boring Records are attached showing the soil descriptions and Standard Penetration Resistances.



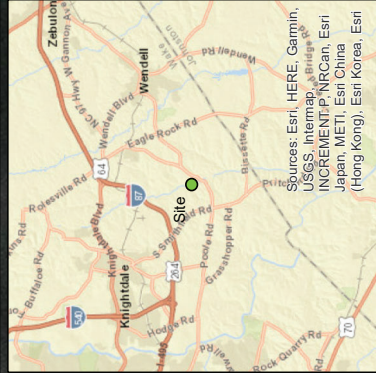
LABORATORY PROCEDURES

Wash # 200 Sieve: The determination of percent fines was performed on select soil samples obtained during our field investigation. Soil samples were washed over the #200 sieve to determine the percent passing. The test was conducted using general guidance from ASTM 1140. The results are presented on the attached Atterberg Limits Results.

Soil Plasticity Tests (Atterberg Limits Test): Select samples were identified for Atterberg Limits testing to determine the soil's plasticity characteristics. This test was conducted using general guidance from ASTM D 4318. The Plasticity Index (PI) is representative of this characteristic and is determined utilizing the Liquid Limit (LL) and the Plastic Limit (PL). The Liquid Limit is the moisture content at which the soil will flow as a heavy viscous. The Plastic Limit is the moisture content at which the soil transitions between the plastic and semi-solid states. The data obtained is presented on the attached Atterberg Limits Results sheet.

Standard Proctor Compaction Test: Select samples of the on-site and borrow soils were obtained from auger cuttings to determine their suitability as fill material. Standard Proctor Compaction Tests was conducted using general guidance from ASTM D 698 and were performed on these soils to determine their compaction characteristics including maximum dry density and optimum moisture content. The test results are presented on the attached Moisture-Density Relationship Sheets included in the Appendix.

California Bearing Ratio Test (CBR): The results of the compaction tests described above were utilized in compacting the samples for laboratory CBR tests. The California Bearing Ratio, usually abbreviated as CBR, is a punching shear test. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil, that has been correlated with pavement performance to establish design criteria for pavement thickness. The test is performed on a six-inch diameter, five-inch thick disc of compacted soil that is confined in a steel cylinder. Before testing, the sample is inundated in water under a confining pressure approximately equal to the weight of the future pavement in order to determine the potential swelling, and to simulate the worst possible condition that can occur in the field. A piston, approximately two inches in diameter, is then forced into the soil at a standard rate to determine the resistance to penetration. The CBR is the ratio, expressed as a percentage, of the actual load required to produce a 0.1 inch deflection to that required to produce the same deflection in a certain standard crushed stone. This test was conducted using general guidance from ASTM D 1883. The results of the CBR tests are shown on the attached California Bearing Ratio Test Results sheet included in the Appendix.



SITE VICINITY MAP
(Not to Scale)

DRAWING TITLED "LAKE MYRA
COUNTY PARK,"
DATED JANUARY 31, 2024
DEVELOPED BY SUSAN HATCHELL
LANDSCAPE ARCHITECTURE, PLLC

THIS SHEET IS FOR BORING
AND TEST PIT INFORMATION
PURPOSES ONLY.



Legend

Approximate Boring Location

Boring and Test Pit Labels (approximate)

- Boring and Test Pit Name Designation Refusal (ft)
- Low Consistency Soil Depth Range (ft)
- Partially Weathered Rock Depth (ft)
- Water Depth (ft) Fill or Alluvium Depth (ft)
- High Plasticity/Elastic Soil Depth Range (ft)

SHEET TITLE:

Boring Location Map
Figure 2
Lake Myra Site
Wendell, North Carolina

N



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DATE: August 13, 2025

PROJECT NO. 644-24-00661-002-GEO

SCALE: NTS

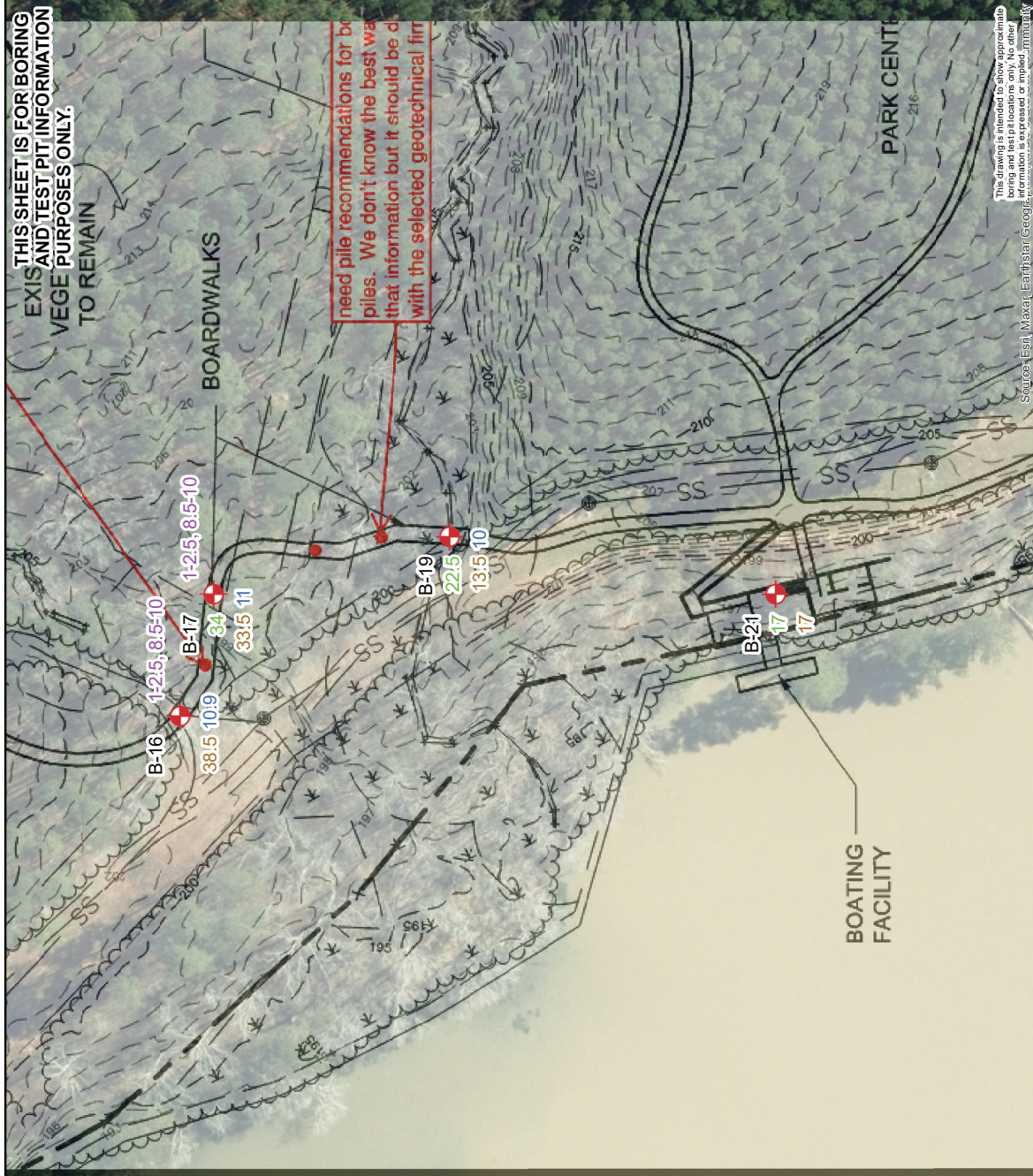
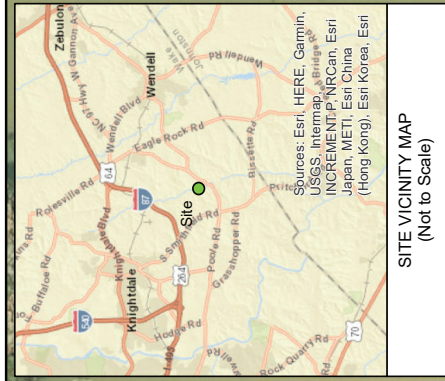
DRAWN BY: BRL

CHECKED BY: DCS

ESP
2200 Gateway Centre Blvd
Suite 216
Merrisville, NC 27660
www.espsciences.com
Phone: 919-478-1070

The drawing is intended to show approximate locations only. The information is expressed or implied as advisory only.

Sources: Esri, HERE, DeLorme, Mapbox, Google, Microsoft, Bing, etc.



Legend

 - Approximate Boring Location

Boring and Test Pit Labels (approximate)

Boring and Test Pit Name Designation **Refusal (ft)**

Low Consistency Soil Depth Range (ft)

Partially Weathered Rock Depth (ft)

Water Depth (ft) Fill or Alluvium Depth (ft)

High Plasticity/Elastic Soil Depth Range (ft)

SHEET TITLE:	Boring Location Map Figure 3
	Lake Myra Site Wendell, North Carolina

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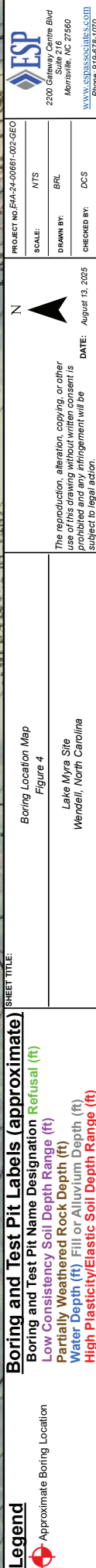
DATE: August 13, 2025

N 

PROJECT NO. E&A-24-00661--002-GEO	
SCALE: NTS	
DRAWN BY: BRL	
CHECKED BY: DCS	

[illegible]

DRAWING TITLED "LAKE MYRA
COUNTY PARK,"
DATED JANUARY 31, 2024,
DEVELOPED BY SUSAN HATCHER,
LANDSCAPE ARCHITECTURE, P.C.



Boring and Test Pit Labels (approximate)

Legend

 Approximate Boring Location

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DATE: August 13, 2025



Boring Location Map
Figure 4

SHEET TITLE:

Legend

Boring and Test Pit Name Designation **Refusal (ft)**
Low Consistency Soil Depth Range (ft)
Partially Weathered Rock Depth (ft)
Water Depth (ft) **Fill or Alluvium Depth (ft)**
High Plasticity/Elastic Soil Depth Range (ft)



Approximate Boring Location

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Lake Myra Site
Wendell, North Carolina

DATE: August 13, 2025

E1A-24-00664-002 GEO

SCALE:

DRAWN BY:

CHECKED BY:

ESP
2200 Gateway Centre Blvd
Suite 216
Morrisville, NC 27560
www.espassociates.com
Phone: 919.678.4070

This drawing is intended to show approximate boring and test pit locations only. No other information is expressed or implied.

Source: Esri, Maxar, Earthstar Geographic

Sources: Esri, HERE, Garmin, USGS, Imagery, Mapbox, OpenStreetMap contributors, and the U.S. National Geographic Society

DRAWING TITLED "LAKE MYRA
COUNTY PARK,"
DATED JANUARY 31, 2024,
DEVELOPED BY SUSAN HATCHELL,
LANDSCAPE ARCHITECTURE, PILLCC



Boring and Test Pit Name Designation **Refusal (ft)**
Low Consistency Soil Depth Range (ft)
Partially Weathered Rock Depth (ft)
Water Depth (ft) **Fill or Alluvium Depth (ft)**
High Plasticity/Elastic Soil Depth Range (ft)

Boring Location Map
Figure 5

DATE: August 13, 2025

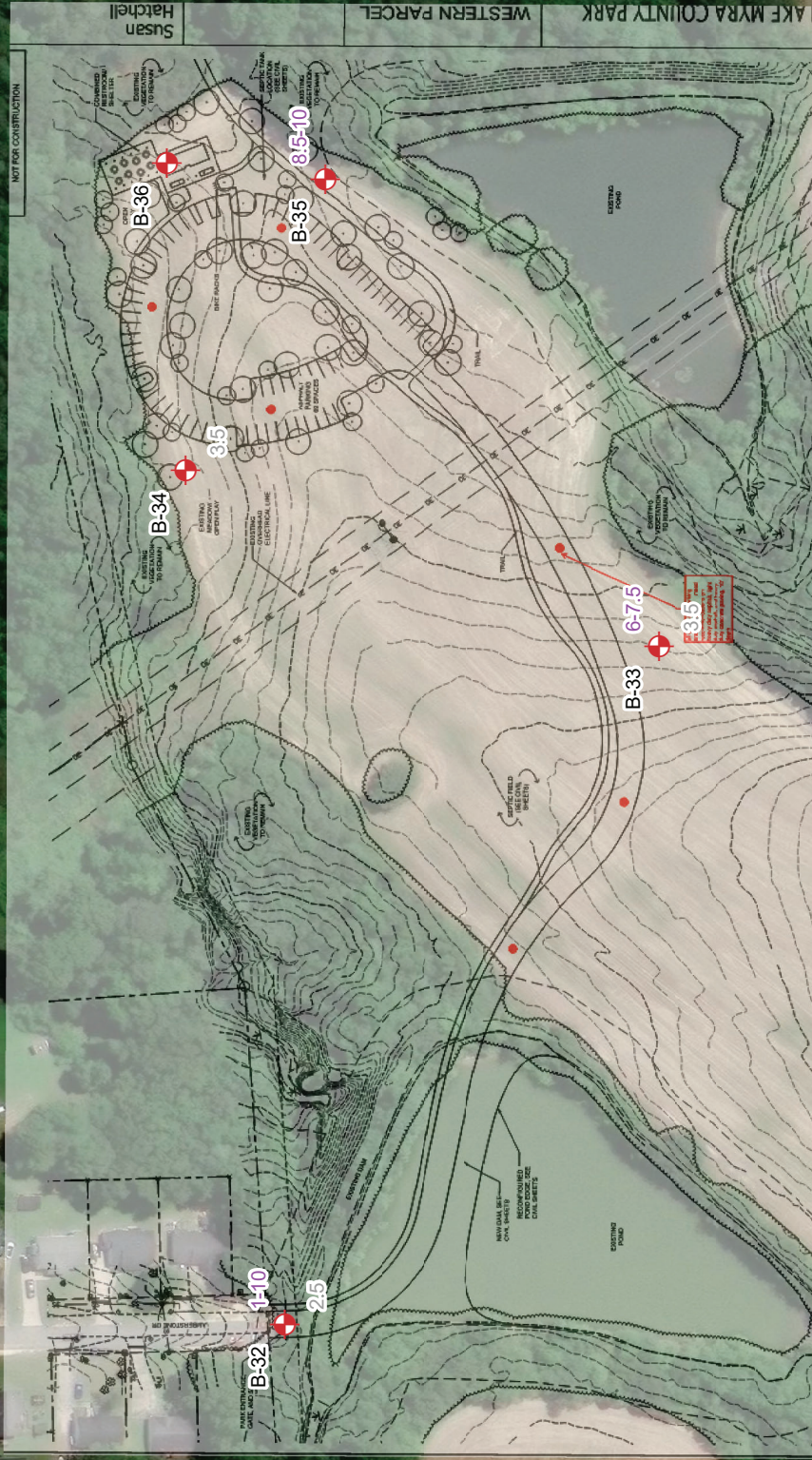
SCALE:	NTS
DRAWN BY:	BRL
CHECKED BY:	DCS

This drawing is intended to show approximate boring and test pit locations only. No other information is expressed or implied.



Sources: Esri, HERE, Garmin, USGS, Intermap, iSDI, Esri, Japan, METI, Esri China (Hong Kong), Esri Korea, Esri

**DRAWING TITLED "LAKE MYRA
COUNTY PARK,"
DATED JANUARY 31, 2024
DEVELOPED BY SUSAN HATCHELL
LANDSCAPE ARCHITECTURE, PLLC**



Legend

- Approximate Boring Location

Boring and Test Pit Labels (approximate)

Boring and Test Pit Name Designation Refusal (ft)

Low Consistency Soil Depth Range (ft)

Partially Weathered Rock Depth (ft)

Water Depth (ft) Fill or Alluvium Depth (ft)

High Plasticity/Elastic Soil Depth Range (ft)

SHEET TITLE:

Boring Location Map
Figure 6

Lake Myra Site
Wendell, North Carolina

PROJECT NO.: FEA-24-00661-002-GE0

SCALE: NTS

DRAWN BY: BRL

CHECKED BY: DCS

N

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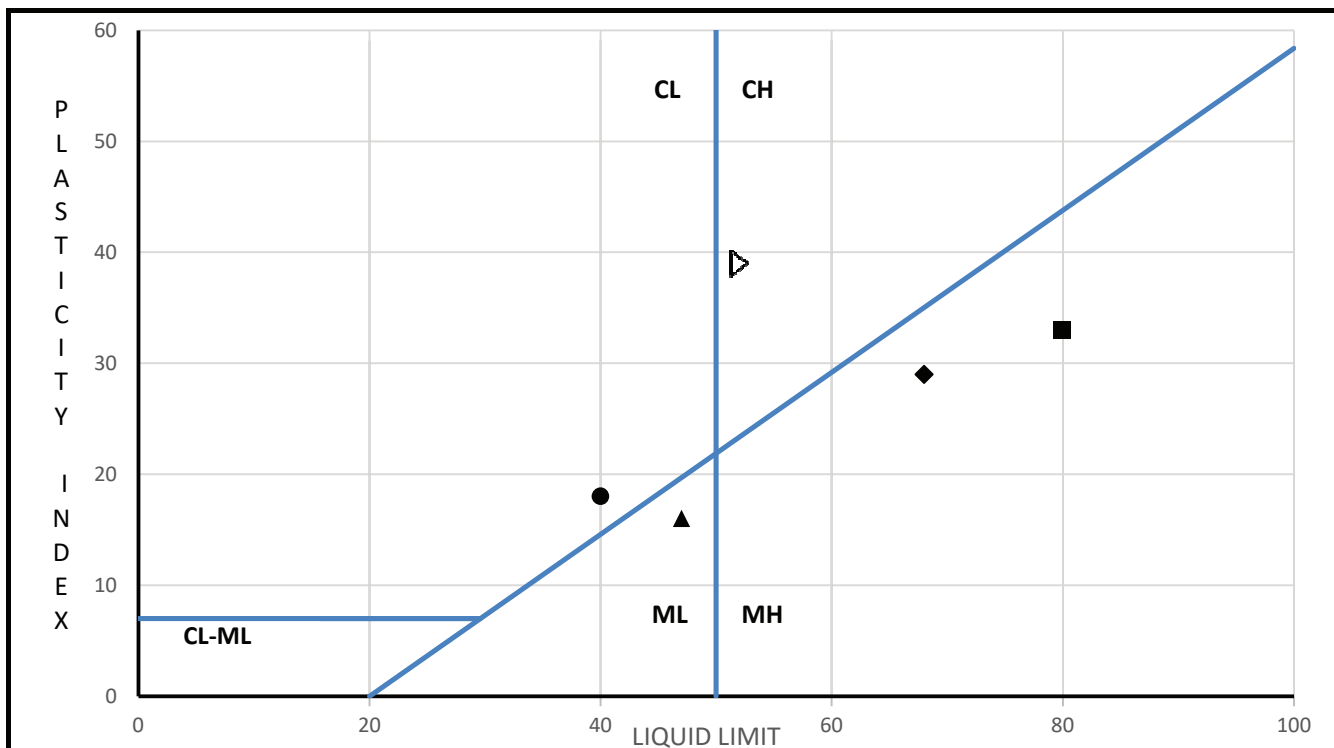
DATE: August 13, 2026

2220 Gateway Centre Blvd
Morriseville, NC 27560

www.espsurveying.com
 Phone: 319.476.1770

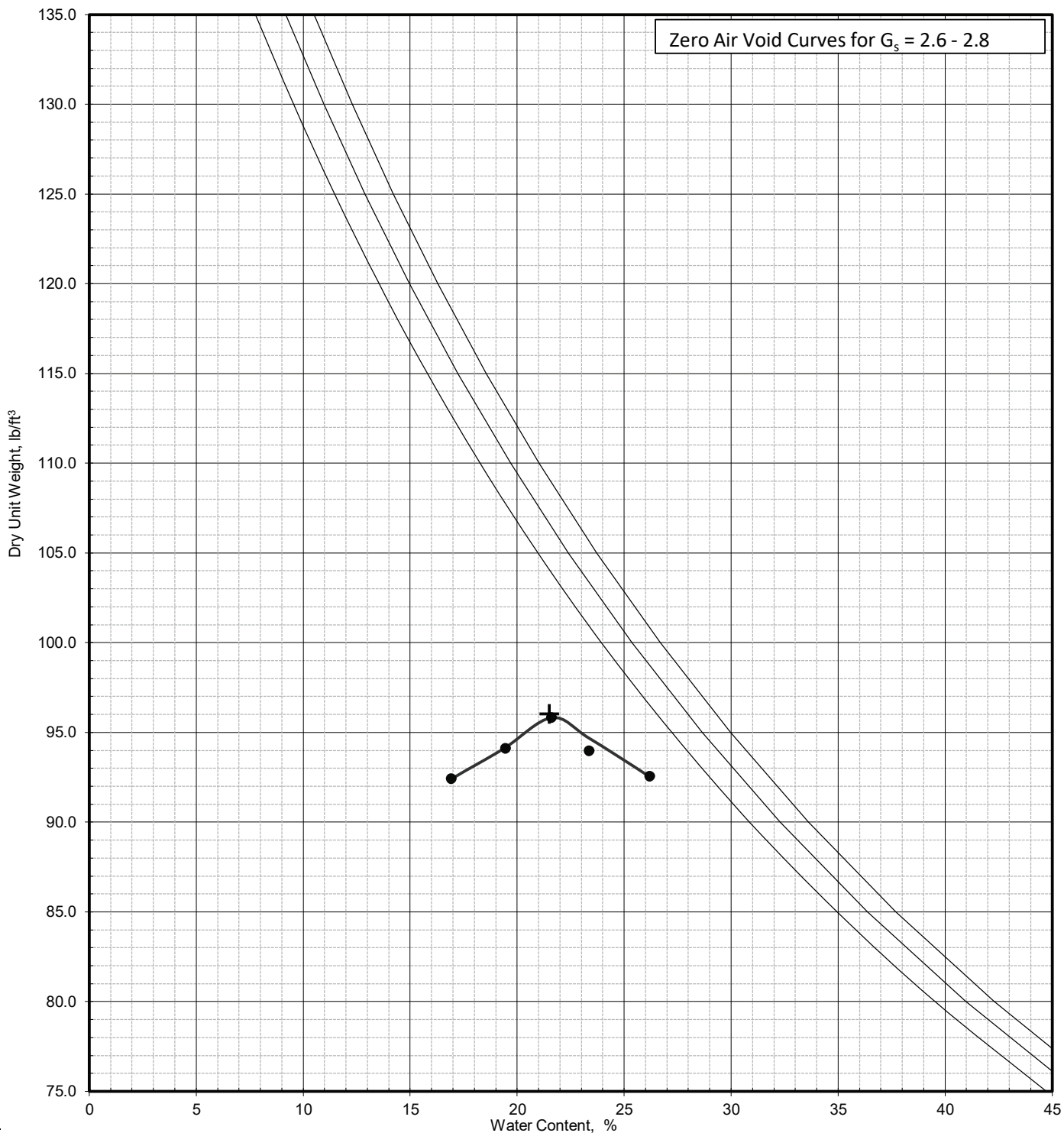
Boring and Test Pit Labels (approximate)

Boring and Test Pit Name	Designation	Refusal (ft)
Low Consistency Soil	Depth Range (ft)	
Partially Weathered Rock	Depth (ft)	
Water Depth (ft)	Fill or Alluvium Depth (ft)	
High Plasticity/Elastic Soil	Depth Range (ft)	



Specimen Identification	LL	PL	PI	Fines	Classification
■ B-01 (1' - 2.5')	80	47	33	97.3	Elastic silt MH
◆ B-04 (1' - 2.5')	68	39	29	97.4	Elastic silt MH
▲ B-07 (0' - 10')	47	31	16	80.2	Silt with sand ML
● B-32 (3.5' - 5')	40	22	18	39.9	Clayey sand SC
▷ B-36 (1' - 2.5')	52	13	39	49.8	Clayey sand SC

Remarks:		ATTERBERG LIMITS' RESULTS	
		TEST METHOD: ASTM D4318	
	Address:	2200 Gateway Centre Blvd. Suite 216 Morrisville, NC 27560	Project: Lake Myra Site
	Telephone:	919-678-1070	Number: 24-00661-002-GEO
Lab Technician: challenbeck		Project Manager: blong	



Soil Description: Tan Silt with Sand ML				Sample No. S-3	
Sample Type: BLK	Preparation:	Rammer: Manual - 5.5lbf (24.5N)	Location: B-07		
Depth: 0 - 10 ft	Maximum Dry Unit Weight: 96.0 lb/ft³	PL: 31	PI: 16		
Received water content: %	Optimum Water Content: 21.5 %	Fines: 80.2 %	LL: 47		
Remarks:		STANDARD MOISTURE-DENSITY RELATIONSHIP			
		TEST METHOD: ASTM D698 method A			
	Address: 2200 Gateway Centre Blvd. Suite 216 Morrisville, NC 27560 Telephone: 919-678-1070		Project: Lake Myra Site		
			Number: 24-00661-002-GEO		
Lab Technician: challenbeck			Project Manager: blong		

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The test results shown are specific to the specimen/sample numbers tested, as noted above.



June 25, 2025

Project No. 2025-174-001

Ben Long
ESP Associates, Inc
2200 Gateway Centre Blvd. Suite 216
Morrisville, NC 27560

blong@espassociates.com

Transmittal
Laboratory Test Results
24-00661-002 Lake Myra

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

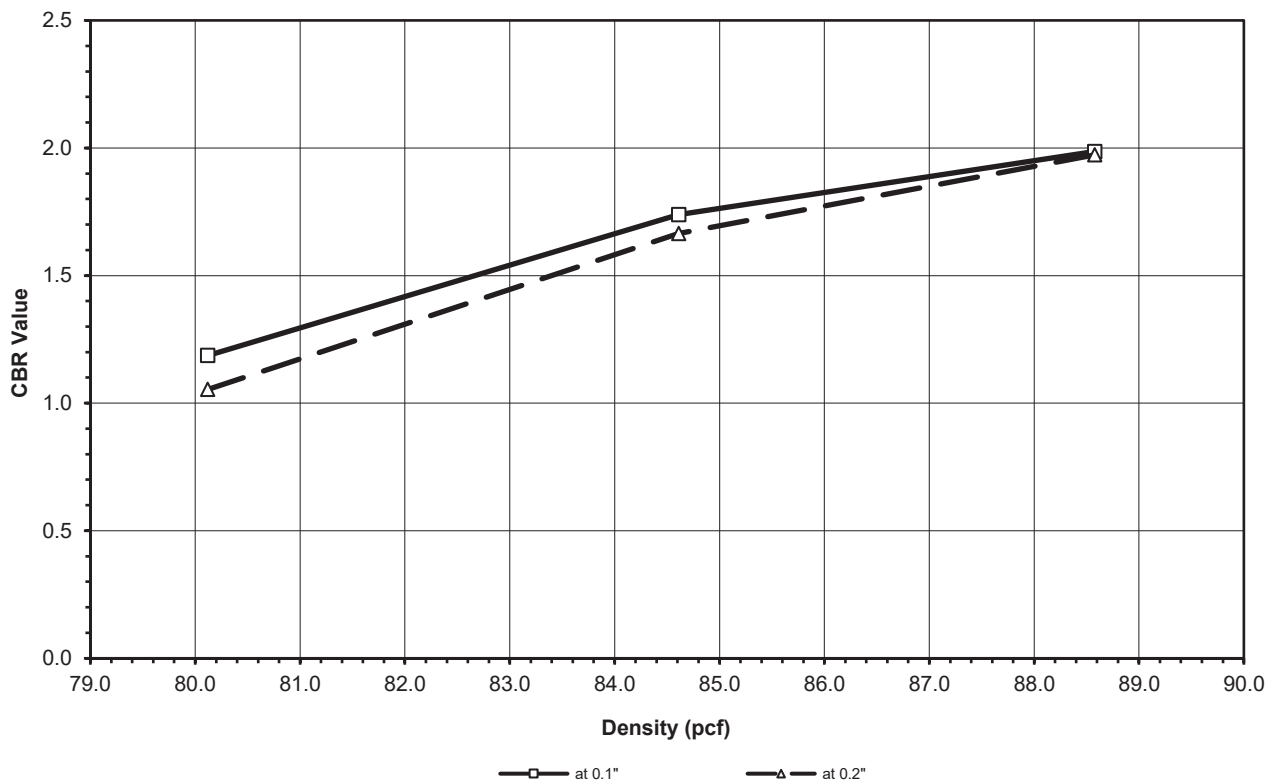
Michael P. Smith
Regional Manager

***We understand that you have a choice in your laboratory services
and we thank you for choosing Geotechnics.***

3 POINT CBR TEST
ASTM D 1883-16 / AASHTO T193-13

Client:	ESP Associates, Inc.	Boring No.:	B-4
Client Reference:	24-00661-002 Lake Myra	Depth (ft):	10'
Project No.:	R-2025-174-001	Sample No.:	NA
Lab ID:	R-2025-174-001-001	Visual Description:	Light Brown Sandy Clay

Point No.	1	2	3
Blows per Layer	10	25	56
Dry Density (pcf)	80.1	84.6	88.6
Dry Density (g/cm ³)	1.28	1.36	1.42
Penetration Stress @ 0.1"	11.87	17.39	19.86
Penetration Stress @ 0.2"	15.80	24.97	29.59
CBR Values @ 0.1"	1.19	1.74	1.99
CBR Values @ 0.2"	1.05	1.66	1.97

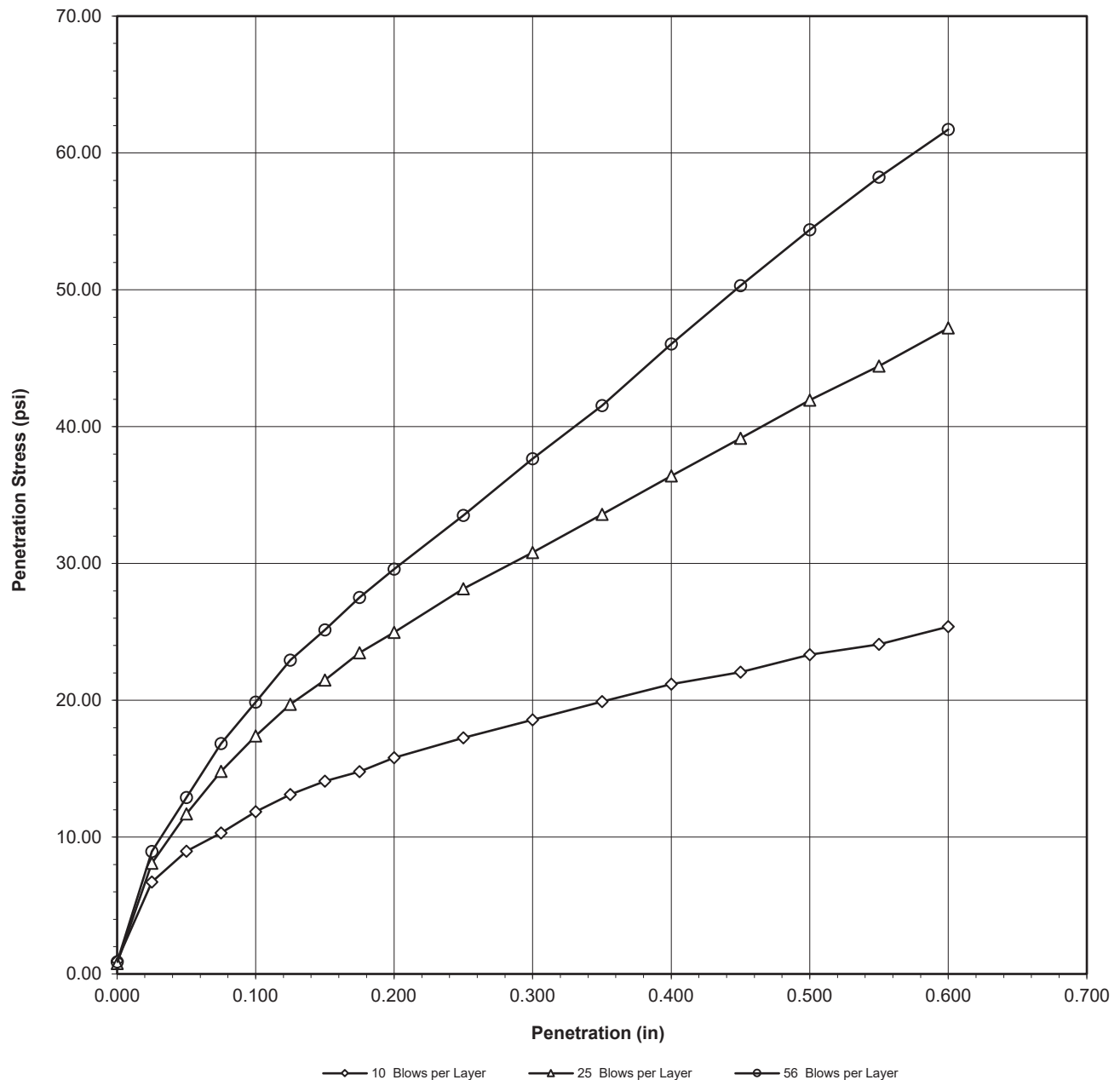


Tested By NS Date 6/20/25 Input Checked By DL Date 6/25/25

3 POINT CBR TEST
ASTM D 1883-16 / AASHTO T193-13

Client:	ESP Associates, Inc.	Boring No.:	B-4
Client Reference:	24-00661-002 Lake Myra	Depth (ft):	10'
Project No.:	R-2025-174-001	Sample No.:	NA
Lab ID:	R-2025-174-001-001	Visual Description:	Light Brown Sandy Clay

Penetration Stress vs. Penetration



3 POINT CBR TEST

ASTM D 1883-16 / AASHTO T193-13

Client:	ESP Associates, Inc.	Boring No.:	B-4
Client Reference:	24-00661-002 Lake Myra	Depth (ft):	10'
Project No.:	R-2025-174-001	Sample No.:	NA
Lab ID:	R-2025-174-001-001	Visual Description:	Light Brown Sandy Clay
			+3/4" Scalped & Replaced (%) NA

Test Type	STANDARD	Density Measurement	Before Soaking	After Soaking
Molding Method	C	Wt. of Mold & Wet Sample (g)	7716.6	8112.0
Mold ID	R-432	Wt. of Wet Sample (g)	3518	3913
Weight of Mold (g)	4198.6	Sample Volume (cm ³)	2125	2230
Mold Volume (cm ³)	2125	Wet Density (g/cm ³)	1.66	1.75
Surcharge (lb)	10	Wet Density (pcf)	103.4	109.5
Piston Area (in ²)	3	Dry Density (pcf)	80.1	79.9
Sample Height (in)	4.58	Dry Density (g/cm³)	1.28	1.28
Sample Conditions	Soaked			
Blows per Layer	10			

Water Contents	As Received	Beginning Compaction	After Compaction	Average Begin&Aft	After Soaking	Top 1" After Soak
Tare No.	N/A	441	441		495	708
Wt. of Tare & Wet Sample (g)	N/A	502.48	502.48		430.9	445.2
Wt. of Tare & Dry Sample (g)	N/A	411.55	411.55		341.1	327.04
Wt of Tare (g)	N/A	97.99	97.99		99.3	90.8
Moisture Content (%)	N/A	29.0	29.0	29.0	37.1	50.0

Piston Displacement (in)	Load (lb)	Penetration Stress (psi)	Swell Measurement		
			Elapsed Time (hr)	Dial Gauge (Div)	Percent Swell
0	2.91	1.0			
0.025	20.13	6.7			
0.050	26.91	9.0			
0.075	30.89	10.3			
0.100	35.60	11.9	0.00	489	0.00%
0.125	39.33	13.1	67.25	715	4.93%
0.150	42.26	14.1	96.00	716	4.96%
0.175	44.38	14.8			
0.200	47.41	15.8			
0.250	51.80	17.3			
0.300	55.72	18.6			
0.350	59.71	19.9			
0.400	63.54	21.2			
0.450	66.17	22.1			
0.500	70.02	23.3			
0.550	72.26	24.1			
0.600	76.14	25.4			

1 Division = 0.001 (in)

Tested By NS Date 6/20/25 Input Checked By DL Date 6/25/25

3 POINT CBR TEST

ASTM D 1883-16 / AASHTO T193-13

Client:	ESP Associates, Inc.	Boring No.:	B-4
Client Reference:	24-00661-002 Lake Myra	Depth (ft):	10'
Project No.:	R-2025-174-001	Sample No.:	NA
Lab ID:	R-2025-174-001-001	Visual Description:	Light Brown Sandy Clay

Test Type	STANDARD	+3/4" Scalped & Replaced (%)	NA
Molding Method	C	Density	Before Soaking
Mold ID	R-354	Measurement	After Soaking
Weight of Mold (g)	4187.4	Wt. of Mold & Wet Sample (g)	7911.4
Mold Volume (cm ³)	2129	Wt. of Wet Sample (g)	3724
Surcharge (lb)	10	Sample Volume (cm ³)	2129
Piston Area (in ²)	3	Wet Density (g/cm ³)	1.75
Sample Height (in)	4.58	Wet Density (pcf)	109.1
Sample Conditions	Soaked		
Blows per Layer	25	Dry Density (pcf)	84.6
		Dry Density (g/cm ³)	1.36
			1.32

Water Contents	As Received	Beginning Compaction	After Compaction	Average Begin/Aft	After Soaking	Top 1" After Soak
Tare No.	N/A	441	441		423	14-A
Wt. of Tare & Wet Sample (g)	N/A	502.48	502.48		488.6	395.8
Wt. of Tare & Dry Sample (g)	N/A	411.55	411.55		384.24	297.1
Wt of Tare (g)	N/A	97.99	97.99		100.1	87.2
Moisture Content (%)	N/A	29.0	29.0	29.0	36.7	47.0

Piston Displacement (in)	Load (lb)	Penetration Stress (psi)	Swell Measurement		
			Elapsed Time (hr)	Dial Gauge (Div)	Percent Swell
0	2.32	0.8			
0.025	24.28	8.1			
0.050	35.09	11.7			
0.075	44.43	14.8			
0.100	52.16	17.4	0.00	416	0.00%
0.125	59.11	19.7	67.67	649	5.09%
0.150	64.44	21.5	96.00	650	5.11%
0.175	70.41	23.5			
0.200	74.92	25.0			
0.250	84.43	28.1			
0.300	92.42	30.8			
0.350	100.77	33.6			
0.400	109.19	36.4			
0.450	117.42	39.1			
0.500	125.83	41.9			
0.550	133.27	44.4			
0.600	141.62	47.2			

1 Division = 0.001 (in)

Tested By NS Date 6/20/25 Input Checked By DL Date 6/25/25

3 POINT CBR TEST

ASTM D 1883-16 / AASHTO T193-13

Client:	ESP Associates, Inc.	Boring No.:	B-4
Client Reference:	24-00661-002 Lake Myra	Depth (ft):	10'
Project No.:	R-2025-174-001	Sample No.:	NA
Lab ID:	R-2025-174-001-001	Visual Description:	Light Brown Sandy Clay

Test Type	STANDARD	+3/4" Scalped & Replaced (%)	NA
Molding Method	C	Density	Before
Mold ID	R-676	Measurement	Soaking
Weight of Mold (g)	4110.8	Wt. of Mold & Wet Sample (g)	8005.7
Mold Volume (cm ³)	2127	Wt. of Wet Sample (g)	3894.9
Surcharge (lb)	10	Sample Volume (cm ³)	2127
Piston Area (in ²)	3	Wet Density (g/cm ³)	1.83
Sample Height (in)	4.58	Wet Density (pcf)	114.3
Sample Conditions	Soaked		115.4
Blows per Layer	56	Dry Density (pcf)	88.6
		Dry Density (g/cm³)	1.42
			86.0
			1.38

Water Contents	As Received	Beginning Compaction	After Compaction	Average Begin/Aft	After Soaking	Top 1" After Soak
Tare No.	N/A	441	441		444	702
Wt. of Tare & Wet Sample (g)	N/A	502.48	502.48		439.5	373.4
Wt. of Tare & Dry Sample (g)	N/A	411.55	411.55		352.95	286.39
Wt of Tare (g)	N/A	97.99	97.99		99.1	91.6
Moisture Content (%)	N/A	29.0	29.0	29.0	34.1	44.7

Piston Displacement (in)	Load (lb)	Penetration Stress (psi)	Swell Measurement		
			Elapsed Time (hr)	Dial Gauge (Div)	Percent Swell
0	2.63	0.9			
0.025	26.84	8.9			
0.050	38.70	12.9			
0.075	50.49	16.8			
0.100	59.59	19.9	0.00	755	0.00%
0.125	68.82	22.9	68.00	1015	5.68%
0.150	75.45	25.2	96.00	1013	5.63%
0.175	82.52	27.5			
0.200	88.78	29.6			
0.250	100.53	33.5			
0.300	112.97	37.7			
0.350	124.63	41.5			
0.400	138.12	46.0			
0.450	150.90	50.3			
0.500	163.14	54.4			
0.550	174.68	58.2			
0.600	185.15	61.7			

1 Division = 0.001 (in)

Tested By NS Date 6/20/25 Input Checked By DL Date 6/25/25

MOISTURE - DENSITY RELATIONSHIP

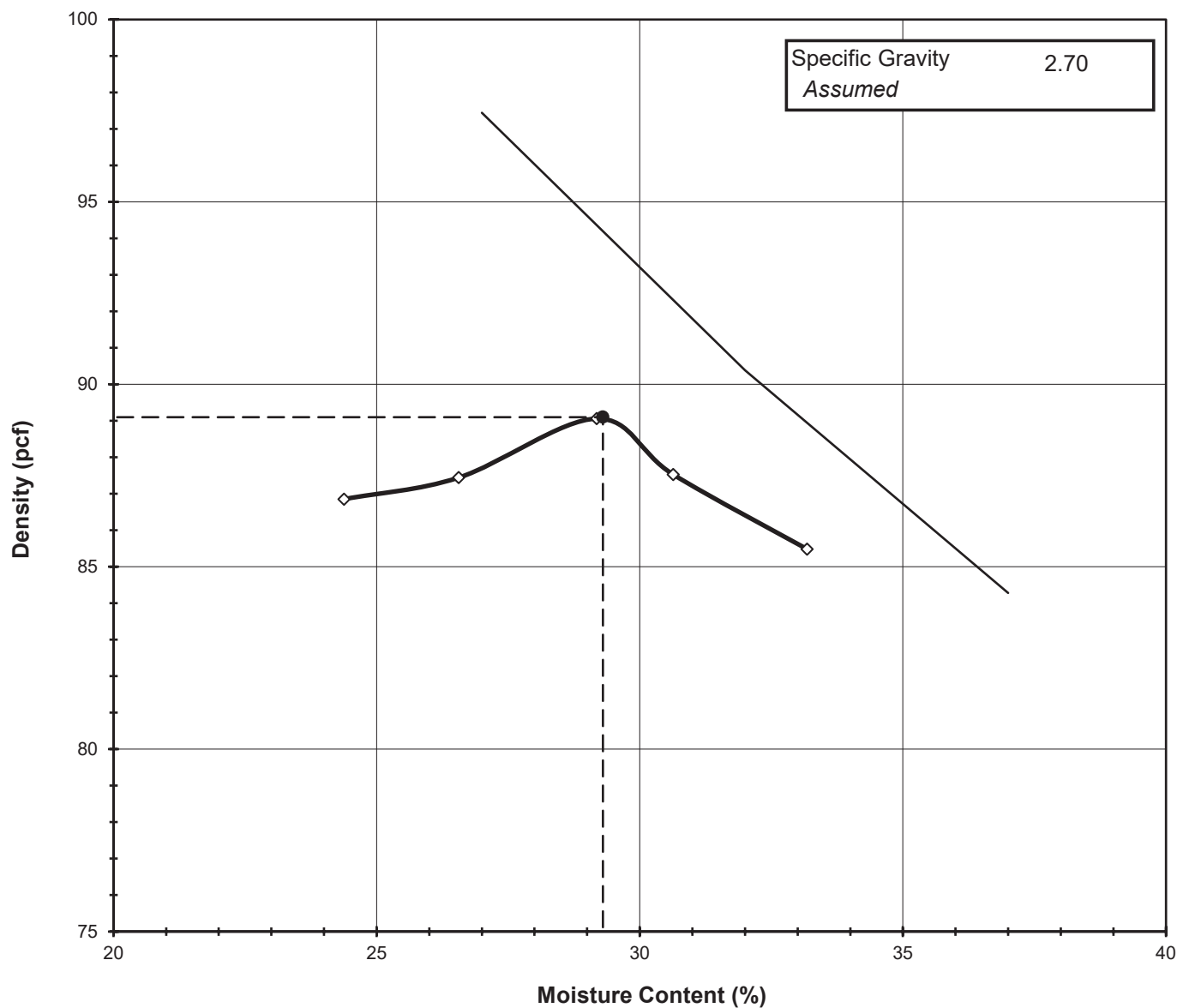
ASTM D698-12

Client: ESP Associates, Inc.
Client Reference: 24-00661-002 Lake Myra
Project No.: R-2025-174-001
Lab ID: R-2025-174-001-001

Boring No.: B-4
Depth (ft): 10'
Sample No.: NA
Test Method **STANDARD**

Visual Description: Light Brown Sandy Clay

Optimum Moisture Content (%): 29.3
Maximum Dry Density (pcf): 89.1



Tested By CRW Date 6/17/25 Checked By DL Date 6/18/25

MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client: ESP Associates, Inc.
Client Reference: 24-00661-002 Lake Myra
Project No.: R-2025-174-001
Lab ID: R-2025-174-001-001

Boring No.: B-4
Depth (ft): 10'
Sample No.: NA

Visual Description: Light Brown Sandy Clay

Total Weight of the Sample (g):	15000
As Received Water Content (%):	8
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	0
Percent Retained on 3/8":	0
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	B

Test Type:	STANDARD
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	R174
Mold ID:	R607
Mold diameter:	4"
Weight of the Mold (g):	4235
Volume of the Mold (cm ³):	943

Mold / Specimen

Point No.	1	2	3	4	5
Weight of Mold & Wet Sample (g):	5868	5907	5974	5963	5956
Weight of Mold (g):	4235	4235	4235	4235	4235
Weight of Wet Sample (g):	1633	1672	1739	1728	1721
Mold Volume (cm ³):	943	943	943	943	943

Moisture Content / Density

Tare Number:	720	489	481	15-A	705
Weight of Tare & Wet Sample (g):	362.40	359.20	342.90	353.60	361.10
Weight of Tare & Dry Sample (g):	308.99	304.43	287.74	290.99	293.91
Weight of Tare (g):	89.90	98.20	98.70	86.60	91.40
Weight of Water (g):	53.41	54.77	55.16	62.61	67.19
Weight of Dry Sample (g):	219.09	206.23	189.04	204.39	202.51

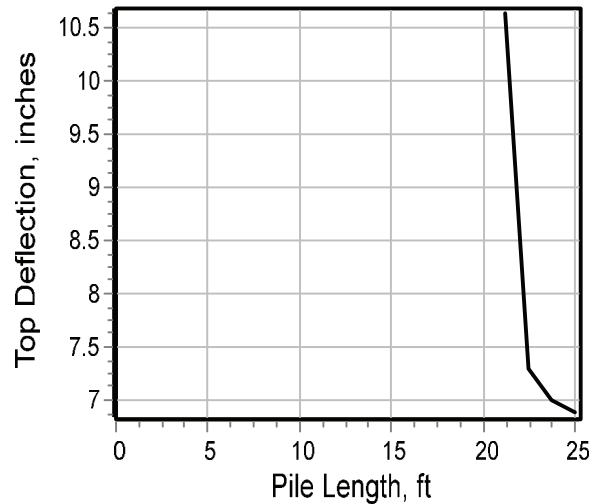
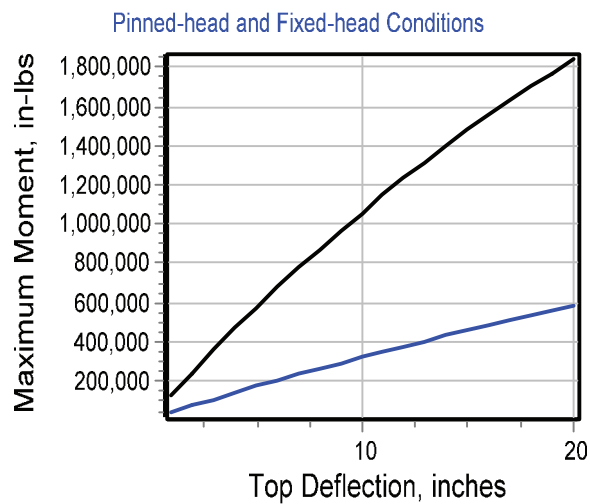
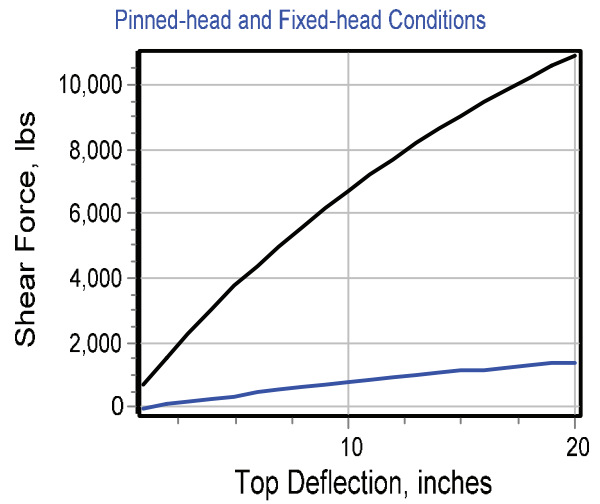
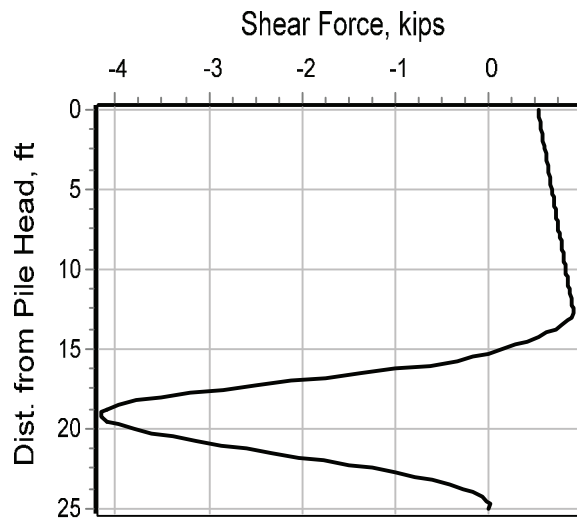
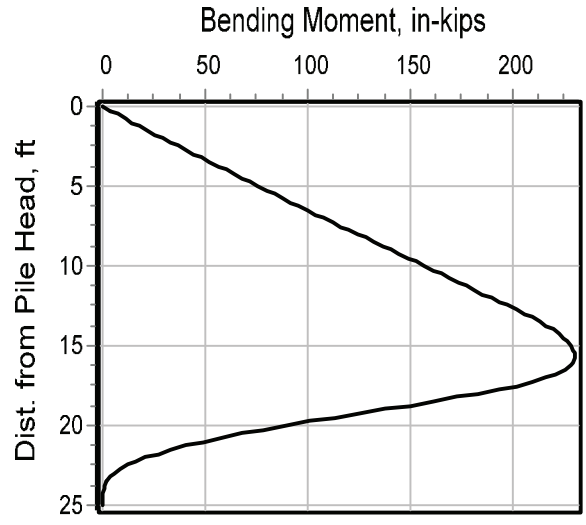
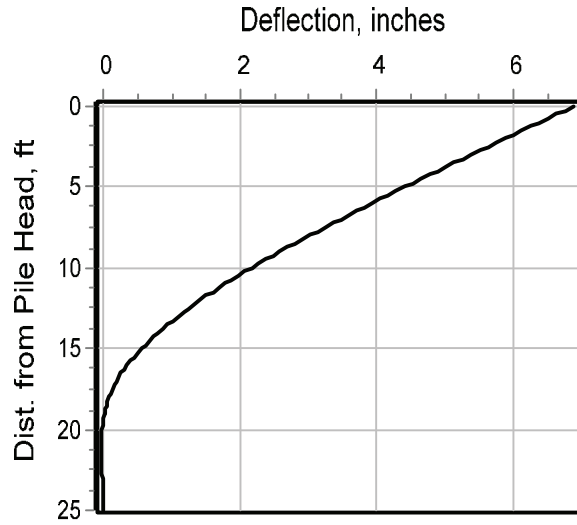
Wet Density (g/cm ³):	1.73	1.77	1.84	1.83	1.82
Wet Density (pcf):	108.0	110.7	115.0	114.3	113.8
Moisture Content (%):	24.4	26.6	29.2	30.6	33.2
Dry Density (pcf):	86.9	87.4	89.1	87.5	85.5

Zero Air Voids

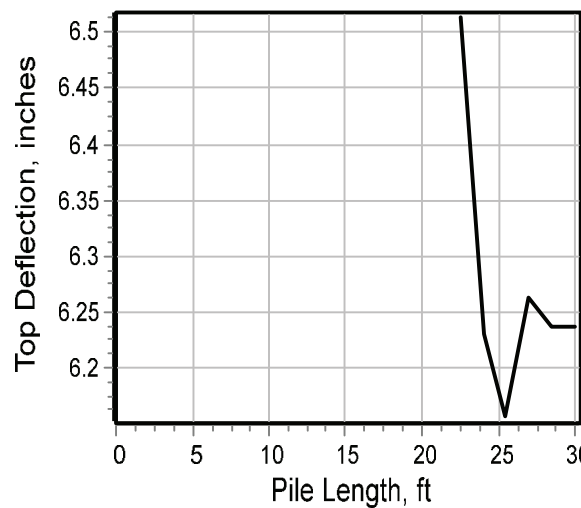
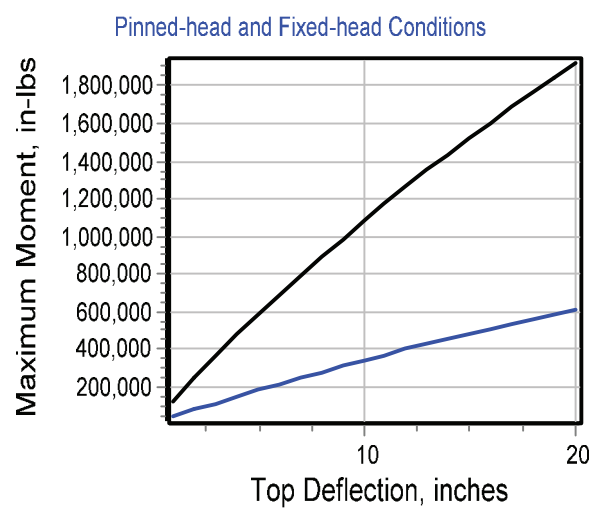
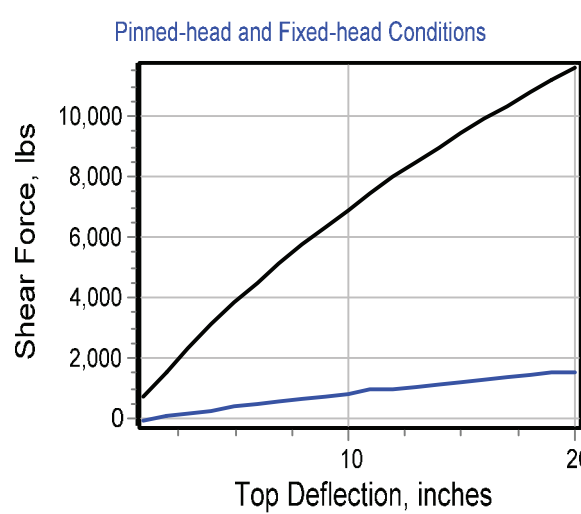
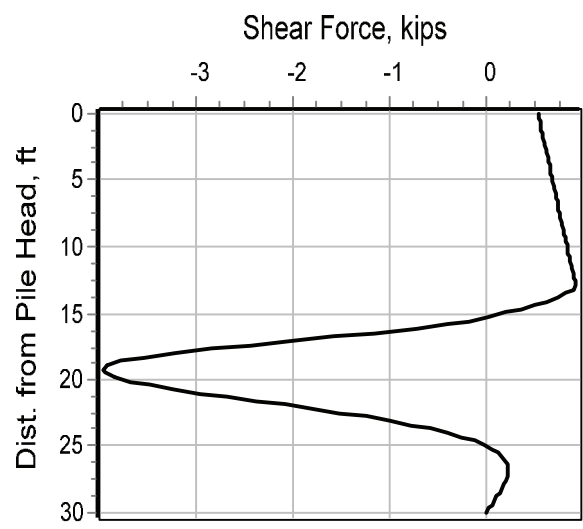
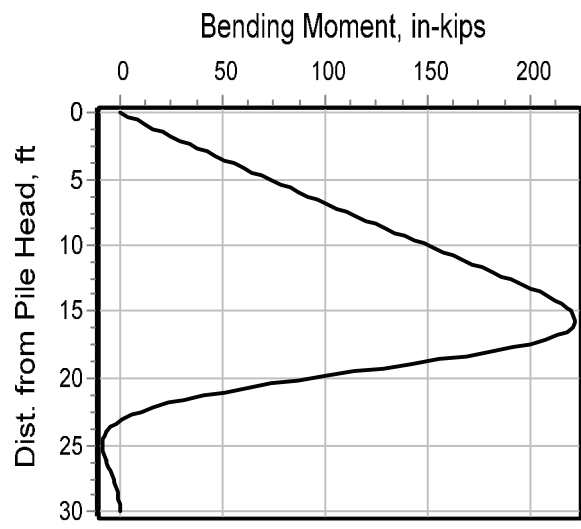
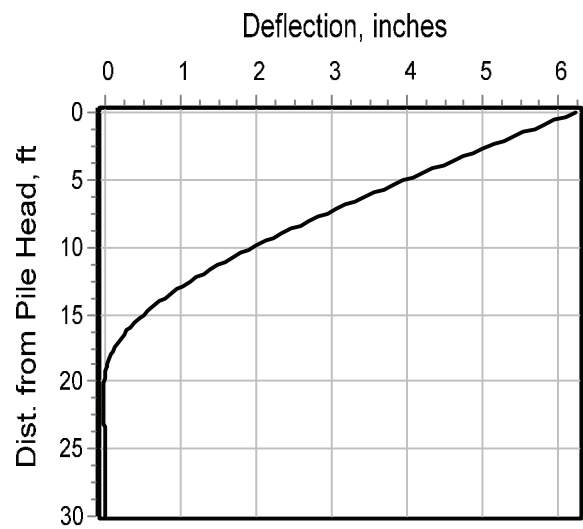
Moisture Content (%):	27.0	32.0	37.0
Dry Unit Weight (pcf):	97.4	90.4	84.3

Tested By CRW Date 6/17/25 Checked By DL Date 6/18/25

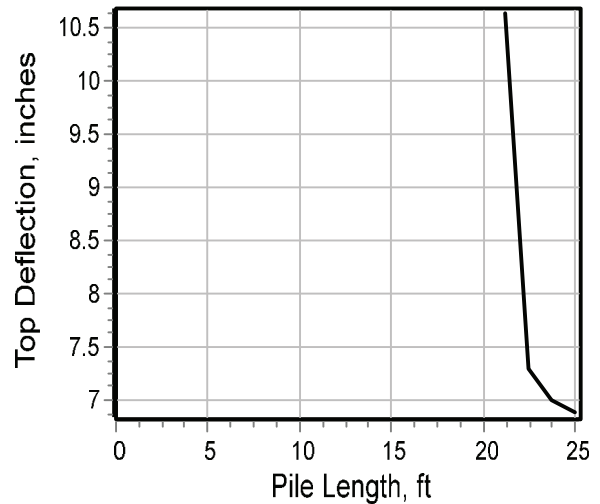
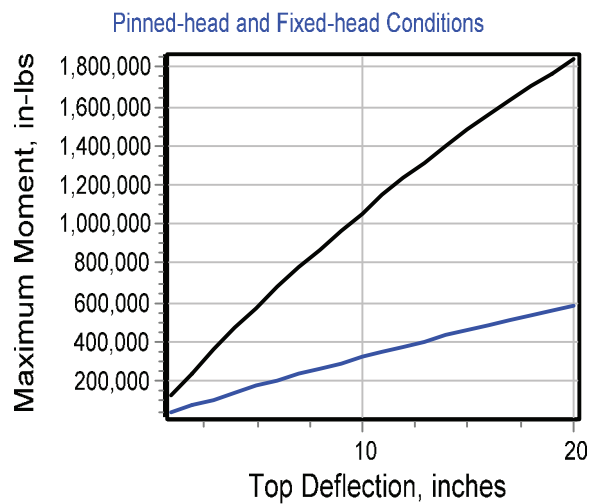
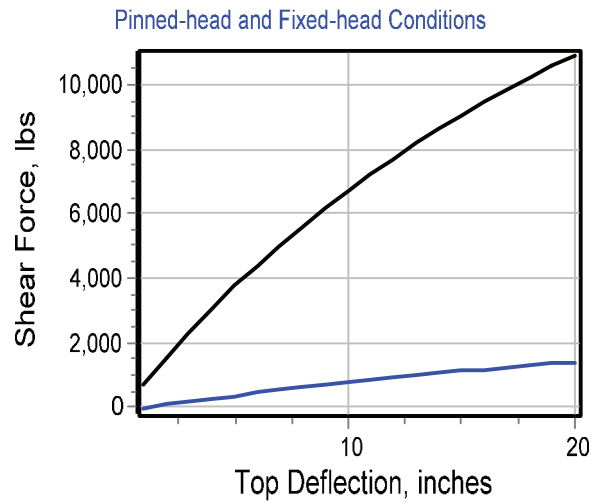
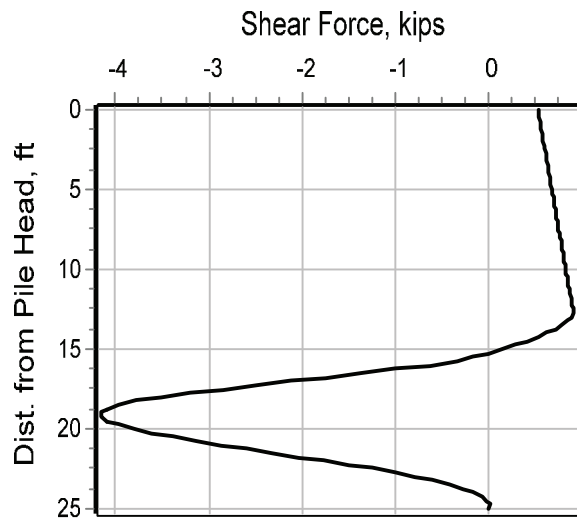
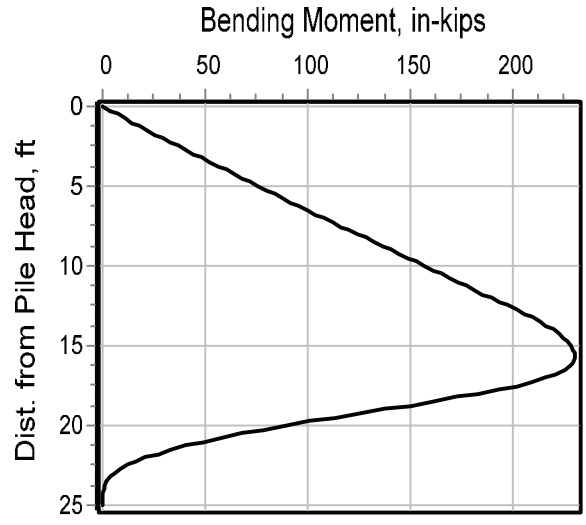
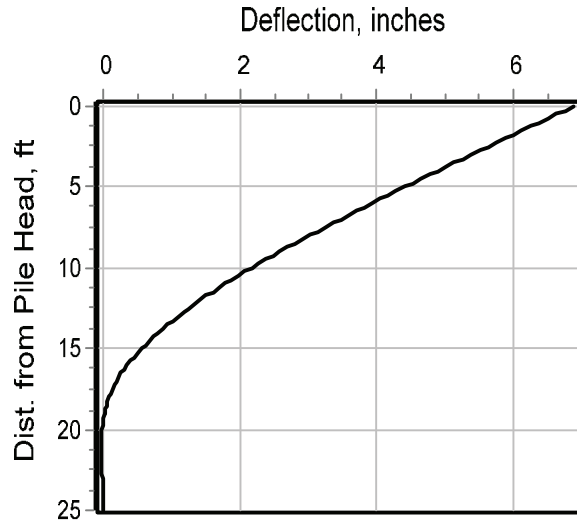
25 foot timber pile,
STA 14+00 to 16+25



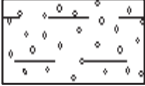
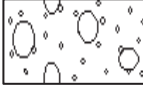
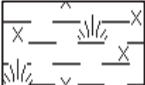
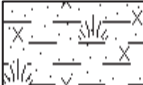
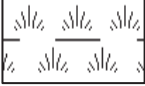
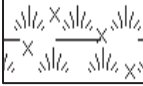
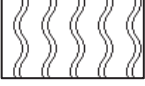
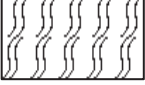
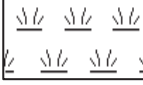
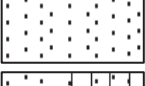
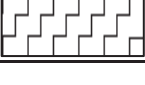
30 foot timber pile, STA
12+00 to 14+00



25 foot timber pile,
Begin to STA 12+00 and STA 16+25 to End



LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

	ABC Stone		Asphalt/Concrete
	Concrete/Brick Debris		Coquina Shell Base Course
	Topsoil/Rootmat		Topsoil/Grassmat
	Topsoil		Wood and Roots
	High Plasticity Clay		Moderate Plasticity Clay
	Clay		Clayey Silt
	Elastic Silt		Silt
	Organic Clay		Organic Silt
	Organic Silt and Clay		Peat
	Poorly Graded Gravel		Poorly Graded Gravel with Silt
	Poorly Graded Gravel with Clay		Clayey Gravel
	Silty Gravel		Poorly Graded Gravel with Silt and Clay
	Well Graded Gravel		Well Graded Gravel with Silt
	Well Graded Gravel with Clay		Silty Sand
	Poorly Graded Sand		Poorly Graded Sand with Clay
	Poorly Graded Sand with Silt		Well Graded Sand
	Well Graded Sand with Clay		Well Graded Sand with Silt
	Partially Weathered Rock		Cored Rock



LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SAMPLER TYPES

(Shown in Samples Column)

	Shelby Tube
	Split Spoon
	Rock Core
	No Recovery

CONSISTENCY OF COHESIVE SOILS

<u>CONSISTENCY</u>	STANDARD PENETRATION RESISTANCE BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

WATER LEVELS

	= Water Level at Boring Termination
	= Water Level at 1 Day
	= Loss of Drilling Fluid
<u>HC</u>	= Hole Cave

CONSISTENCY OF COHESIONLESS SOILS

<u>CONSISTENCY</u>	STANDARD PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

TERMS

Standard Penetration Resistance - The number of blows it takes a 140 lb. hammer falling 30 in. to drive a 1.4 in I.D. split spoon sampler 1 foot (N-Value) as specified in ASTM D-1586.

Dynamic Cone Penetrometer Test Data - The cone point is driven up to three 1 ¾ inch intervals using a 15-pound weight falling 20 inches. The penetrometer test result is the average number of blows per interval. The penetrometer test result is similar to the Standard Penetration Resistance (N-value), as defined by ASTM D 1586. When properly evaluated, the penetrometer test results provide an index for estimating soil strength and relative density.

Kessler Dynamic Cone Penetrometer Test Data – The cone point is driven using a 17.6-pound weight falling 22.6 inches. The total penetration for a given number of blows is measured and recorded in mm/blow as specified in ASTM D 6951. When properly evaluated, the penetrometer test result can be used to describe soil stiffness and estimate an in-situ CBR strength from an appropriate correlation chart.

REC - Total length of rock recovered in the core barrel divided by the total length of the core run times 100 (expressed as a percentage).

RQD - Total length of sound rock segments recovered that are longer than or equal to 4" (mechanical breaks included) divided by the total length of the core run times 100 (expressed as a percentage).



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-01		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 20.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/15/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Very Soft To Very Stiff Reddish Brown and Gray Elastic SILT, (moist)		☒			2
5				☒			16
				☒	-5.0		22
				☒			22
10				☒	-10.0		
				☒			13
15		RESIDUUM: Medium Dense To Very Dense Brown to Tan Silty SAND, medium to coarse, slightly micaceous, (moist)	HC	☒	-15.0		
				☒			54
20		Boring was terminated at 20.0 feet. Cave-in depth at 14.3 feet. Backfilled with soil.		☒	-20.0		
25					-25.0		
30					-30.0		



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-02		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 13.8 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/14/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil		☒			
		RESIDUUM: Stiff Reddish Brown and White Sandy SILT, trace clay, (moist)		☒			12
5		RESIDUUM: Medium Dense Tan to Brown Silty SAND, medium, (moist)		☒	-5.0		30
		PARTIALLY WEATHERED ROCK: When Sampled Becomes White and Tan Silty SAND, fine to medium, (dry)		☒			50/0.4
10			HC	☒	-10.0		50/0.2
15		Boring was terminated at 13.8 feet. Cave-in depth at 10.8 feet. Backfilled with soil.		☒	-15.0		50/0.3
20					-20.0		
25					-25.0		
30					-30.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-04		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 25.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/14/25	WATER LEVEL: ☒ N/A ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Soft To Firm Brown and Orange Elastic SILT, (moist)		☒			4
5				☒	-5.0		6
				☒			3
10		RESIDUUM: Very Soft To Firm Orange and Brown High Plasticity CLAY, (moist)		☒	-10.0		5
15				☒	-15.0		WOH
20				☒	-20.0		2
25		RESIDUUM: Loose Black Silty SAND with gravel, (dry) Boring was terminated at 25.0 feet. Backfilled with soil.		☒	-25.0		8
30					-30.0		



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-07		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 30.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/15/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Very Soft To Stiff Tan and Orange SILT with sand, (moist)					
5				☒			6
				☒			5
				☒	-5.0		WOH
10				☒			WOH
				☒	-10.0		WOH
15				☒			WOH
				☒	-15.0		WOH
20			HC	☒			WOH
				☒	-20.0		4
25				☒			12
				☒	-25.0		
30				☒			
				☒	-30.0		
		Boring was terminated at 30.0 feet. Cave-in depth at 20.3 feet. Backfilled with soil.					



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-09		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 10.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/14/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil		☒			
5		RESIDUUM: Firm To Stiff Reddish Brown to Tan CLAY with sand, (moist)		☒			14
				☒	-5.0		8
				☒			6
10		RESIDUUM: Firm Tannish Brown Sandy SILT, moderately micaceous, trace manganese stains, (moist)		☒			6
		Boring was terminated at 10.0 feet. Cave-in depth at 7.8 feet. Backfilled with soil.			-10.0		
15							
20					-20.0		
25					-25.0		
30					-30.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-10			
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET			
LOGGED BY: Benjamin Long	BORING DEPTH: 25.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:				
DATE DRILLED: 05/15/25	WATER LEVEL: ☒ 16.8 feet @ TOB ☒ 12.1 feet						
DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						1030507090	
		Topsoil		☒			
		RESIDUUM: Firm To Stiff Orange and Reddish Brown Sandy SILT, (moist)		☒			12
5				☒	-5.0		8
		RESIDUUM: Loose Tan and Orange Silty SAND, medium to coarse, (moist)		☒			6
10				☒	-10.0		3
		RESIDUUM: Very Soft To Soft Orange and Tan Sandy CLAY, slightly micaceous, (wet)	☒				
15			☒	-15.0		3	
20			☒	-20.0		2	
25		RESIDUUM: Loose Orange Clayey SAND, slightly micaceous, (wet)		☒	-25.0		6
	Boring was terminated at 25.0 feet. Cave-in depth at 17.0 feet. Backfilled with soil.						
30					-30.0		



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-11		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 10.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/14/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil		☒			
		RESIDUUM: Stiff Reddish Brown CLAY with sand, slightly micaceous, (moist)		☒			14
5		RESIDUUM: Stiff Orange and Brown Sandy SILT, (moist)		☒	-5.0		9
		RESIDUUM: Loose Pink and Orange Brown Silty SAND, medium to coarse, slightly micaceous, (moist)		☒			9
10		Boring was terminated at 10.0 feet. Cave-in depth at 7.7 feet. Backfilled with soil.		☒	-10.0		6
15					-15.0		
20					-20.0		
25					-25.0		
30					-30.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-13		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 18.9 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/14/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Stiff Orange Brown Sandy SILT, (moist)		☒			12
5		RESIDUUM: Stiff Orange Brown CLAY with sand, slightly micaceous, (moist)		☒	-5.0		9
		RESIDUUM: Loose To Medium Dense Tan and Brown Silty SAND, medium, trace manganese stains, (moist)		☒			5
10				☒	-10.0		8
15				☒	-15.0		29
20		PARTIALLY WEATHERED ROCK: When Sampled Becomes Tan and Orange Silty SAND, medium, (dry) Boring was terminated at 18.9 feet. Cave-in depth at 17.5 feet. Backfilled with soil.	HC	☒	-20.0		50/0.4
25					-25.0		
30					-30.0		



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-15					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 20.0 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:			
DATE DRILLED: 05/15/25		WATER LEVEL: ☒ Dry @ TOB ☒ N/A							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF	
						10	30	50	70	90		
		Topsoil										
		RESIDUUM: Very Loose To Loose White and Gray Silty SAND, fine to coarse, moderately micaceous, (moist)		☒								9
5				☒								7
				☒	-5.0							5
				☒								4
10				☒	-10.0							6
				☒								8
15				☒	-15.0							
			HC	☒								
20				☒	-20.0							
		Boring was terminated at 20.0 feet. Cave-in depth at 16.4 feet. Backfilled with soil.										
25					-25.0							
30					-30.0							



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-16		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 38.8 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/07/25	WATER LEVEL: 10.9 feet @ TOB N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Very Loose Brown Silty SAND, medium, (moist)				●	4
		RESIDUUM: Loose To Medium Dense Gray and Brown Clayey SAND, medium, (moist)			196.0	●	11
5						●	7
10		RESIDUUM: Loose To Dense Tan and White Silty SAND, medium to coarse, (moist)			191.0	●	5
			N				
			HC				
15					186.0	●	8
20					181.0	●	43
25					176.0	●	16
30					171.0	●	17
						●	40

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-16					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 38.8 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:			
DATE DRILLED: 05/07/25		WATER LEVEL: ☒ 10.9 feet @ TOB ☒ N/A							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF		
						10	30	50	70	90			
40		RESIDUUM: Loose To Dense Tan and White Silty SAND, medium to coarse, (moist)											
		PARTIALLY WEATHERED ROCK: When Sampled Becomes Tan and White Silty SAND, medium to coarse, (moist) Boring was terminated at 38.8 feet. Cave-in depth at 12.5 feet. Backfilled with soil.		☒	161.0							50/0.3	
45					156.0								
50					151.0								
55					146.0								
60					141.0								
65					136.0								

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-17			
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET			
LOGGED BY: Benjamin Long	BORING DEPTH: 33.6 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:				
DATE DRILLED: 05/07/25	WATER LEVEL: ☒ 11.0 feet @ TOB ☒ N/A						
DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
		Topsoil				10 30 50 70 90	
		RESIDUUM: Very Loose Tan and Gray Clayey SAND, medium, (moist)		☒			4
5		RESIDUUM: Firm Tan and Gray Sandy CLAY, (moist)		☒	197.0		8
		RESIDUUM: Soft To Firm Brown and Gray Sandy SILT, (moist)		☒			8
10				☒	192.0		3
			☒ HC	☒			
15		RESIDUUM: Very Dense White and Brown Silty SAND, medium to coarse, (wet)		☒	187.0		51
20				☒	182.0		33
25				☒	177.0		45
30				☒	172.0		34
		PARTIALLY WEATHERED ROCK: Silty SAND, medium to coarse Auger refusal encountered at 34.0 feet. Boring was terminated at 33.6 feet. Cave-in depth at 12.5 feet. Backfilled with soil.		☒	167.0		50/0.1

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-19		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 22.7 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES: Hole was offset to top of slope at easement approximately 10 feet higher in elevation.		
DATE DRILLED: 05/14/25	WATER LEVEL: ☒ 10.0 feet @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Medium Dense To Dense Orange Brown with White Silty SAND, medium to coarse, (moist)		☒			18
5				☒	196.0		19
				☒			31
10			☒	☒	191.0		23
				☒			
15		PARTIALLY WEATHERED ROCK: When Sampled Becomes Gray and White Silty SAND, medium, (dry)		☒	186.0		50/0.4
				☒			
20			HC	☒	181.0		50/0.3
				☒			
		Auger refusal encountered at 22.5 feet. Boring was terminated at 22.7 feet. Cave-in depth at 19.0 feet. Backfilled with soil.		☒			50/0.2
25					176.0		
30					171.0		
					166.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-20		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 15.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/15/25		WATER LEVEL: ▽ 9.0 feet @ TOB ▼ 7.4 feet			

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Medium Dense To Very Dense Orange Brown and Tan Silty SAND, medium to coarse, (moist)		☒			
5				☒			
				☒	-5.0		20
				☒			
				☒			30
				☒			
			▼	☒			39
10			HC	☒	-10.0		56
				☒			
				☒			
				☒			
		PARTIALLY WEATHERED ROCK: When Sampled Becomes White and Tan medium to coarse, (dry)		☒			
15		Auger refusal encountered at 15.0 feet. Boring was terminated at 15.0 feet. Cave-in depth at 9.2 feet. Backfilled with soil.		☒	-15.0		50/0.2
20					-20.0		
25					-25.0		
30					-30.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-21		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 17.2 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/15/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Loose To Medium Dense Gray and Brown Well Graded SAND with silt, medium, (moist)		☒			16
5				☒			7
				☒	-5.0		8
		RESIDUUM: Loose To Dense Tan and Gray Silty SAND, fine to medium, (moist)		☒			9
10				☒	-10.0		33
				☒	-15.0		50/0.2
15			HC	☒			
		PARTIALLY WEATHERED ROCK: When Sampled Becomes White Silty SAND, medium to coarse		☒			
		Auger refusal encountered at 17.0 feet. Boring was terminated at 17.2 feet. Cave-in depth at 13.6 feet. Backfilled with soil.					
20					-20.0		
					-25.0		
25					-30.0		
30							



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-23		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD:	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 8.6 Feet	DRILL RIG:	NOTES:		
DATE DRILLED: 05/06/25	WATER LEVEL: ☒ Dry @ TOB ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
5		RESIDUUM: Loose Tan and Gray Clayey SAND, fine to medium, (moist)		☒			6
				☒	-5.0		8
				☒			50/0.4
10			PARTIALLY WEATHERED ROCK: When Sampled Becomes Gray and White Silty SAND, fine to medium, (dry)		☒		50/0.1
		Boring was terminated at 8.6 feet. Cave-in depth at 8.8 feet. Backfilled with soil.	HC	☐			
15					-10.0		
20					-15.0		
25					-20.0		
30					-25.0		
					-30.0		



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-24					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 13.7 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:			
DATE DRILLED: 05/06/25		WATER LEVEL: ☒ Dry @ TOB ☒ N/A							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF	
						10	30	50	70	90		
		Topsoil										
		RESIDUUM: Loose To Dense Tan and Gray Clayey SAND, fine to medium, (moist)		☒								9
5				☒								7
			HC	☒	-5.0							42
		PARTIALLY WEATHERED ROCK: When Sampled Becomes Gray and White Silty SAND, fine to medium, (dry)		☒								50/0.4
10				☒	-10.0							
				☒								50/0.2
15		Boring was terminated at 13.7 feet. Cave-in depth at 5.5 feet. Backfilled with soil.		☒	-15.0							
20					-20.0							
25					-25.0							
30					-30.0							

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-26		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 20.0 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES: Offset to BA-1 locations due to unstable soils		
DATE DRILLED: 05/16/25		WATER LEVEL: ☒ 11.0 feet @ TOB ☒ 4.0 feet			

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Soft Orange Brown and Tan Sandy CLAY, (moist)		☒			4
5		RESIDUUM: Medium Dense Orange Brown and Tan Silty SAND, medium to coarse, some clay, (moist)	☒	☒	196.0		12
				☒			11
10		RESIDUUM: Medium Dense Brown and Tan Silty SAND with gravel, medium to coarse, (moist to wet)	HC	☒	191.0		14
			☒				
15				☒	186.0		13
20		Boring was terminated at 20.0 feet. Cave-in depth at 10.0 feet. Backfilled with soil.		☒	181.0		25
25					176.0		
30					171.0		
					166.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-27					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 20.0 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES: Offset to BA-2 due to wet soils			
DATE DRILLED: 05/16/25		WATER LEVEL: ▽ 7.2 feet @ TOB ▼ 3.5 feet							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF	
						10	30	50	70	90		
		Topsoil										
		RESIDUUM: Firm To Very Stiff Bluish Gray CLAY with sand, (moist)		X								5
5				X	194.0							18
		RESIDUUM: Loose To Medium Dense Brown and Tan Silty SAND, coarse, slightly micaceous, (moist to wet)		X								15
10				X	189.0							9
15				X	184.0							16
20		Boring was terminated at 20.0 feet. Cave-in depth at 7.0 feet. Backfilled with soil.		X	179.0							25
25					174.0							
30					169.0							
					164.0							

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-28		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 39.3 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES: Offset to BA-3 due to wet soils		
DATE DRILLED: 05/16/25	WATER LEVEL: ▽ 5.0 feet @ TOB ▼ 3.5 feet				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Loose To Dense Orange Brown and Gray Silty SAND, fine to coarse, (moist to wet)		☒		●	11
5				☒	191.0	●	9
				☒		●	18
10				☒	186.0	●	11
				☒		●	18
15				☒	181.0	●	18
				☒		●	31
20				☒	176.0	●	31
				☒		●	46
25				☒	171.0	●	46
				☒		●	43
30				☒	166.0	●	43
				☒		●	50/0.4
		PARTIALLY WEATHERED ROCK: When Sampled Becomes White Silty SAND, coarse		☒	161.0	●	50/0.4



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-28			
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in	
LOGGED BY: Benjamin Long		BORING DEPTH: 39.3 Feet		DRILL RIG: Geoprobe 7822 DT		DRILLING COMPANY: CVET	
DATE DRILLED: 05/16/25		WATER LEVEL: 5.0 feet @ TOB 3.5 feet				NOTES: Offset to BA-3 due to wet soils	

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF
						10	30	50	70	90	
		PARTIALLY WEATHERED ROCK: When Sampled Becomes White Silty SAND, coarse									
40		Boring was terminated at 39.3 feet. Cave-in depth at 5.0 feet. Backfilled with soil.		☒	156.0						50/0.4
45					151.0						
50					146.0						
55					141.0						
60					136.0						
65					131.0						
					126.0						

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DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL
 TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR
 DETERMINATION OF DISTANCES OR QUANTITIES.

PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-29					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 28.8 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:			
DATE DRILLED: 05/06/25		WATER LEVEL: ☒ 12.0 feet @ TOB ▼ 9.0 feet							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF	
						10	30	50	70	90		
		Topsoil										
		RESIDUUM: Loose To Very Dense Tan and Orange Brown medium, (moist to wet)		☒								6
5				☒	194.0							10
				☒								36
10			▼ HC	☒	189.0							20
			N	☒								
15				☒	184.0							62
				☒								
20				☒	179.0							62
				☒								
25		PARTIALLY WEATHERED ROCK: Silty SAND, medium to coarse, (dry)		☒	174.0							50/0.3
				☒								
30		Boring was terminated at 28.8 feet. Cave-in depth at 10.0 feet. Backfilled with soil.		☒	169.0							50/0.3
					164.0							



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-30					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 8.9 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:			
DATE DRILLED: 05/06/25		WATER LEVEL: ☒ Dry @ TOB ☒ N/A							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF
						10	30	50	70	90	
		Topsoil									
		RESIDUUM: Loose Orange Brown Clayey SAND, medium to coarse, (moist)		☒							10
5				☒							10
		PARTIALLY WEATHERED ROCK: When Sampled Becomes Gray and Orange Silty SAND, medium to coarse, (dry)		☒	193.0						50/0.4
		Boring was terminated at 8.9 feet. Cave-in depth at 6.0 feet. Backfilled with soil.		☒							50/0.4
10					188.0						
15					183.0						
20					178.0						
25					173.0						
30					168.0						

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD B-31		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 16.2 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/06/25	WATER LEVEL: ☒ Dry @ TOB ▼ 8.0 feet				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Medium Dense To Dense Tan to Brown Silty SAND, medium to coarse, (moist)		☒			32
5				☒			
				☒	199.0		24
				☒			17
10			▼	☒	194.0		11
			HC				
		PARTIALLY WEATHERED ROCK: Silty SAND, medium to coarse, (dry)		☒			50/0.3
15				☒	189.0		
		Auger refusal encountered at 16.2 feet. Boring was terminated at 16.2 feet. Cave-in depth at 12.0 feet. Backfilled with soil.		☒			50/0.2
20					184.0		
25					179.0		
30					174.0		



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-35			
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 10.0 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:	
DATE DRILLED: 05/16/25		WATER LEVEL: ☒ Dry @ TOB ☒ N/A					

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil		☒			
		RESIDUUM: Stiff Reddish Brown and Tan Sandy SILT, trace clay, (moist)		☒		●	10
5				☒	-5.0	●	10
		RESIDUUM: Loose Orange Brown and Tan medium to coarse, (moist)		☒		●	9
10		Boring was terminated at 10.0 feet. Cave-in depth at 6.4 feet. Backfilled with soil.		☒	-10.0	●	6
15					-15.0		
20					-20.0		
25					-25.0		
30					-30.0		

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD B-36					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long		BORING DEPTH: 20.0 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES:			
DATE DRILLED: 05/16/25		WATER LEVEL: ☒ Dry @ TOB ☒ N/A							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF	
						10	30	50	70	90		
		Topsoil										
		RESIDUUM: Very Stiff Reddish Brown and Tan Clayey SAND, slightly micaceous, trace clay, (moist)		☒								18
5		RESIDUUM: Medium Dense To Very Dense Orange Tan to Tannish White Silty SAND, medium to coarse, slightly micaceous, trace rock fragments, (moist)		☒	-5.0							14
				☒								22
10				☒	-10.0							24
				☒								
15				☒	-15.0							23
				☒								
20		Boring was terminated at 20.0 feet. Cave-in depth at 13.1 feet. Backfilled with soil.		☒	-20.0							60
25					-25.0							
30					-30.0							



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD BA-8		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: CVET	
LOGGED BY: Benjamin Long	BORING DEPTH: 8.6 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES:		
DATE DRILLED: 05/06/25	WATER LEVEL: ☒ Dry @ TOB ☒ Dry				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		RESIDUUM: Loose To Medium Dense Brown Silty SAND, medium, (moist)		☒			
5				☒			
		PARTIALLY WEATHERED ROCK: When Sampled Becomes Brown and White Silty SAND, medium to coarse, (dry)		☒	200.0		50/0.2
10		Auger refusal encountered at 8.5 feet. Boring was terminated at 8.6 feet. Cave-in depth at 5.0 feet. Backfilled with soil.		☒			50/0.1
					195.0		
					190.0		
15							
					185.0		
20							
					180.0		
25							
					175.0		
30							

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.



PROJECT: Lake Myra Site Wendell, NC			TEST BORING RECORD LB-02		
PROJECT No.: 24-00661-002-GEO-001	ELEVATION: Existing Ground Surface	DRILLING METHOD: Hollow Stem Auger	AUGER I.D.: 2.25 in	DRILLING COMPANY: Mid-Atlantic Drilling	
LOGGED BY: Benjamin Long	BORING DEPTH: 18.6 Feet	DRILL RIG: Geoprobe 7822 DT	NOTES: Water depth approximately 6 feet		
DATE DRILLED: 05/27/25	WATER LEVEL: ☒ N/A ☒ N/A				

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)	BPF
						10 30 50 70 90	
		Topsoil					
		ALLUVIUM: Very Soft To Soft Gray CLAY with sand, (moist)					WOH
5					183.0		3
							12
10					178.0		4
15					173.0		50/0.5
		PARTIALLY WEATHERED ROCK: When Sampled Becomes Tan and Brown Poorly Graded SAND with gravel, coarse, (moist)					
20		Auger refusal encountered at 18.6 feet. Boring was terminated at 18.6 feet. Backfilled with soil.			168.0		50/0.1
25					163.0		
30					158.0		



PROJECT: Lake Myra Site Wendell, NC				TEST BORING RECORD LB-03					
PROJECT No.: 24-00661-002-GEO-001		ELEVATION: Existing Ground Surface		DRILLING METHOD: Hollow Stem Auger		AUGER I.D.: 2.25 in		DRILLING COMPANY: Mid-Atlantic Drilling	
LOGGED BY: Benjamin Long		BORING DEPTH: 7.0 Feet		DRILL RIG: Geoprobe 7822 DT		NOTES: Water depth approximately 7 feet			
DATE DRILLED: 05/27/25		WATER LEVEL: ☒ N/A ☑ N/A							

DEPTH (ft)	GRAPHIC LOG	SOIL DESCRIPTION	WATER LEVEL	SAMPLE	ELEV. (ft)	STANDARD PENETRATION TEST DATA (Blows/ft)					BPF
						10	30	50	70	90	
		ALLUVIUM: Black ORGANIC SOIL with sand, (wet)		☒							1
		POSSIBLE RESIDUUM: Loose Tan Silty SAND, coarse, (moist)		☒	182.0						7
		PARTIALLY WEATHERED ROCK: When Sampled Becomes Tan medium to coarse Auger refusal encountered at 6.9 feet. Boring was terminated at 7.0 feet. Backfilled with soil.		☒							50/0.5 50/0.1
5											
10											
15											
20											
25											
30											

DEPTH MEASUREMENTS ARE SHOWN TO ILLUSTRATE THE GENERAL ARRANGEMENTS OF THE SOIL TYPES ENCOUNTERED AT THE BOREHOLE LOCATIONS. DO NOT USE DEPTH MEASUREMENTS FOR DETERMINATION OF DISTANCES OR QUANTITIES.





ESP Associates, Inc.

espassociates.com

800.960.7317

info@espassociates.com

AFFILIATED SUBSIDIARIES



Pickett and Associates, LLC

www.pickettusa.com

813.877.7770

info@pickettusa.com



Ditesco, LLC

www.ditescoservices.com

970.632.5068

info@ditescoservices.com



CivilCorp, LLC

www.civilcorp.us

361.570.7500

info@civilcorp.us

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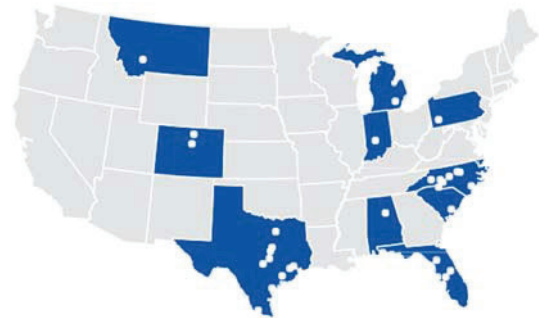
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MONTANA | BOZEMAN





January 29, 2026

Mr. Eric Staele
Wake County
337 S Salisbury Street
Raleigh, North Carolina 27601

Reference: **SUBSURFACE EXPLORATION SERVICES ADDENDUM #1**
Lake Myra Site
Wendell, North Carolina
ESP Project No. E4A-24-00661-002

Dear Mr. Staele:

ESP Associates, Inc. (ESP) has previously completed a subsurface exploration for the above referenced project located in Wendell, North Carolina (reference "Report of Subsurface Evaluation, Lake Myra Site", dated August 29, 2025). Based on email correspondence between Mr. Eric Staele with Wake County, and Mr. Ben Long with ESP on December 12, 2025, it is our understanding that the county would like two fire lane access pavement sections. One would consist of only ABC Stone and the other would be a combination of ABC Stone combined with a GrassPave 2 product. The purpose of this Addendum is to provide the requested pavement recommendations. The information presented in this Addendum is to be used in conjunction with the above referenced subsurface exploration report.

Pavements

General Design Basis. ESP has utilized the “AASHTO Guide for Design of Pavement Structures”, dated 1993 and GrassPave2 & GravelPave2 – Base Course Depth Recommendations” as guidance for the analysis and design process and for selection of subgrade soil support values, structural coefficient for pavement layers and selection of recommended pavement components. The recommendations presented herein assume that the production and placement of the base course meet the requirements of the current NCDOT “Standard Specifications for Roads and Structures”.

Serviceability Index and Regional Factor. A terminal serviceability index of $P_t=2.0$ and initial serviceability index of $P_o=4.2$ were used for the pavement design analysis in conjunction with a regional factor of 1.

Design Traffic Volumes. The traffic volumes have been assumed by ESP based on anticipated usage. We have assumed one fire truck trip per week.

Design of New ABC Roadway Sections. The pavement sections required were established based on the above stated design parameters and traffic using a CBR value of 4. The recommended sections are presented below.

Section Type	Aggregate Base Course, (Inches)
Heavy Duty:	18
Heavy Duty with GrassPave2 product installed.	12

We recommend that special care be given to providing adequate drainage away from pavement areas to reduce infiltration of surface water to the base course and subgrade materials in these areas. If these materials are allowed to become saturated during the life of the pavement section, then there will be a strength reduction of the materials that could result in a reduced life of the pavement section. All water should be routed away from the pavement areas and adequate slopes provided to maintain drainage off site. Pavement areas should be proofrolled prior to placing structural fill and/or base course. Proofrolling procedures are outlined in subsequent sections of our previously referenced subsurface exploration report.

CLOSING

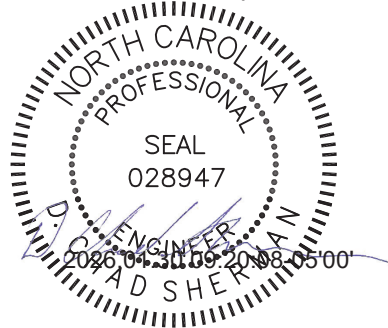
ESP appreciates the opportunity to assist you during this phase of the project. If you should have any questions concerning this report, or if we may be of further assistance, please contact us.

Sincerely,

ESP Associates, Inc.

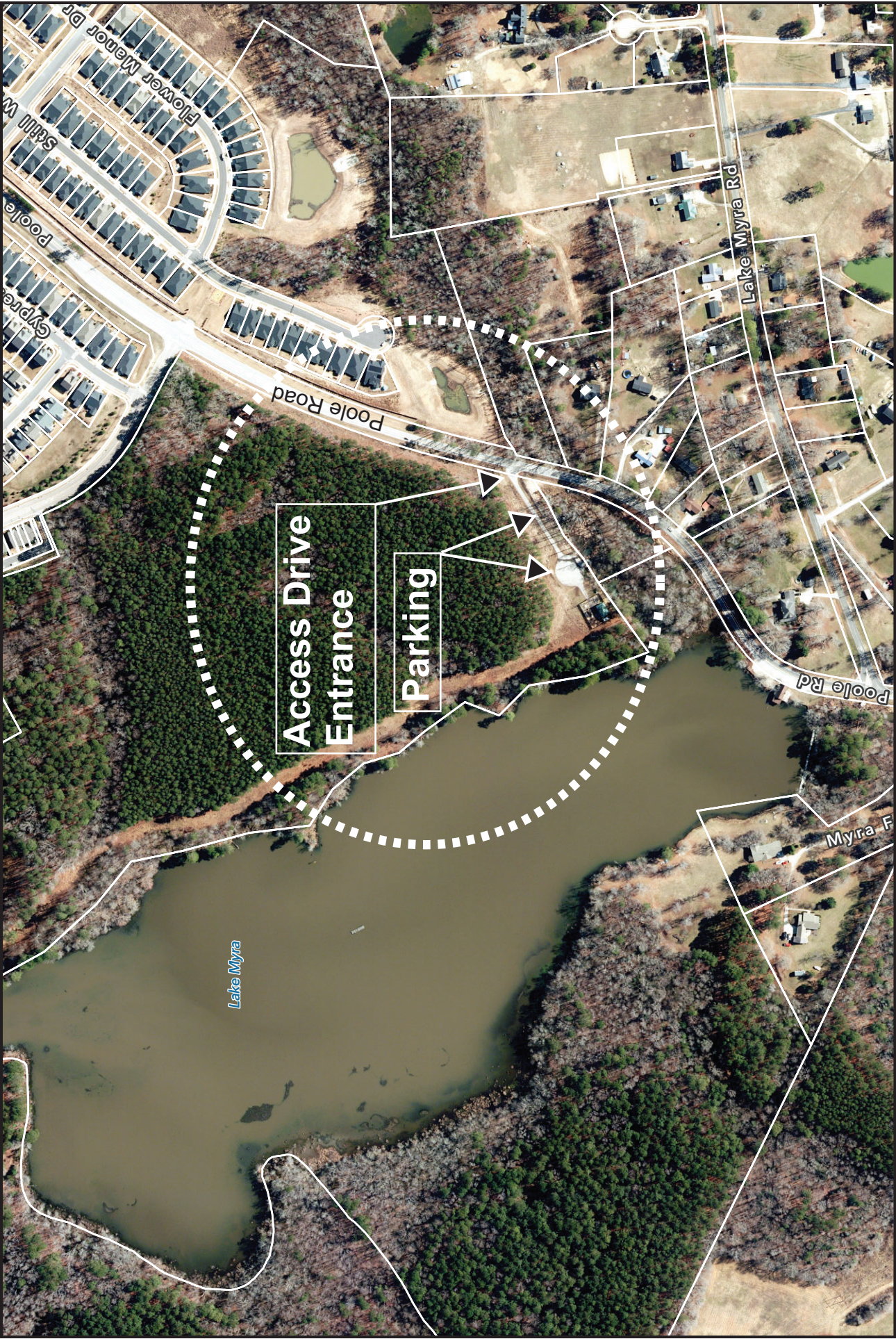


Ben Long, PE
Project Manager



D. Chad Sherman, PE
NC Registration No. 28947

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Lake Myra East - Access

Access Dates:

Thursday September 3: 9:00-11:30 AM

Tuesday September 15: 9:00-11:30 AM

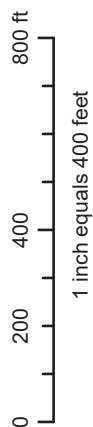
Thursday September 17: 9:00-11:30 AM



Lake Myra West - Access

Access Dates:

Thursday September 3: 9:00-11:30 AM
Tuesday September 15: 9:00-11:30 AM
Thursday September 17: 9:00-11:30 AM



Disclaimer
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APPENDIX E - OBTAINED PERMITS

Obtained permits will be provided in conjunction with the Pre-Construction Conference.
Obtained permits include:

- 401 Approval – Entire project
- 404 Approval – Entire project
- Buffer Impact Approval – Entire project
- Erosion Control Approval – Western Parcel
- NCDOT Driveway Permit – Western Parcel
- Duke Energy Approval – Western Parcel

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***LAKE MYRA COUNTY PARK
WENDELL, WAKE COUNTY, NC
PRODUCTION WELL CONSTRUCTION REPORT***

**LAKE MYRA COUNTY PARK WELL SITE:
LATITUDE (APPROX.) = N 35° 45' 36"
LONGITUDE (APPROX.) = W 78° 26' 24"**

**WAKE COUNTY WELL CONSTRUCTION PERMIT #
GW-151737-2025**

GMA Project #: 169801

PREPARED FOR:

**Michael D. Allen PE, LEED AP
Land Development Group Manager
NV5
3300 Regency Parkway, Suite 100
Cary, NC 27518**

PREPARED BY:

**Groundwater Management Associates, Inc.
2205-A Candun Drive
Apex, NC 27523
Telephone 919-363-6310**

March 31, 2026

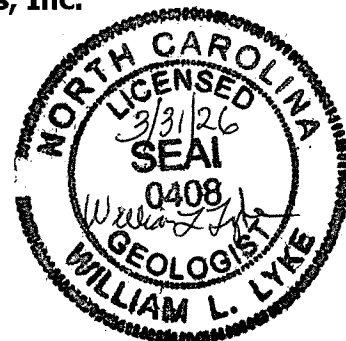


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LIST OF FIGURES

- 1.** Location of Well Site
- 2.** Well As-Built Schematic

LIST OF APPENDICES

- I.** Wake County Well Construction Permit, GW-1 Form Prepared by NW Poole Drilling, and Geophysical Logs.
- II.** Aquifer Test Data Sheets and Plots.
- III.** Laboratory Analytical Reports.

1.0 INTRODUCTION

Wake County (the County) requested the installation of a water supply well to service the area of the park west of Lake Myra. The site is located off Old South Smithfield Road, Knightdale, NC 27545 on the Poor Boy Farms Lot, PIN# 1763519788. The well site is located inside a tree line east of an agricultural field (Figure 1) at latitude N 35° 45' 36" and longitude W 78° 26' 24".

GMA was contracted by NV5 to provide hydrogeological consultation for the installation and testing of the new water-supply well. GMA prepared the water-supply well permit application for Wake County and received the well construction permit (permit # GW-151737-2025 issued on July 21, 2025) from the County. GMA prepared a well construction specification for use in soliciting bids from water-supply well drilling firms. NW Poole Drilling Company (NW Poole) was contracted by the County to install the new well. The water-bearing zones in the constructed well are in the Rolesville Granite.

Based upon the intent of this well serving the public at a County park, the well will be a transient non-community public water-supply well.

GMA has completed this final report summarizing well construction, aquifer testing, the results of water quality testing. This report includes recommendations on maximum well yield and pump depth.

2.0 WELL CONSTRUCTION

On January 23, 2026, NW Poole used air-rotary drilling methods to advance a 13 7/8-inch diameter boring to an approximate depth of 64 feet below land surface (BLS) 5 feet below the top of hard rock. The bedrock of the area is the Rolesville Granite (NCGS 1985). NW Poole determined that they had encountered soil to a depth of 2 feet BLS and then clay from 2 feet to 59 feet BLS. NW Poole installed the 8-inch diameter steel casing, with a drive shoe, in the 13 7/8-inch boring, to a depth of 64 feet BLS. NW Poole pressure grouted the annulus of the 8-inch casing using cement grout, and the grout was allowed more than 72 hours to cure before additional drilling activities commenced.

On January 27 through the 28th, 2026, NW Poole advanced a nominal 8-inch diameter boring from the bottom of the well casing (64 feet BLS) to a total well depth of 300 feet BLS. The boring was advanced using air-rotary drilling methods. White, gray, and pink quartz and feldspar fragments were produced continuously during the drilling, which is characteristic of the Rolesville Granite.

Water-bearing fractures were distributed throughout the depth of the well, and the water-bearing fractures are associated with "soft zones" or fracture zones. The shallowest notable

water-bearing fracture was encountered at a depth of 85 feet BLS which the driller estimated to have a yield of 15 gallons per minute (gpm). Other water-bearing fractures (and their estimated yields) were recognized at depths of 120 feet (10 gpm), and 190 feet (3 gpm). Small water-bearing fractures were also encountered. The well was developed using air-lift pumping until drill cuttings were cleared from the well and low-turbidity water was produced. After development of the well, NW Poole estimated the total yield of the well at 300 feet BLS to be about 30 gpm.

The well permit, well construction information from NW Poole, and well logging data are presented in Appendix I.

3.0 AQUIFER TESTING

NW Poole completed a step-drawdown test on February 6, 2026 at the Lake Myra County Park well site in Wake County. Because the driller estimated during the drilling operation that the well could produce 30 gpm, GMA recommended three steps performed: 20 gpm, 30 gpm, and 40 gpm. The graph of pumping water levels at each pumping rate presented in Appendix II indicated that the 40 gpm pumping rate would be sustainable for the 24-hour test. The aquifer test pump was set at 255 feet below TOC.

The 24-hour constant rate pumping aquifer test started at 9:00 am on February 17, 2026 and ended at 9:00 am on February 18, 2026 with 2 hrs of recovery time. Pumping Rate was 40 gpm. Flow meter starting was 06073942. Flow meter ending was 06140431. Total gallons pumped were 66,489 gallons, averaging 46.1 gpm for the test. Flow adjustments were made at the beginning of the test to set the rate a 40 gpm. Minor rate adjustments were also made between the 7th and 5th hours before the end of the test.

Static water level before the test was 12.60 feet below the top of the monitoring point (MP). MP is 29.0 inches above land surface, and 2.75 inches above the top of casing (TOC). All of the driller's numbers are from MP not TOC. TOC is 26.25 inches above land surface. The pumping water level after 24 hours was 45.2 feet below MP.

After 24 hours of pumping, the total drawdown for the test was 32.6 feet. The constant discharge rate (Q) was 40gpm. Specific Capacity = $40/32.6=1.2$ gpm/ft of drawdown. This well may be capable of a higher discharge rate assuming the static water level and the specific capacity of the well remain constant. This well may support a discharge rate of up to 80 gpm, which could result in 65 feet of drawdown, still well above the first water producing zone encountered at 80-85 feet.

Recovery was measured for 2 hrs after the pump was turned off. The first measurement was 5 minutes after the pump was off and it was 16.6 feet below MP. At 60 minutes the water level

was 13.6 feet below MP. It was 13.4 after 120 minutes, and unchanged for several readings after one hour. Water level recovery was very rapid.

Water level data were collected by NW Poole during aquifer testing and are attached in Appendix II.

4.0 AQUIFER TEST DATA EVALUATION

Prior to the 24- hour constant rate aquifer test, the static water level was measured to be 12.6 feet below MP. The pumping water level after 24 hours of pumping was 45.2 feet below MP. The total drawdown recorded during the test was 32.6 feet. The beginning pumping rate for the test was 40 gpm, and that rate was maintained throughout the test. The specific capacity determined for the test was 1.2 gpm/foot of drawdown.

The contractor started the pumping test with the valve mostly open, resulting in an initial pumping rate of 78 gpm. Flow rate adjustments were made for the first 30 minutes of pumping until the flow rate finally met the planned 40 gpm rate. The over-pumping of the well for the first 35 minutes of testing created more drawdown that would have otherwise occurred if the test started and remained at 40 gpm from the beginning. The result is that water levels recovered in the well from 35 minutes until 1 hour and 50 minutes of pumping. The rising water levels for most of the first 2 hours of pumping made the data unsuitable for analyses by the Cooper-Jacob method. Therefore, GMA did not attempt to calculate transmissivity of the fractured bedrock aquifer.

Instead, we relied upon evaluation of the observed specific capacity and stabilization of pumping water levels and an indicator of the sustainability of the tested pumping rate of 40 gpm. The graph of specific capacity (Appendix II) demonstrates that the specific capacity remained very consistent at about 1.2 gpm/ft of drawdown throughout the test. The graph shows where the drilling contractor must have allowed the flow rate to drop during the night, and then they adjusted the flow rate back up to 40 gpm. Unfortunately, the contractor did not report the timing and amount of flow rate adjustments made. It does appear that at about 3 am, the flow rate was adjusted back up to 40 gpm, and the water levels stabilized at 40 gpm for the final 5 hours of the test. Based upon these observations, it appears that the well is capable of being pump at a rate of at least 40 gpm for future use.

Data plots of drawdown and recovery data from the aquifer testing are included in Appendix II.

5.0 WATER QUALITY ANALYSES

Environmental Chemists Inc (Wilmington NC) performed the laboratory analyses of the sample collected by NW Poole approximately 24 hours into the aquifer test. Laboratory analyses are presented in Appendix III. The following observations are made:

- Bacteriologicals: The well tested negative for coliform and E. Coli.
- Organic Compounds: No organic compounds were detected.
- Inorganic Compounds: Inorganics analyses reported no inorganic compounds exceeded allowable limits, although the reported pH of 6.3 is below the secondary MCL of 6.5.
- Radiological Results: Gross Alpha, Uranium, Radium 226, Radium 228, and Gross Beta concentrations were not reported above allowable limits.
- Herbicides/Pesticides: Herbicides/pesticides were not detected.
- Disinfection Byproducts Formation Potential: TTHMFP and THAFP results indicated that the water has a low potential for forming excessive Trihalomethanes or Haloacetic Acids following disinfection with chlorine.

The water sample was also analyzed for emerging contaminants. Three emerging contaminant (PFAS) compounds were reported in the water sample collected from the well. These compounds do not have a formal drinking water standard in NC, so NC developed an Interim Maximum Allowable Concentration (IMAC) for those compounds. This is a groundwater quality standard established by the NC Dept. of Environmental Quality for substances lacking formal standards, often used to set remediation targets. IMACs provide quick, protective limits for pollutants before permanent, formal standards are adopted through the Environmental Management Commission (EMC). In late 2024, the state established new IMACs for several PFAS compounds, including PFOA, PFOS, and GenX, to enhance groundwater protection NC Dept. of Environmental Quality. IMACs are generally temporary, with a recommendation for a formal standard or expiration made within 12 months, according to NC Dept. of Environmental Quality.

For this Lake Myra well, the estimated concentration detected for PFHxA of 0.645 J ng/L is well below the IMAC of 4000 ng/L, and there is no EPA Maximum Contaminant Level (MCL) for drinking water for that constituent. The concentration detected in the well water of PFOS (2.74 ng/L) is above the IMAC of 0.7 ng/L, but below the EPA public drinking water MCL of 4.0 ng/L. The concentration detected in the well water of PFOA (1.95 ng/L) is above the IMAC of 0.001 ng/L, but below the EPA drinking water MCL of 4.0 ng/L.

All three detections are below the EPA drinking water MCLs, but PFOA and PFOS are above the NC IMAC groundwater standards. Note that both the PFOA and PFOS IMAC standards are at concentrations below current method detection limits listed in the analytical lab results, meaning any detection of either compound could automatically be viewed as a violation by the State, but not by EPA.

An option would be to resample the well using a pump, tubing, and other supporting equipment that reduce the potential for sample cross-contamination by exposure to those compounds which are commonly found in plastics, rubber seals, adhesives, water-resistant fabrics, stain protective coatings (such as Scotch Guard), etc. It is not unusual to have false detections of PFAS compounds if sampling procedures might have allowed for cross-contamination. GMA recommends resampling for emerging chemicals (PFAS) would be prudent before considering water treatment options to remove PFAS.

6.0 RECOMMENDATIONS

The Lake Myra County Park Water-Supply Production Well was completed February 28, 2026 with an 8-inch diameter open borehole from 64 to 300 feet BLS. Major water-bearing fractures were encountered at depths of 85 feet and 120 feet.

The 24-hour constant rate aquifer test started at 9:00 am on 2-17-2026 and ended at 9:00 am on 2-18-2026 with 2 hours of recovery time. Static water level before the test was 12.60 feet below the top of the tube (MP). MP is 29.0 inches above land surface, and 2.75 inches above the top of casing (TOC). The pumping water level after 24 hours was 45.2 feet below MP. Total drawdown for the test was 32.6 feet. $Q=40\text{gpm}$. Specific Capacity = $40/32.6=1.2\text{ gpm/ft of drawdown}$.

The flow meter totalizer indicated that 66,489 gallons were pumped during the 24 hours of pumping, giving an average pumping rate during the test of 46 gpm. The pumping rate was maintained by the driller for most of the test at 40 gpm. Together, our aquifer test data and the totalizer data support GMA's opinion that the 40-gpm pumping rate should be approved by the County.

GMA recommends a pump sized for 40-60 gpm. The pump intake should be set at a depth of 80 feet below TOC. Because the pumping water level should not be drawn down below the shallowest major water producing zone at 80 feet, the pump intake should be set at a depth of 80 feet below TOC. GMA suggests adding 10 feet of water above the pump intake to prevent cavitation, and another 5 feet buffer above the pump intake to account for regional water-level declines or possible seasonal declines during drought. That would provide a maximum pumping water level depth below TOC of 65 feet. That should provide adequate water column to meet projected use of the well and provide a buffer for water-level declines.

Environmental Chemists Inc (Wilmington NC) performed the laboratory analyses of the sample collected by NW Poole approximately 24-hours into the aquifer test. Laboratory analyses are presented in Appendix III. The following observations are made:

- Bacteriologicals: The well tested negative for coliform and E. Coli.
- Organic Compounds: No organic compounds were detected.
- Inorganic Compounds: Inorganics analyses reported no inorganic compounds exceeded allowable limits.
- Radiological Results: Gross Alpha, Uranium, Radium 226, Radium 228, and Gross Beta concentrations were not reported above allowable limits.
- Herbicides/Pesticides: Herbicides/pesticides were not detected.

The water sample was also analyzed for emerging contaminants. Three emerging contaminant (PFAS) compounds were reported in the water sample collected from the well. All three detections (PFHxA, PFOA, PFOS) are below the EPA drinking water MCLs, but PFOA and PFOS are above the NC IMAC groundwater standards. GMA recommends resampling for emerging chemicals (PFAS) would be prudent before considering water treatment options to remove PFAS.

7.0 REPORT CERTIFICATION

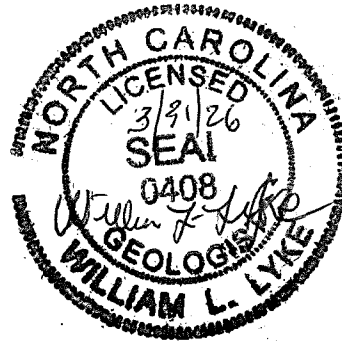
I, William L. Lyke, a Licensed Geologist for Groundwater Management Associates, Inc. (GMA), do certify that the information contained in this report is correct and accurate to the best of my knowledge. GMA is a professional corporation licensed to practice geology (Greenville and Apex, NC #C-121) and engineering (Apex, NC #C-0854) in the state of North Carolina.

William L. Lyke

William L. Lyke, P.G., P.E.
Senior Hydrogeologist/Civil Engineer

James K. Holley

James K. Holley, P.G.
Senior Hydrogeologist



8.0 REFERENCES

Cooper, H.H., Jr., and Jacob, C.E., 1946, A generalized graphical method for evaluating formation constants and summarizing wellfield history., *Transactions, American Geophysical Union*, Vol. 27, No.4.

Driscoll, Fletcher G., 1986, Groundwater and Wells, Second Edition, Johnson Filtration Systems, Inc., 1089 pages.

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NCGS, 1985, "Geologic Map of North Carolina", North Carolina Department of Natural Resources and Community Development, Division of Land Resources, North Carolina Geological Survey, 1 sheet.

Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate of and duration of discharge of a well using groundwater storage., *Transactions, American Geophysical Union*, Washington, D.C., pp 518-524.

FIGURES

THIS PRODUCT IS FOR GENERAL REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED, AND IS NOT INTENDED FOR, SURVEY OR ENGINEERING PURPOSES. LOCATIONS ARE APPROXIMATE. GIS SOURCE DATA: PARCELS, STREAMS, TOPOGRAPHY, AND CONTOURS FROM WAKE COUNTY GIS.



LEGEND

-  WELL LOCATION
-  100 FT RADIUS
-  SITE PARCEL
-  STREAMS
-  STREETS
-  TOPO CONTOUR

PROJECT: 169801
FILE: DRAWINGS/169801/
WELL LOCATIONv2

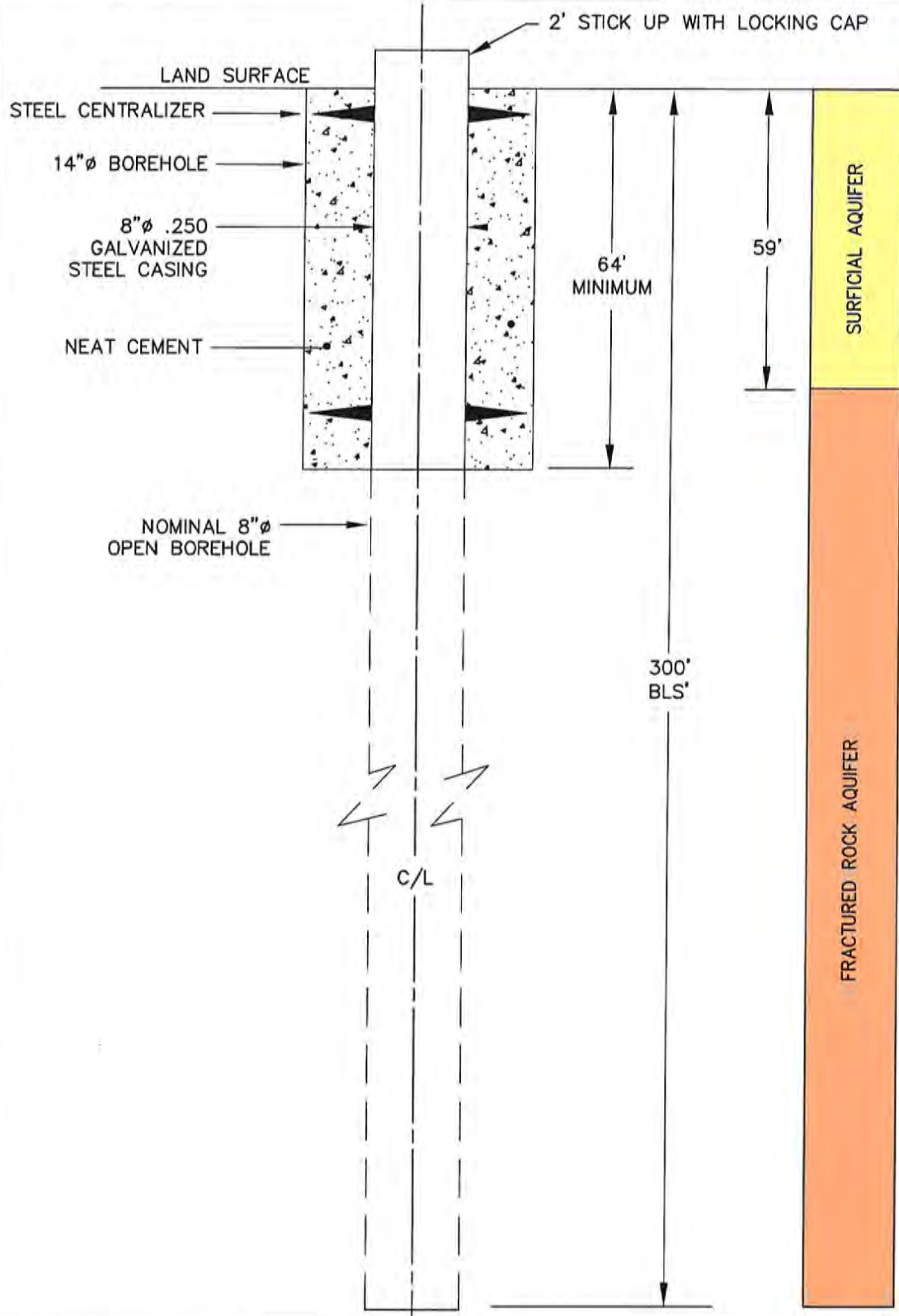
**SITE MAP WITH
WELL LOCATION**

FIGURE 1 DATE 3/30/2026



LAKE MYRA COUNTY PARK,
WENDELL,
WAKE COUNTY, NC





LEGEND

BLS = BELOW LAND SURFACE

NOT TO SCALE



GROUNDWATER MANAGEMENT ASSOCIATES, INC.

File: J:\1600'S\169801\FIG 2

WATER SUPPLY WELL CONSTRUCTION

Date: 3/27/26

Project No. 169801

LAKE MYRA COUNTY PARK, WAKE COUNTY, NC

Figure 2

APPENDIX I

**WAKE COUNTY WELL CONSTRUCTION PERMIT,
GW-1 FORM PREPARED BY NW POOLE DRILLING,
AND GEOPHYSICAL LOGS**

WAKE COUNTY DEPARTMENT OF HEALTH & HUMAN SERVICES WELL PERMIT
***PERMIT VOID IF NOT IN COMPLIANCE WITH ZONING REGULATIONS AND/OR IF SITE IS ALTERED
OR INTENDED USE CHANGED***

WELL CONSTRUCTION AUTHORIZATION

PERMIT #: GW-151737-2025

APPLICATION DATE: 07/21/2025

SITE INFORMATION:

PIN: 1763519788

SITE ADDRESS: 0 S SMITHFIELD RD
KNIGHTDALE, NC 27545

SUBDIVISION: PROP POOR BOY FARMS **LOT:** 2

ACRES: 92

TOWNSHIP: 10 - Marks Creek

JURISDICTION: R-40

ZONING: R-40

APPLICANT: William L Lyke

PHONE NUMBER: (919) 363-6301

OWNER:

PROPOSED USE:

EXISTING USE:

PERMIT CONDITIONS & COMMENTS:

A review of GIS datasets revealed one or more buildings built between the years 1948 and 1987 within 150 feet of the subject parcel. Additional testing of this well for Pesticides will be required for final approval of this water supply.

Due to the underlying geology at this site, Wake County requires testing of this well for Gross Alpha* activity to screen for radiological contaminants. In addition, Wake County recommends a test for radon in water.

*GROSS ALPHA TESTING NOTE: Please allow 8 to 12 weeks for gross alpha testing. Initial gross alpha testing takes 3 to 4 weeks. If the initial test exceeds drinking water standards (which happens in approximately 1 in 5 cases), installation of treatment is required along with confirmation testing of the treated water, requiring an additional 3 to 4 weeks for the confirmation test. If the initial treatment system installed is insufficient, additional corrective action and testing will be required.

Well area B setbacks:

1. 143' from north property line.
2. 400' from south property line.
3. 1,074' from east property line.

* Well driller must verify all distance requirements before drilling.

OTHER CONDITIONS:

SCOPE: **SATISFIED?:**

COMMENTS:

See attached site plan for well location and wastewater system design. If changes are necessary, prior approval by Wake County Health & Human Services is required before installation. The testing required under this permit does not include all possible contaminants. Private wells are not routinely monitored by a utility or other agency. Continued monitoring of private wells and testing for contaminants other than those required for the certificate of completion or certificate of occupancy is the responsibility of the well owner. Neither Wake County nor the Environmental Health Specialist warrants the quantity or quality of water produced by this well

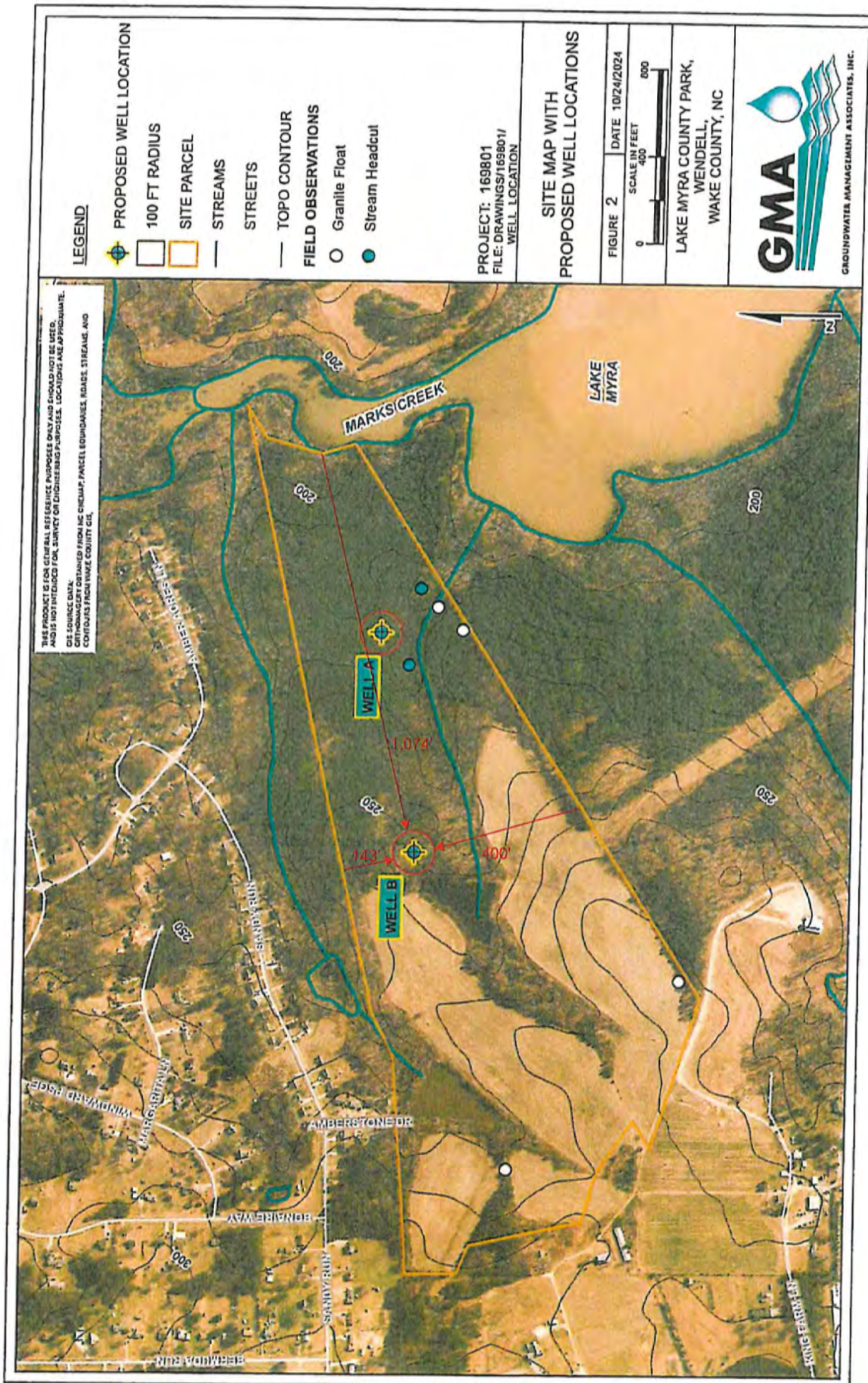
This construction authorization permit expires on 07/30/2030.

PERMIT ISSUED: 07/31/2025

ISSUED BY: Glen Shoemaker

SIGNATURE:

Glen C. Shumaker



Well area B setbacks:

1. 143' from north property line.
2. 400' from south property line.
3. 1,074' from east property line.

* Well driller must verify all distance requirements before drilling.

WELL CONSTRUCTION RECORD (GW-1)

1. Well Contractor Information:

Jayse Phillips

Well Contractor Name

4684A

NC Well Contractor Certification Number

NW Poole Well and Pump Co.

Company Name

2. Well Construction Permit #: GW-151739-2025

List all applicable well construction permits (i.e. UIC, County, State, Variance, etc.)

3. Well Use (check well use):

Water Supply Well:	
☐ Agricultural	☒ Municipal/Public
☐ Geothermal (Heating/Cooling Supply)	☐ Residential Water Supply (single)
☐ Industrial/Commercial	☐ Residential Water Supply (shared)
☐ Irrigation	
Non-Water Supply Well:	
☐ Monitoring	☐ Recovery
Injection Well:	
☐ Aquifer Recharge	☐ Groundwater Remediation
☐ Aquifer Storage and Recovery	☐ Salinity Barrier
☐ Aquifer Test	☐ Stormwater Drainage
☐ Experimental Technology	☐ Subsidence Control
☐ Geothermal (Closed Loop)	☐ Tracer
☐ Geothermal (Heating/Cooling Return)	☐ Other (explain under #21 Remarks)

4. Date Well(s) Completed: 1-28-26 Well ID#

5a. Well Location:

LAKE MYIA COUNTY PARK

Facility/Owner Name

Facility ID# (if applicable)

O.S. Smithfield Rd, Knightdale NC 27545

Physical Address, City, and Zip

WAKE

1763519788

County

Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees: (if well field, one lat/long is sufficient)

35° 45' 36.97" N 78° 26' 23.17" W

6. Is (are) the well(s) ☒ Permanent or ☐ Temporary

7. Is this a repair to an existing well: ☐ Yes or ☒ No
If this is a repair, fill out known well construction information and explain the nature of the repair under #21 remarks section or on the back of this form.

8. For Geoprobe/DPT or Closed-Loop Geothermal Wells having the same construction, only 1 GW-1 is needed. Indicate TOTAL NUMBER of wells drilled: 1

9. Total well depth below land surface: 300 (ft.)
For multiple wells list all depths if different (example- 3@200' and 2@100')

10. Static water level below top of casing: 12.6 (ft.)
If water level is above casing, use "+"

11. Borehole diameter: 8 (in.)

12. Well construction method: Air rotary
(i.e. auger, rotary, cable, direct push, etc.)

FOR WATER SUPPLY WELLS ONLY:

13a. Yield (gpm) 40 Method of test: Pumping

13b. Disinfection type: Granular HTH Amount: 1 Lb.

For Internal Use Only:

14. WATER ZONES					
FROM	TO	DESCRIPTION			
85 ft	90 ft	15 ft m 190-195 2 ft m			
115 ft	120 ft	10 ft m 280-285 3 ft m			
15. OUTER CASING (for multi-cased wells) OR LINER (if applicable)					
FROM	TO	DIAMETER	THICKNESS	MATERIAL	
+2 ft	64 ft	8 in.	Sch 40	galvneal	
16. INNER CASING OR TUBING (geothermal closed-loop)					
FROM	TO	DIAMETER	THICKNESS	MATERIAL	
ft	ft	in.			
ft	ft	in.			
17. SCREEN					
FROM	TO	DIAMETER	SLOT SIZE	THICKNESS	MATERIAL
0 ft	ft	in.			
ft	ft	in.			
18. GROUT					
FROM	TO	MATERIAL	EMPLACEMENT METHOD & AMOUNT		
0 ft	64 ft	DF	PUMP, 250 gallon of slurry		
ft	ft				
ft	ft				
19. SAND/GRAVEL PACK (if applicable)					
FROM	TO	MATERIAL	EMPLACEMENT METHOD		
ft	ft				
ft	ft				
20. DRILLING LOG (attach additional sheets if necessary)					
FROM	TO	DESCRIPTION (color, hardness, soil/rock type, grain size, etc.)			
0 ft	2 ft	TOP SOIL			
2 ft	39 ft	CLAY			
39 ft	300 ft	Sandstone granite			
ft	ft				
ft	ft				
ft	ft				
ft	ft				
21. REMARKS					
Case hardened drive shoe was used.					

22. Certification:

Signature of Certified Well Contractor

Date

By signing this form, I hereby certify that the well(s) was (were) constructed in accordance with 15A NCAC 02C .0100 or 15A NCAC 02C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

23. Site diagram or additional well details:

You may use the back of this page to provide additional well site details or well construction details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

24a. For All Wells: Submit this form within 30 days of completion of well construction to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

24b. For Injection Wells: In addition to sending the form to the address in 24a above, also submit one copy of this form within 30 days of completion of well construction to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

24c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well construction to the county health department of the county where constructed.



Geophysical Investigation Report

at

**Lake Myra County Park
Knightdale, NC**

for

**N.W. Poole Well and
Pump Co
Wendell, NC**

by

**Enviroprobe Service, Inc.
81 Marter Avenue
Mt Laurel, NJ 08054**

February 2026

March 3, 2026

Kevin Letchworth
N.W. Poole Well and Pump Co.
P.O. Box 1958
3500 Rolesville Rd.
Wendell, NC 27591



REPORT: GEOPHYSICAL INVESTIGATION
Lake Myra County Park
Knightdale, NC

Dear Mr. Letchworth:

We are pleased to present our report for the geophysical borehole logging investigation performed at Lake Myra County Park in Knightdale, NC. The investigation was performed on February 25, 2026.

If you have any questions concerning this report please contact us at 856-858-8584. We look forward to working with you in the future.

Respectfully submitted,

Enviroprobe Service, Inc.

Matt McMillen

Matt McMillen
Senior Geophysicist

1) INTRODUCTION AND PURPOSE

A water well located at Lake Myra County Park in Knightdale, NC was the subject of this geophysical survey.

The purpose of the geophysical borehole logging was to investigate lithology, fracture location and orientation, deviation of the borehole, and overall physical condition of the well.

2) GEOPHYSICAL METHODOLOGY

Geophysical borehole logging was conducted using a Mount Sopris MXA winch with a Matrix console and Mount Sopris 2FA -1000 fluid probe, Mount Sopris 2PCA-1000 caliper probe, Mount Sopris 2PGA-1000 gamma probe, and an ALT QL40-OBI-2G optical televiewer.

The borehole logs consist of caliper, fluid resistivity/ conductivity, fluid temperature, natural gamma, optical televiewer, and acoustic televiewer.

3) INTERPRETATION

Fractures are classified in the structure logs and tadpole plots as three groups; open fractures, partial open fractures, and closed fractures.

Open fractures are fractures in the rock that appear to be open based on caliper data. Partial open fractures are fractures that appear not to be fully open in the borehole. Closed fractures show as fractures and have no significant caliper enlargement. Possible bedding planes are also identified. All orientations are based on magnetic north.

Interpretations are on the comments section of the log.

Appendix A has all the geophysical logs. Appendix B has the fracture data.

Well

The well was approximately 296.4 feet in depth. Water level in the well was approximately 10.4 feet with bottom of casing at 64.1 feet. All depths are based on ground surface at the time of the logging.

The geophysical logging of this borehole detected fractures or caliper enlargements based on the caliper log. Significant fractures or enlargements were detected at approximately:

- 1) 66.5 feet to 69.5 feet
- 2) 72.3 feet to 74.7 feet
- 3) 76.8 feet to 79.6 feet

- 4) 86.1 feet to 88.3 feet
- 5) 118.3 feet to 119.4 feet

Smaller enlargements are also seen but may not have been detected by the caliper.

Possible flow in or out of the well was detected at eight possible locations based on the change in the fluid resistivity and fluid temperature. These locations in the well where flow may be occurring are at approximately:

- 1) 72.1 feet
 - 2) 87.8 feet
 - 3) 130.8 feet
 - 4) 158.3 feet
 - 5) 171.7 feet
 - 6) 201.1 feet
 - 7) 224.4 feet
 - 8) 277.5 feet
- Possibly from enlargement at 86.1 feet to 88.3 feet.

Areas without a significant fracture could have flow out of a bedding plane or small fracture not detected by the caliper.

See Appendix A for the logs of this well.

Appendix B has the fracture orientation data for this well.

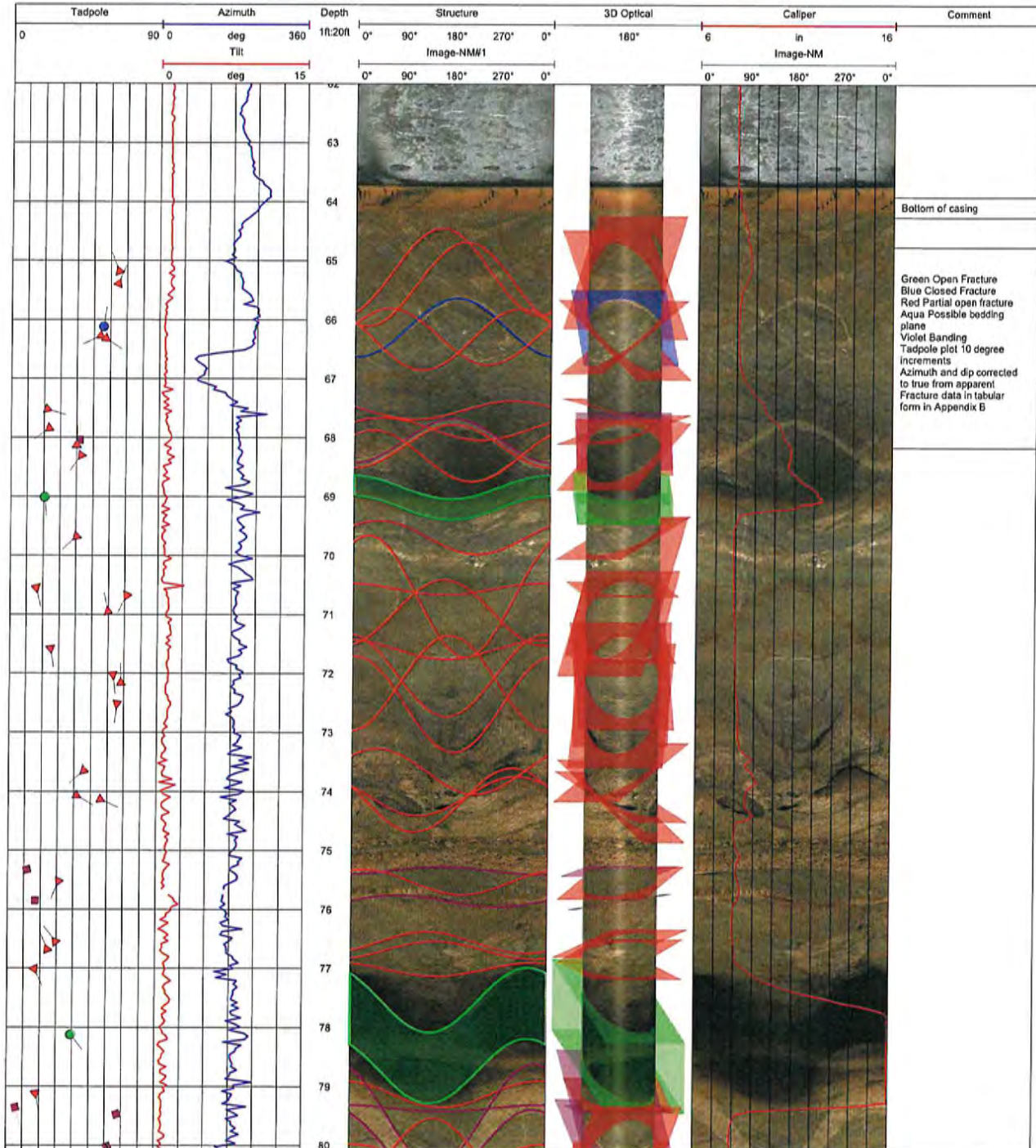
4) CONCLUSIONS

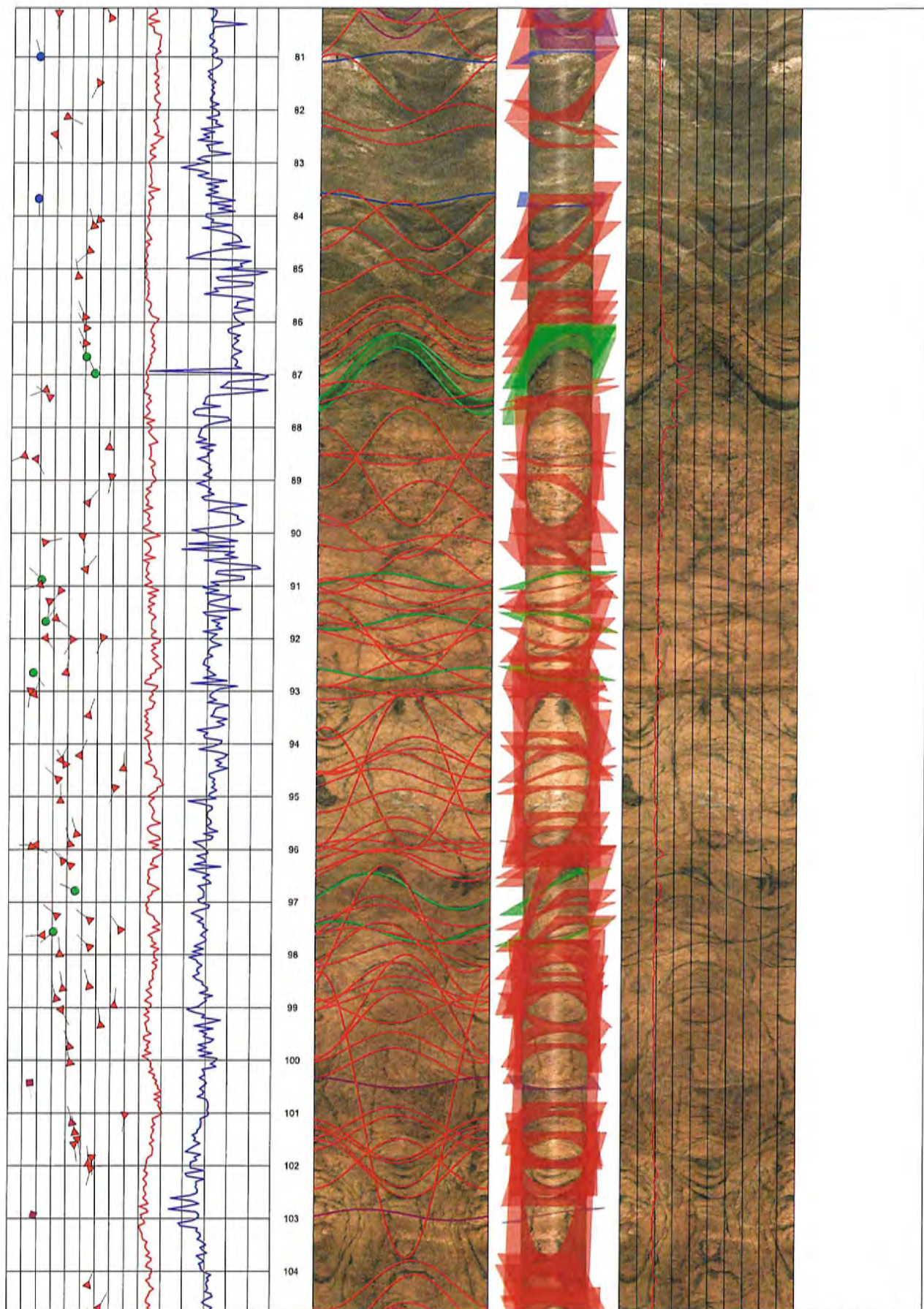
A geophysical borehole logging investigation of a water well located at Lake Myra County Park in Knightdale, NC was conducted using caliper, fluid resistivity/conductivity, fluid temperature, natural gamma, and optical televiewer. The purpose of this investigation was to investigate lithology, fracture location and orientation, deviation of the borehole, and overall physical condition of the borehole.

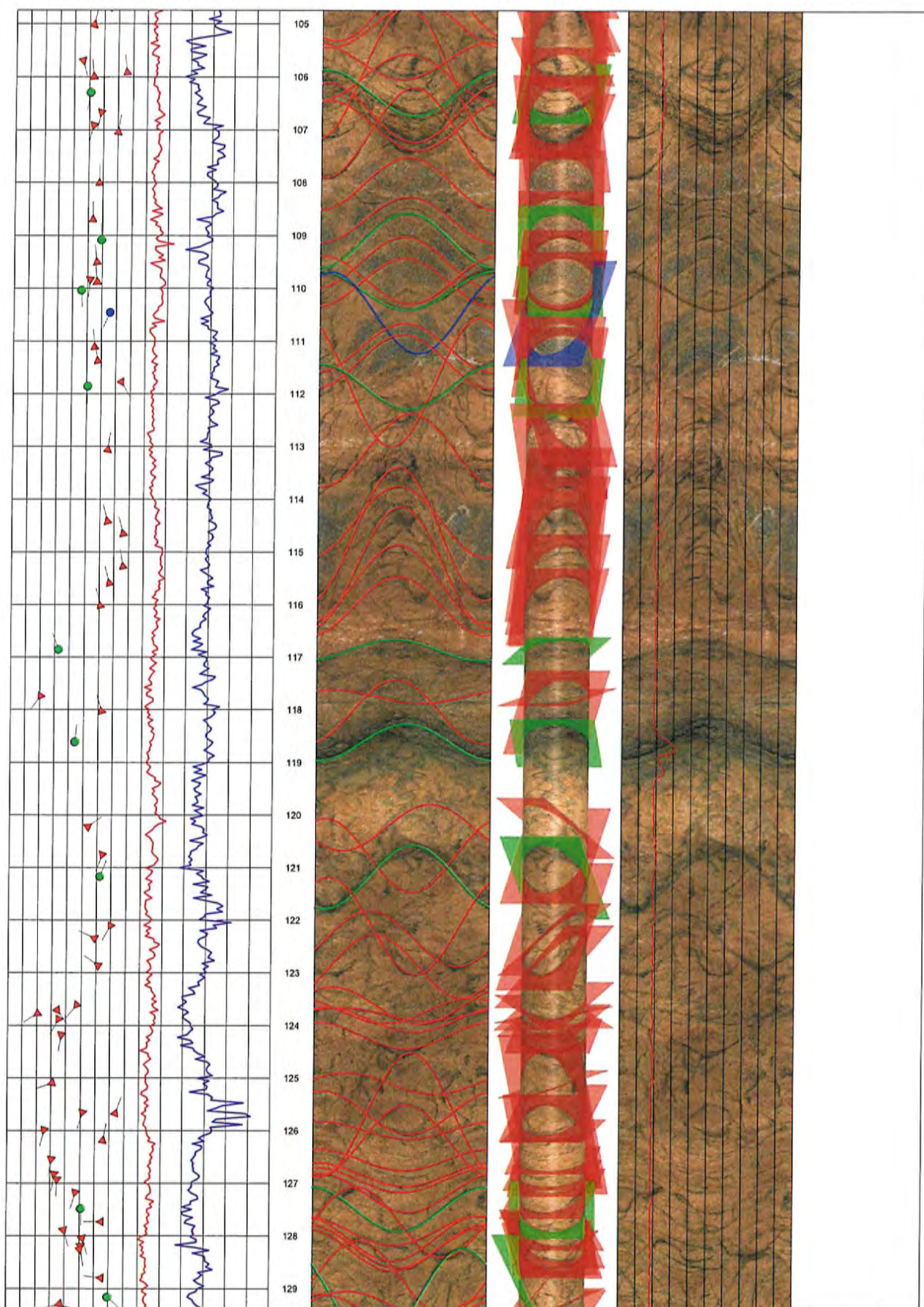
Results are shown as borehole logs. A discussion of the borehole is given in the interpretation section.

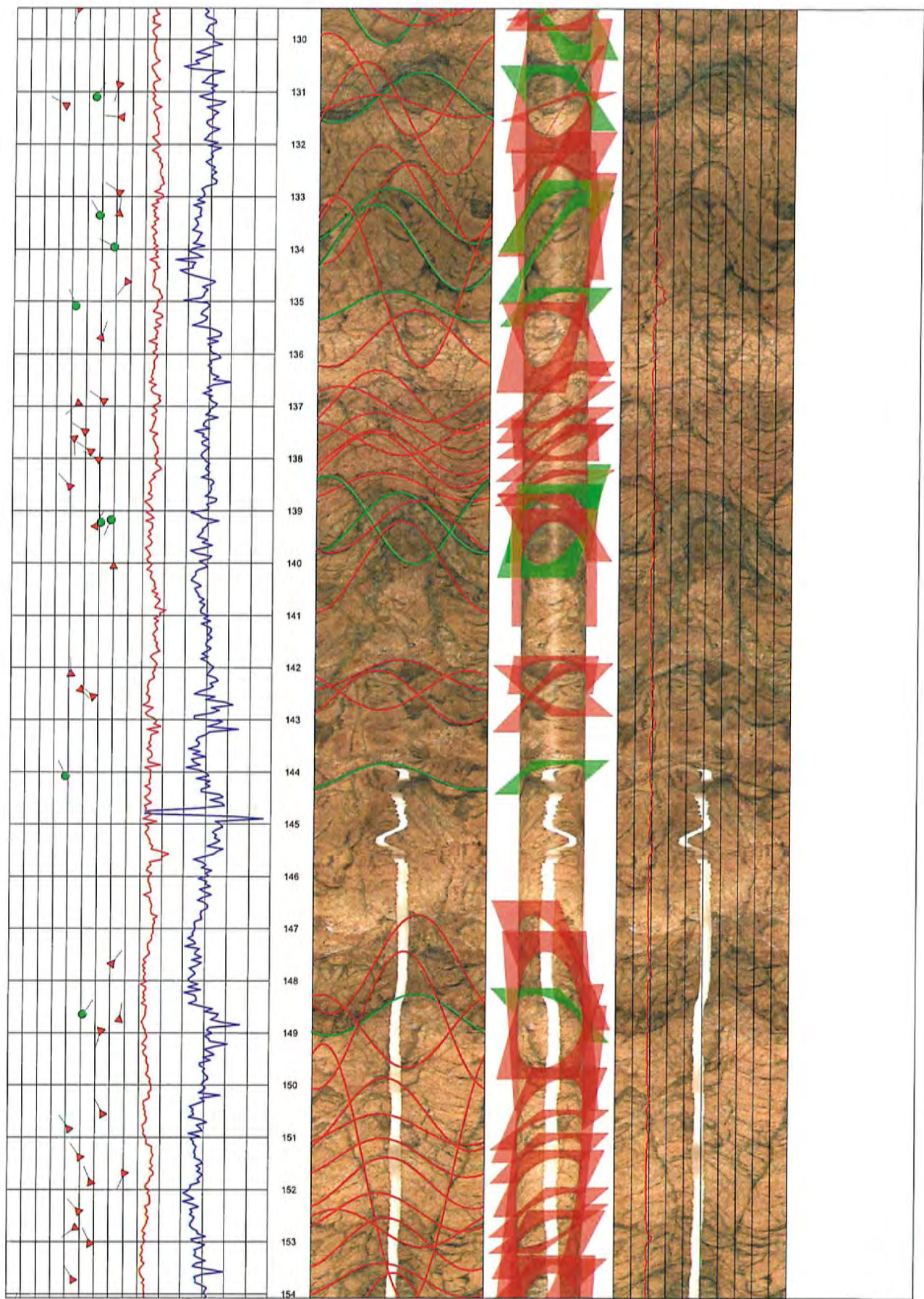
APPENDIX A

Lake Myra County Park
 Knightdale, NC
 prepared for
 N.W. Poole Well and Pump Co.
 Wendell, NC
 by
 Enviroprobe Service, Inc.
 Mount Laurel, NJ
 Optical Televiewer

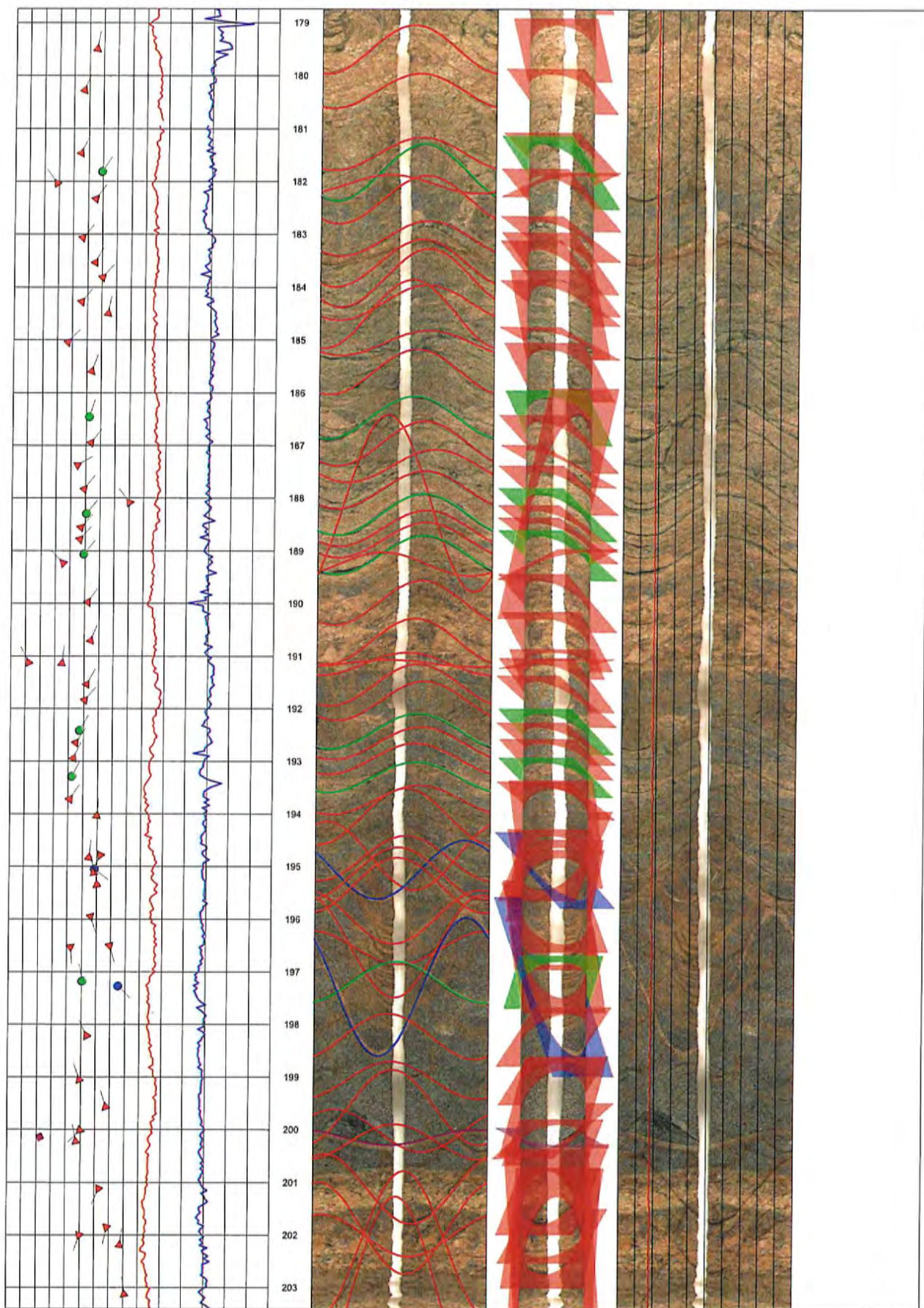


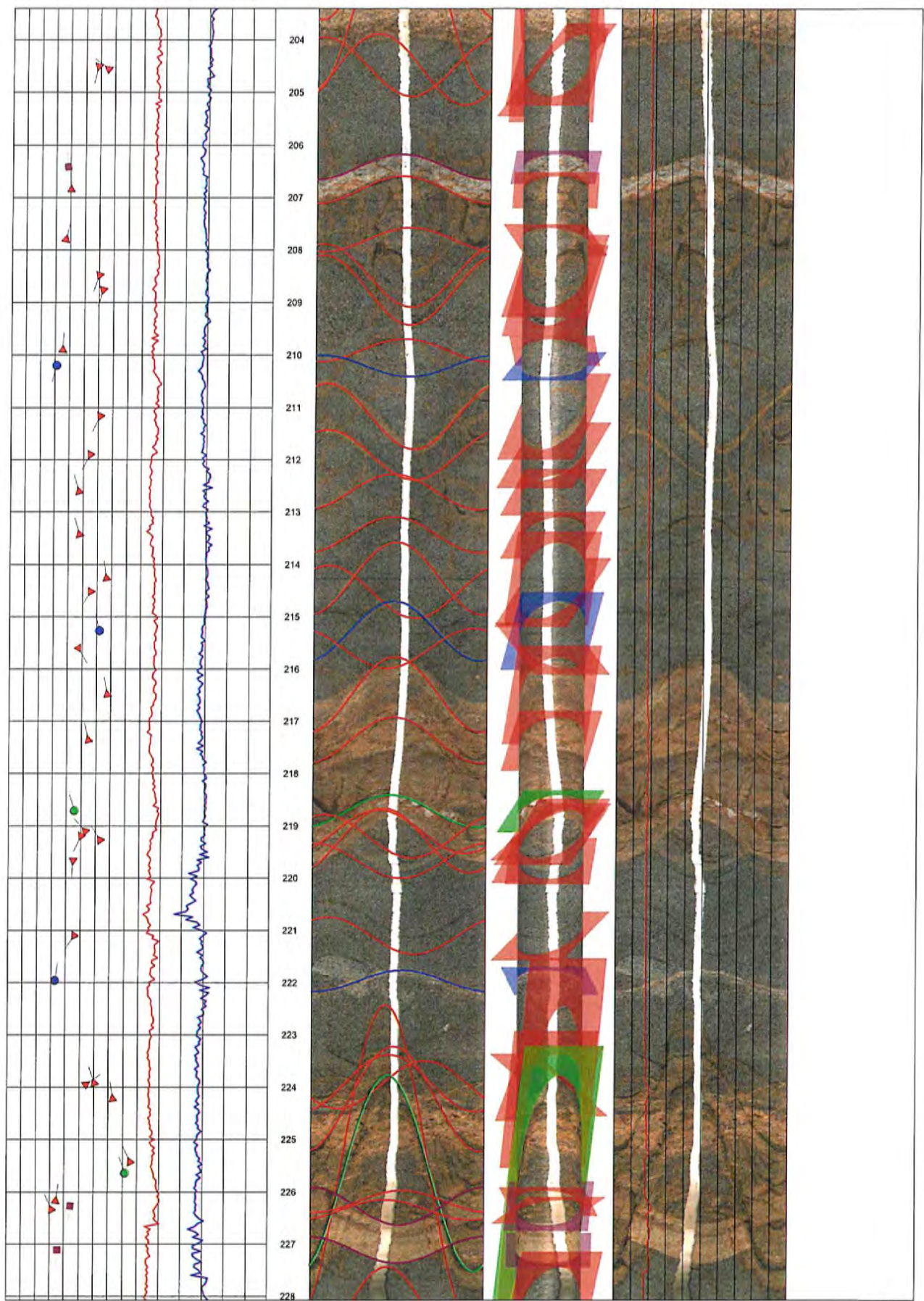


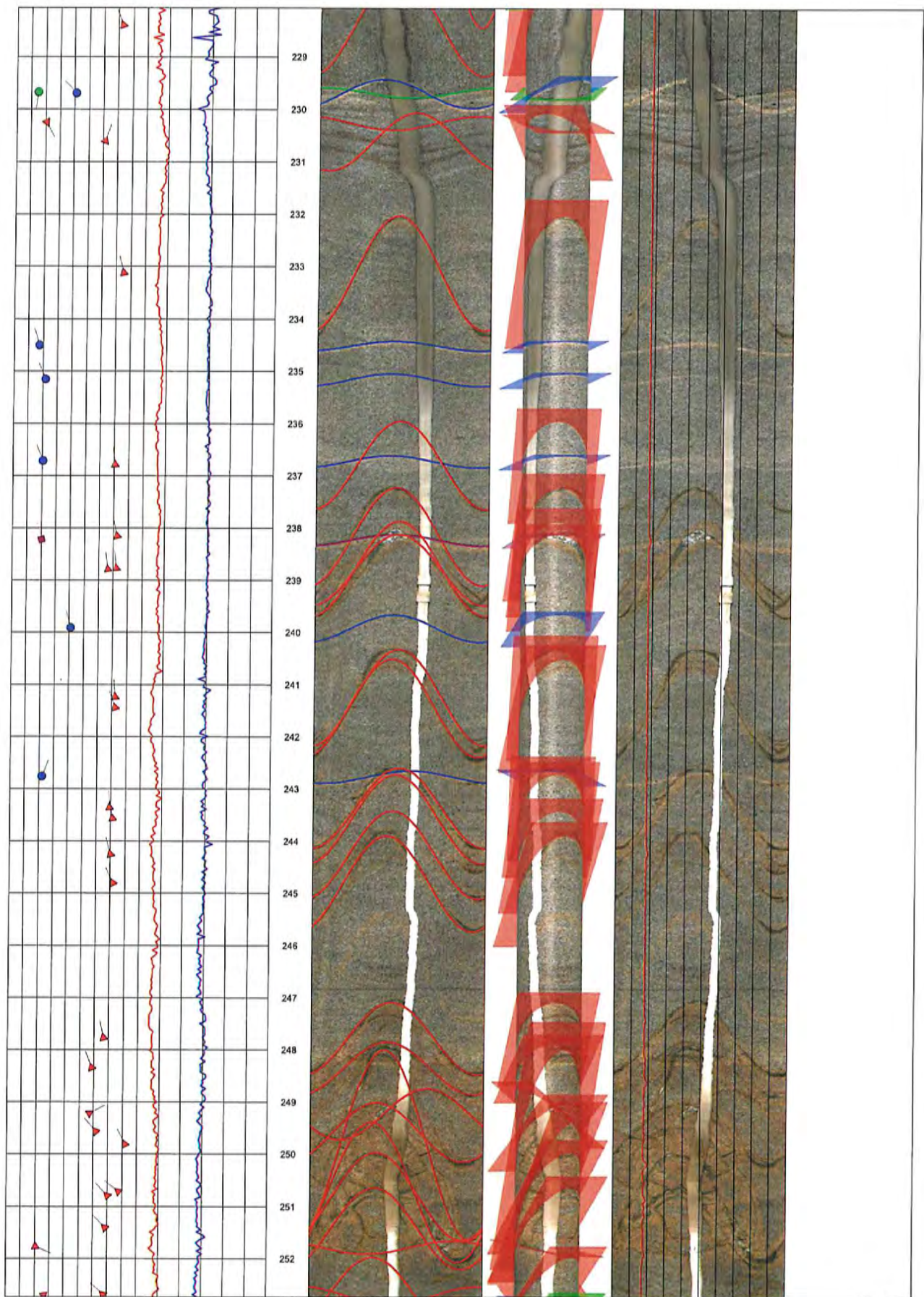


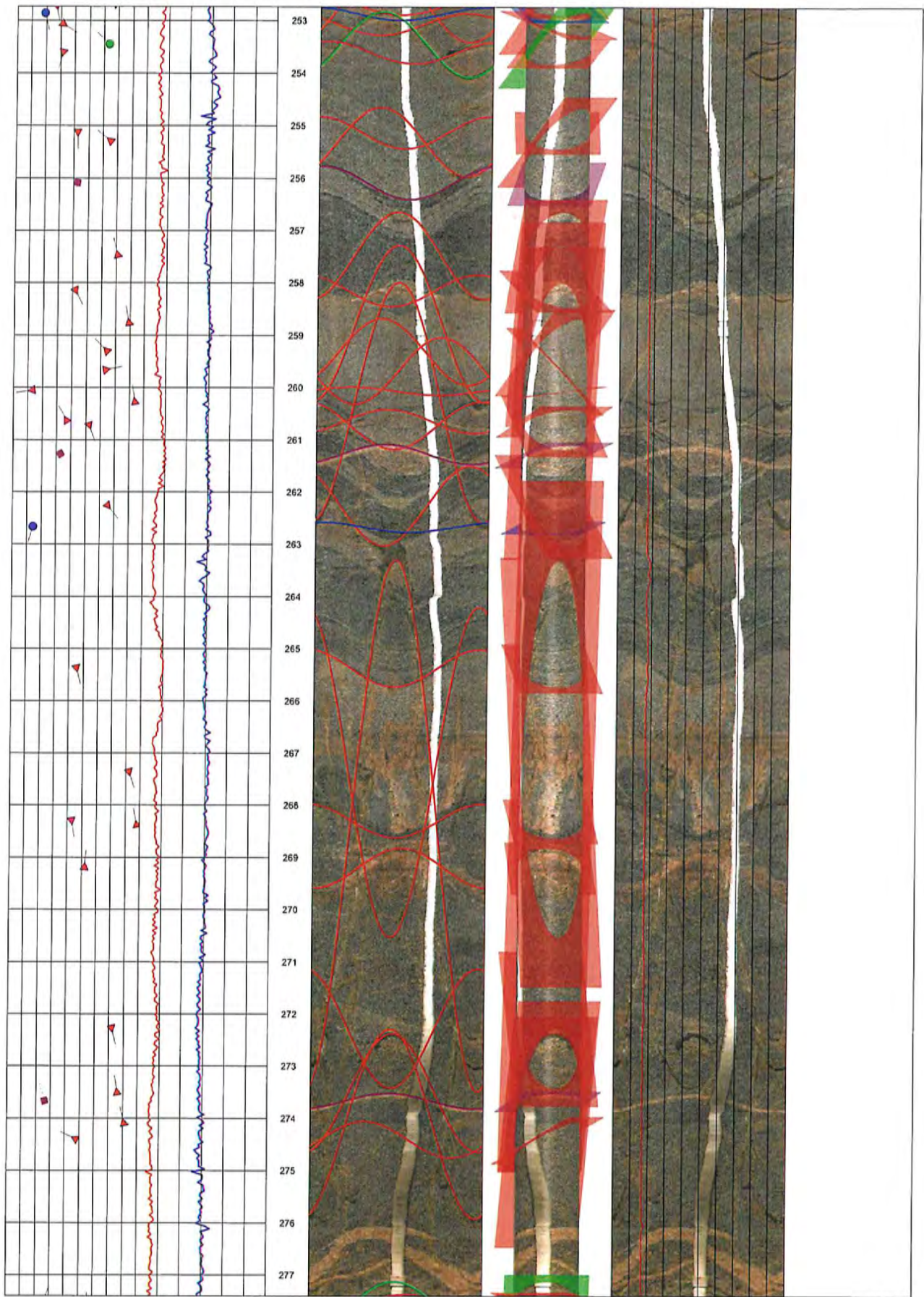


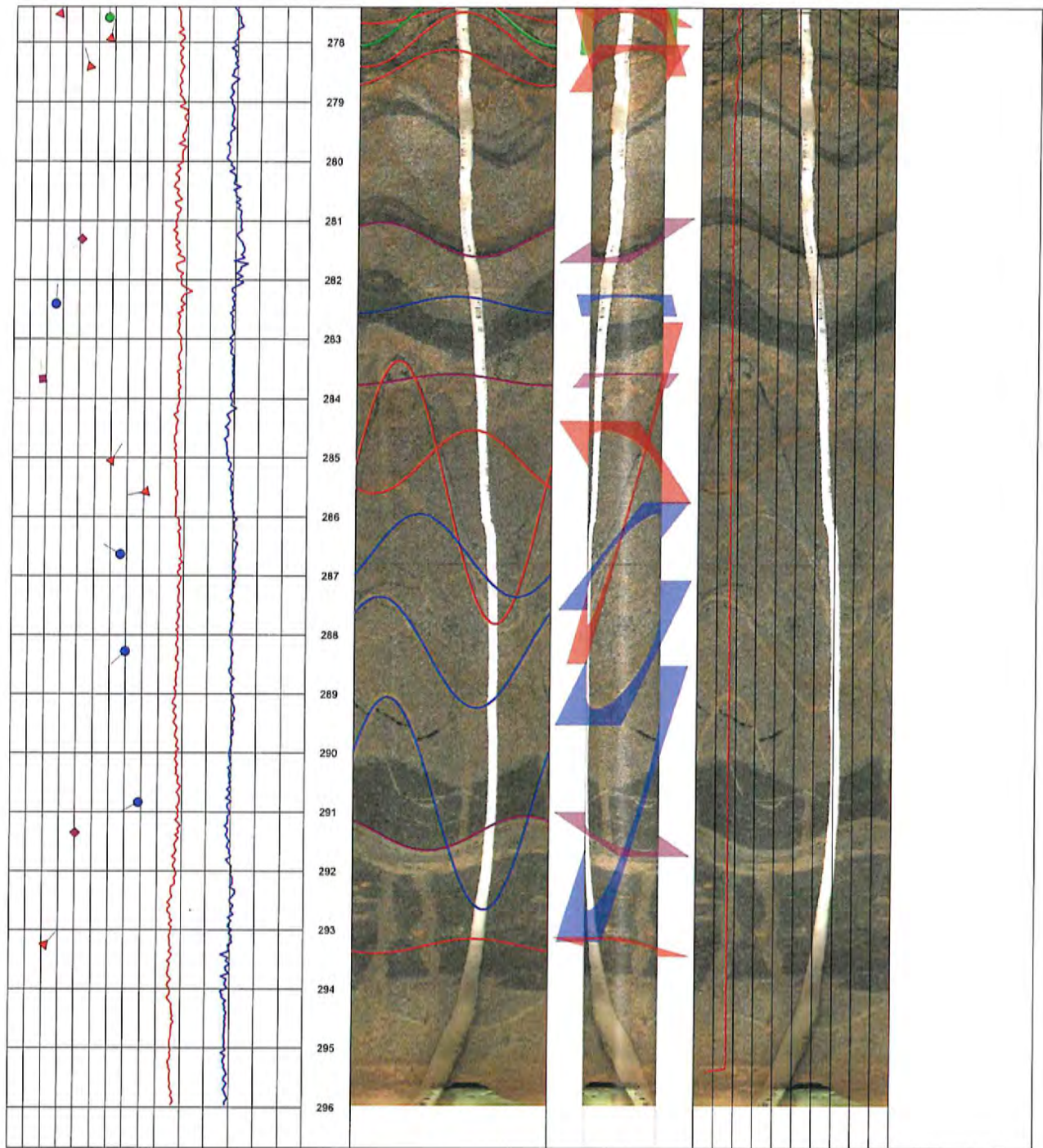




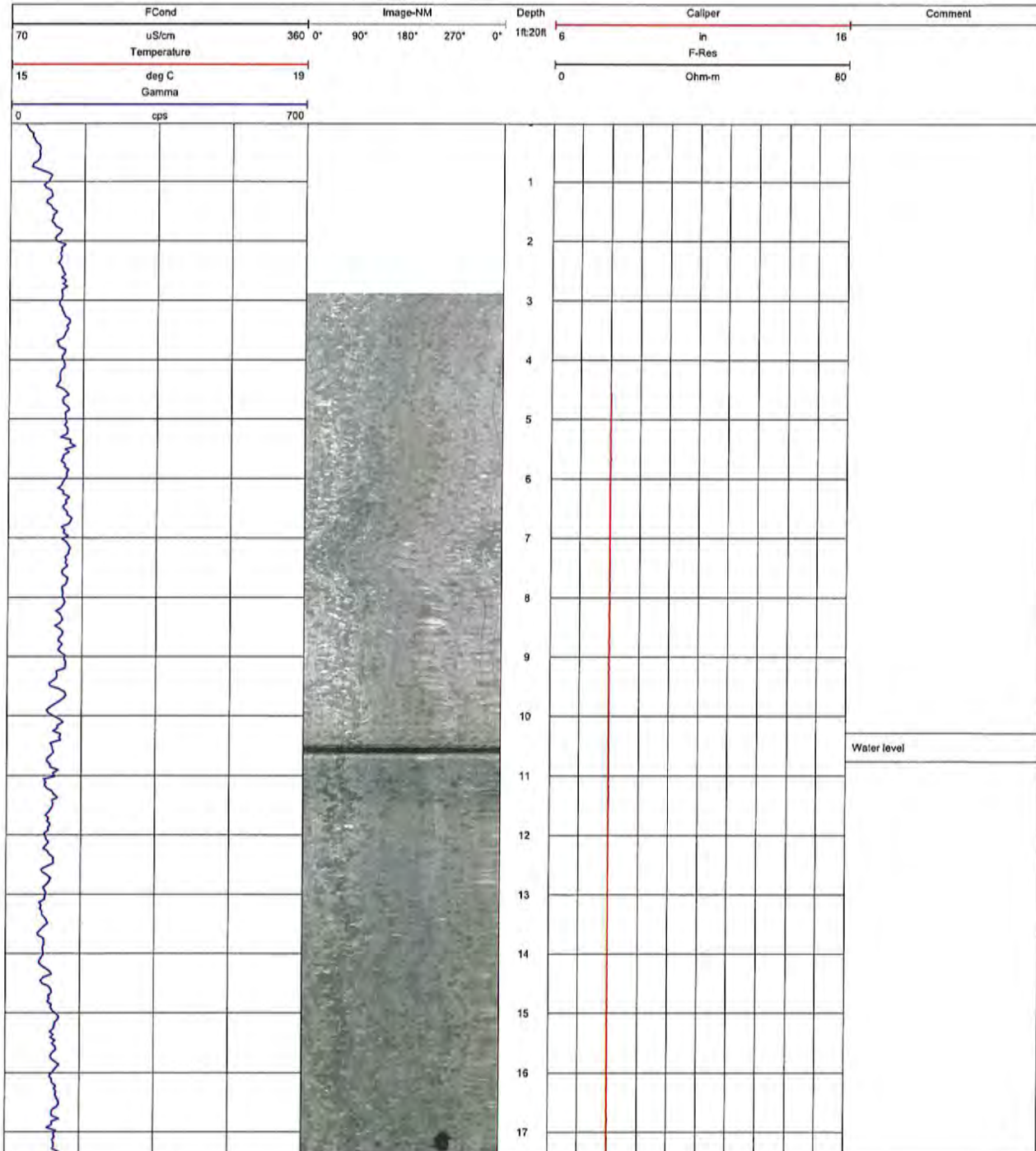


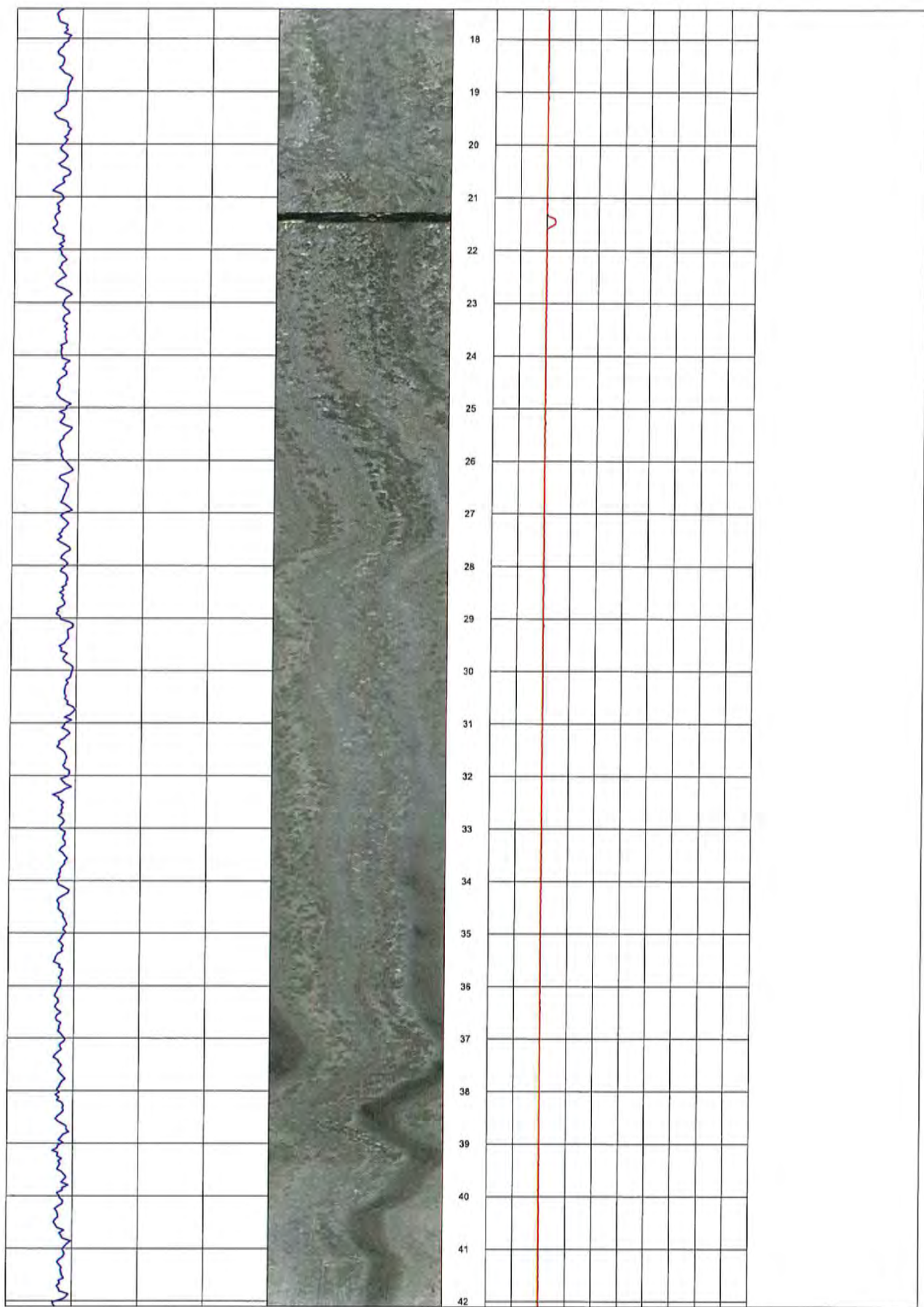


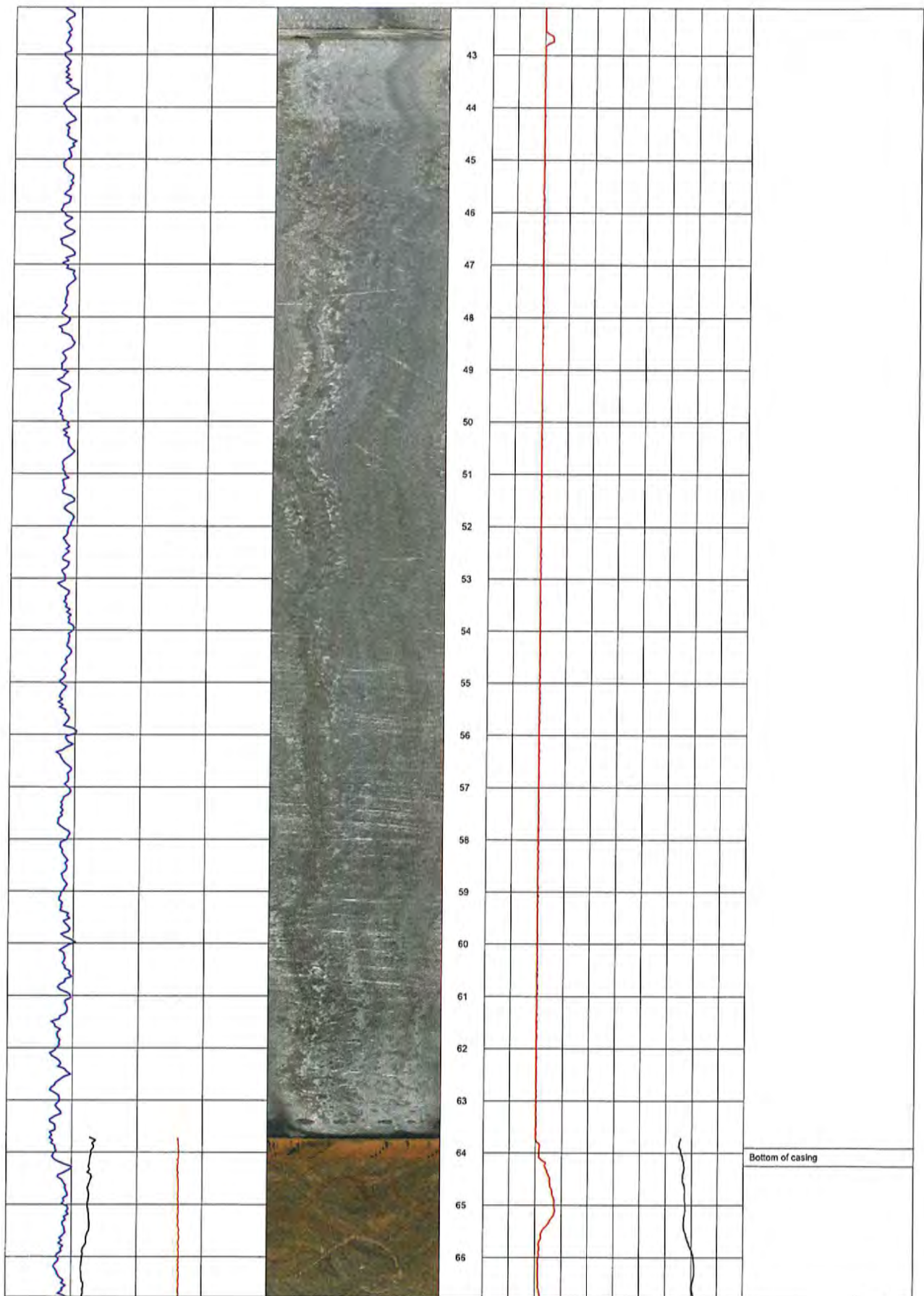


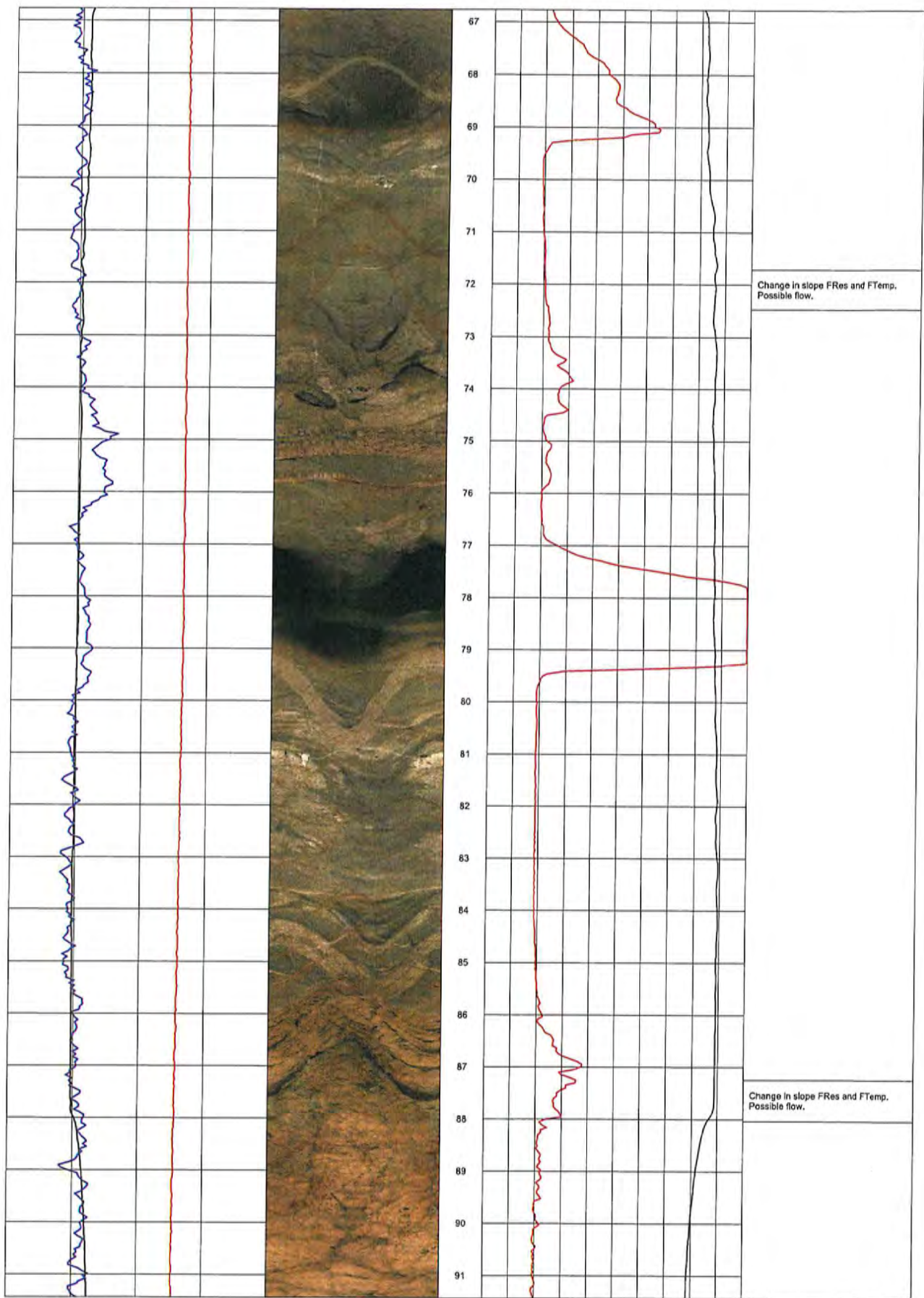


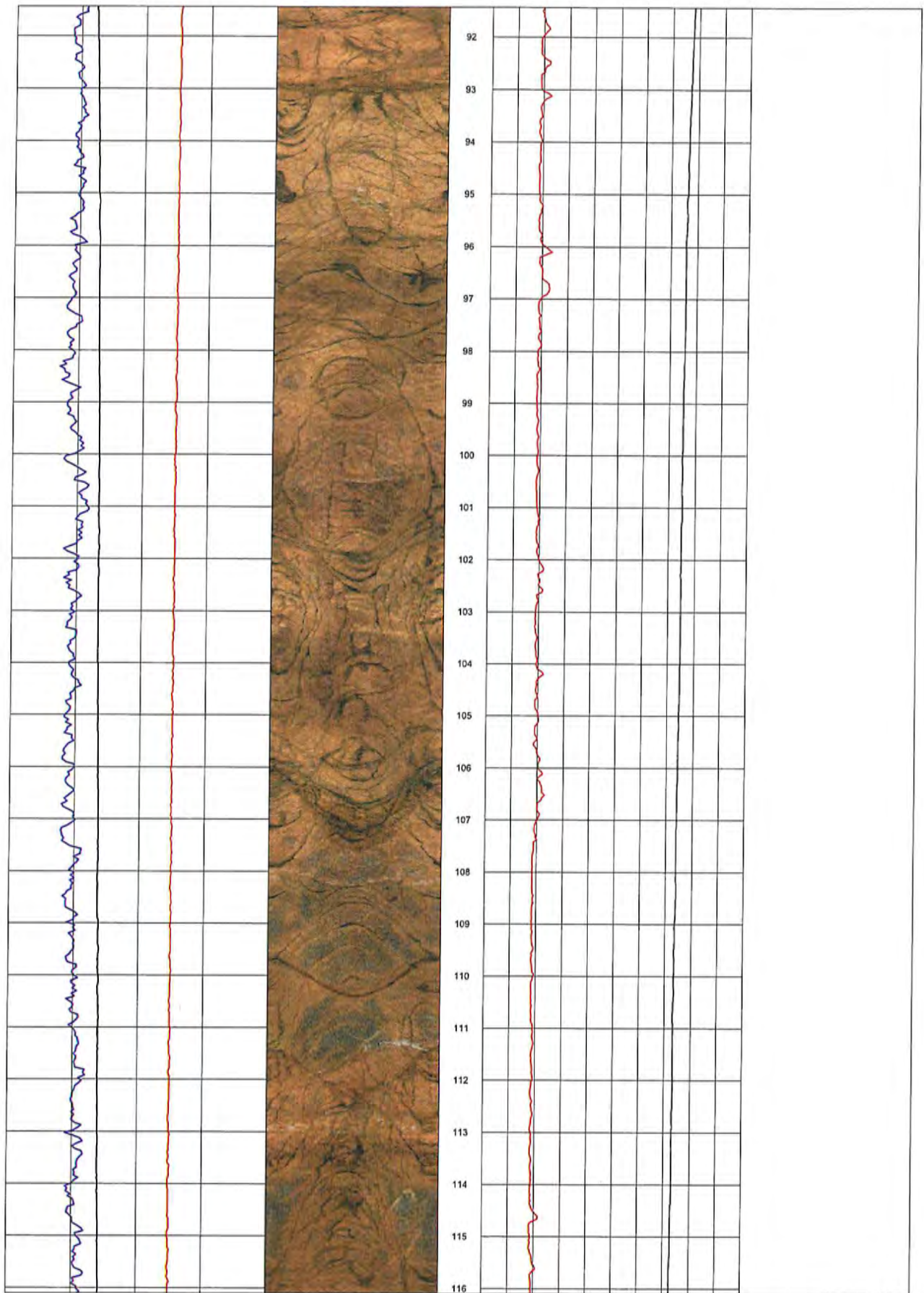
Lake Myra County Park
 Knightdale, NC
 prepared for
 N.W. Poole Well and Pump Co.
 Wendell, NC
 by
 Enviroprobe Service, Inc.
 Mount Laurel, NJ
 Caliper, Fluid, and Natural Gamma

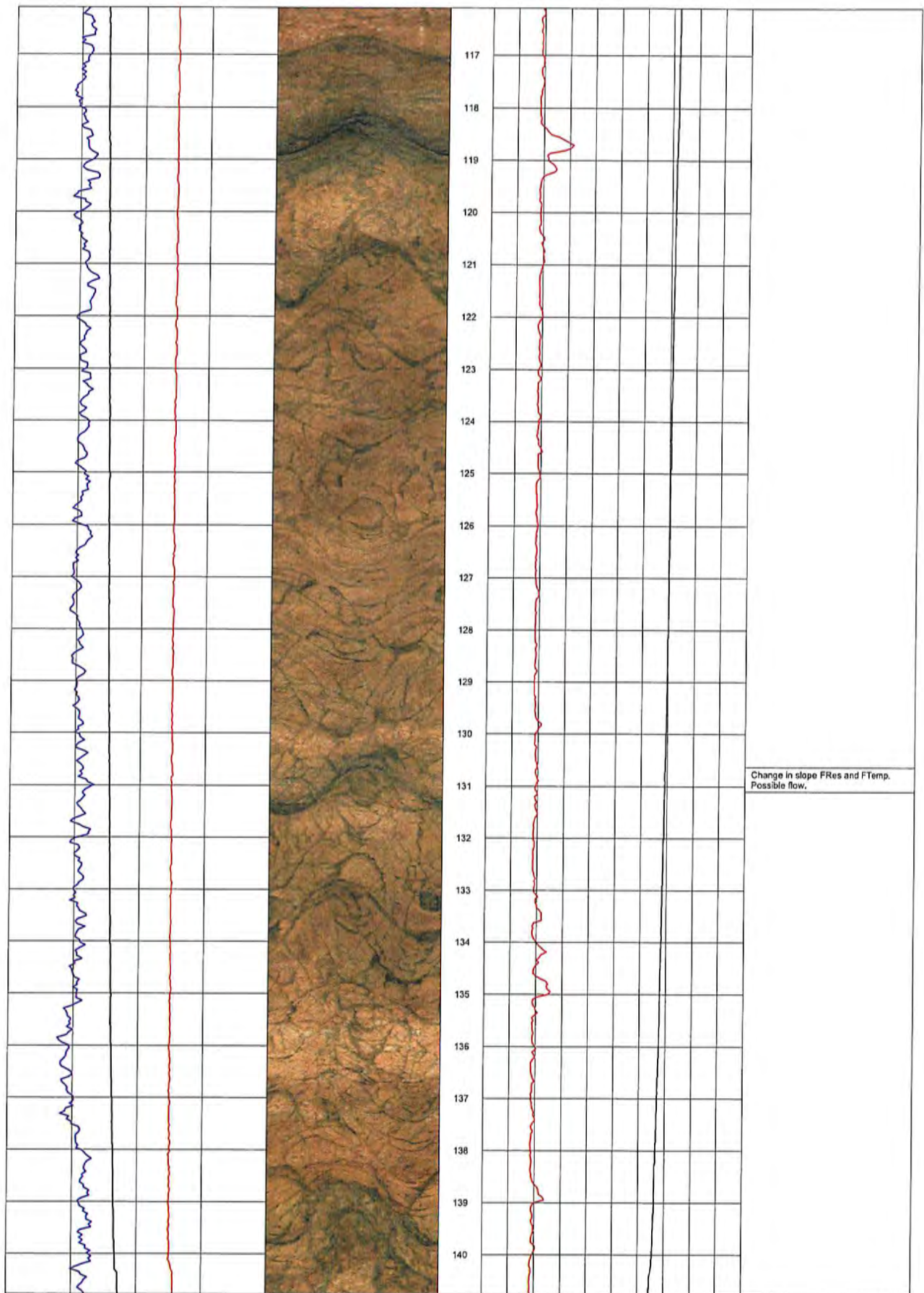


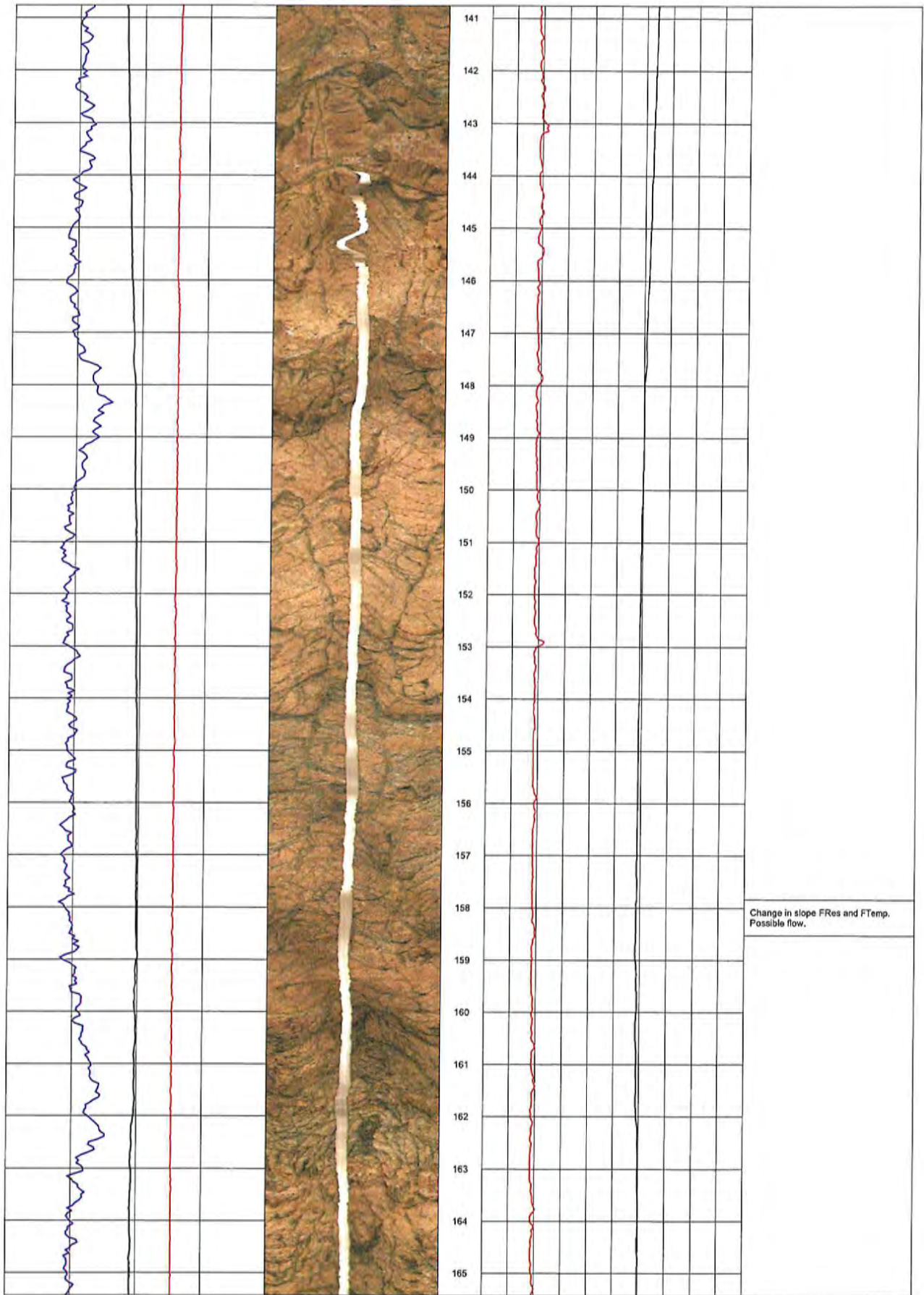


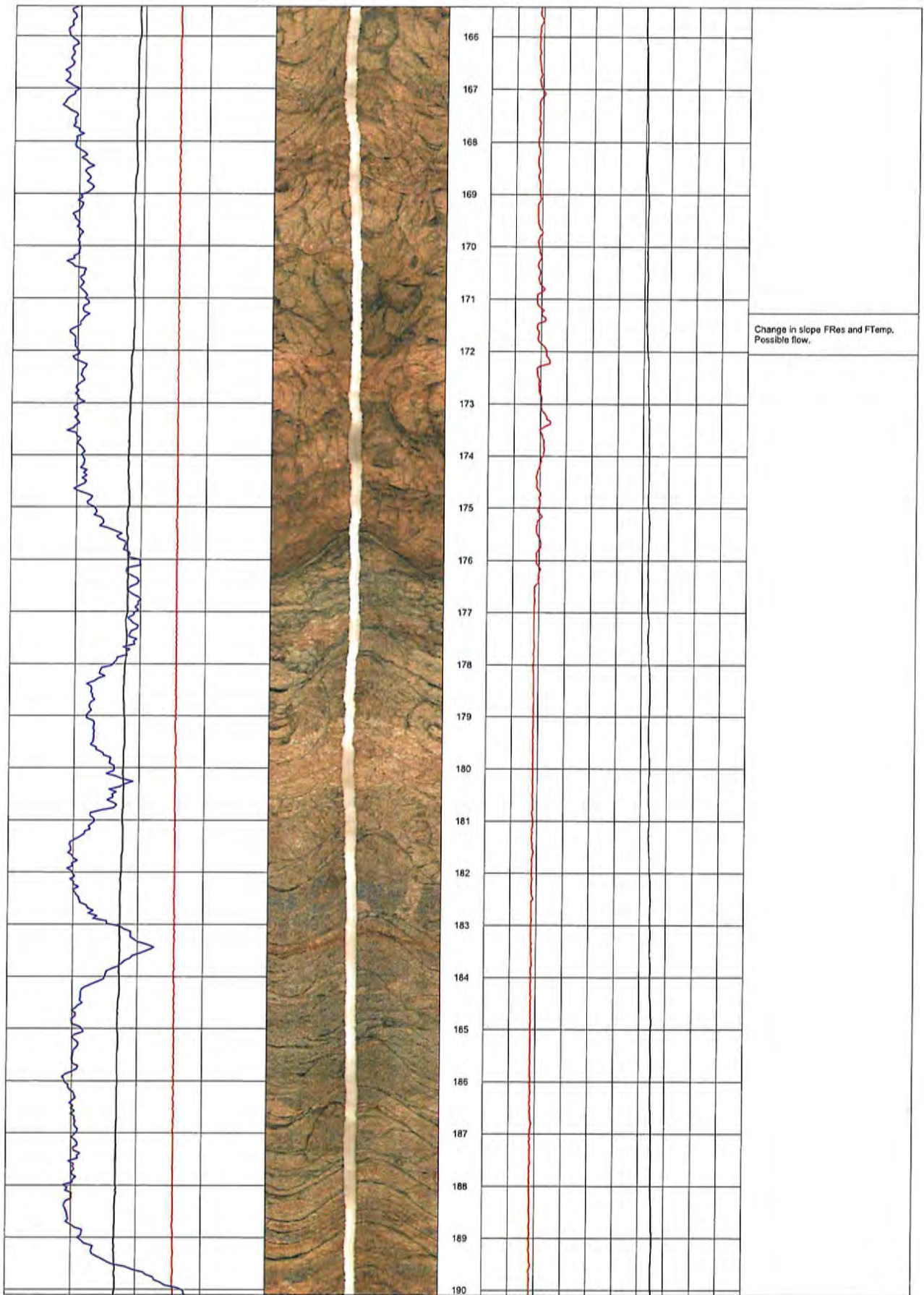


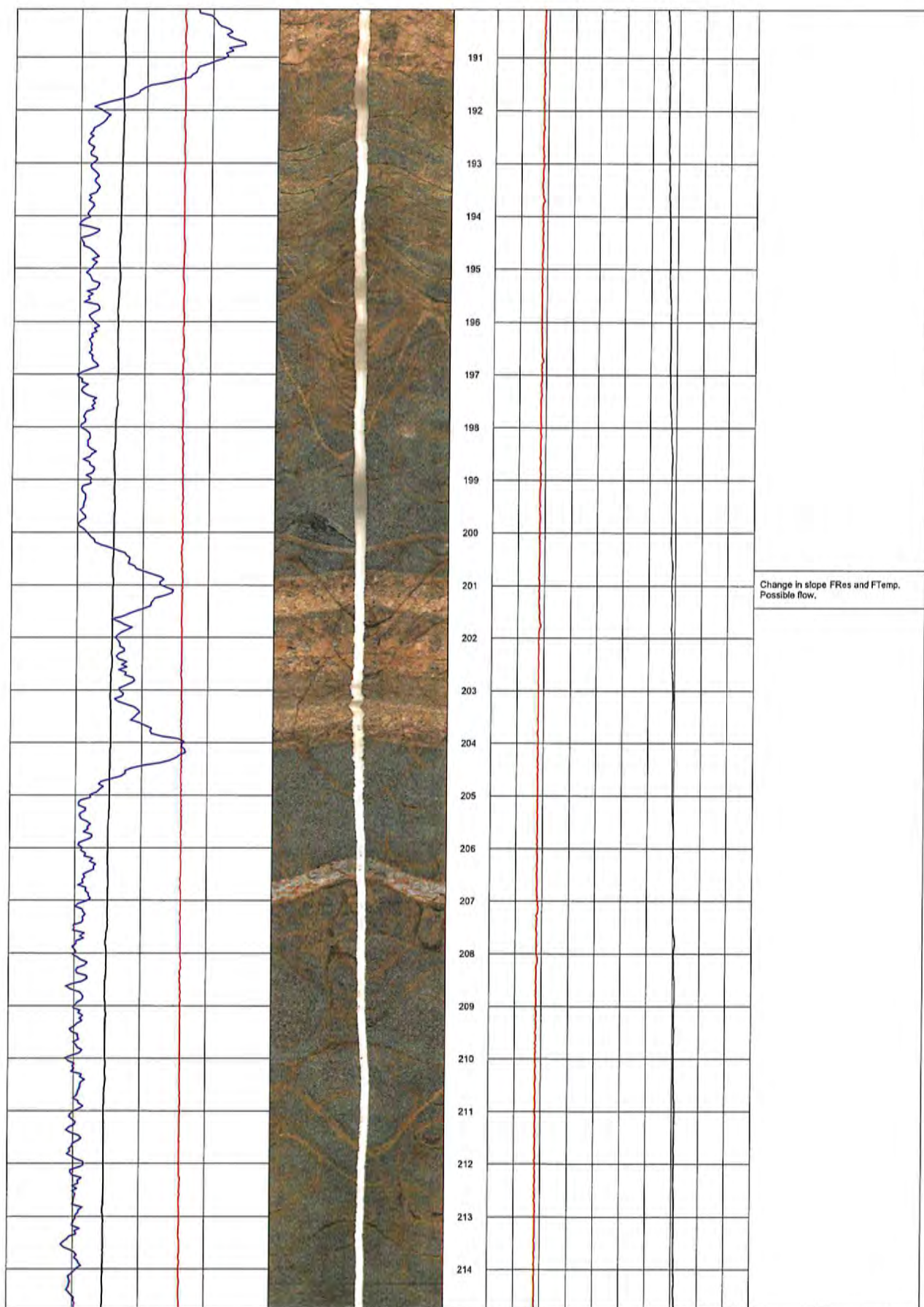


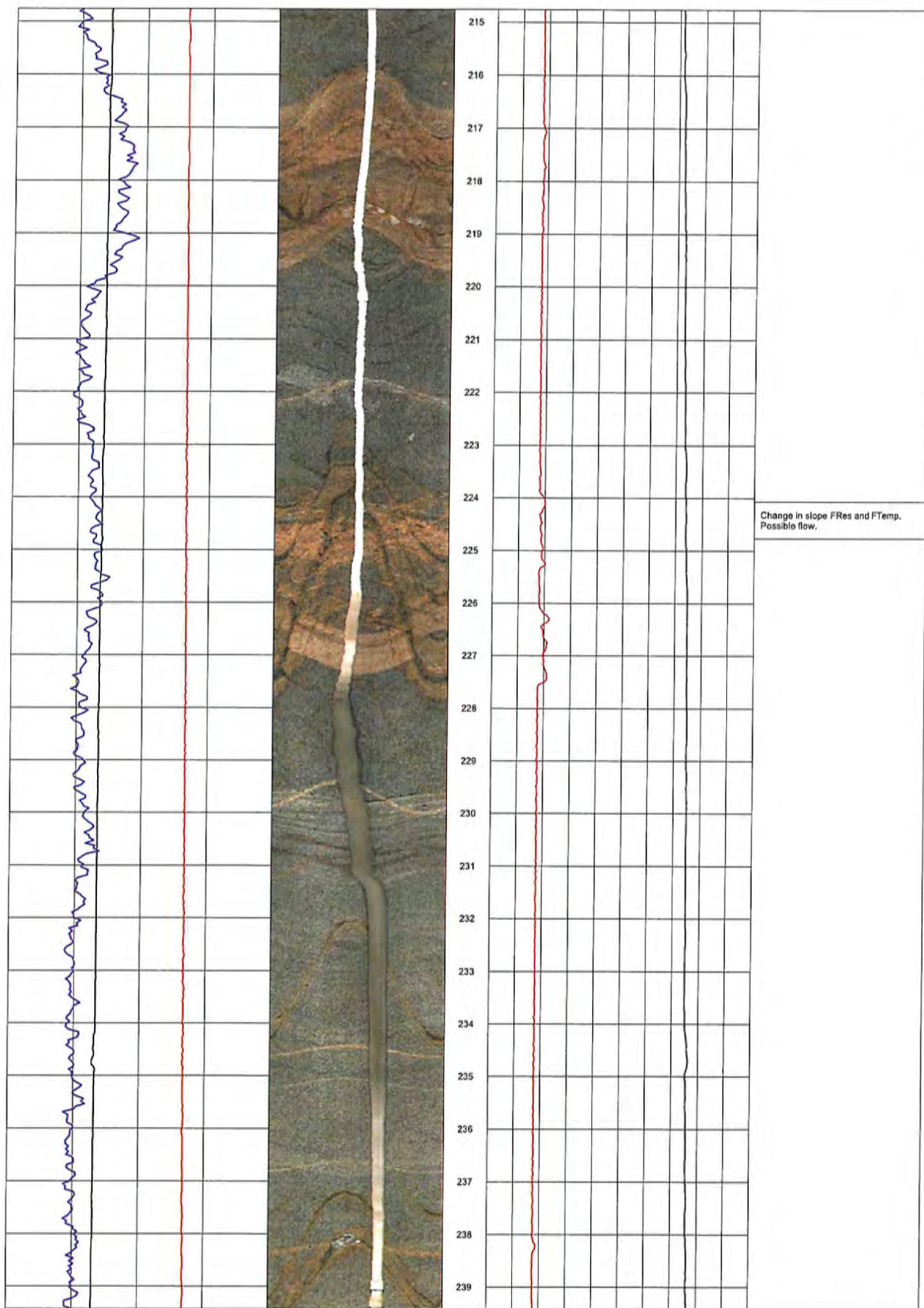


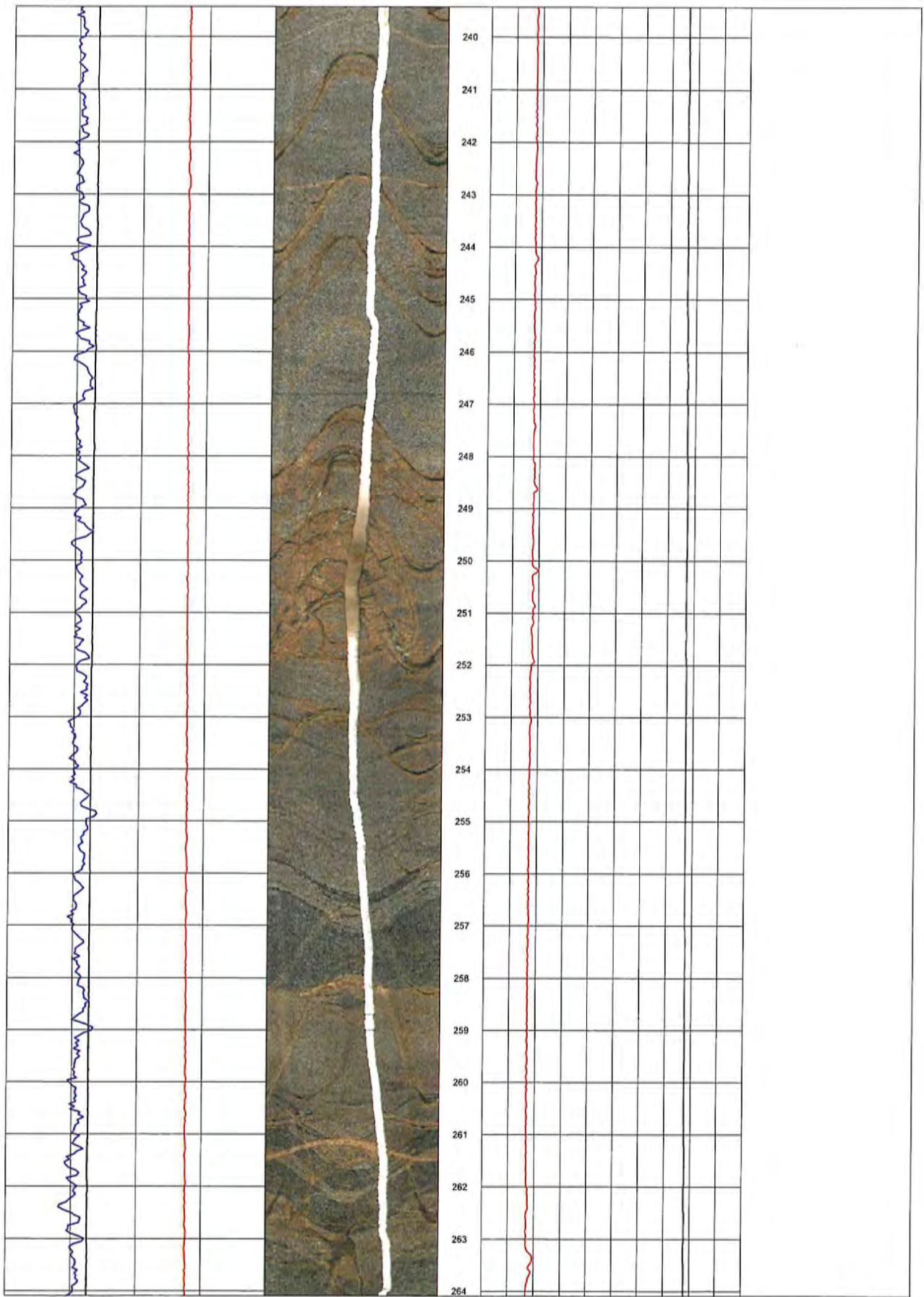


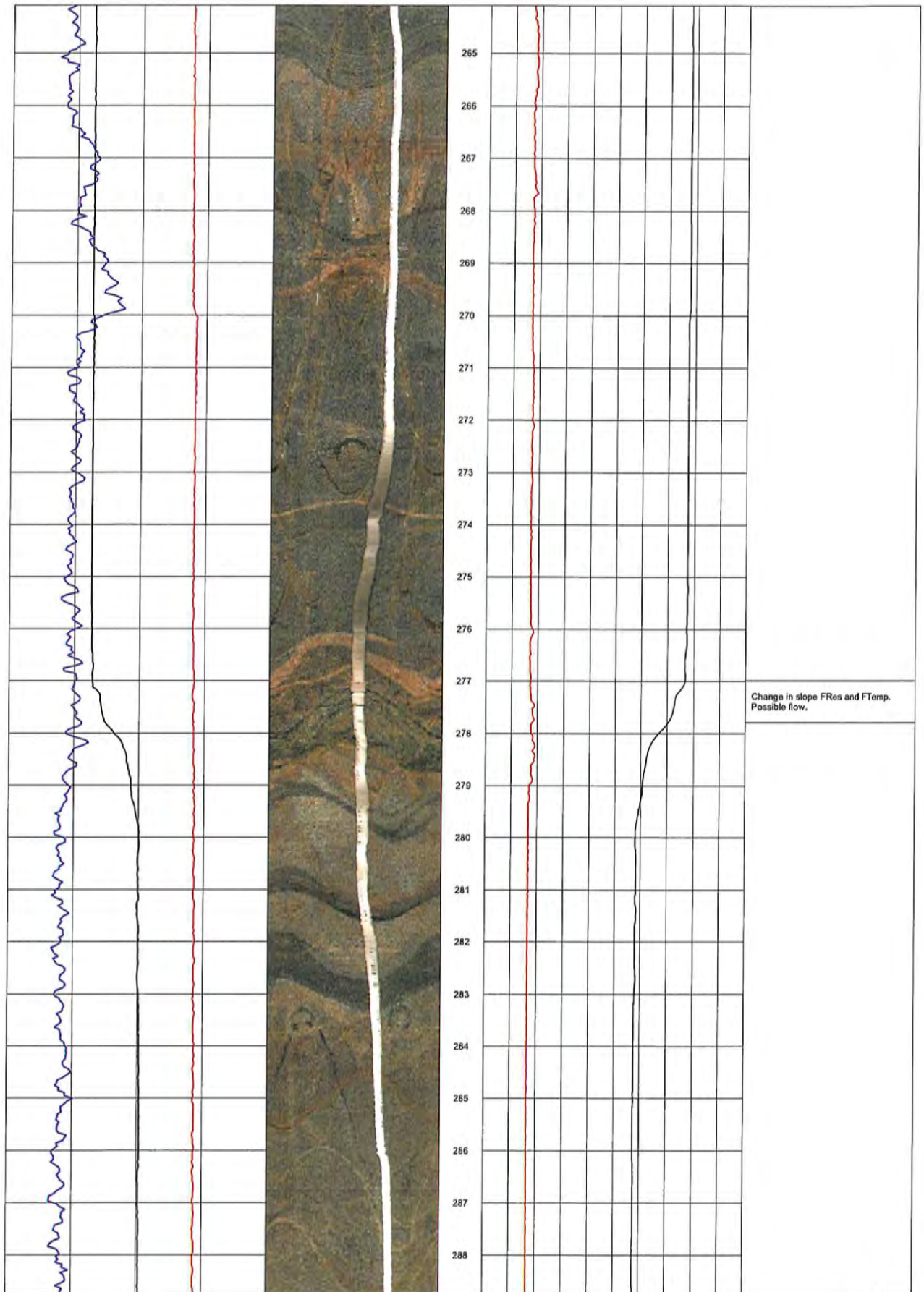


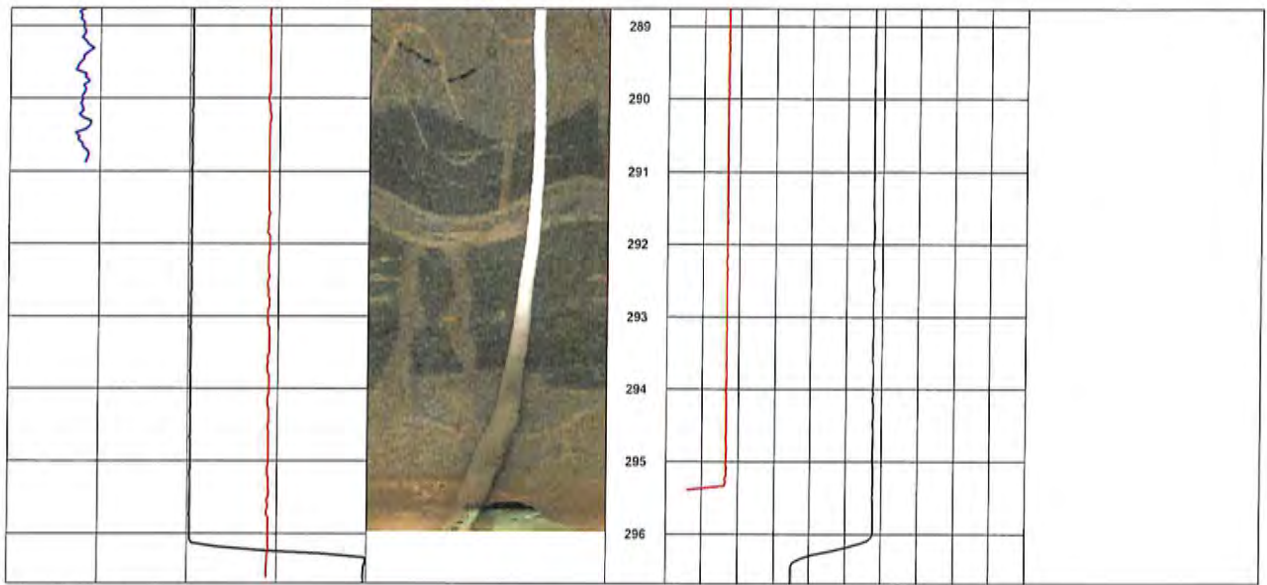




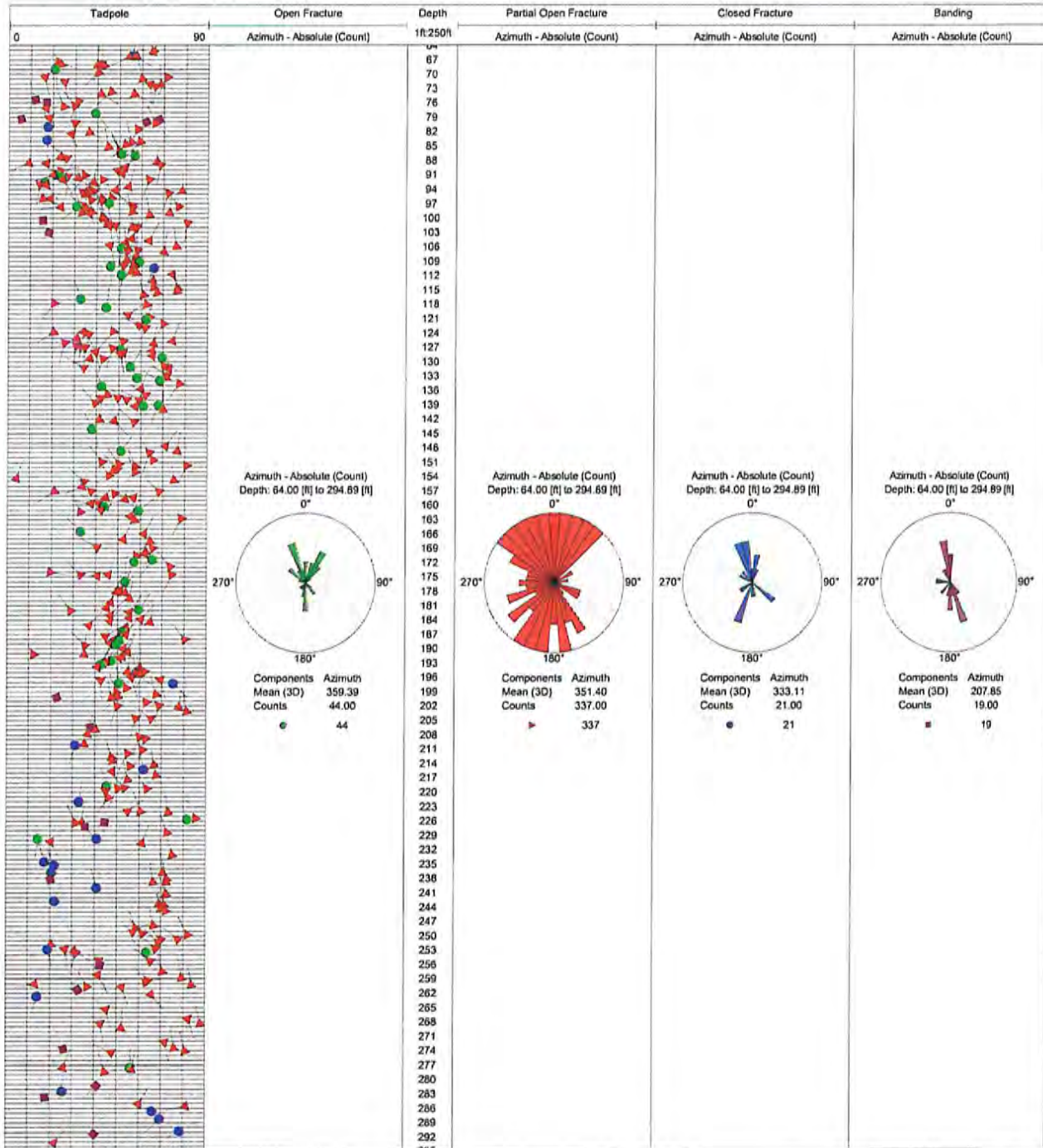




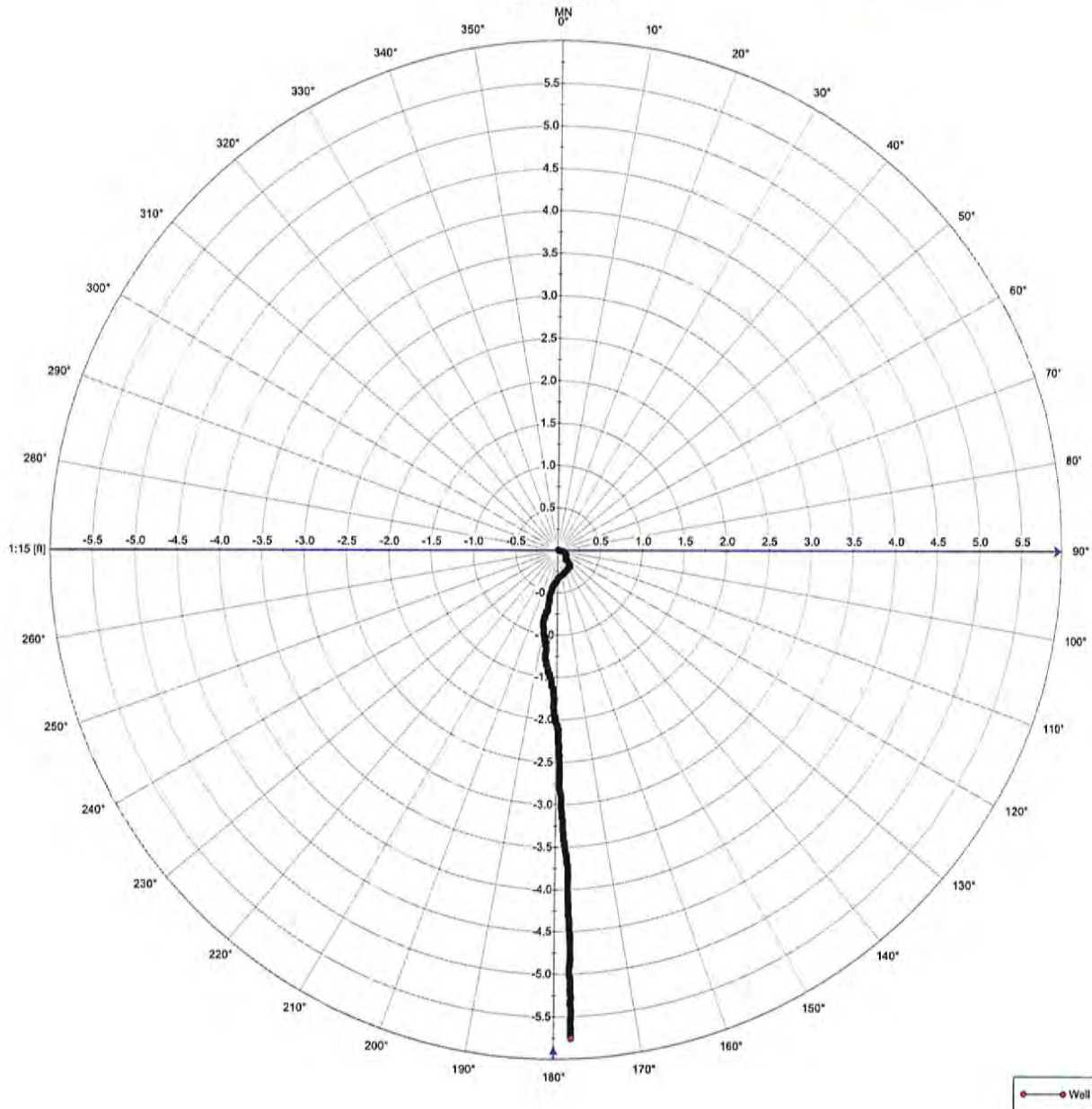




Lake Myra County Park
 Knightdale, NC
 prepared for
 N.W. Poole Well and Pump Co.
 Wendell, NC
 by
 Enviroprobe Service, Inc.
 Mount Laurel, NJ
 Rose Diagram

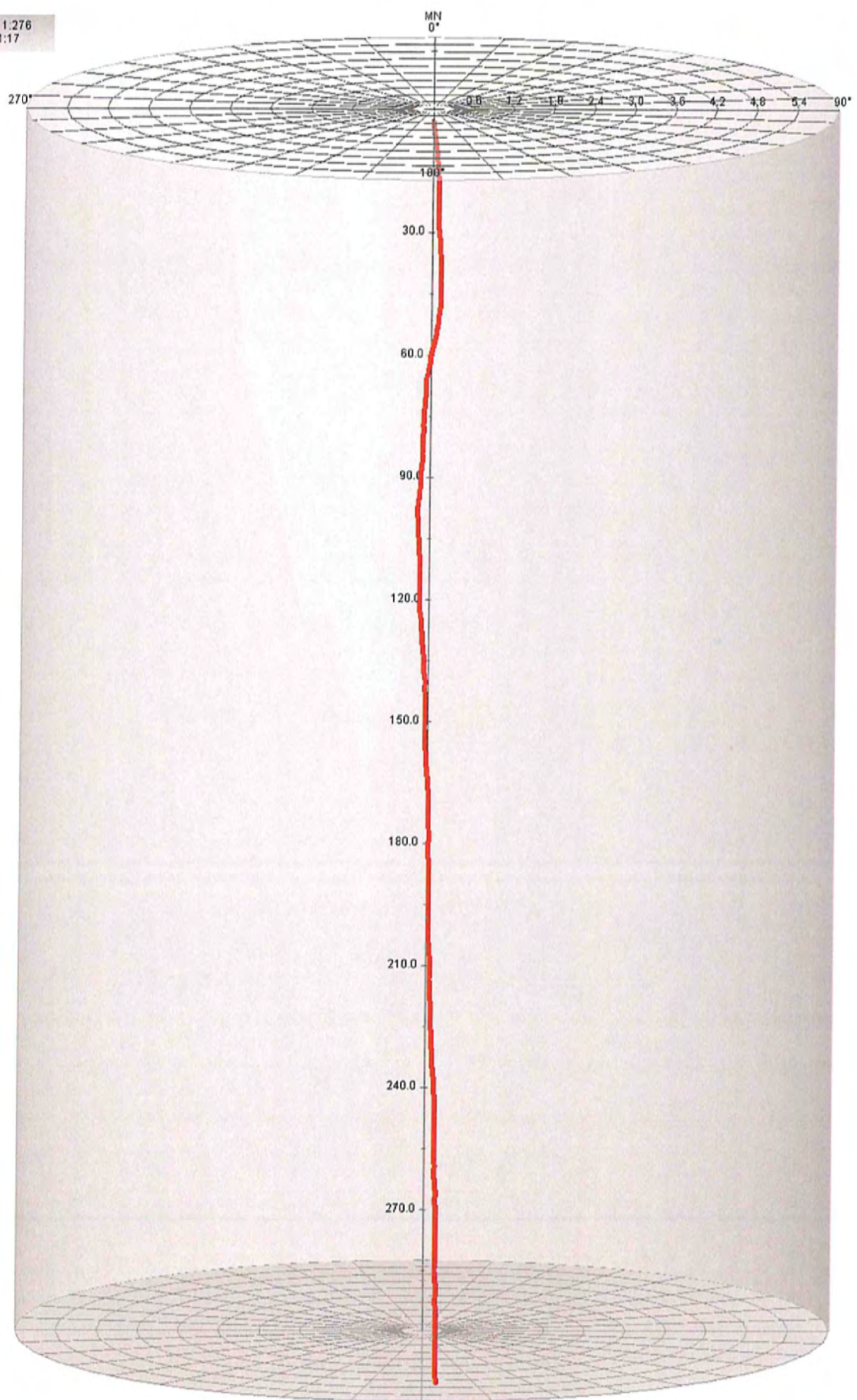


Lake Myra County Park
Knightdale, NC
prepared for
N.W. Poole Well and Pump Co.
Wendell, NC
by
Enviroprobe Service, Inc.
Mount Laurel, NJ
Deviation



Depth [m] 1:276
Horiz [m] 1:17

Well →



APPENDIX B

Lake Myra County Park Structure Data					
Depth	Azimuth	Dip	Aperture	Type	Fracture
ft	deg	deg	inch/10		
65.18	338.94	64.92	0	no data	Partial open fracture
65.38	23.51	64.79	0	no data	Partial open fracture
66.11	7.96	55.87	0	no data	Fracture Closed
66.27	243.96	54.15	0	no data	Partial open fracture
66.32	124.03	57.29	0	no data	Partial open fracture
67.52	107.59	21.73	0	no data	Partial open fracture
67.84	233.58	23.22	0	no data	Partial open fracture
68.04	0.69	41.79	0	no data	Banding
68.13	1.85	39.82	0	no data	Partial open fracture
68.3	215.97	42.66	0	no data	Partial open fracture
69.01	175.65	20.86	39.16	no data	Fracture Open
69.68	226.4	40.19	0	no data	Partial open fracture
70.55	167.62	16.14	0	no data	Partial open fracture
70.67	207.74	71.33	0	no data	Partial open fracture
70.95	347.4	59.96	0	no data	Partial open fracture
71.58	170.68	25.06	0	no data	Partial open fracture
72.02	173.33	63.28	0	no data	Partial open fracture
72.15	357.95	68.38	0	no data	Partial open fracture
72.51	187.06	65.85	0	no data	Partial open fracture
73.65	227.11	45.81	0	no data	Partial open fracture
74.06	121.41	41.49	0	no data	Partial open fracture
74.14	114.9	56.31	0	no data	Partial open fracture
75.33	345.22	11.8	0	no data	Banding
75.53	204.19	31.18	0	no data	Partial open fracture
75.84	271.37	17.05	0	no data	Banding
76.55	321.88	29.5	0	no data	Partial open fracture
76.68	336.3	24.63	0	no data	Partial open fracture
77.01	155.83	16.82	0	no data	Partial open fracture
78.12	143.42	39.33	111.38	no data	Fracture Open
79.12	169.17	18.04	0	no data	Partial open fracture
79.35	164.44	5.55	0	no data	Banding
79.47	158.19	67.64	0	no data	Banding
80.01	155.63	61.91	0	no data	Banding
80.17	184.56	29.82	0	no data	Partial open fracture
80.26	334.61	65.97	0	no data	Partial open fracture
80.99	345.37	17.7	0	no data	Fracture Closed
81.48	206.98	58.07	0	no data	Partial open fracture
82.12	115.47	36.31	0	no data	Partial open fracture
82.45	157.23	28.21	0	no data	Partial open fracture
83.67	180.37	17.37	0	no data	Fracture Closed
84.06	224.48	59.11	0	no data	Partial open fracture
84.18	345.06	55.21	0	no data	Partial open fracture
84.65	227.82	52.53	0	no data	Partial open fracture
85.14	349.71	44.81	0	no data	Partial open fracture
85.91	336.39	49.67	0	no data	Partial open fracture

86.12	331.74	50.49	0	no data	Partial open fracture
86.4	335.01	50.17	0	no data	Partial open fracture
86.66	335.47	51.01	0	no data	Fracture Open
86.97	336.86	57.01	17.03	no data	Fracture Open
87.28	248.87	23.31	0	no data	Partial open fracture
87.42	308.99	26.01	0	no data	Partial open fracture
88.37	3.19	66.78	0	no data	Partial open fracture
88.53	247.6	9.02	0	no data	Partial open fracture
88.59	153.52	17.02	0	no data	Partial open fracture
88.92	191	68.64	0	no data	Partial open fracture
89.42	37.98	52.42	0	no data	Partial open fracture
90.05	172.32	49.1	0	no data	Partial open fracture
90.17	78.18	23.13	0	no data	Partial open fracture
90.68	38.66	51.23	0	no data	Partial open fracture
90.88	313.34	21.61	0	no data	Fracture Open
90.97	252.24	20.24	0	no data	Partial open fracture
91.08	214.99	34.15	0	no data	Partial open fracture
91.29	186.13	26.62	0	no data	Partial open fracture
91.61	127.32	31.21	0	no data	Partial open fracture
91.67	33.77	24.34	0	no data	Fracture Open
91.98	200.98	63.48	0	no data	Partial open fracture
91.98	147.31	24.37	0	no data	Partial open fracture
92.01	207.92	42.55	0	no data	Partial open fracture
92.64	10.66	38.3	0	no data	Partial open fracture
92.64	143.43	16.39	0	no data	Fracture Open
92.99	188.43	14.08	0	no data	Partial open fracture
93.05	18.24	17.09	0	no data	Partial open fracture
93.45	19.22	53.98	0	no data	Partial open fracture
94.21	25.14	48.19	0	no data	Partial open fracture
94.3	24.78	35.45	0	no data	Partial open fracture
94.38	329.72	38.29	0	no data	Partial open fracture
94.46	3.18	78.24	0	no data	Partial open fracture
94.66	313.62	33.27	0	no data	Partial open fracture
94.83	198.18	72.18	0	no data	Partial open fracture
95.07	358.68	35.11	0	no data	Partial open fracture
95.7	344.06	46.21	0	no data	Partial open fracture
95.9	346.55	41.9	0	no data	Partial open fracture
95.91	268.94	18.87	0	no data	Partial open fracture
95.95	110.34	15.38	0	no data	Partial open fracture
96.22	319.05	37.13	0	no data	Partial open fracture
96.3	313.72	42.23	0	no data	Partial open fracture
96.78	294.54	45.48	0	no data	Fracture Open
97.25	309.69	32.83	0	no data	Partial open fracture
97.34	307.3	55.77	0	no data	Partial open fracture
97.52	324.22	76.73	0	no data	Partial open fracture
97.56	229.84	30.95	0	no data	Fracture Open
97.63	265.9	23.58	0	no data	Partial open fracture
97.85	313.64	55.6	0	no data	Partial open fracture
97.98	356.46	35.13	0	no data	Partial open fracture

98.59	344.53	55.63	0	no data	Partial open fracture
98.63	349.73	37.5	0	no data	Partial open fracture
98.83	344.32	32.98	0	no data	Partial open fracture
98.95	5.95	72.65	0	no data	Partial open fracture
99.03	154.41	36.63	0	no data	Partial open fracture
99.33	352.1	63.47	0	no data	Partial open fracture
99.74	342.8	42.26	0	no data	Partial open fracture
100.05	346.94	42.87	0	no data	Partial open fracture
100.42	172.73	15.34	0	no data	Banding
101.03	189.55	80.87	0	no data	Partial open fracture
101.18	344.58	44.42	0	no data	Partial open fracture
101.37	350.64	46.21	0	no data	Partial open fracture
101.49	170.96	48.15	0	no data	Partial open fracture
101.59	172.19	45.78	0	no data	Partial open fracture
101.83	179	58	0	no data	Partial open fracture
101.95	355.46	55.76	0	no data	Partial open fracture
102.05	194.9	57.5	0	no data	Partial open fracture
102.93	284.3	18.3	0	no data	Banding
104.26	22.52	55.7	0	no data	Partial open fracture
104.68	28.67	63.48	0	no data	Partial open fracture
105.01	14.45	52.88	0	no data	Partial open fracture
105.69	165.51	45.68	0	no data	Partial open fracture
105.91	353.51	75.83	0	no data	Partial open fracture
106	354.45	53.1	0	no data	Partial open fracture
106.29	190.96	51.28	0	no data	Fracture Open
106.66	192.63	58.36	0	no data	Partial open fracture
106.91	196.21	53.47	0	no data	Partial open fracture
107.05	9.34	70.07	0	no data	Partial open fracture
108.01	359.58	57.61	0	no data	Partial open fracture
108.69	359.75	53.37	0	no data	Partial open fracture
109.08	359.29	59.41	0	no data	Fracture Open
109.5	352.58	56.36	0	no data	Partial open fracture
109.83	185.27	51.87	0	no data	Partial open fracture
109.88	354.97	56.73	0	no data	Partial open fracture
110.03	178.75	46.24	0	no data	Fracture Open
110.45	204.26	65.81	0	no data	Fracture Closed
111.11	355.61	55.52	0	no data	Partial open fracture
111.37	351.82	57.72	0	no data	Partial open fracture
111.77	148.89	74.02	0	no data	Partial open fracture
111.85	183.85	51.22	0	no data	Fracture Open
113.06	9.52	65.2	0	no data	Partial open fracture
114.41	345.35	65.52	0	no data	Partial open fracture
114.65	344.6	76.38	0	no data	Partial open fracture
115.28	350.55	76.22	0	no data	Partial open fracture
115.59	344.92	67.2	0	no data	Partial open fracture
116.01	346.62	61.02	0	no data	Partial open fracture
116.85	338.4	32.9	0	no data	Fracture Open
117.73	215.94	20.75	0	no data	Partial open fracture
118.02	343.69	62.29	0	no data	Partial open fracture

118.61	5.35	44.48	0	no data	Fracture Open
120.22	54.43	53.95	0	no data	Partial open fracture
120.75	200.9	63.71	0	no data	Partial open fracture
121.17	20.99	62.3	0	no data	Fracture Open
122.1	208.44	70.01	0	no data	Partial open fracture
122.34	294.83	59	0	no data	Partial open fracture
122.86	304.45	61.77	0	no data	Partial open fracture
123.61	219.39	47.25	0	no data	Partial open fracture
123.71	145.68	34.01	0	no data	Partial open fracture
123.77	236.85	20.62	0	no data	Partial open fracture
123.88	208.1	35.05	0	no data	Partial open fracture
124.18	189.84	36.76	0	no data	Partial open fracture
125.09	249.98	30.93	0	no data	Partial open fracture
125.65	197.61	51.85	0	no data	Partial open fracture
125.67	21.15	74.21	0	no data	Partial open fracture
125.98	195.2	25.69	0	no data	Partial open fracture
126.19	11.13	65.59	0	no data	Partial open fracture
126.54	188.74	30.8	0	no data	Partial open fracture
126.82	190.32	32.9	0	no data	Partial open fracture
126.92	183.98	34.64	0	no data	Partial open fracture
127.17	197.17	47.21	0	no data	Partial open fracture
127.48	180.03	51.16	0	no data	Fracture Open
127.73	269.7	65.05	0	no data	Partial open fracture
127.89	165.47	39.45	0	no data	Partial open fracture
128.03	163.35	52.17	0	no data	Partial open fracture
128.19	174.71	51.2	0	no data	Partial open fracture
128.25	167.68	50.45	0	no data	Partial open fracture
128.8	275.28	65.26	0	no data	Partial open fracture
129.16	133.34	69.8	0	no data	Fracture Open
129.29	254.06	37	0	no data	Partial open fracture
129.41	199.25	42.85	0	no data	Partial open fracture
130.86	196.11	70.6	0	no data	Partial open fracture
131.09	29.84	55.43	0	no data	Fracture Open
131.26	301.05	34.17	0	no data	Partial open fracture
131.48	274.09	72.66	0	no data	Partial open fracture
132.92	305.82	71.64	0	no data	Partial open fracture
133.32	6.02	71.54	0	no data	Partial open fracture
133.35	329.36	58.55	0	no data	Fracture Open
133.95	298.66	68.82	0	no data	Fracture Open
134.62	215.93	77.4	0	no data	Partial open fracture
135.08	336.42	42.53	0	no data	Fracture Open
135.69	20.81	60.05	0	no data	Partial open fracture
136.89	304.52	62.26	0	no data	Partial open fracture
136.94	229.35	44.87	0	no data	Partial open fracture
137.48	302.77	49.63	0	no data	Partial open fracture
137.61	177.29	42.06	0	no data	Partial open fracture
137.86	304.63	53.68	0	no data	Partial open fracture
138.01	298.64	59.09	0	no data	Partial open fracture
138.53	317.55	39.51	0	no data	Partial open fracture

139.17	205	68.17	0	no data	Fracture Open
139.21	351.63	61.29	0	no data	Fracture Open
139.29	28.28	57.32	0	no data	Partial open fracture
140.06	0.48	70.1	0	no data	Partial open fracture
142.12	355.99	41.45	0	no data	Partial open fracture
142.42	136.04	48.1	0	no data	Partial open fracture
142.55	310.57	56.99	0	no data	Partial open fracture
144.08	333.28	38.29	0	no data	Fracture Open
147.68	37.66	71.14	0	no data	Partial open fracture
148.64	35.65	51.46	0	no data	Fracture Open
148.74	8.84	76.53	0	no data	Partial open fracture
148.95	197.21	63.94	0	no data	Partial open fracture
150.55	331.95	65.64	0	no data	Partial open fracture
150.84	322.62	42.5	0	no data	Partial open fracture
151.38	325.14	50.17	0	no data	Partial open fracture
151.68	204.13	80.78	0	no data	Partial open fracture
151.86	338.07	57.64	0	no data	Partial open fracture
152.42	317.97	49.51	0	no data	Partial open fracture
152.73	233.64	47.59	0	no data	Partial open fracture
153.03	335.46	57.52	0	no data	Partial open fracture
153.73	328.48	45.74	0	no data	Partial open fracture
154.28	19.34	4.12	0	no data	Partial open fracture
154.71	353.37	75.16	0	no data	Partial open fracture
155.02	314.01	34.36	0	no data	Partial open fracture
155.99	247.51	33.69	0	no data	Partial open fracture
157.02	236.7	21.35	0	no data	Partial open fracture
157.05	311.68	37.9	0	no data	Partial open fracture
157.1	313.3	68.45	0	no data	Partial open fracture
157.49	201.4	48.45	0	no data	Partial open fracture
158.34	255.61	44.34	0	no data	Partial open fracture
158.39	281.4	56.87	0	no data	Partial open fracture
158.72	251.74	53.06	0	no data	Partial open fracture
159.47	294.74	41.21	0	no data	Partial open fracture
159.65	279.19	37.86	0	no data	Partial open fracture
160.21	16.57	43.73	0	no data	Fracture Open
160.94	291.53	42.38	0	no data	Partial open fracture
161.1	51.17	59.26	0	no data	Fracture Open
161.36	335.63	33	0	no data	Partial open fracture
162.24	28.6	55.39	0	no data	Partial open fracture
162.79	207.33	78.55	0	no data	Partial open fracture
163.06	355.23	57.43	0	no data	Partial open fracture
165.5	313.9	33.22	0	no data	Fracture Open
165.96	29.24	61.68	0	no data	Partial open fracture
167.08	24.85	52.52	0	no data	Partial open fracture
167.62	228.77	64.49	0	no data	Partial open fracture
168.74	299.46	40.6	0	no data	Partial open fracture
169.02	202.27	65.59	0	no data	Partial open fracture
169.72	358.98	62.6	0	no data	Partial open fracture
170.03	258.13	61.98	0	no data	Partial open fracture

170.53	209.27	58.23	0	no data	Partial open fracture
171.35	218.53	65.75	0	no data	Fracture Open
171.78	203.15	57.65	0	no data	Fracture Open
172.82	321.71	73.6	0	no data	Partial open fracture
173.87	100.1	19.41	0	no data	Partial open fracture
174.49	314.76	33.17	0	no data	Partial open fracture
174.52	281.52	45.68	0	no data	Partial open fracture
174.52	204.45	74.25	0	no data	Partial open fracture
174.7	272.74	40.7	0	no data	Partial open fracture
175.93	0.42	53.56	0	no data	Fracture Open
177.71	44.88	50.84	0	no data	Partial open fracture
178.11	14.65	49.42	0	no data	Partial open fracture
178.27	11.38	53.17	0	no data	Partial open fracture
179.49	10.11	55.29	0	no data	Partial open fracture
180.28	22.11	46.72	0	no data	Partial open fracture
181.46	27.11	44.95	0	no data	Partial open fracture
181.81	34.12	59.62	0	no data	Fracture Open
182.04	324.71	28.65	0	no data	Partial open fracture
182.33	37.32	55.27	0	no data	Partial open fracture
183.07	41.89	46.59	0	no data	Partial open fracture
183.53	30.56	55.35	0	no data	Partial open fracture
183.81	42.82	60.47	0	no data	Partial open fracture
184.28	40.43	46.38	0	no data	Partial open fracture
184.49	11.03	64.49	0	no data	Partial open fracture
185.04	43.89	37.01	0	no data	Partial open fracture
185.59	21.24	53.73	0	no data	Partial open fracture
186.46	17.35	52.45	0	no data	Fracture Open
186.95	37.68	53.74	0	no data	Partial open fracture
187.37	59.37	44.41	0	no data	Partial open fracture
187.83	38.79	49.2	0	no data	Partial open fracture
188.08	323.31	80.28	0	no data	Partial open fracture
188.29	38.29	50.97	0	no data	Fracture Open
188.55	42.66	47.33	0	no data	Partial open fracture
188.78	42.7	46.61	0	no data	Partial open fracture
189.06	39.08	49.43	0	no data	Fracture Open
189.23	315.82	35.23	0	no data	Partial open fracture
189.97	34.93	52.55	0	no data	Partial open fracture
190.7	21.76	54.63	0	no data	Partial open fracture
191.12	333.07	12.28	0	no data	Partial open fracture
191.13	6.85	34.94	0	no data	Partial open fracture
191.53	28.12	52.23	0	no data	Partial open fracture
191.84	41.1	50.89	0	no data	Partial open fracture
192.41	29.38	47.44	0	no data	Fracture Open
192.64	35.74	44.96	0	no data	Partial open fracture
192.94	24.86	43.37	0	no data	Partial open fracture
193.28	26.49	42.63	0	no data	Fracture Open
193.72	32.97	41.03	0	no data	Partial open fracture
194.04	6.22	59.82	0	no data	Partial open fracture
194.78	205.34	62.26	0	no data	Partial open fracture

194.83	7.12	54.53	0	no data	Partial open fracture
195.05	128.63	58.63	0	no data	Fracture Closed
195.11	351.42	58.21	0	no data	Partial open fracture
195.34	350.74	60.15	0	no data	Partial open fracture
195.94	162.49	56.27	0	no data	Partial open fracture
196.5	165.26	69.48	0	no data	Partial open fracture
196.52	175.62	42.5	0	no data	Partial open fracture
197.17	349.23	50.86	0	no data	Fracture Open
197.27	134.79	75.28	0	no data	Fracture Closed
198.21	333.68	54.02	0	no data	Partial open fracture
199.05	339.73	49.37	0	no data	Partial open fracture
199.56	342.77	67.56	0	no data	Partial open fracture
200	225.02	50.1	0	no data	Partial open fracture
200.14	153.96	22.74	0	no data	Banding
200.22	348.19	47.22	0	no data	Partial open fracture
201.12	203.95	63.12	0	no data	Partial open fracture
201.85	192.81	68.81	0	no data	Partial open fracture
202	200.28	49.98	0	no data	Partial open fracture
202.19	8.22	77.75	0	no data	Partial open fracture
203.12	351.7	81.3	0	no data	Partial open fracture
204.5	194.03	58.34	0	no data	Partial open fracture
204.55	306.3	65.18	0	no data	Partial open fracture
206.41	355.21	37.99	0	no data	Banding
206.84	358.38	40.21	0	no data	Partial open fracture
207.79	13.86	36.77	0	no data	Partial open fracture
208.48	198.56	60.01	0	no data	Partial open fracture
208.75	196.72	62.8	0	no data	Partial open fracture
209.9	3.59	35.31	0	no data	Partial open fracture
210.2	196.09	31.12	0	no data	Fracture Closed
211.16	205.61	61.38	0	no data	Partial open fracture
211.9	206.83	54.74	0	no data	Partial open fracture
212.6	342.89	47.32	0	no data	Partial open fracture
213.42	343.74	47.83	0	no data	Partial open fracture
214.26	350.65	66.56	0	no data	Partial open fracture
214.52	211.01	55.84	0	no data	Partial open fracture
215.26	345.88	62.2	0	no data	Fracture Closed
215.59	151.27	47.83	0	no data	Partial open fracture
216.48	348.82	67.68	0	no data	Partial open fracture
217.36	347.7	54.83	0	no data	Partial open fracture
218.7	341.95	45.61	0	no data	Fracture Open
219.1	317.89	53.25	0	no data	Partial open fracture
219.19	206.4	50.35	0	no data	Partial open fracture
219.27	327.08	63.37	0	no data	Partial open fracture
219.66	185.04	44.84	0	no data	Partial open fracture
221.09	214.05	46.14	0	no data	Partial open fracture
221.95	7.81	32.92	0	no data	Fracture Closed
223.92	341.66	60.53	0	no data	Partial open fracture
223.94	56.03	54.7	0	no data	Partial open fracture
224.22	350.57	73.21	0	no data	Partial open fracture

225.43	334.28	85.56	0	no data	Partial open fracture
225.64	339.36	81.96	0	no data	Fracture Open
226.18	7.78	34.28	0	no data	Partial open fracture
226.26	184.33	44.38	0	no data	Banding
226.34	334.9	31.44	0	no data	Partial open fracture
227.11	180.25	35.58	0	no data	Banding
228.39	340.46	72.66	0	no data	Partial open fracture
229.67	189.45	14.79	0	no data	Fracture Open
229.69	315.17	41.12	0	no data	Fracture Closed
230.25	152.76	20.43	0	no data	Partial open fracture
230.6	19.93	61.43	0	no data	Partial open fracture
233.11	346.26	75.02	0	no data	Partial open fracture
234.5	342.9	17.6	0	no data	Fracture Closed
235.15	336.9	21.96	0	no data	Fracture Closed
236.71	336.92	20.77	0	no data	Fracture Closed
236.78	354.14	70.64	0	no data	Partial open fracture
238.15	347.08	72.48	0	no data	Partial open fracture
238.22	346.44	20.12	0	no data	Banding
238.77	353.29	72.28	0	no data	Partial open fracture
238.79	352.43	66.38	0	no data	Partial open fracture
239.91	345.02	41.04	0	no data	Fracture Closed
241.23	355.28	72.23	0	no data	Partial open fracture
241.44	341.62	72.33	0	no data	Partial open fracture
242.75	20.79	22.12	0	no data	Fracture Closed
243.35	357.81	69.11	0	no data	Partial open fracture
243.56	350.65	71.36	0	no data	Partial open fracture
244.25	344.92	70.06	0	no data	Partial open fracture
244.8	333.88	72.13	0	no data	Partial open fracture
247.77	346.78	66.54	0	no data	Partial open fracture
248.34	339.45	58.67	0	no data	Partial open fracture
249.22	61	57.35	0	no data	Partial open fracture
249.56	318.6	61.78	0	no data	Partial open fracture
249.81	333.17	81.97	0	no data	Partial open fracture
250.71	307.78	77.79	0	no data	Partial open fracture
250.8	317.39	70.19	0	no data	Partial open fracture
251.41	315.34	68.86	0	no data	Partial open fracture
251.77	114.11	20.51	0	no data	Partial open fracture
252.68	311.96	67.69	0	no data	Partial open fracture
252.7	169.59	26.72	0	no data	Partial open fracture
252.85	167.16	19.11	0	no data	Fracture Closed
253.06	122.98	31.22	0	no data	Partial open fracture
253.44	311.99	63.7	0	no data	Fracture Open
253.6	195.09	31.63	0	no data	Partial open fracture
255.12	178.31	42.17	0	no data	Partial open fracture
255.29	308.67	65.29	0	no data	Partial open fracture
256.08	190.48	42.51	0	no data	Banding
257.47	346.46	70.77	0	no data	Partial open fracture
258.13	152.42	41.76	0	no data	Partial open fracture
258.77	349.43	79.47	0	no data	Partial open fracture

259.31	315.29	64.24	0	no data	Partial open fracture
259.66	78.44	63.3	0	no data	Partial open fracture
260.05	260.56	13.3	0	no data	Partial open fracture
260.28	349.22	84.02	0	no data	Partial open fracture
260.63	329.68	36.9	0	no data	Partial open fracture
260.71	160.61	52.36	0	no data	Partial open fracture
261.27	325.47	32.62	0	no data	Banding
262.25	141.13	65.65	0	no data	Partial open fracture
262.66	197.74	14.42	0	no data	Fracture Closed
265.36	166.12	45.28	0	no data	Partial open fracture
267.35	163.13	82.45	0	no data	Partial open fracture
268.29	171.34	42.88	0	no data	Partial open fracture
268.38	348.41	88.12	0	no data	Partial open fracture
269.19	4.67	52.26	0	no data	Partial open fracture
272.27	167.47	71.96	0	no data	Partial open fracture
273.5	349.66	76.2	0	no data	Partial open fracture
273.66	343.03	26.27	0	no data	Banding
274.09	345.08	81.17	0	no data	Partial open fracture
274.4	294.91	47.85	0	no data	Partial open fracture
277.51	21.1	26.29	0	no data	Partial open fracture
277.58	358.34	56.49	0	no data	Fracture Open
277.93	11.61	57.08	0	no data	Partial open fracture
278.41	343.05	44.77	0	no data	Partial open fracture
281.3	224.16	41.02	0	no data	Banding
282.4	2.44	25.83	0	no data	Fracture Closed
283.67	353.65	17.94	0	no data	Banding
285.05	33.14	60.24	0	no data	Partial open fracture
285.57	258.38	81.53	0	no data	Partial open fracture
286.63	299.6	66.44	0	no data	Fracture Closed
288.27	226.44	69.86	0	no data	Fracture Closed
290.83	241.96	78.76	0	no data	Fracture Closed
291.35	135.81	40.06	0	no data	Banding
293.25	41.34	22.06	0	no data	Partial open fracture

APPENDIX II

AQUIFER TEST DATA SHEETS AND TEST PLOTS

LAKE MYRA COUNTY PARK WELL STEEPTEST DATA FROM NW POOLE

Time	Water Level	Pumping Rate GPM	Remarks FEB 6, 2026
9:00 AM	25.2	20	20 gpm Calibration
9:05	23.6	20	
9:10	23.0	20	
9:15	22.9	20	
9:20	22.8	20	

9:25 AM	22.7	20	
9:30	22.7	20	
9:35	22.7	20	
9:40	22.7	20	
9:45	22.6	20	
9:50	22.6	20	
9:55	22.6	20	
10:00	22.6	20	
10:05	22.6	20	
10:10	22.6	20	
10:15	22.6	20	
10:20	22.5	20	
10:25	22.5	20	
10:30	22.5	20	
10:35	22.5	20	
10:40	22.5	20	
10:45	22.5	20	

10:50	22.5	20	
10:55	22.5	20	
11:00	22.5	20	

Time	Water Level	Pumping Rate GPM	Remarks
11:15 AM	45.0	30	Recalibrated to 30 gpm
11:20	39.2	30	
11:25	35.3	30	
11:30	31.0	30	
11:35	30.2	30	
11:40	30.0	30	
11:45	30.0	30	
11:50	30.0	30	
11:55	29.9	30	
12:00 PM	29.9	30	
12:05	29.9	30	
12:10	29.9	30	
12:15	29.9	30	
12:20	29.5	30	
12:25	29.5	30	
12:30	29.5	30	
12:35	29.5	30	
12:40	29.5	30	
12:45	29.5	30	

12:50	29.5	30	
12:55	29.5	30	
1:00	29.5	30	

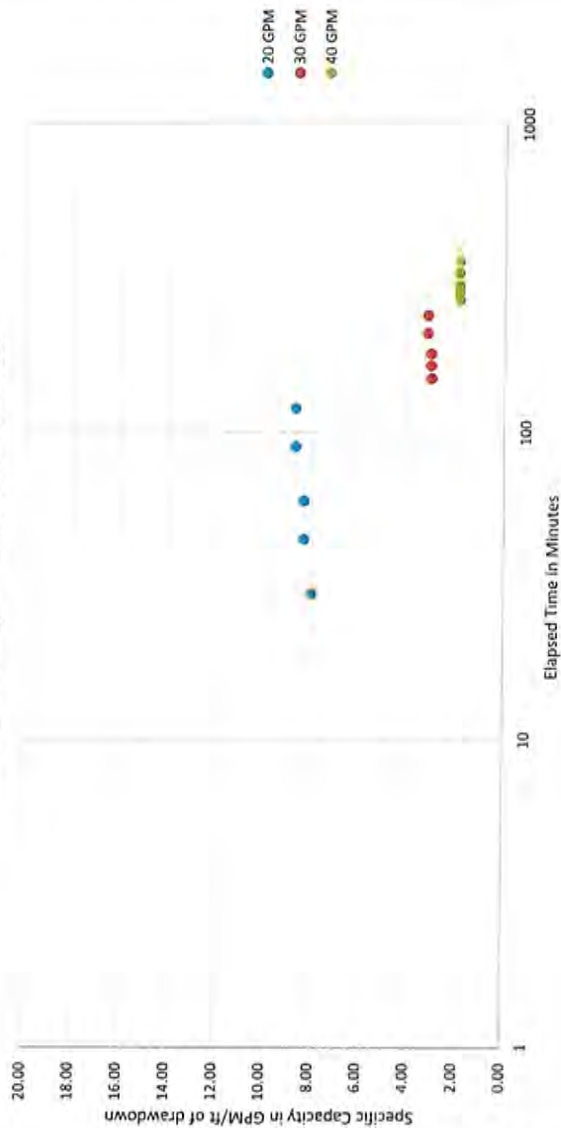
1:05 PM	29.5	30	
1:10	29.5	30	
1:15	29.5	30	
1:30	42.3	40	Recalibrated to 40 gpm
1:35	42.3	40	
1:40	42.4	40	
1:45	42.4	40	
1:50	42.1	40	
1:55	41.8	40	
2:00	41.5	40	
2:05	41.3	40	
2:10	41.3	40	
2:15	41.3	40	
2:20	41.3	40	
2:25	41.3	40	
2:30	41.3	40	
2:35	41.3	40	
2:45	41.2	40	

2:55 PM	41.2	40	
3:00	41.2	40	
3:05	41.2	40	
3:10	41.2	40	
3:15	41.2	40	
3:20	41.2	40	
3:25	41.2	40	
3:30	41.2	40	
			Shutdown Test

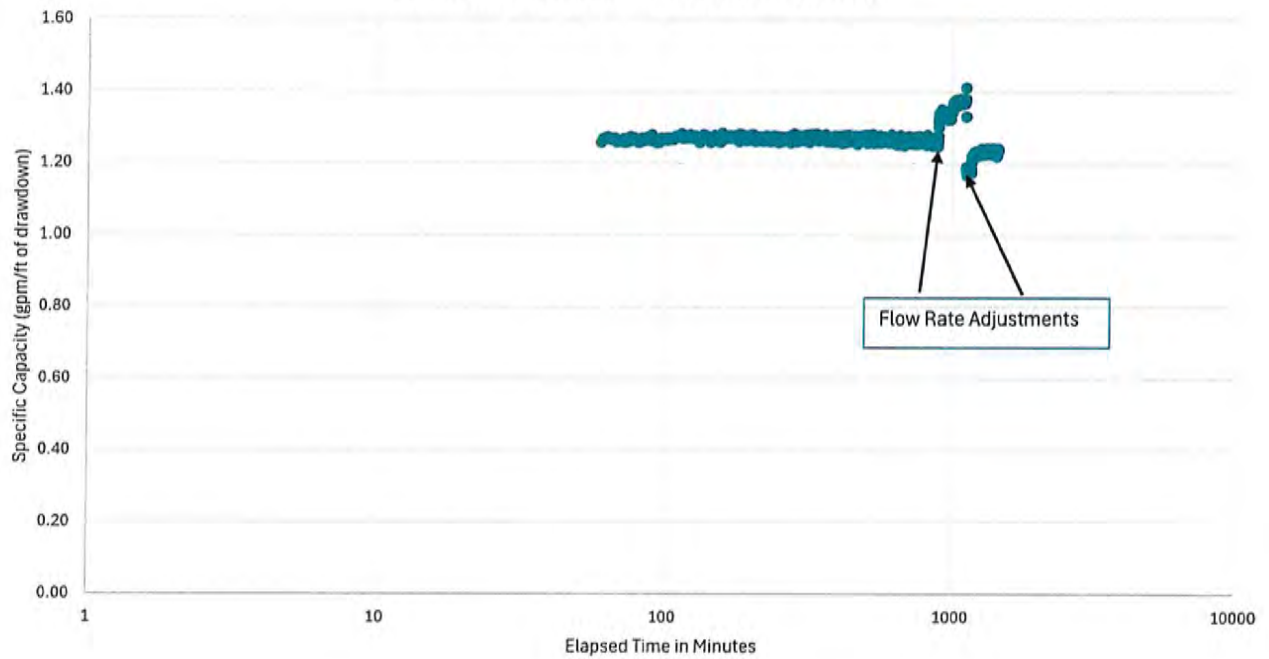
Step Drawdown Pumping Test - Lake Myra County Park, Wake County, NC

Time (min)	Pumping Water Level (ft)	Drawdown (ft)	Pumping Rate	Spec. Cap. (Q/s)
0.5	25.20	5.00	20	4.00
5	23.60	3.40	20	5.88
10	23.00	2.80	20	7.14
15	22.90	2.70	20	7.41
20	22.80	2.60	20	7.69
30	22.70	2.50	20	8.00
45	22.60	2.40	20	8.33
60	22.60	2.40	20	8.33
90	22.50	2.30	20	8.70
120	22.50	2.30	20	8.70
121	45.00	24.80	30	1.21
125	39.20	19.00	30	1.58
130	35.50	15.30	30	1.96
135	31.00	10.80	30	2.78
140	30.20	10.00	30	3.00
150	30.00	9.80	30	3.06
165	29.90	9.70	30	3.09
180	29.90	9.70	30	3.09
210	29.50	9.30	30	3.23
240	29.50	9.30	30	3.23
241	42.30	22.10	40	1.81
245	42.30	22.10	40	1.81
250	42.40	22.20	40	1.80
255	42.40	22.20	40	1.80
260	42.10	21.90	40	1.83
270	41.50	21.30	40	1.88
285	41.30	21.10	40	1.90
300	41.30	21.10	40	1.90
330	41.20	21.00	40	1.90
360	41.20	21.00	40	1.90

Lake Myra County Park Step-Drawdown Test



Lake Myra County Park Pumping Test Results



NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT
ENVIRONMENTAL MANAGEMENT COMMISSION
GROUNDWATER SECTION
P.O. Box 27687 - Raleigh, NC 27611



PUMPING TEST RECORD

WAKE COUNTY BID # 25-084

Test Conducted By: N.W. Poole Well & Pump Co. Well Construction Permit No.: GW-151739-2025

1. WELL LOCATION: Nearest Town: Knightdale County: Wake
Address: 0 S. Smithfield Rd. Knightdale, NC 27545
2. OWNER: Wake County Facilities Design and Construction
3. USE OF WELL: Public Water Supply
4. WELL DEPTH: 300' Casing Diameter: 8" Casing Type: Galvanized
5. DRILLING CONTRACTOR: N.W. Poole Well Co. Was casing grouted: Yes
6. STATIC WATER LEVEL: 12.6 below top of casing
7. WELL YIELD: 40 gpm Specific Capacity: 1.226
8. PUMPING WATER LEVEL: 45.2'
9. CHLORINATION: Type: HTH Amount: 2 lbs
10. TIME AND DATE: PUMP STARTED: 2/17/26 @ 9:00am PUMP STOPPED: 2/18/25 @ 9:00am
11. WATER LEVEL MEASURING DEVICE: Electronic Probe FLOW MEASURING DEVICE: Meter
12. TEST PUMP: Type: 60 gpm Make: Grundfos Horsepower: 7 1/2

- Pump intake @ 255' below the top of the casing. -

Time	Water Level	Pumping Rate GPM	Remarks
9:00 a.m.	12.6	78	Beginning Meter: 6,073,942
9:05	48.6	50	
9:10	46.8	48	
9:15	41.2	38	
9:20	43.4	43	

Pumping Test - Record

Time	Water Level	Pumping Rate GPM	Remarks
9:25	51.4	43	
9:30	47.4	41	
9:35	45.3	40	
9:40	45.0	40	
9:45	44.8	40	
9:50	45.0	40	
9:55	44.7	40	
10:00	44.6	40	
10:10	44.6	40	
10:20	44.6	40	
10:30	44.6	40	
10:40	44.6	40	
10:50	44.3	40	
11:00	44.3	40	
11:15	44.3	40	
11:30	44.3	40	
11:45	44.3	40	
12:00	44.3	40	
12:30	44.3	40	
1:00	44.4	40	
2:00	44.3	40	
3:00	44.3	40	

Pumping Test – Record

Time	Water Level	Pumping Rate GPM	Remarks
4:00	44.3	40	
5:00	44.5	40	
6:00	44.4	40	
7:00	44.4	40	
8:00	44.4	40	
9:00	44.4	40	
10:00	44.4	40	
11:00	44.4	40	
12:00 a.m.	44.4	40	
1:00	44.4	40	
2:00	44.4	40	
3:00	46.7	40	
4:00	45.3	40	
5:00	45.2	40	
6:00	45.2	40	
7:00	45.2	40	
8:00	45.2	40	
9:00 a.m. 02/18/26	45.2	40	
			Shut down
			End Meter: 6,140,431
			Total Gallons Pumped: 66,489

Pumping Test – Recovery

Time	Water Level		Time	Water Level	Remarks
9:05	16.6				
9:10	15.5				
9:15	14.8				
9:20	14.5				
9:25	14.3				
9:30	14.2				
9:40	14.1				
9:50	14.0				
10:00	13.6				
10:15	13.6				
10:30	13.6				
10:45	13.6				
11:00 a.m. 02/18/26	13.6	Recovery Level Test Terminated			

APPENDIX III
LABORATORY ANALYTICAL REPORTS



Environmental Chemists, Inc.

6602 Windmill Way, Wilmington, NC 28405 • 910.392.0223 Lab • 910.392.4424 Fax
710 Bowserstown Road, Manteo, NC 27954 • 252.473.5702 Lab/Fax
255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL INORGANIC CHEMICAL ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location: New Well

Facility ID:

Sample Point: Special

Collection Date:

Collection Time:

2/18/2026

8:40.00 AM

Collected by: Kris Letchworth

Mail Results to (water system representative)

Phone Number: 919-266-9223

NW Poole Well and Pump

Post Office box 1958

Wendell

NC

27591

Fax Number:

Responsible Person's email

LABORATORY ID #: 37729

☐ SAMPLE UNSATISFACTORY

☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT	QUANTIFIED RESULTS	ANALYSES BEGUN	ANALYSES COMPLETED	ALLOWABLE LIMITS
0100	Turbidity	SM 2130 B	0.1	0.2 NTU	02/19/2026 15:15	2/23/2026 9:33	
1005	Arsenic	EPA 200.8	0.005	<0.005 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.01
1010	Barium	EPA 200.8	0.4	<0.400 mg/L	02/25/2026 13:39	2/27/2026 14:17	2
1015	Cadmium	EPA 200.8	0.001	<0.001 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.005
1016	Calcium	EPA 200.7	1	6.13 mg/L	02/24/2026 10:23	2/26/2026 16:03	
1017	Chloride	SM 4500 Cl B	5	5 mg/L	02/24/2026 11:15	2/24/2026 15:55	250
1020	Chromium	EPA 200.8	0.02	<0.020 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.1
1022	Copper	EPA 200.8	0.05	<0.050 mg/L	02/25/2026 13:39	2/27/2026 14:17	1.3
1024	Cyanide	EPA 335.4	0.05	<0.050 mg/L	02/25/2026 08:56	2/25/2026 11:27	0.2
1025	Fluoride	SM 4500 F C	0.1	<0.100 mg/L	02/20/2026 12:00	2/23/2026 9:36	4
1028	Iron	EPA 200.7	0.06	<0.060 mg/L	02/24/2026 10:23	2/26/2026 16:03	0.3
1030	Lead	EPA 200.8	0.003	<0.003 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.015
1031	Magnesium	EPA 200.7	1	1.12 mg/L	02/24/2026 10:23	2/26/2026 16:03	
1032	Manganese	EPA 200.8	0.01	<0.010 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.05
1035	Mercury	EPA 245.1	0.0004	<0.0004 mg/L	02/26/2026 12:18	2/27/2026 8:21	0.002
1036	Nickel	EPA 200.8	0.1	<0.100 mg/L	02/25/2026 13:39	2/27/2026 14:17	
1040	Nitrate Nitrogen	EPA 353.2	1	3.48 mg/L	02/18/2026 16:49	2/27/2026 7:29	10
1041	Nitrite Nitrogen	EPA 353.2	0.1	<0.10 mg/L	02/18/2026 16:49	2/19/2026 11:38	1
1045	Selenium	EPA 200.8	0.01	<0.010 mg/L	02/25/2026 13:39	2/27/2026 14:17	



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ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL INORGANIC CHEMICAL ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location: New Well

Facility ID:

Sample Point: Special

Collection Date:

Collection Time:

2/18/2026

8:40:00 AM

Collected by: Kris Letchworth

Mail Results to (water system representative)

Phone Number: 919-266-9223

NW Poole Well and Pump

Post Office box 1958

Wendell

NC

27591

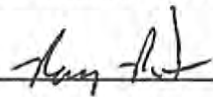
Fax Number:

Responsible Person's email:

LABORATORY ID #: 37729		☐ SAMPLE UNSATISFACTORY			☐ RESAMPLE REQUIRED				
CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT	QUANTIFIED RESULTS	ANALYSES BEGUN	ANALYSES COMPLETED	ALLOWABLE LIMITS		
1050	Silver	EPA 200.8	0.05	<0.050 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.1		
1052	Sodium	EPA 200.7	0.5	9.54 mg/L	02/24/2026 10:23	2/26/2026 16:03			
1055	Sulfate (NW)	EPA 300.0	5	8 mg/L	02/24/2026 11:50	2/25/2026 14:36	250		
1068	Acidity	SM 2310 B	1	20 mg/L	02/27/2026 12:45	3/2/2026 9:35			
1074	Antimony	EPA 200.8	0.003	<0.003 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.003		
1075	Beryllium	EPA 200.8	0.002	<0.002 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.002		
1085	Thallium	EPA 200.8	0.001	<0.001 mg/L	02/25/2026 13:39	2/27/2026 14:17	0.002		
1095	Zinc	EPA 200.7	0.01	0.358 mg/L	02/24/2026 10:23	2/26/2026 16:03	5		
1905	Color PtCo	SM 2120B (PtCo)	5	<5 units	02/19/2026 15:20	2/20/2026 11:29	15		
1915	Total Hardness	SM 2340 C	1	22 mg/L	02/23/2026 10:45	2/24/2026 10:52			
1925	pH	SM 4500 H B	6.5	6.3 units	02/23/2026 14:10	2/24/2026 11:01	8.5		
1927	Alkalinity	SM 2320B	1	17 mg/L	02/24/2026 12:55	2/25/2026 8:40			
1930	Total Dissolved Solids (TDS)	SM 2540 C		113 mg/L	02/20/2026 13:30	2/23/2026 9:38	500		

Note: Except for Iron, Manganese and Sulfate, if result exceeds allowable limit, the laboratory must fax analytical results to the within 48 hours

Comment:

Reviewed by: 



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255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL - PESTICIDES AND SYNTHETIC ORGANIC CHEMICALS (SOC) ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location Where Collected: New Well

Facility ID:

Sample Point: Special

Collection Date: Collection Time:

2/18/2026

8:40:00 AM

Collected by: Kris Letchworth

Mail Results to (water system representative)

Phone Number: 919-266-9223

NW Poole Well and Pump

Post Office box 1958

Wendell NC 27591

Attn:

Fax Number:

Responsible Person's email:

LABORATORY ID #: 37729		☐ SAMPLE UNSATISFACTORY		☐ RESAMPLE REQUIRED						
CONTAM. CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT	QUANTIFIED RESULTS	ANALYSES BEGUN	ANALYSES COMPLETED	ALLOWABLE LIMITS			
2005	Endrin	EPA 508.1	0.00001	< 0.00001 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.002			
2010	Lindane	EPA 508.1	0.00002	< 0.00002 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.0002			
2015	Methoxychlor	EPA 508.1	0.0001	< 0.0001 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.04			
2020	Toxaphene	EPA 508.1	0.001	< 0.001 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.003			
2031	Dalapon	EPA 515.4	0.001	< 0.001 mg/L	02/23/2026 08:45	3/9/2026 12:21	0.2			
2035	Di(2-ethylhexyl)adipate	EPA 525.2	0.0006	< 0.0006 mg/L	02/23/2026 0800	3/9/2026 12:23	0.4			
2036	Oxamyl(vydate)	EPA 531.1	0.002	< 0.002 mg/L	02/19/2026 10:41	2/24/2026 9:37	0.2			
2037	Simazine	EPA 525.2	0.00007	< 0.00007 mg/L	02/23/2026 0800	3/9/2026 12:23	0.004			
2039	Di(2-ethylhexyl)phthalate	EPA 525.2	0.00132	< 0.00132 mg/L	02/23/2026 0800	3/9/2026 12:23	0.006			
2040	Picloram	EPA 515.4	0.0001	< 0.0001 mg/L	02/23/2026 08:45	3/9/2026 12:21	0.5			
2041	Dinoseb	EPA 515.4	0.0002	< 0.0002 mg/L	02/23/2026 08:45	3/9/2026 12:21	0.007			
2042	Hexachlorocyclopentadiene	EPA 525.2	0.0001	< 0.0001 mg/L	02/23/2026 0800	3/9/2026 12:23	0.05			
2046	Carbofuran	EPA 531.1	0.0009	< 0.0009 mg/L	02/19/2026 10:41	2/24/2026 9:37	0.04			
2050	Atrazine	EPA 508.1	0.0001	< 0.0001 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.003			
2051	Alachlor	EPA 508.1	0.0002	< 0.0002 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.002			
2065	Heptachlor	EPA 525.2	0.00004	< 0.00004 mg/L	02/23/2026 0800	3/9/2026 12:23	0.0004			
2067	Heptachlor epoxide	EPA 508.1	0.00002	< 0.00002 mg/L	02/25/2026 08:00	3/10/2026 11:14	0.0002			

LABORATORY LOG 26-08821

REPORT #: 2026-03639



Environmental Chemists, Inc.

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255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL - PESTICIDES AND SYNTHETIC ORGANIC CHEMICALS (SOC) ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location Where Collected: New Well

Facility ID:

Sample Point: Special

Collection Date:

Collection Time:

Collected by: Kris Letchworth

2/18/2026

8:40:00 AM

Mail Results to (water system representative)

Phone Number: 919-266-9223

Fax Number:

Responsible Person's email

NW Poole Well and Pump

Post Office box 1958

Wendell

NC

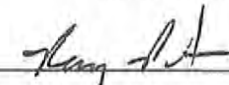
27591

Attn:

LABORATORY ID #: 37729		☒ SAMPLE UNSATISFACTORY			☐ RESAMPLE REQUIRED					
2105	2,4-D	EPA 515.4	0.0001	< 0.0001	mg/L	02/23/2026	08:45	3/9/2026	12:21	0.07
2110	2,4,5-TP (Silvex)	EPA 515.4	0.0002	< 0.0002	mg/L	02/23/2026	08:45	3/9/2026	12:21	0.05
2274	Hexachlorobenzene	EPA 525.2	0.0001	< 0.0001	mg/L	02/23/2026	0800	3/9/2026	12:23	0.001
2306	Benzo(a)pyrene	EPA 525.2	0.00002	< 0.00002	mg/L	02/23/2026	0800	3/9/2026	12:23	0.0002
2326	Pentachlorophenol	EPA 515.4	0.00004	< 0.00004	mg/L	02/23/2026	08:45	3/9/2026	12:21	0.001
2383	(PCB) Total Polychlorinated Biphen	EPA 508.1	0.0001	< 0.0001	mg/L	02/25/2026	08:00	3/10/2026	11:14	0.0005
2931	1,2-Dibromo-3-chloropropane (DB	EPA 504.1	0.00002	< 0.00002	mg/L	02/23/2026	10:00	2/27/2026	14:08	0.0002
2946	Ethylene Dibromide (EDB)	EPA 504.1	0.00001	< 0.00001	mg/L	02/23/2026	10:00	2/27/2026	14:08	0.00005
2959	Chlordane	EPA 508.1	0.0002	< 0.0002	mg/L	02/25/2026	08:00	3/10/2026	11:14	0.002

Note: If result exceeds allowable limit, the laboratory must fax analytical results to the within 48 hours.

Comment:

Reviewed by: 



Environmental Chemists, Inc.

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255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL - VOLATILE ORGANIC CHEMICALS (VOCs) ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location Where Collected: New Well

Facility ID:

Sample Point: Special

Collection Date:

Collection Time:

2/18/2026

8:40:00 AM

Collected by: Kris Letchworth

Mail Results to (water system representative)

Phone Number: 919-266-9223

NW Poole Well and Pump

Fax Number:

Post Office box 1958

Responsible Person's email:

Wendell

NC

27591

LABORATORY ID #: 37729

☐ SAMPLE UNSATISFACTORY

☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT	QUANTIFIED RESULTS	ANALYSES BEGUN	ANALYSES COMPLETED	ALLOWABLE LIMITS
2030	p-Isopropyltoluene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2210	Chloromethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2212	Dichlorodifluoromethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2214	Bromomethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2216	Chloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2218	Trichlorofluoromethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2246	Hexachlorobutadiene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2248	Naphthalene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2378	1,2,4-Trichlorobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	0.07
2380	Cis-1,2-dichloroethylene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	0.07
2408	Dibromomethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2410	1,1-Dichloropropene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2412	1,3-Dichloropropane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2413	1,3-Dichloropropene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2414	1,2,3-Trichloropropane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2416	2,2-Dichloropropane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2418	1,2,4-Trimethylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2420	1,2,3-Trichlorobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2422	n-Butylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2424	1,3,5-Trimethylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	
2426	tert-Butylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026 12:34	3/3/2026 11:51	



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ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL - VOLATILE ORGANIC CHEMICALS (VOCs) ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location Where Collected: New Well

Facility ID:

Sample Point: Special

Collection Date:

Collection Time:

2/18/2026

8:40:00 AM

Collected by: Kris Letchworth

Mail Results to (water system representative)

Phone Number: 919-266-9223

NW Poole Well and Pump

Fax Number:

Post Office box 1958

Responsible Person's email:

Wendell

NC

27591

LABORATORY ID #: 37729			☐ SAMPLE UNSATISFACTORY		☐ RESAMPLE REQUIRED				
2428	sec-Butylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2430	Bromochloromethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2941	Chloroform	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2942	Bromoform	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2943	Bromodichloromethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2944	Chlorodibromomethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2955	Xylenes(total)	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	10
2964	Dichloromethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2965	o-Chlorotoluene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2966	p-Chlorotoluene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2967	m-Dichlorobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2968	o-Dichlorobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.6
2969	p-Dichlorobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.075
2976	Vinyl chloride	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.002
2977	1,1-Dichloroethylene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.007
2978	1,1-Dichloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2979	Trans-1,2-dichloroethylene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.1
2980	1,2-Dichloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2981	1,1,1-Trichloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.2
2982	Carbon tetrachloride	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2983	1,2-Dichloropropane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2984	Trichloroethylene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2985	1,1,2-Trichloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005



Environmental Chemists, Inc.

6602 Windmill Way, Wilmington, NC 28405 • 910.392.0223 Lab • 910.392.4424 Fax
710 Bowserstown Road, Manteo, NC 27954 • 252.473.5702 Lab/Fax
255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NEW WELL - VOLATILE ORGANIC CHEMICALS (VOCs) ANALYSIS

Name of System: Lake Myra

County:

Sample Type: Special

Location Where Collected: New Well

Facility ID:

Sample Point: Special

Collection Date:

Collection Time:

Collected by: Kris Letchworth

2/18/2026

8:40:00 AM

Mail Results to (water system representative)

Phone Number: 919-266-9223

NW Poole Well and Pump

Fax Number:

Post Office box 1958

Responsible Person's email:

Wendell

NC

27591

LABORATORY ID #: 37729			☐ SAMPLE UNSATISFACTORY		☐ RESAMPLE REQUIRED				
2986	1,1,1,2-Tetrachloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2987	Tetrachloroethylene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2988	1,1,2,2-Tetrachloroethane	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2989	Chlorobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.1
2990	Benzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.005
2991	Toluene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	1
2992	Ethylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.7
2993	Bromobenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2994	Isopropylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	
2996	Styrene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	0.1
2998	n-Propylbenzene	EPA 524.2	0.0005	< 0.0005 mg/L	02/26/2026	12:34	3/3/2026	11:51	

Note: If result exceeds allowable limit, the laboratory must fax analytical results to the within 48 hours.

Comment:

Reviewed by: 



Environmental Chemists, Inc.

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710 Bowserstown Road, Manteo, NC 27954 • 252.473.5702 Lab/Fax
255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

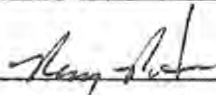
NW Poole Well and Pump
Post Office box 1958
Wendell NC 27591
Attention:

Date of Report: Mar 10, 2026
Customer PO #:
Report #: 2026-03639
Report to:
Project ID: Lake Myra

TTHM - HAA5 FORMATION POTENTIAL

Lab ID	Sample ID:	Collect Date/Time	Matrix	Sampled by
26-08821	Site: New Well	2/18/2026 8:40 AM	DW	Kris Letchworth
Test	Method	Results	Date Analyzed	
Bromodichloromethane	EPA 524.2	0.001 mg/L	03/03/2026	
Bromoform	EPA 524.2	<0.001 mg/L	03/03/2026	
Chloroform	EPA 524.2	0.003 mg/L	03/03/2026	
Dibromochloromethane	EPA 524.2	<0.001 mg/L	03/03/2026	
TTHMFP	EPA 524.2	0.004 mg/L	03/03/2026	
Dibromoacetic Acid	EPA 552.2	<0.001 mg/L	02/27/2026	
Dichloroacetic Acid	EPA 552.2	0.004 mg/L	02/27/2026	
Monobromoacetic Acid (MBAA)	EPA 552.2	<0.001 mg/L	02/27/2026	
Monochloroacetic Acid	EPA 552.2	<0.002 mg/L	02/27/2026	
THAFP	EPA 552.2	0.006 mg/L	02/27/2026	
Trichloroacetic Acid	EPA 552.2	0.002 mg/L	02/27/2026	
4 Hour Chlorine Demand 8.65 mg/L depleted from a 20 mg/L dose.	SM 5710 B	*	02/20/2026	
7 Day Chlorine Residual 0.99 mg/L depleted from a 10 mg/L dose.	SM 5710 B	*	02/20/2026	

Comment:

Reviewed by: 



Environmental Chemists, Inc.

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ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

BACTERIOLOGICAL ANALYSIS

Note: ALL applicable information must be supplied for compliance credit

Water System ID #:

Lake Myra

County:

System Type:

Water Source:

Distribution - Total Coliform Rule (TCR)

Sample Type:

Facility ID:

Location Code: New Well

Sample Point: Special

Location: New Well

Collected by: Kris Letchworth

DATE: 2/18/2026

TIME: 8:40:00 AM

Mail Results to (water system representative):

NW Poole Well and Pump

Post Office box 1958

Wendell NC 27591

Phone Number: 919-266-9223

Fax Number:

Complete for Repeat, Triggered, or Additional / Confirmation Samples:

Previous Positive Laboratory ID Number: _____

" Positive Laboratory Log Number: _____

" Positive Location Code: _____

" Positive Collection Date: _____

Disinfectant Used:

Responsible Person's Name

Customer Number

Total Chlorine Residual

mg/L

14070007

Free Chlorine Residual:

mg/L

LABORATORY ID #: 37729

☐ Repeat Samples Required from Client

☐ Resample Required from Client

CONTAM CODE	CONTAMINANT	METHOD CODE	QUANTIFIED RESULTS	ANALYSES BEGUN	ANALYSES COMPLETED
3100	Total Coliform	SM 9223B	Absent	02/18/2026 15:30	2/19/2026 10:00
3014	E. Coli	SM 9223B	Absent	02/18/2026 15:30	2/19/2026 10:00

Comment:

Reviewed by:

GRace Stokes



E-MAILED



Environmental Chemists, Inc.

6602 Windmill Way, Wilmington, NC 28405 • 910.392.0223 Lab • 910.392.4424 Fax
710 Bowserstown Road, Manteo, NC 27954 • 252.473.5702 Lab/Fax
255-A Wilmington Highway, Jacksonville, NC 28540 • 910.347.5843 Lab/Fax

ANALYTICAL & CONSULTING CHEMISTS

info@environmentalchemists.com

NW Poole Well and Pump

Post Office box 1958

Wendell NC 27591

Attention:

Date of Report: Mar 10, 2026

Customer PO #:

Customer ID: 14070007

Report #: 2026-03639

Project ID: Lake Myra

Lab ID	Sample ID:	Collect Date/Time	Matrix	Sampled by
26-08821	Site: New Well	2/18/2026 8:40 AM	DW	Kris Letchworth
Test	Method	Results	Date Analyzed	
Uranium	EPA 200.8	0.89 pCi/L	02/25/2026	

Comment:

Reviewed by: 



Florida Radiochemistry Services, Inc.

5456 Hoffner Ave., Suite 201 Orlando, FL 32812

Phone: (407) 382-7733 Fax: (407) 382-7744

RADIOLOGICAL ANALYSIS

Note: All information must be supplied for compliance credit.

WATER SYSTEM ID #: N/A

County: N/A

Name of Water System: NW Poole - Site Property

Sample Type: ☐ Entry Point - Single Sample

☐ Entry Point - Composite

☒ Special/Non-Compliance

Mail Results to (system representative):

EnviroChem

6602 Windmill Way

Wilmington NC 28405

910-392-0223

Collection Data

Period	Date (MM/DD/YY)	Title (Specify AM or PM)	Facility Loc Code	Sample Location	Collected By
Single or 1st Qtr	02/18/26	08:40 AM	N/A	New Well	K. Letchworth
2nd Qtr					
3rd Qtr					
4th Qtr					

LABORATORY ID #: 12709

☐ SAMPLE UNSATISFACTORY

☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (RRL)	NOT DETECTED (i.e. < RRL)	QUANTIFIED RESULTS* (pCi/L)	COUNTING ERROR	ALLOWABLE LIMIT
4002	Gross Alpha	900.0	3 pCi/L	X		0.9	15 pCi/L
4004	Radon	---	100 pCi/L				N/A
4005	Uranium	---	2 pCi/L				20.1 pCi/L
4010	Combined Radium	N/A	N/A		< 1.0	0.7	5 pCi/L
4020	Radium 226	903.1	1 pCi/L	X		0.5	3 pCi/L
4030	Radium 228	Ro-05	1 pCi/L	X		0.5	2 pCi/L
4100	Gross Beta	900.0	4 pCi/L		6.1	1.2	50 pCi/L

Note: If result exceeds allowable limit, the laboratory must fax analytical results to the State within 48 hours.

	DATE:	TIME:
ANALYSES BEGUN:	2/26/24	9:20 AM
ANALYSES COMPLETED:	3/6/24	7:15 AM

Laboratory Log #: 2602171-09

Certified By: SNV

COMMENTS: 26-03639 / 08821

EMSL Analytical, Inc.

2500 Gateway Centre Blvd. Suite 600
Morrisville, NC 27560
919/465-3900

ASBESTOS ANALYSIS - Entry Point

Note: All information must be supplied for compliance credit.

Water System Number: N/A

County: N/A

Name of Water System: NW Poole - Lake Myra

Sample Type: ☐ Entry Point (Compliance) ☒ Non-compliance

Facility ID No: N/A Sample Point: New Well

Collected By: K. Latchworth
(Please Print)

Collection Date	Collection Time
2/18/2026 (MM/DD/YY)	8:40 AM (Specify AM or PM)

Mail Results to (water system representative):

Envirochem
6602 Windmill Way
Wilmington, NC 28405

Phone#: 910/392-0223

Fax#:

Responsible Person's email:

Laboratory ID #: 37792

Contam. Code	Contaminant	Method Code	Required Reporting Limit (R.R.L.)	Analysis Started	Analysis Ended	Not Detected (i.e. < R.R.L.)	Quantified Results 1, 2	Allowable Limit
1094	ASBESTOS	100.2	0.2 MFL	2/18/2026 1:58 PM	03/3/2026 2:30 PM	☒	MFL	7 MFL

Notes: ¹ MFL = Million Fibers per Liter > 10 µm.

² If result exceeds the allowable limit, the laboratory must report the analytical results to the State within 48 hours.

Laboratory Log #: 292600871

Certified By:

Billy Barnes
(Print and sign name)



COMMENTS: 26-03639/08821

ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Ray Porter
Environmental Chemists Inc
6602 Windmill Way
Wilmington, North Carolina 28405

Generated 3/5/2026 12:12:04 PM

JOB DESCRIPTION

2026-03639

JOB NUMBER

680-269764-1

Eurofins Savannah

1

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Drinking Water and Wastewater Southeast, LLC Project Manager.

Authorization



Generated
3/5/2026 12:12:04 PM

Authorized for release by
John Andros, Project Manager I
John.Andros@et.eurofinsus.com
(404)944-4744

Definitions/Glossary

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

2

Qualifiers

LCMS

Qualifier	Qualifier Description
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
I	Ion ratio outside limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
Q	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional initial metals/anion analysis of the sample
OLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Sample Summary

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Sample Origin
680-269764-1	26-08821	Water	02/18/26 08:40	02/27/26 14:00	North Carolina

3

Case Narrative

Client: Environmental Chemists Inc
Project: 2026-03639

Job ID: 680-269764-1

Job ID: 680-269764-1

Eurofins Savannah

Job Narrative 680-269764-1

4

The analytical test results presented in this report meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page, unless otherwise noted. Data qualifiers and/or narrative comments are included to explain any exceptions, if applicable. Regulated compliance samples (e.g. SDWA, NPDES) must comply with associated agency requirements/permits.

- Matrix-specific batch QC (e.g., MS, MSD, SD) may not be reported when insufficient sample volume is available or when site-specific QC samples are not submitted. In such cases, a Laboratory Control Sample Duplicate (LCSD) may be analyzed to provide precision data for the batch.
- For samples analyzed using surrogate and/or isotope dilution analytes, any recoveries falling outside of established acceptance criteria are re-prepared and/or re-analyzed to confirm results, unless the deviation is due to sample dilution or otherwise explained in the case narrative.

Receipt

The sample was received on 2/27/2026 2:00 PM. Unless otherwise noted below, the sample arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 20.0°C.

PFAS

Method 1633A: EPA Method 1633 requires that all consumables used in the collection, preparation, and analysis of samples and for reporting of Per- and Polyfluorinated Alkyl Substances (PFAS) must have a representative lot check analysis performed to demonstrate cleanliness to be free of PFAS. The containers used for samples(s) 26-08821 (680-269764-1) did not originate from the laboratory, therefore the laboratory cannot guarantee the containers were PFAS-free prior to collection of the sample.

Method 1633A: Samples(s) 26-08821 (680-269764-1) were submitted in a nonstandard container and subsampling was required.

Method 1633A: The LLC/LCSD labeled isotope(s) d5-NEtFOSAA recovery associated with sample: 26-08821 (680-269764-1) is outside the QC acceptance limits. Since the recovery for target analytes is within the limits, the data is reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Eurofins Savannah

Client Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Client Sample ID: 26-08821

Lab Sample ID: 680-269764-1

Date Collected: 02/18/26 08:40

Matrix: Water

Date Received: 02/27/26 14:00

Method: EPA 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		3.68	1.01	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoropentanoic acid (PFPeA)	ND		1.84	0.551	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorohexanoic acid (PFHxA)	0.645	J	1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoroheptanoic acid (PFHpA)	ND		1.84	0.735	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorooctanoic acid (PFOA)	1.95		1.84	0.827	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorononanoic acid (PFNA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorodecanoic acid (PFDA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoroundecanoic acid (PFUnA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorododecanoic acid (PFDoA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorotridecanoic acid (PFTeDA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorotetradecanoic acid (PFTeDA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.84	0.735	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorooctanesulfonic acid (PFOS)	2.74		1.84	1.19	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorononanesulfonic acid (PFNS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.84	0.551	ng/L		03/03/26 14:26	03/04/26 08:49	1
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	ND		3.68	0.919	ng/L		03/03/26 14:26	03/04/26 08:49	1
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	ND		3.68	0.919	ng/L		03/03/26 14:26	03/04/26 08:49	1
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	ND		3.68	0.919	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorooctanesulfonamide (PFOSA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	ND		1.84	1.01	ng/L		03/03/26 14:26	03/04/26 08:49	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	ND		9.19	3.68	ng/L		03/03/26 14:26	03/04/26 08:49	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	ND		9.19	3.68	ng/L		03/03/26 14:26	03/04/26 08:49	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		1.84	1.29	ng/L		03/03/26 14:26	03/04/26 08:49	1
4,8-Dioxo-3H-perfluorononanoic acid (ADONA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Nonafluoro-3,6-dioxahexanoic acid (NFDHA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
9-Chlorohexadecafluoro-3-oxanonan-9-yl-sulfonic acid (9Cl-PF3ONS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1

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Client Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Client Sample ID: 26-08821

Lab Sample ID: 680-269764-1

Date Collected: 02/18/26 08:40

Matrix: Water

Date Received: 02/27/26 14:00

Method: EPA 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecan e-1-sulfonic acid (11Cl-PF3OUdS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEEA)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	ND		3.68	0.919	ng/L		03/03/26 14:26	03/04/26 08:49	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	ND		9.19	2.57	ng/L		03/03/26 14:26	03/04/26 08:49	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	ND		9.19	2.30	ng/L		03/03/26 14:26	03/04/26 08:49	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.84	0.460	ng/L		03/03/26 14:26	03/04/26 08:49	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4-PFBA	103		5 - 130				03/03/26 14:26	03/04/26 08:49	1
13C5-PFPaA	105		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C5-PFHxA	99.7		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C4-PFHpA	105		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C8-PFOA	103		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C9-PFNA	96.8		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C6-PFDA	99.9		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C7-PFUnA	95.6		30 - 130				03/03/26 14:26	03/04/26 08:49	1
13C2-PFDoA	86.5		10 - 130				03/03/26 14:26	03/04/26 08:49	1
13C2-PFTeDA	91.4		10 - 130				03/03/26 14:26	03/04/26 08:49	1
13C3-PFBS	99.9		40 - 135				03/03/26 14:26	03/04/26 08:49	1
13C3-PFHxS	99.7		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C8-PFOS	106		40 - 130				03/03/26 14:26	03/04/26 08:49	1
13C8-PFOSA	90.6		40 - 130				03/03/26 14:26	03/04/26 08:49	1
d3-NMeFOSAA	90.0		40 - 170				03/03/26 14:26	03/04/26 08:49	1
d5-NEtFOSAA	75.4		25 - 135				03/03/26 14:26	03/04/26 08:49	1
13C2 4:2 FTS	108		40 - 200				03/03/26 14:26	03/04/26 08:49	1
13C2 6:2 FTS	111		40 - 200				03/03/26 14:26	03/04/26 08:49	1
13C2 8:2 FTS	132		40 - 300				03/03/26 14:26	03/04/26 08:49	1
13C3-HFPO-DA	97.4		40 - 130				03/03/26 14:26	03/04/26 08:49	1
D7-NMeFOSE	79.2		10 - 130				03/03/26 14:26	03/04/26 08:49	1
D9-NEtFOSE	73.9		10 - 130				03/03/26 14:26	03/04/26 08:49	1
d5-NEtPFOSA	76.6		10 - 130				03/03/26 14:26	03/04/26 08:49	1
d3-NMePFOSA	80.0		10 - 130				03/03/26 14:26	03/04/26 08:49	1

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Isotope Dilution Summary

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
680-269764-1	26-08821	103	105	99.7	105	103	96.8	99.9	95.6
LCS 410-776892/23-A	Lab Control Sample	86.6	86.6	80.9	81.5	74.6	66.9	78.0	80.6
LCSD 410-776892/1-A	Lab Control Sample Dup	101	94.8	99.8	99.9	97.4	82.2	85.8	80.7
LLCS 410-776892/2-A	Lab Control Sample	105	103	97.7	103	107	100	97.2	96.4
MB 410-776892/22-A	Method Blank	83.8	83.7	77.8	77.4	79.1	68.0	80.1	77.9
		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFDaA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
680-269764-1	26-08821	86.5	91.4	99.9	99.7	106	90.6	90.0	75.4
LCS 410-776892/23-A	Lab Control Sample	63.5	64.5	79.0	72.1	77.4	73.0	67.3	58.6
LCSD 410-776892/1-A	Lab Control Sample Dup	72.8	56.7	87.1	91.3	86.8	93.3	88.1	178 *5+
LLCS 410-776892/2-A	Lab Control Sample	89.8	77.4	104	110	91.8	94.0	92.0	170 *5+
MB 410-776892/22-A	Method Blank	72.0	68.3	82.3	77.4	85.5	73.3	68.7	59.3
		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
680-269764-1	26-08821	108	111	132	97.4	79.2	73.9	76.6	80.0
LCS 410-776892/23-A	Lab Control Sample	91.3	81.1	109	79.8	42.0	34.0	62.9	62.2
LCSD 410-776892/1-A	Lab Control Sample Dup	106	96.8	82.6	97.3	38.1	35.1	69.5	77.4
LLCS 410-776892/2-A	Lab Control Sample	114	116	97.6	99.0	60.0	54.4	78.0	81.8
MB 410-776892/22-A	Method Blank	93.8	90.1	98.8	73.6	53.9	43.6	61.9	60.0

Surrogate Legend

PFBA = 13C4-PFBA
 PFPeA = 13C5-PFPeA
 13C5PHA = 13C5-PFHxA
 C4PFHA = 13C4-PFHpA
 C8PFOA = 13C8-PFOA
 C9PFNA = 13C9-PFNA
 C6PFDA = 13C6-PFDA
 13C7PUA = 13C7-PFUnA
 PFDaA = 13C2-PFDaA
 PFTDA = 13C2-PFTeDA
 C3PFBS = 13C3-PFBS
 C3PFHS = 13C3-PFHxS
 C8PFOS = 13C8-PFOS
 PFOSA = 13C8-PFOSA
 d3NMFOS = d3-NMeFOSAA
 d5NEFOS = d5-NEiFOSAA
 M242FTS = 13C2 4 2 FTS
 M262FTS = 13C2 6 2 FTS
 M282FTS = 13C2 8 2 FTS
 HFPODA = 13C3-HFPO-DA
 NMFM = D7-NMeFOSE
 NEFM = D9-NEiFOSE
 d5NPFSA = d5-NEiPFOSA
 d3NMFSA = d3-NMePFOSA

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A

Lab Sample ID: MB 410-776892/22-A
Matrix: Water
Analysis Batch: 777012

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 776892

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		4.00	1.10	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoropentanoic acid (PFPeA)	ND		2.00	0.600	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorohexanoic acid (PFHxA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoroheptanoic acid (PFHpA)	ND		2.00	0.800	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorooctanoic acid (PFOA)	ND		2.00	0.900	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorononanoic acid (PFNA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorodecanoic acid (PFDA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoroundecanoic acid (PFUnA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorododecanoic acid (PFDoA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorotridecanoic acid (PFTeDA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorotetradecanoic acid (PFTeDA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.00	0.600	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.00	1.30	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorononanesulfonic acid (PFNS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	ND		4.00	1.00	ng/L		03/03/26 14:26	03/04/26 05:25	1
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	ND		4.00	1.00	ng/L		03/03/26 14:26	03/04/26 05:25	1
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	ND		4.00	1.00	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorooctanesulfonamide (PFOSA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	ND		2.00	1.10	ng/L		03/03/26 14:26	03/04/26 05:25	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	ND		10.0	4.00	ng/L		03/03/26 14:26	03/04/26 05:25	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	ND		10.0	4.00	ng/L		03/03/26 14:26	03/04/26 05:25	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		2.00	1.40	ng/L		03/03/26 14:26	03/04/26 05:25	1
4,8-Dioxo-3H-perfluorononanoic acid (ADONA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: MB 410-776892/22-A
Matrix: Water
Analysis Batch: 777012

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 776892

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecan e-1-sulfonic acid (11Cl-PF3OUdS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESEA)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	ND		4.00	1.00	ng/L		03/03/26 14:26	03/04/26 05:25	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	ND		10.0	2.80	ng/L		03/03/26 14:26	03/04/26 05:25	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	ND		10.0	2.50	ng/L		03/03/26 14:26	03/04/26 05:25	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.00	0.500	ng/L		03/03/26 14:26	03/04/26 05:25	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4-PFBA	83.8		5 - 130	03/03/26 14:26	03/04/26 05:25	1
13C5-PFPeA	83.7		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C5-PFHxA	77.8		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C4-PFHpA	77.4		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C8-PFOA	79.1		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C9-PFNA	68.0		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C6-PFDA	80.1		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C7-PFUnA	77.9		30 - 130	03/03/26 14:26	03/04/26 05:25	1
13C2-PFDoA	72.0		10 - 130	03/03/26 14:26	03/04/26 05:25	1
13C2-PFTeDA	68.3		10 - 130	03/03/26 14:26	03/04/26 05:25	1
13C3-PFBS	82.3		40 - 135	03/03/26 14:26	03/04/26 05:25	1
13C3-PFHxS	77.4		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C8-PFOS	85.5		40 - 130	03/03/26 14:26	03/04/26 05:25	1
13C8-PFOSA	73.3		40 - 130	03/03/26 14:26	03/04/26 05:25	1
d3-NMeFOSAA	68.7		40 - 170	03/03/26 14:26	03/04/26 05:25	1
d5-NEIFOSAA	59.3		25 - 135	03/03/26 14:26	03/04/26 05:25	1
13C2 4:2 FTS	93.8		40 - 200	03/03/26 14:26	03/04/26 05:25	1
13C2 6:2 FTS	90.1		40 - 200	03/03/26 14:26	03/04/26 05:25	1
13C2 8:2 FTS	98.8		40 - 300	03/03/26 14:26	03/04/26 05:25	1
13C3-HFPO-DA	73.6		40 - 130	03/03/26 14:26	03/04/26 05:25	1
D7-NMeFOSE	53.9		10 - 130	03/03/26 14:26	03/04/26 05:25	1
D9-NEIFOSE	43.6		10 - 130	03/03/26 14:26	03/04/26 05:25	1
d5-NEIPFOA	61.9		10 - 130	03/03/26 14:26	03/04/26 05:25	1
d3-NMePFOSA	60.0		10 - 130	03/03/26 14:26	03/04/26 05:25	1

Lab Sample ID: LCS 410-776892/23-A
Matrix: Water
Analysis Batch: 777012

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	80.0	75.47		ng/L		94	70 - 140
Perfluoropentanoic acid (PFPeA)	40.0	36.52		ng/L		91	65 - 135
Perfluorohexanoic acid (PFHxA)	40.0	39.73		ng/L		99	70 - 145
Perfluoroheptanoic acid (PFHpA)	40.0	36.82		ng/L		92	70 - 150
Perfluorooctanoic acid (PFOA)	40.0	36.92		ng/L		92	70 - 150
Perfluorononanoic acid (PFNA)	40.0	39.89		ng/L		100	70 - 150
Perfluorodecanoic acid (PFDA)	40.0	33.88		ng/L		85	70 - 140

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: LCS 410-776892/23-A
Matrix: Water
Analysis Batch: 777012

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluoroundecanoic acid (PFUnA)	40.0	36.44		ng/L		91	70 - 145
Perfluorododecanoic acid (PFDoA)	40.0	41.89		ng/L		105	70 - 140
Perfluorotridecanoic acid (PFTriDA)	40.0	38.78		ng/L		97	65 - 140
Perfluorotetradecanoic acid (PFTeDA)	40.0	35.02		ng/L		88	60 - 140
Perfluorobutanesulfonic acid (PFBS)	35.5	32.29		ng/L		91	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	37.6	38.19		ng/L		102	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	36.5	33.63		ng/L		92	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	38.2	35.82		ng/L		94	70 - 150
Perfluorooctanesulfonic acid (PFOS)	37.2	33.46		ng/L		90	55 - 150
Perfluorononanesulfonic acid (PFNS)	38.5	34.24		ng/L		89	65 - 145
Perfluorododecanesulfonic acid (PFDoS)	38.8	28.59		ng/L		74	50 - 145
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	75.0	71.24		ng/L		95	70 - 145
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	76.2	74.32		ng/L		98	65 - 155
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	76.8	70.38		ng/L		92	60 - 150
Perfluorooctanesulfonamide (PFOSA)	40.0	37.99		ng/L		95	70 - 145
N-methylperfluorooctane sulfonamide (NMeFOSA)	40.0	40.60		ng/L		102	60 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	40.0	39.46		ng/L		99	65 - 145
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	40.0	34.55		ng/L		86	50 - 140
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	40.0	36.79		ng/L		92	70 - 145
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	200	197.9		ng/L		99	70 - 145
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	200	210.0		ng/L		105	70 - 135
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	30.0	30.25		ng/L		101	70 - 140
4,8-Dioxo-3H-perfluorononanoic acid (ADONA)	37.8	37.05		ng/L		98	65 - 145
Perfluoro-4-methoxybutanoic acid (PFMBA)	40.0	36.16		ng/L		90	60 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	40.0	41.63		ng/L		104	55 - 140
Nonafluoro-3,6-dioxahexanoic acid (NFDHA)	40.0	34.41		ng/L		86	50 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	37.4	33.92		ng/L		91	70 - 155

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: LCS 410-776892/23-A
Matrix: Water
Analysis Batch: 777012

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroicosafuoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	37.8	32.95		ng/L		87	55 - 160
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	35.7	31.94		ng/L		90	70 - 140
3-Perfluoropropylpropanoic acid (3:3 FTCA)	80.0	71.82		ng/L		90	65 - 130
3-Perfluoropentylpropanoic acid (5:3 FTCA)	200	163.5		ng/L		82	70 - 135
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	200	151.4		ng/L		76	50 - 145
Perfluorodecanesulfonic acid (PFDS)	38.6	32.79		ng/L		85	60 - 145

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4-PFBA	86.6		5 - 130
13C5-PFPeA	86.6		40 - 130
13C5-PFHxA	80.9		40 - 130
13C4-PFHpA	81.5		40 - 130
13C8-PFOA	74.6		40 - 130
13C9-PFNA	66.9		40 - 130
13C6-PFDA	78.0		40 - 130
13C7-PFUnA	80.6		30 - 130
13C2-PFDoA	63.5		10 - 130
13C2-PFTeDA	64.5		10 - 130
13C3-PFBS	79.0		40 - 135
13C3-PFHxS	72.1		40 - 130
13C8-PFOS	77.4		40 - 130
13C8-PFOSA	73.0		40 - 130
d3-NMeFOSAA	67.3		40 - 170
d5-NEIFOSAA	58.6		25 - 135
13C2 4:2 FTS	91.3		40 - 200
13C2 6:2 FTS	81.1		40 - 200
13C2 8:2 FTS	109		40 - 300
13C3-HFPO-DA	79.8		40 - 130
D7-NMeFOSE	42.0		10 - 130
D9-NEIFOSE	34.0		10 - 130
d5-NEIPFOSA	62.9		10 - 130
d3-NMePFOSA	62.2		10 - 130

Lab Sample ID: LCSD 410-776892/1-A
Matrix: Water
Analysis Batch: 777590

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	80.0	68.22		ng/L		85	70 - 140	10	30
Perfluoropentanoic acid (PFPeA)	40.0	38.81		ng/L		97	65 - 135	6	30
Perfluorohexanoic acid (PFHxA)	40.0	31.85		ng/L		80	70 - 145	22	30
Perfluoroheptanoic acid (PFHpA)	40.0	35.01		ng/L		88	70 - 150	5	30
Perfluorooctanoic acid (PFOA)	40.0	33.56		ng/L		84	70 - 150	10	30
Perfluorononanoic acid (PFNA)	40.0	36.49		ng/L		91	70 - 150	9	30

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: LCSD 410-776892/1-A
Matrix: Water
Analysis Batch: 777590

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Perfluorodecanoic acid (PFDA)	40.0	32.72		ng/L		82	70 - 140	3	30
Perfluoroundecanoic acid (PFUnA)	40.0	33.60		ng/L		84	70 - 145	8	30
Perfluorododecanoic acid (PFDoA)	40.0	35.00		ng/L		87	70 - 140	18	30
Perfluorotridecanoic acid (PFTriDA)	40.0	37.89		ng/L		95	65 - 140	2	30
Perfluorotetradecanoic acid (PFTeDA)	40.0	36.35		ng/L		91	60 - 140	4	30
Perfluorobutanesulfonic acid (PFBS)	35.5	33.26		ng/L		94	60 - 145	3	30
Perfluoropentanesulfonic acid (PFPeS)	37.5	34.89		ng/L		93	65 - 140	9	30
Perfluorohexanesulfonic acid (PFHxS)	36.5	28.26		ng/L		77	65 - 145	17	30
Perfluorohaptanesulfonic acid (PFHpS)	38.2	36.43		ng/L		95	70 - 150	2	30
Perfluorooctanesulfonic acid (PFOS)	37.2	33.04		ng/L		89	55 - 150	1	30
Perfluorononanesulfonic acid (PFNS)	38.5	33.89		ng/L		88	65 - 145	1	30
Perfluorododecanesulfonic acid (PFDoS)	38.8	23.88		ng/L		62	50 - 145	18	30
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4.2 FTS)	75.0	61.74		ng/L		82	70 - 145	14	30
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6.2 FTS)	76.2	71.75		ng/L		94	65 - 155	4	30
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8.2 FTS)	76.8	61.52		ng/L		80	60 - 150	13	30
Perfluorooctanesulfonamide (PFOSA)	40.0	33.96		ng/L		85	70 - 145	11	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	40.0	35.61		ng/L		89	60 - 150	13	30
N-ethylperfluorooctane sulfonamide (NEFOSA)	40.0	38.32		ng/L		96	65 - 145	3	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	40.0	31.51		ng/L		79	50 - 140	9	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEFOSAA)	40.0	31.47		ng/L		79	70 - 145	16	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	200	189.5		ng/L		95	70 - 145	4	30
N-ethylperfluorooctane sulfonamidoethanol (NEFOSE)	200	176.8		ng/L		88	70 - 135	17	30
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	30.0	24.38		ng/L		81	70 - 140	22	30
4,8-Dioxo-3H-perfluorononanoic acid (ADONA)	37.8	35.33		ng/L		93	65 - 145	5	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	40.0	37.75		ng/L		94	60 - 150	4	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	40.0	41.66		ng/L		104	55 - 140	0	30
Nonafluoro-3,6-dioxahexanoic acid (NFDHA)	40.0	35.78		ng/L		89	50 - 150	4	30
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	37.4	34.93		ng/L		94	70 - 155	3	30

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: LCSD 410-776892/1-A				Client Sample ID: Lab Control Sample Dup						
Matrix: Water				Prep Type: Total/NA						
Analysis Batch: 777590				Prep Batch: 776892						
Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit	
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF30UdS)	37.8	29.55		ng/L		78	55 - 160	11	30	
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	35.7	30.21		ng/L		85	70 - 140	6	30	7
3-Perfluoropropylpropanoic acid (3:3 FTCA)	80.0	70.63		ng/L		88	65 - 130	2	30	
3-Perfluoropentylpropanoic acid (5:3 FTCA)	200	141.0		ng/L		70	70 - 135	15	30	
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	200	128.9		ng/L		64	50 - 145	16	30	
Perfluorodecane sulfonic acid (PFDS)	38.6	31.28		ng/L		81	60 - 145	5	30	
Isotope Dilution	LCSD %Recovery	LCSD Qualifier	Limits							
13C4-PFBA	101		5 - 130							
13C5-PFPeA	94.8		40 - 130							
13C5-PFHxA	99.8		40 - 130							
13C4-PFHpA	99.9		40 - 130							
13C8-PFOA	97.4		40 - 130							
13C9-PFNA	82.2		40 - 130							
13C6-PFDA	85.8		40 - 130							
13C7-PFUnA	80.7		30 - 130							
13C2-PFDoA	72.8		10 - 130							
13C2-PFTeDA	56.7		10 - 130							
13C3-PFBS	87.1		40 - 135							
13C3-PFHxS	91.3		40 - 130							
13C8-PFOS	86.8		40 - 130							
13C8-PFOSA	93.3		40 - 130							
d3-NMeFOSAA	88.1		40 - 170							
d5-NEIFOSAA	178	*5+	25 - 135							
13C2 4:2 FTS	106		40 - 200							
13C2 6:2 FTS	96.8		40 - 200							
13C2 8:2 FTS	82.8		40 - 300							
13C3-HFPO-DA	97.3		40 - 130							
D7-NMeFOSE	38.1		10 - 130							
D9-NEIFOSE	35.1		10 - 130							
d5-NEIPFOSA	69.5		10 - 130							
d3-NMePFOSA	77.4		10 - 130							

Lab Sample ID: LLCS 410-776892/2-A
Matrix: Water
Analysis Batch: 777590

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits			
Perfluorobutanoic acid (PFBA)	8.00	6.449		ng/L		81	70 - 140			
Perfluoropentanoic acid (PFPeA)	4.00	3.398		ng/L		85	65 - 135			
Perfluorohexanoic acid (PFHxA)	4.00	3.526		ng/L		88	70 - 145			
Perfluoroheptanoic acid (PFHpA)	4.00	2.957		ng/L		74	70 - 150			
Perfluorooctanoic acid (PFOA)	4.00	3.248		ng/L		81	70 - 150			
Perfluorononanoic acid (PFNA)	4.00	3.117		ng/L		78	70 - 150			

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QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: LLCS 410-776892/2-A
Matrix: Water
Analysis Batch: 777590

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spiked Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorodecanoic acid (PFDA)	4.00	3.234		ng/L		81	70 - 140
Perfluoroundecanoic acid (PFUnA)	4.00	3.054		ng/L		76	70 - 145
Perfluorododecanoic acid (PFDoA)	4.00	3.024		ng/L		76	70 - 140
Perfluorotridecanoic acid (PFTrDA)	4.00	3.117		ng/L		78	65 - 140
Perfluorotetradecanoic acid (PFTeDA)	4.00	3.515		ng/L		88	60 - 140
Perfluorobutanesulfonic acid (PFBS)	3.55	2.981		ng/L		84	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.76	2.796		ng/L		74	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	3.65	2.824		ng/L		77	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.82	3.202		ng/L		84	70 - 150
Perfluorooctanesulfonic acid (PFOS)	3.72	3.181		ng/L		86	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.85	3.343		ng/L		87	65 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.88	2.528		ng/L		65	50 - 145
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	7.50	7.099		ng/L		95	70 - 145
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	7.62	5.692		ng/L		75	65 - 155
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	7.68	5.956		ng/L		78	60 - 150
Perfluorooctanesulfonamide (PFOSA)	4.00	3.277		ng/L		82	70 - 145
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	3.463		ng/L		87	60 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	4.00	3.518		ng/L		88	65 - 145
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4.00	3.341		ng/L		84	50 - 140
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4.00	3.031		ng/L		76	70 - 145
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	20.0	17.35		ng/L		87	70 - 145
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	20.0	17.33		ng/L		87	70 - 135
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	3.00	2.813		ng/L		94	70 - 140
4,8-Dioxo-3H-perfluorononanoic acid (ADONA)	3.78	3.364		ng/L		89	65 - 145
Perfluoro-4-methoxybutanoic acid (PFMBA)	4.00	3.236		ng/L		81	60 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	4.00	3.604		ng/L		90	55 - 140
Nonafluoro-3,6-dioxahexanoic acid (NFDHA)	4.00	4.008		ng/L		100	50 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	3.74	3.248		ng/L		87	70 - 155

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Eurofins Savannah

QC Sample Results

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Method: 1633A - Per- and Polyfluoroalkyl Substances by LC/MS/MS, 1633A (Continued)

Lab Sample ID: LLCS 410-776892/2-A
Matrix: Water
Analysis Batch: 777590

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 776892

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	3.78	2.985		ng/L		79	55 - 160
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	3.57	3.370		ng/L		94	70 - 140
3-Perfluoropropylpropanoic acid (3:3 FTCA)	8.00	7.344		ng/L		92	65 - 130
3-Perfluoropentylpropanoic acid (5:3 FTCA)	20.0	16.32		ng/L		82	70 - 135
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	20.0	15.29		ng/L		76	50 - 145
Perfluorodecanesulfonic acid (PFDS)	3.86	3.047		ng/L		79	60 - 145

Isotope Dilution	LLCS %Recovery	LLCS Qualifier	Limits
13C4-PFBA	105		5 - 130
13C5-PFPeA	103		40 - 130
13C5-PFHxA	97.7		40 - 130
13C4-PFHpA	103		40 - 130
13C8-PFOA	107		40 - 130
13C9-PFNA	100		40 - 130
13C6-PFDA	97.2		40 - 130
13C7-PFUnA	96.4		30 - 130
13C2-PFDoA	89.8		10 - 130
13C2-PFTeDA	77.4		10 - 130
13C3-PFBS	104		40 - 135
13C3-PFHxS	110		40 - 130
13C8-PFOS	91.8		40 - 130
13C8-PFOSA	94.0		40 - 130
d3-NMeFOSAA	92.0		40 - 170
d5-NEIFOSAA	170	*5+	25 - 135
13C2 4:2 FTS	114		40 - 200
13C2 6:2 FTS	116		40 - 200
13C2 8:2 FTS	97.6		40 - 300
13C3-HFPO-DA	99.0		40 - 130
D7-NMeFOSE	60.0		10 - 130
D9-NEIFOSE	54.4		10 - 130
d5-NEIPFOSA	78.0		10 - 130
d3-NMePFOSA	81.8		10 - 130

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QC Association Summary

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

LCMS

Prep Batch: 776892

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-269764-1	26-08821	Total/NA	Water	1633A	
MB 410-776892/22-A	Method Blank	Total/NA	Water	1633A	
LCS 410-776892/23-A	Lab Control Sample	Total/NA	Water	1633A	
LCSD 410-776892/1-A	Lab Control Sample Dup	Total/NA	Water	1633A	
LLCS 410-776892/2-A	Lab Control Sample	Total/NA	Water	1633A	

Analysis Batch: 777012

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-269764-1	26-08821	Total/NA	Water	1633A	776892
MB 410-776892/22-A	Method Blank	Total/NA	Water	1633A	776892
LCS 410-776892/23-A	Lab Control Sample	Total/NA	Water	1633A	776892

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Analysis Batch: 777590

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCSD 410-776892/1-A	Lab Control Sample Dup	Total/NA	Water	1633A	776892
LLCS 410-776892/2-A	Lab Control Sample	Total/NA	Water	1633A	776892

Lab Chronicle

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Client Sample ID: 26-08821

Lab Sample ID: 680-269764-1

Date Collected: 02/18/26 08:40

Matrix: Water

Date Received: 02/27/26 14:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633A			136 mL	5 mL	776892	03/03/26 14:26	V3FW	ELLE
Total/NA	Analysis	1633A		1			777012	03/04/26 08:49	LDU5	ELLE
Instrument ID: 30570										

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID: 680-269764-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

The accreditations/certifications listed below are applicable to this report

Authority	Program	Identification Number	Expiration Date
North Carolina (WW/SW)	State	521	01-01-27

Method Summary

Client: Environmental Chemists Inc
Project/Site: 2026-03639

Job ID 680-269764-1

Method	Method Description	Protocol	Laboratory
1633A	Per- and Polyfluoroalkyl Substances by LC/MS/MS 1633A	EPA	ELLE
1633A	Solid-Phase Extraction (SPE)	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

ELLE = EuroFins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike Lancaster, PA 17601, TEL (717)656-2300

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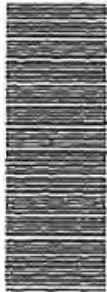
Environmental Chemist
66002 Windmill Way, Wilmington, NC 28405
Phone: 910-392-0223 Fax: 910-392-4424
info@environmentalchemists.com

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SAV

REQUEST FOR SUBCONTRACTED SERVICES

Report #	Sample #	Date	Time	Matrix	Analysis Requested	Preservation	Comments
2026-03639	26-08821	2/18/2026	8:40	DW	SW-33 EPA 1633		

2/24/26



680-269764 Chain of Custody

Prepared by:	For Shipment By: JPS
Relinquished By: [Signature]	Date/Time: 2/24/26 17:00
Received By: [Signature]	Date/Time: 2/27/26 1400

Tuesday, February 24, 2026

ups

20.0/20.0

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7001 Chatham Center Drive Suite 600
Savannah, GA 31405
Phone: 912-354-7858 Fax: 912-352-0

Chain of Custody Record



Client Information (Sub Contract Lab)		Sampler: Andros, John Phone: N/A E-Mail: John Andros@eurofins.com		Cerner Tracking No(s): N/A State of Origin: North Carolina		GOC No: 680-808327.1 Page: Page 1 of 1 Job #: 680-269764-1	
Address: 2425 New Holland Pike, City: Lancaster State, Zip: PA, 17601 Phone: 717-656-2300(Tel) Email: N/A		Project Name: PFAS for Various Sites/Matrices-NC SOW: N/A		Due Date Requested: 3/13/2026 TAT Requested (days): N/A		Analysis Requested: 1637/1638, 1639/1640, 1641/1642, 1643/1644, 1645/1646, 1647/1648, 1649/1650, 1651/1652, 1653/1654, 1655/1656, 1657/1658, 1659/1660, 1661/1662, 1663/1664, 1665/1666, 1667/1668, 1669/1670, 1671/1672, 1673/1674, 1675/1676, 1677/1678, 1679/1680, 1681/1682, 1683/1684, 1685/1686, 1687/1688, 1689/1690, 1691/1692, 1693/1694, 1695/1696, 1697/1698, 1699/1700, 1701/1702, 1703/1704, 1705/1706, 1707/1708, 1709/1710, 1711/1712, 1713/1714, 1715/1716, 1717/1718, 1719/1720, 1721/1722, 1723/1724, 1725/1726, 1727/1728, 1729/1730, 1731/1732, 1733/1734, 1735/1736, 1737/1738, 1739/1740, 1741/1742, 1743/1744, 1745/1746, 1747/1748, 1749/1750, 1751/1752, 1753/1754, 1755/1756, 1757/1758, 1759/1760, 1761/1762, 1763/1764, 1765/1766, 1767/1768, 1769/1770, 1771/1772, 1773/1774, 1775/1776, 1777/1778, 1779/1780, 1781/1782, 1783/1784, 1785/1786, 1787/1788, 1789/1790, 1791/1792, 1793/1794, 1795/1796, 1797/1798, 1799/1800, 1801/1802, 1803/1804, 1805/1806, 1807/1808, 1809/1810, 1811/1812, 1813/1814, 1815/1816, 1817/1818, 1819/1820, 1821/1822, 1823/1824, 1825/1826, 1827/1828, 1829/1830, 1831/1832, 1833/1834, 1835/1836, 1837/1838, 1839/1840, 1841/1842, 1843/1844, 1845/1846, 1847/1848, 1849/1850, 1851/1852, 1853/1854, 1855/1856, 1857/1858, 1859/1860, 1861/1862, 1863/1864, 1865/1866, 1867/1868, 1869/1870, 1871/1872, 1873/1874, 1875/1876, 1877/1878, 1879/1880, 1881/1882, 1883/1884, 1885/1886, 1887/1888, 1889/1890, 1891/1892, 1893/1894, 1895/1896, 1897/1898, 1899/1900, 1901/1902, 1903/1904, 1905/1906, 1907/1908, 1909/1910, 1911/1912, 1913/1914, 1915/1916, 1917/1918, 1919/1920, 1921/1922, 1923/1924, 1925/1926, 1927/1928, 1929/1930, 1931/1932, 1933/1934, 1935/1936, 1937/1938, 1939/1940, 1941/1942, 1943/1944, 1945/1946, 1947/1948, 1949/1950, 1951/1952, 1953/1954, 1955/1956, 1957/1958, 1959/1960, 1961/1962, 1963/1964, 1965/1966, 1967/1968, 1969/1970, 1971/1972, 1973/1974, 1975/1976, 1977/1978, 1979/1980, 1981/1982, 1983/1984, 1985/1986, 1987/1988, 1989/1990, 1991/1992, 1993/1994, 1995/1996, 1997/1998, 1999/2000, 2001/2002, 2003/2004, 2005/2006, 2007/2008, 2009/2010, 2011/2012, 2013/2014, 2015/2016, 2017/2018, 2019/2020, 2021/2022, 2023/2024, 2025/2026, 2027/2028, 2029/2030, 2031/2032, 2033/2034, 2035/2036, 2037/2038, 2039/2040, 2041/2042, 2043/2044, 2045/2046, 2047/2048, 2049/2050, 2051/2052, 2053/2054, 2055/2056, 2057/2058, 2059/2060, 2061/2062, 2063/2064, 2065/2066, 2067/2068, 2069/2070, 2071/2072, 2073/2074, 2075/2076, 2077/2078, 2079/2080, 2081/2082, 2083/2084, 2085/2086, 2087/2088, 2089/2090, 2091/2092, 2093/2094, 2095/2096, 2097/2098, 2099/2100, 2101/2102, 2103/2104, 2105/2106, 2107/2108, 2109/2110, 2111/2112, 2113/2114, 2115/2116, 2117/2118, 2119/2120, 2121/2122, 2123/2124, 2125/2126, 2127/2128, 2129/2130, 2131/2132, 2133/2134, 2135/2136, 2137/2138, 2139/2140, 2141/2142, 2143/2144, 2145/2146, 2147/2148, 2149/2150, 2151/2152, 2153/2154, 2155/2156, 2157/2158, 2159/2160, 2161/2162, 2163/2164, 2165/2166, 2167/2168, 2169/2170, 2171/2172, 2173/2174, 2175/2176, 2177/2178, 2179/2180, 2181/2182, 2183/2184, 2185/2186, 2187/2188, 2189/2190, 2191/2192, 2193/2194, 2195/2196, 2197/2198, 2199/2200, 2201/2202, 2203/2204, 2205/2206, 2207/2208, 2209/2210, 2211/2212, 2213/2214, 2215/2216, 2217/2218, 2219/2220, 2221/2222, 2223/2224, 2225/2226, 2227/2228, 2229/2230, 2231/2232, 2233/2234, 2235/2236, 2237/2238, 2239/2240, 2241/2242, 2243/2244, 2245/2246, 2247/2248, 2249/2250, 2251/2252, 2253/2254, 2255/2256, 2257/2258, 2259/2260, 2261/2262, 2263/2264, 2265/2266, 2267/2268, 2269/2270, 2271/2272, 2273/2274, 2275/2276, 2277/2278, 2279/2280, 2281/2282, 2283/2284, 2285/2286, 2287/2288, 2289/2290, 2291/2292, 2293/2294, 2295/2296,	

Login Sample Receipt Checklist

Client: Environmental Chemists Inc

Job Number: 680-269764-1

Login Number: 269764

List Source: Eurofins Savannah

List Number: 1

Creator: Lincoln, Alyssa

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	No ice per client request.
Cooler Temperature is acceptable.	False	Cooler temperature outside required temperature criteria.
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Login Sample Receipt Checklist

Client: Environmental Chemists Inc

Job Number: 680-269764-1

Login Number: 269764

List Number: 2

Creator: Trzos, Hazel

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Creation: 03/02/26 02:16 PM

Question	Answer	Comment
The cooler's custody seal is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable, where thermal pres is required ($\leq 6^{\circ}\text{C}$, not frozen).	True	
Cooler Temperature is recorded.	True	
WV: Container Temp acceptable, where thermal pres is required ($\leq 6^{\circ}\text{C}$, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol for all requested analyses.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace $> 6\text{mm}$ in diameter (none, if from WV)?	N/A	

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Analytical & Consulting Chemists

ENVIRONMENTAL CHEMISTS, INC

NCDEMR: DWQ CERTIFICATION # 94 NCDHHS: DLS CERTIFICATION # 37729

6602 Windmill Way Wilmington, NC 28405
OFFICE: 910-392-0223 FAX 910-392-4424
info@environmentalchemists.com

COLLECTION AND CHAIN OF CUSTODY

Client: NW Poole		PROJECT NAME: <u>LAKE MYRA</u>		REPORT NO: <u>26-03039</u>												
ADDRESS:		CONTACT NAME: Kevin Letchworth		PO NO:												
		REPORT TO:		PHONE/FAX:												
		COPY TO:		email:												
Sampled By: <u>RAE LETCHWORTH</u> SAMPLE TYPE: I = Influent, E = Effluent, W = Well, ST = Stream, SO = Soil, SL = Sludge, Other:																
Sample Identification	Collection			Sample Type	Composite or Grab	Container (P or G)	Chlorine mg/L	LAB ID NUMBER	PRESERVATION							ANALYSIS REQUESTED
	Date	Time	Temp						NONE	HCL	H2SO4	HNO3	NAOH	THIO	OTHER	
New Well	8-18-80	8:40			C	P		8021	X	X	X	X	X	X	X	VOC, SOC, New Well IOC
					C	P										Asbestos, Rads (5 compounds)
					G	G										Total Coliform, THM/HAAFP, CL2 Demand
					C	P										PFAS
					C	P			X							
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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Work under separate contracts.
- 4. Owner-furnished products.
- 5. Access to site.
- 6. Work restrictions.
- 7. Specification and Drawing conventions.

- B. Related Requirements:

- 1. Section 012900 "Payment Procedures" for requirements for the Schedule of Values to differentiate portions of the Work funded from separate sources.
- 2. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Lake Myra County Park Phase 1

- 1. Project Location: Eastern Parcel – 10505 Poole Road
Western Parcel – 0 S Smithfield Road

- B. Owner: Wake County, North Carolina

- 1. Owner's Contact: Eric Staehle
Wake County Facilities, Design & Construction
336 Fayetteville Street
WCOB, 12th Floor
Raleigh, NC 27601
919-856-6369
Eric.Staehle@wake.gov

- C. Landscape Architect: Susan Hatchell Landscape Architecture, PLLC

- 1. Project Manager: Jennifer Steed
711 W. North Street
Raleigh, North Carolina 27603
919-845-8397, Jennifer@susanhatchell.com

D. Architect: Esse Architects

1. Project Manager: Miranda Pottoff, AIA, LEED BD+C
632 Pershing Road
Raleigh, North Carolina 27608
919-270-6455, Miranda@esse-architects.com

E. Landscape Architect's Consultants: The Landscape Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Civil Engineer, Site Structural Engineer, and Surveyor: NV5
3300 Regency Parkway, Suite 100
Cary, NC 27518
2. Building Structural Engineer: Lynch Mykins/IMEG
301 N. West Street, Suite 105
Raleigh, NC 27603
3. MEP Engineers: The Wooten Company
120 N Boylan Avenue
Raleigh, NC 27603

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. This project includes the construction of a new Wake County park. New work includes a new Park Center, Maintenance Facility, Shelter/Restrooms, well house, fishing pier, boardwalks, asphalt entrance drives at two parcels, parking areas, internal sidewalks, trails, site amenities, and related structural, mechanical, electrical, and plumbing services, site electrical, stormwater, planting and seeding as well as other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1. Disc Golf Course Signage and Site Signage
2. Public Art Installation

1.6 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.
- B. Owner-Furnished Products:
 - 1. New playground equipment
 - 2. Reclaimed playground equipment
 - 3. Building furniture
 - 4. Building address signage
 - 5. Site directional signage
 - 6. Exhibits

1.7 ACCESS TO SITE

- A. General: Contractor shall have use of Project site within the Contract limits for construction operations during construction period.
- B. Use of Site: Limit use of Project site to Work in areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine construction operations to the limits shown on the Contract Drawings.
 - 2. Driveways, Walkways and Entrances: Keep entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.
- D. Owner Limited Occupancy of Completed Areas of Construction: Owner shall occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Contractor shall complete Maintenance Facility and access drive a minimum of 4 months prior to completion of remaining buildings for Owner to occupy, furnish equipment and begin maintenance operations on portions of the Park not under construction.
 - 2. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.

3. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
4. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
5. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise agreed upon. A variation of work hours during the spring and summer may be coordinated with the Owner.
 1. Weekend Hours: Require written approval from Owner.
- C. Tree Protection and Silt Fencing: Tree protection and silt fencing shall be installed as shown on plans prior to the start of any construction activities.
- D. Site Control and Protection: It is the option of the Contractor to provide additional chain link fencing to protect work from vandalism or the general public from hazardous conditions.
- E. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Landscape Architect and Owner not less than five days in advance of proposed utility interruptions.
 2. Obtain Landscape Architect's written permission before proceeding with utility interruptions.
- F. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Landscape Architect not less than five days in advance of proposed disruptive operations.
 2. Obtain Landscape Architect's written permission before proceeding with disruptive operations.
- G. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY:

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.

C. Related Sections:

1. Section 012200 "Unit Prices" for procedures for using unit prices.
2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Order allowances.
3. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.2 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.3 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.4 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.5 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.6 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.2 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Security Equipment and Installation

- 1. Lump Sum Allowance: Includes installation of security equipment to be installed by subcontractor on Wake County approved vendor list and from Wake County provided documents. General Contractor shall be responsible for bidding the allowance with County-approved vendor list.
- 2. Amount: \$290,000

B. Allowance No. 2: Security Fiber Optic and Telecommunications Cabling Installation

- 1. Lump Sum Allowance: Includes installation of fiber optic and telecommunications cabling as shown on electrical site plans to be installed by subcontractor on Wake County approved vendor list and from Wake County provided documents. General Contractor shall be responsible for bidding the allowance with County-approved vendor list.
- 2. Amount: \$100,000

C. Allowance No. 3: Permit Fees

- 1. Lump Sum Allowance: Include an allowance for City of Raleigh meter permit fees.
- 2. Amount: \$40,000.00

D. Allowance No. 4: Access Door for Hard Ceilings

- 1. Unit Cost Allowance: Include an allowance in the base bid for providing and installing two (2) Access Doors for Hard Ceilings. See Section 012200 Unit Prices, Unit Price No. 1.

2. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

E. Allowance No. 5: BDA System

1. Unit Cost Allowance: Include two (2) exit signs, two (2) emergency lights, two (2) fire alarm horn/strobes, and eight (8) fire alarm monitor modules for potential BDA System. Include installation.
2. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

F. Allowance No. 6: Unsuitable Soil – On-Site Disposal and Backfill with On-Site Source Suitable Soils

1. Description: Removal of unsuitable soil, disposal of unsuitable soil for re-use on-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an on-site source.
2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
3. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
4. Quantity Allowance: 100 cubic yards.
5. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

G. Allowance No. 7: Unsuitable Soil – On-site disposal and Backfill with Off-Site Source Suitable Soils.

1. Description: Removal of unsuitable soil, disposal for re-use on-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an off-site source.
2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
3. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
4. Quantity Allowance: 250 cubic yards.
5. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

H. Allowance No. 8: Unsuitable soil – Off-site disposal and Backfill with On-Site Source Suitable Soils.

1. Description: Removal, disposal off-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an on-site source.
2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
3. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
4. Quantity Allowance: 50 cubic yards.
5. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

- I. Allowance No. 9: Unsuitable Soil – Off-site disposal and Backfill with Off-Site Source Suitable Soils.
 - 1. Description: Removal, disposal off-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an off-site source.
 - 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 - 3. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 - 4. Quantity Allowance: 250 cubic yards.
 - 5. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

- J. Allowance No. 10: Mass Rock Excavation and Replacement with Imported Structural Fill.
 - 1. Description: Removal, disposal off-site, and replacement of mass rock excavation with imported structural backfill from an off-site source.
 - 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 - 3. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 - 4. Quantity Allowance: 200 cubic yards.
 - 5. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

- K. Allowance No. 11: Trench Rock Excavation and Replacement with Imported Structural Fill.
 - 1. Description: Removal, disposal off-site, and replacement of trench rock excavation with imported structural backfill from an off-site source.
 - 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 - 3. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 - 4. Quantity Allowance: 150 cubic yards.
 - 5. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

- L. Allowance No. 12: Erosion Control Matting.
 - 1. Description: Providing and installing erosion control matting.
 - 2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 - 3. Quantity Allowance: 500 square yards.
 - 4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

M. Allowance No. 13: Engineered Geotextile Fabric.

1. Description: Providing and installing engineered geotextile fabric.
2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
3. Quantity Allowance: 500 square yards.
4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

N. Allowance No. 14: #57 Drainage Stone.

1. Description: Providing and installing #57 stone.
2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
3. Quantity Allowance: 50 cubic yards.
4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

O. Allowance No. 15: 6" Perforated PVC Drainage Pipe (French Drain)

1. Description: Providing and installing 6" perforated PVC drainage pipe.
2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
3. Quantity Allowance: 50 linear feet.
4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

P. Allowance No. 16: Trail Pipe Crossing – 12" RCP

1. Description: Providing and installing 12" RCP pipe for trail crossing.
2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
3. Quantity Allowance: 75 linear feet.
4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

Q. Allowance No. 17: Trail Pipe Crossing – 15" RCP

1. Description: Providing and installing 15" RCP pipe for trail crossing.
2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
3. Quantity Allowance: 50 linear feet.
4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

R. Allowance No. 18: Trail Pipe Crossing – 18" RCP

1. Description: Providing and installing 18" RCP pipe for trail crossing.
2. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
3. Quantity Allowance: 50 linear feet.

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4. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

S. Allowance No. 19: Project Contingency Allowance

1. Contingency Allowance: To be used when pre-authorized in writing by the Owner.
2. Amount: \$250,000

END OF SECTION 012100

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SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Section 014000 "Quality Requirements" for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

- A. Unit Price No. 1: Access Door for Hard Ceilings
 - 1. Description: See Section 083113 "Access Doors and Frames" for specifications.
 - 2. Unit of Measurement: Each
- B. Unit Price No. 2: Exit Sign
 - 1. Description: See Section 265100 "Interior Lighting" for specifications.
 - 2. Unit of Measure: Each
- C. Unit Price No. 3: Emergency Light
 - 1. Description: See Section 265100 "Interior Lighting" for specifications.
 - 2. Unit of Measure: Each
- D. Unit Price No. 4: Fire Alarm Horn/Strobes
 - 1. Description: See Section 284600 "Fire Detection and Alarm" for specifications.
 - 2. Unit of Measure: Each
- E. Unit Price No. 5: Fire Alarm Monitor Modules for Potential BDA System
 - 1. Description: See Section 284600 "Fire Detection and Alarm" for specifications.
 - 2. Unit of Measure: Each
- F. Unit Price No. 6: Unsuitable Soil – On-Site Disposal and Backfill with On-Site Source Suitable Soils. As referenced in Section 012100 "Allowances", Part 3.3.
 - 1. Description: Removal of unsuitable soil, disposal of unsuitable soil for re-use on-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an on-site source.
 - 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 - 3. Unit of Measure: Cubic Yard
 - 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- G. Unit Price No. 7: Unsuitable Soil – On-site disposal and Backfill with Off-Site Source Suitable Soils. As referenced in Section 012100 "Allowances", Part 3.3.
 - 1. Description: Removal of unsuitable soil, disposal for re-use on-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an off-site source.
 - 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 - 3. Unit of Measure: Cubic Yard

4. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- H. Unit Price No. 8: Unsuitable soil – Off-site disposal and Backfill with On-Site Source Suitable Soils. As referenced in Section 012100 "Allowances", Part 3.3.
1. Description: Removal, disposal off-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an on-site source.
 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 3. Unit of Measure: Cubic Yard
 4. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- I. Unit Price No. 9: Unsuitable Soil – Off-site disposal and Backfill with Off-Site Source Suitable Soils. As referenced in Section 012100 "Allowances", Part 3.3.
1. Description: Removal, disposal off-site, and replacement of unsuitable soil and/or debris with a controlled backfill material from an off-site source.
 2. Unit Price includes excavation, transportation, re-spread, compaction, and backfill to compaction requirements per specifications.
 3. Unit of Measure: Cubic Yard
 4. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- J. Unit Price No. 10: Mass Rock Excavation and Replacement with Imported Structural Fill
1. Description: Mass rock excavation, removal and disposal off-site and replacement with imported structural fill per Section 312000 "Earth Moving" not otherwise indicated in the Contract Documents.
 2. Unit of Measure: Cubic Yard (CY)
- K. Unit Price No. 11: Trench Rock Excavation and Replacement with Imported Structural Fill
1. Description: Trench rock excavation, removal and disposal off-site and replacement with imported structural fill per Section 312000 "Earth Moving" not otherwise indicated in the Contract Documents.
 2. Unit of Measure: Cubic Yard (CY)
- L. Unit Price No. 12: Erosion Control Matting
1. Description: Erosion control matting per details not otherwise indicated in the Contract Documents.
 2. Unit of Measure: Square Yard (SY)

- M. Unit Price No. 13: Engineered Geotextile Fabric
1. Description: Engineered geotextile fabric per details not otherwise indicated in the Contract Documents.
 2. Unit of Measure: Square Yard (SY)
- N. Unit Price No. 14: #57 Drainage Stone
1. Description: NCDOT #57 aggregate per Section 312000 "Earth Moving" not otherwise indicated in the Contract Documents.
 2. Unit of Measure: Cubic Yard (CY)
- O. Unit Price No. 15: 6" Perforated PVC Drainage Pipe (French Drain)
1. Description: 6" perforated PVC drainage pipe per details not otherwise indicated in the Contract Documents.
 2. Unit of Measurement: Linear Foot (LF)
- P. Unit Price No. 16: Trail Pipe Crossing – 12 Inch
1. Description: 12-inch Trail Pipe Crossing per details not otherwise indicated in the Contract Documents.
 2. Unit of Measurement: Linear Foot (LF)
- Q. Unit Price No. 17: Trail Pipe Crossing – 15 Inch
1. Description: 15-inch Trail Pipe Crossing per details not otherwise indicated in the Contract Documents.
 2. Unit of Measurement: Linear Foot (LF)
- R. Unit Price No. 18: Trail Pipe Crossing – 18 Inch
1. Description: 18-inch Trail Pipe Crossing per details not otherwise indicated in the Contract Documents.
 2. Unit of Measurement: Linear Foot (LF)
- S. Unit Price No. 19: Clearing and Stump Removal
1. Description: Clearing and stump removal per Section 311000 "Site Clearing" not otherwise indicated in the Contract Documents.
 2. Unit of Measure: Acre (AC)
- T. Unit Price No. 20: Selective Tree Removal – 2"-6" caliper
1. Description: Selective tree removal of a 2"-6" caliper tree with the stump cut flush per details not otherwise indicated in the Contract Documents.
 2. Unit of Measurement: Each

- U. Unit Price No. 21: Selective Tree Removal – 7”-15” caliper
 - 1. Description: Selective tree removal of a 7”-15” caliper tree with the stump cut flush per details not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Each
- V. Unit Price No. 22: Selective Tree Removal – greater than 15” caliper
 - 1. Description: Selective tree removal of a greater than 15” caliper tree with the stump cut flush per details not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Each
- W. Unit Price No. 23: Silt Fence
 - 1. Description: Silt Fence per details not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Linear Foot (LF)
- X. Unit Price No. 24: Tree Protection Fence (TPF)
 - 1. Description: Tree Protection Fence per details not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Linear Foot (LF)
- Y. Unit Price No. 25: Concrete Paving (4” thick)
 - 1. Description: Concrete Paving, 4” thick, per Section 321313 “Concrete Paving” not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Square Yard (SY)
- Z. Unit Price No. 26: Concrete Paving (6” thick)
 - 1. Description: Concrete Paving, 6” thick, per Section 321313 “Concrete Paving” not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Square Yard (SY)
- AA. Unit Price No. 27: Concrete Curb and Gutter
 - 1. Description: Curb and Gutter per Section 321313 “Concrete Paving” not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Linear Foot (LF)
- BB. Unit Price No. 28: Asphalt Paving
 - 1. Description: Asphalt Paving per Section 321216 “Asphalt Paving” not otherwise indicated in the Contract Documents.
 - 2. Unit of Measurement: Ton

CC. Unit Price No. 29: Timber Pile (Add) – Longer Timber Pile

1. Description: Long timber pile (add) per details not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Linear Foot (LF)

DD. Unit Price No. 30: Timber Pile (Deduct) – Shorter Timber Pile

1. Description: Short timber pile (deduct) per details not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Linear Foot (LF)

EE. Unit Price No. 31: Trail Boardwalk – Wood (10' Clear)

1. Description: 10'-clear trail wood boardwalk per details not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Linear Foot (LF)

FF. Unit Price No. 32: Trail Boardwalk - Composite (10' Clear)

1. Description: 10'-clear trail composite boardwalk per details not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Linear Foot (LF)

GG. Unit Price No. 33: Trail Boardwalk 10' x 10' Crossing

1. Description: Trail boardwalk crossing per details not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Linear Foot (LF)

HH. Unit Price No. 34: Canopy Tree (2" caliper, B&B)

1. Description: Canopy Tree (2" caliper, B&B) according to Section 329300 "Planting" not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Each (EA)

II. Unit Price No. 35: Understory Tree (8' min. height, B&B)

1. Description: Understory Tree (8' min. height, B&B) according to Section 329300 "Planting" not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Each (EA)

JJ. Unit Price No. 36: Seeding

1. Description: Permanent Seeding according to Section 329200 "Turf and Grasses" not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Square Yard (SY)

KK. Unit Price No. 37: Triple Shredded Hardwood Mulch

1. Description: Permanent Seeding according to Section 329300 "Planting" not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Cubic Yard (CY)

END OF SECTION 012200

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for Alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.
 - 1. The cost or credit for each Alternate is the net addition to, or deduction from, the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
 - 2. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

1.4 PROCEDURES

- A. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.

Include as part of each Alternate miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of Alternate.

- B. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.
- C. Execute accepted Alternates under the same conditions as other work of the Contract.
- D. Schedule: A list of Alternates is included in Part 2 of this Specification

1. Include as part of each Alternate miscellaneous device, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

1.5 GENERAL

- A. Total prices for the Alternates listed herein shall be included on the Proposal Form, in the spaces provided for this purpose. Price shall include ALL cost of materials, fasteners, installation, labor, overhead and profit for a COMPLETE installed price.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 ALTERNATES:

A. Alternate #1 ADD: Boardwalk A across Lake Myra

1. Alternate Add: Provide Boardwalk A across Lake Myra including trail connection to the boardwalk, benches, viewer scope, and associated split rail fencing. Reference sheet L-401 for Boardwalk A plan and trail connection, sheet L-605 and L-606 for split rail fencing and railing details, and sheets S0.4, S1.1, S1.2, and S1.3 for the structural plans and details. Reference Specification 323300 Site Furnishings for bench and viewer scope.
2. Base Bid: No Boardwalk A.

B. Alternate #2 ADD: Boating Access

3. Alternate Add: Provide Boating Access including trail connection. Reference sheet L-106 for boating facility plan and trail connections, sheet L-606 for railing details, and sheet S1.1, S1.2, and S1.3 for structural details.
4. Base Bid: No Boating Facility.

C. Alternate #3 ADD: Fishing Pier

1. Alternate Add: Provide Fishing Pier including trail connection. Reference sheet L-106 for fishing pier plan and trail connections, sheet L-606 for railing details, and sheet S1.1, S1.2, and S1.3 for structural details.
2. Base Bid: No Fishing Pier.

END OF SECTION 012300

SECTION 012500 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Per the Instructions to Bidders, substitutions will be considered until 7 days prior to the bid. Submit each request for consideration electronically to the Licensed Professional who prepared the bid documents. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

- b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Architect will notify bidding contractors of acceptance or rejection of proposed substitution in an addendum prior to the bid.
- a. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within sixty (60) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
 - 2. Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.
 - 3. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Field Order form.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are for informational purposes only and are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within twenty (20) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

- b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use for acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Owner's Representative will issue a Change Order for signatures of Owner and Contractor on the Contract Change Order Form.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed

with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than within thirty (30) days of the Contractor's receipt of the construction agreement for signature.

- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Landscape Architect.
 - c. Contractor's name and address.
 - d. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent (5%) of the Contract Sum.
 4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 6. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
 7. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent (5%) percent of the Contract Sum and subcontract amount.
 9. Schedule of Values Revisions: Update and resubmit before the next Pay App when Change Orders or Construction Change Directives result in a change in the contract sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

- C. Payment Application Times: Submit Application for Payment to Architect by the date indicated in the General Conditions. The period covered by each Application for Payment is one month, ending on the last day of the month.
 - 1. Submit draft copy of Application for Payment seven (7) days prior to due date for review by Architect.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
 - 1. Other Application for Payment forms proposed by the Contractor shall be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit a signed and notarized PDF copy of each Application for Payment to Architect by a method ensuring receipt within 24 hours. Include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule.
 4. Combined Contractor's construction schedule incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Schedule of unit prices.
 7. Submittal schedule.
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 12. Initial progress report.
 13. Report of preconstruction conference.
 14. Certificates of insurance and insurance policies.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to, the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706.
 5. AIA Document G706A.
 6. AIA Document G707.
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for preparing and submitting contract modifications.
 - 2. Section 012900 "Payment Procedures" for application for payment requirements.
 - 3. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in a designated spot on the project site. Keep list current at all times.
- C. Emergency Contact List: Within seven (7) days of starting construction operations, submit an emergency contact list.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:

- a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
- 1.7 REQUEST FOR INFORMATION (RFI)
- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 7 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Cost Change Proposal according to Section 012600 "Contract Modification Procedures."

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
 - 1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Web-Based Project Software: Provide, administer, and use web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
 - 1. Web-based Project software site includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.

- j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 - 2. Provide up to twelve (12) Project software user licenses for use of Owner, Architect, and Architect's consultants.
 - 3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
- 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Architect will schedule and conduct meetings and conferences virtually or at Project site unless otherwise indicated.
- 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 - 2. Agenda will be distributed to all invited attendees.
 - 3. Minutes: Architect will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, within five days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
- 1. Conduct the conference to review responsibilities and personnel assignments.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long lead items.

- d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of Record Documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid and safety.
 - y. Security.
 - z. Progress cleaning.
4. Minutes: Architect will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.

- o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Owner's partial occupancy requirements.
 - k. Installation of Owner's furniture, fixtures, and equipment.
 - l. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

- E. Progress Meetings: Architect will conduct progress meetings at regular intervals as confirmed at the Pre-Construction Conference.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
 4. Minutes: Architect will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Contractor's shall revise construction schedule after each progress meeting where revisions to the schedule have been made or

recognized. Issue revised schedule concurrently with the report of each meeting.

- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

- B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.
3. Section 01770 "Closeout Procedures" for submitting photographs and digital .jpeg files as Project Record Documents at Project closeout.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 2. Predecessor Activity: An activity that precedes another activity in the network.
 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Submittal Schedule
 - 2. Working electronic copy of schedule file, where indicated.
 - 3. PDF electronic file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - 3. Total Float Report: List of activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at monthly intervals.
- F. Material Location Reports: Submit at monthly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.

- H. Special Reports: Submit at time of unusual event.
- I. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than thirty (30) days for

completion of punch list items and final completion.

- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.

- e. Completion of electrical installation.
 - f. Substantial Completion.
 - D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
 - E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 01 2900 "Payment Procedures" for cost reporting and payment procedures.
 - F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
 - G. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
 - H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)
- A. General: Prepare network diagrams using AON (activity-on-node) format.
 - B. Startup Network Diagram: Submit diagram within fourteen (14) days of date established for the Notice to Proceed. Outline significant construction activities for the first ninety (90) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
 - C. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than sixty (60) days after date established for the Notice to Proceed.
 - 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing
 - j. Commissioning.
 - k. Punch list and final completion.
 - l. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.

9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special

report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three (3) days before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in designated locations on the project site.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
3. Within fourteen (14) days after receipt of the Construction Agreement by the Contractor for signatures, the Contractor shall prepare and submit to the Architect and Owner for review and approval schedules showing the order in which he proposes to carry on the Work, including dates at which he will start the various parts of the Work, estimated date of completion of each part; and, as applicable, the dates at which special detail drawings will be required, and respective dates for submission of Shop Drawings, the beginning of manufacture, the testing and the installation of materials, supplies and equipment. The basic project schedule shall be presented at the preconstruction meeting and no partial payments shall be made until it has been submitted to the Architect and City.
4. The Architect shall specify acceptable scheduling or project management software programs, type of schedule methodology, either bar chart or critical path, to be utilized by the Contractor in reflecting the construction project's progress. The Contractor shall provide the schedule to the Architect and Owner electronically and in hard copy. See supplemental conditions if there are preferred scheduling software required by the Architect and/or Owner and any specific scheduling requirements.

- B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. General Conditions
5. Supplemental General Conditions

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in

individual Specification Sections as "action submittals."

- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit within fourteen (14) days of initial receipt of the Construction Agreement for signatures. Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - 2. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - 3. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD and PDF format.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing time: Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow fourteen (14) calendar days for initial review of each submittal for single discipline and twenty-one (21) calendar days for multiple disciplines. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow fourteen (14) calendar days for review of each resubmittal.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Landscape

Architect.

3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Landscape Architect
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier
 - h. Revise first subparagraph below to suit Project and office practice.
 - i. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 - j. Category and type of submittal.
 - k. Submittal purpose and description.
 - l. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - m. Drawing number and detail references, as appropriate.
 - n. Indication of full or partial submittal.
 - o. Location(s) where product is to be installed, as appropriate.
 - p. Other necessary identification.
 - q. Remarks.
 - r. Signature of transmitter.
 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Landscape Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Landscape Architect.
 5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Landscape Architect will return without review submittals received from sources other than Contractor.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

- a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each multiple item
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specifications Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, supplies, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution of transmittal forms.

- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 – PRODUCTS

2.1 SUBMITTAL REQUIREMENTS

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specifications Sections. Types of submittals are indicated in individual Specification Sections.
 1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.

- c. Operation range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before or concurrent with Samples.
 - 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file unless otherwise specified
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 - 3. Disposition: For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file

illustrating Sample characteristics, and identification information for record. Final colors will not be selected from color charts - physical samples are required. Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one (1) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.

5. Submit product schedule in the following format:
 - a. PDF electronic file
- F. Qualification Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Architects and owners, and other information specified.
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure. Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for

Project. Include the following information:

1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

PART 3 – EXECUTION

3.1 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

3.2 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note

corrections and field dimensions. Mark with approval stamp before submitting it to Architect.

- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.3 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of **five** previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

- D. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.
- I. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- J. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within thirty (30) days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may be the Contractor's project superintendent, separate quality control manager or other designated individual appointed by the contractor to be responsible for the quality of work on the job site
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests

- and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
- 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Complete test or inspection data.
 - 8. Test and inspection results and an interpretation of test results.
 - 9. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 10. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 11. Name and signature of laboratory inspector.
 - 12. Recommendations on retesting and re-inspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
- 1. Name, address, telephone number, and email address of technical representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- F. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- G. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- H. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- I. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- J. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- K. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- L. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect **seven** days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven (7) calendar days for initial review and each re-review of each mockup.
 - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 8. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspection will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- 1.8 SPECIAL TESTS AND INSPECTIONS
- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Landscape Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Landscape Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Landscape Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 2. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org
 - 3. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 4. AI - Asphalt Institute; www.asphaltinstitute.org.
 - 5. AIA - American Institute of Architects (The); www.aia.org.
 - 6. ANSI - American National Standards Institute; www.ansi.org.
 - 7. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
 - 8. ASTM - ASTM International; www.astm.org.
 - 9. AWS - American Welding Society; www.aws.org.
 - 10. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
 - 11. CSI - Construction Specifications Institute (The); www.csinet.org.
 - 12. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
 - 13. FSC - Forest Stewardship Council U.S.; www.fscus.org.
 - 14. ICBO - International Conference of Building Officials; (See ICC).
 - 15. ICC - International Code Council; www.iccsafe.org.
 - 16. NCMA - National Concrete Masonry Association; www.ncma.org.
 - 17. NSPE - National Society of Professional Engineers; www.nspe.org.
 - 18. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
 - 19. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
 - 20. TPI - Turfgrass Producers International; www.turfgrasssod.org.
 - 21. USGBC - U.S. Green Building Council; www.usgbc.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOE - Department of Energy; www.energy.gov.
5. EPA - Environmental Protection Agency; www.epa.gov.
6. FG - Federal Government Publications; www.gpo.gov/fdsys.
7. GSA - General Services Administration; www.gsa.gov.
8. HUD - Department of Housing and Urban Development; www.hud.gov.
9. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
10. OSHA - Occupational Safety & Health Administration; www.osha.gov.
11. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
12. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
13. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
14. USPS - United States Postal Service; www.usps.com.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 013300 "Submittal Procedures" for procedures for preparing and delivering submittals.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to Owner, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: The General Contractor shall furnish temporary "port-a-johns" for the construction period.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within fifteen (15) days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Erosion and Sedimentation Control Plan: Show compliance with requirements of Construction General Permit or authorities having Jurisdiction, whichever is more

stringent.

- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.
 - 1. Describe delivery, handling and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water and describes plans for dealing with water from these operations. Show procedures for verifying the wet construction has dried sufficiently to permit installation of finish materials.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with ANSI A10.6, NECA, NEMA, National Fire Protection Association (NFPA) 241 and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Owner. Provide materials suitable for use intended.
- B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- C. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel,

chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

- D. Water: Potable

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION:

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, and wash facilities. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar

- disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
 3. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- F. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
1. Install power distribution wiring overhead and rise vertically where least exposed to damage.
 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

2. Provide warning signs at power outlets other than 110 to 120 V.
 3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
 4. Provide metal conduit enclosures or boxes for wiring devices.
 5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits as indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.

- F. Temporary Signs: Provide Project signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touch up signs so they are legible at all times.
 - 3. All temporary signs shall be removed from the site at Substantial Completion.
- G. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.
 - 1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
 - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to authorities having jurisdiction.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide earthen embankments and barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
 - 1. Comply with requirements in Section 015639 "Temporary Tree and Plant Protection."
- I. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As indicated on Drawings.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with

- concrete.
- 4. Remove standing water from decks.
- 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

END OF SECTION 015000

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs.
 - 3. Section 312000 "Earth Moving"

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height six (6") inches above the ground for trees up to and including four (4") inch size at this height and as measured at a height of twelve (12") inches above the ground for trees larger than four (4") inch size.
- B. Tree-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Preserve Trees – Trees that are to be saved in place.
- D. Tree Protection Fence – Fence protecting natural areas and trees from construction work (see detail in plans).
- E. Critical Root Zone (CRZ): Equal to one (1.0') foot per inch of diameter measured at breast height for an individual tree.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 QUALITY ASSURANCE

- A. Preinstallation Conference: Before starting work on project, General Contractor shall meet with Owner and Landscape Architect to review tree protection and trimming procedures and responsibilities. Notify participants at least ten (10) working days before convening meeting. Record discussions and agreements and furnish a copy to each participant.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings
 - 1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
 - 2. Detail fabrication and assembly of protection-zone fencing and signage.
 - 3. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
 - 1. Organic Mulch: one (1) pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree.
 - 2. Location on site plan. Include unique identifier for each.
 - 3. Reason for pruning.
 - 4. Description of pruning to be performed.
 - 5. Description of maintenance following pruning.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. Quality-control program.

1.7 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA.

- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Stockpiled soil in location determined at the pre-construction conference.
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
 - 1. Type: Triple shredded hardwood
 - 2. Size Range: three (3) inches maximum, half (1/2") inch minimum
 - 3. Color: Natural/not dyed.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
 - 1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with two (2") inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from

minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet apart.

- a. Height: four (4') feet.
 - b. Color: High-visibility orange, nonfading.
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
- 1. Size and Text: As shown on Drawings.

PART 3 - EXECUTION

3.1 TREE REMOVAL

- A. Contractor shall remove all trees shown on the plans to be removed. All trees shown to be removed shall be felled with a chain saw and stump removed by Clearing Contractor.
- B. Care must be taken not to damage trees marked for protection.
- C. Clearing Contractor is to haul off all stumps.
- D. Burning is not permitted on Owner's property.
- E. Disposal: Remove excess excavated material, displaced

3.2 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.
- C. Tree Protection Sequence:
 - 1. Temporary erosion and sedimentation control measures
 - 2. Tree protection fence
 - 3. Tree Removal (as shown on Demolition Plans)
 - 4. Other site demolition
 - 5. Restaking of tree protection fence at the direction of Landscape Architect and Owner to include previously paved areas in Tree Protection Zones

3.3 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from

ponding, eroding, or excessive wetting caused by dewatering operations.

- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 2-inch uniform thickness of organic mulch where indicated on drawings. Do not place mulch within 6 inches of tree trunks.

3.4 TREE AND PLANT PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
- B. Tree protection fencing shall be installed outside the minimum radius of the Critical Root Zone (CRZ) of trees (CRZ defined as radius one (1') foot per caliper inch at DBH from trunk of tree).
- C. General Contractor's Surveyor shall stake all site improvements in order to facilitate accurate location of trenching and fencing operations.
- D. Install signage every fifty (50') feet indicating "Do Not Enter Tree Protection Area" in both English and Spanish.
- E. If construction occurs within the CRZ, at least twelve (12") inches of mulch and/or logging mats or plywood shall be placed where machinery maneuvers to reduce soil compaction in this zone.
- F. The tree protection fencing shall not be violated for the entire duration of the project without Owner's approval.
- G. Parking vehicles and/or storing supplies and equipment under trees is not permitted at any time.
- H. Review tree protection fencing with the Owner prior to any vegetation disturbance activity.
- I. Notify Landscape Architect after other site demolition occurs, such as areas previously paved. Some adjustment of tree protection fence may be required in order to protect critical root zones.
- H. Remediation includes but is not limited to replacement, pruning, supplemental water, mulch, nutrition (fertilizer, organic matter, etc.), insect/disease control, staking and compaction mitigation.
- I. After construction or impact, protection devices shall be removed. Mulch or other materials used for a root buffer shall be removed by hand within the critical root zone. It may be removed mechanically beyond this zone. There shall be three (3") inches of mulch

left on site.

- J. Maintain protection zones free of weeds and trash.
- K. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect. All tree replacement and corrective pruning requires Landscape Architect's approval.
- L. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Cut Ends: Do not paint cut root ends.
 - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and dispose of off-site.

3.7 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earthwork".
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately three (3") inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

3.10 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by

Landscape Architect.

1. Submit details of proposed root cutting and tree and shrub repairs.
 2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 4. Perform repairs within twenty-four (24) hours.
 5. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than twenty-five (25%) percent dead or in an unhealthy condition or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain.
- D. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.
- B. Burning is not permitted on Owner's property.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 4. Section 014200 "References" for applicable industry standards for products specified.
 - 5. Section 013300 "Submittal Procedures"
 - 6. Section 017700 "Closeout Procedures"

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional

manufacturers named in the specification.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," contractor required to submit product and additional documentation in order to establish equivalency for approval by Architect and Owner.

B. Product Selection Procedures:

1. Products:

- a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

2. Manufacturers:

- a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

3. Basis-of-Design Product:

- a. Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- b. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

- C. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

- 1. Evidence that proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents, and will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
- 2. Evidence that proposed product provides specified warranty.
- 3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
- 4. Samples, if requested.

- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 - 1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

- 1. Construction layout.
- 2. Field engineering.
- 3. Installation.
- 4. Coordination of Owner-installed products.
- 5. Progress cleaning.
- 6. Starting and adjusting.
- 7. Protection of installed construction.
- 8. Correction of the work.

- B. Related Sections include the following:

- 1. Division 1 Section 013300 "Submittal Procedures."
- 2. Division 1 Section 017700 "Closeout Procedures."

1.3 PREINSTALLATION MEETINGS

- A. Layout Conference: Conduct conference at Project site.

- 1. Prior to establishing layout of new perimeter fencing and site elements, review benchmark, control point, and layout and dimension requirements. Inform Architect and Owner of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Professional surveyor responsible for performing Project surveying and layout.
- 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
- 3. Review requirements for including layouts on Shop Drawings and other submittals.
- 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least ten (10) days prior to the time cutting and patching will be performed. Include the following information:
1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE:

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.

- f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
- 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 – EXECUTION

3.1 EXAMINATION:

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning Work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 1. Before construction, verify the location and points of all elements to remain and to be demolished. Verify all salvageable material with the Owner.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for Work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine floors and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION:

- A. Existing Utility Information: Obtain information necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT:

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly. Architect is not responsible if discrepancies are noted by the Contractor but are not reported to the Architect prior to construction.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each stage of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify the Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner.
- F. Use of Architect's CAD drawings is at Contractor's own risk. Architect is not responsible if discrepancies are discovered but not reported.
- G. The Contractor shall demolish and replace any work that does not meet the intentions of the drawings or that has unresolved discrepancies that are not brought to the Architect's attention prior to construction.

3.4 FIELD ENGINEERING:

- A. Identification: Existing benchmarks, control points, and property corners are noted in the drawings.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION:

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
 - C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
 - D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
 - E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - F. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
 - G. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
 - H. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
 - I. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 - J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - G. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamondcore drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.

3.7 PROGRESS CLEANING:

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with current requirements in National Fire Protection Association (NFPA) 241 for removal of combustible waste materials and debris.
 2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period to the extent possible for normal events.

3.8 STARTING AND ADJUSTING:

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If required, a factory-authorized service representative shall inspect field-assembled components and equipment installation.

3.9 PROTECTION OF INSTALLED CONSTRUCTION:

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK:

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
 - 1. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within thirty (30) days of date established for the Notice to Proceed.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Photographic documentation on all land clearing and construction and demolition waste to be disposed of off site.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of structural materials and 95 percent by weight of road and infrastructure materials generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.4 RECYCLING DEMOLITION WASTE

- A. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- C. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- D. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- F. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- G. Conduit: Reduce conduit to straight lengths and store by material and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

D. Paint: Seal containers and store by type.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Substantial Completion procedures.
 - 3. Final completion procedures.
 - 4. Project Record Documents and as-built surveys to ensure ADA compliance.
 - 5. Warranties.
 - 6. Operation and maintenance manuals. Instruction of Owner's personnel.
 - 7. Final cleaning.
 - 8. Repair of the Work.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls."
 - 2. Section 017419 "Construction Waste Management and Disposal."
 - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at final completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of

- products, equipment, and systems. Submit demonstration and training video recordings specified.
 - 6. Advise Owner of changeover in heat and utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements.
 - 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
- 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
- 1. Certified List of Incomplete Items: Submit a certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 3. Submit pest-control final inspection report.
 - 4. Submit final completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
- 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Upon completion of inspections, Architect will prepare a certificate of final acceptance.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect will return annotated file.

1.9 OPERATION AND MAINTENANCE MANUALS:

- A. Assemble three (3) complete sets of operation and maintenance data indicating the operation and maintenance of each piece of equipment. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
 - B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 5. The Owner will require one (1) hard copy of the warranty and three (3) CD's with pdf's of the warranty.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING:

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instruction at mutually agreed-on times.
 - 2. Schedule training with Owner with at least ten (10) days' advance notice.
- B. Develop an instruction session that includes training for all equipment as required by individual Specification Sections. Include instruction for the following:
 - 1. Review of documentation.
 - 2. Adjustments.
 - 3. Maintenance.
 - 4. Repair.

3.2 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface and apply a layer of mulch.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to site.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.

- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

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TASK DESCRIPTION

COMPLETED

A. General Requirements

- | | | |
|-----|--|-------|
| 1. | Certificate of Substantial Completion (AIA G704)
(Executed by Designer, Contractor and Owner) | _____ |
| 2. | Inspections Certifications | _____ |
| a. | Certificate of Occupancy
(By Building Inspections Officials) | _____ |
| b. | Copy of Building Official Inspection Card
(Showing required inspection approvals) | _____ |
| c. | Other Regulatory Inspection Sign-Offs (as applicable) | _____ |
| (1) | Certification Reports for All Backflow Assemblies
(Includes Plumbing, HVAC, Fire Protection as applicable) | _____ |
| (2) | Well Water Quality Test Report (if applicable) | _____ |
| (3) | Other Certifications as Required
(NCDPS, NC DOT, NC Land Quality, Local Government,
Utilities, Health Dept., Fireproofing Certification, Structural Steel
Inspection Certification, etc.) | _____ |
| 3. | Closeout Reports & Documentation | _____ |
| a. | Owner Instruction and Training with Equipment and Systems
(Memo/List of Attendees required for each session) | _____ |
| b. | HVAC Test and Balance Report
(Approval cover letter from Designer required) | _____ |
| c. | Attic Stock Turnover
(Transfer to Owner with Typed Inventory Required) | _____ |
| d. | Keys & Permanent Hardware Changeover
(Delivery of Final Keys and Cabinet to Owner; Memo of
Hardware Changeover Date) | _____ |
| e. | Insurance Coverage Change Over | _____ |
| f. | Utility Account Change Over | _____ |
| (1) | Electric Service | _____ |
| (2) | Gas Service | _____ |
| (3) | Water Service | _____ |
| (4) | Other Utility Service | _____ |
| g. | Data System Test Report | _____ |

TASK DESCRIPTION

COMPLETED

B. Record Document Requirements

- | | | |
|----|--|-------|
| 1. | As-Built Drawings Submitted by Contractor | _____ |
| a. | Site/Civil | _____ |
| b. | Architectural & Structural | _____ |
| c. | Plumbing | _____ |
| d. | Fire Protection | _____ |
| e. | Mechanical | _____ |
| f. | Electrical | _____ |
| g. | Security | _____ |
| h. | Other (Kitchen Equipment, etc.) | _____ |
| 2. | Fire Alarm/Sprinkler System Zone Map
(per jurisdictional requirements) | _____ |
| 3. | Final Finish Schedule
(updated with actual finishes and bound in with O+M Manual) | _____ |
| 4. | Operation & Maintenance (O+M) Manuals
(Approval cover letter from Designer required) | _____ |
| a. | Product & Operations Data | _____ |
| b. | Maintenance Information | _____ |
| 5. | Product Warranty Certificates/Maintenance Agreements
(Roof installation/other specialty products requiring Owner signature) | _____ |
| 6. | Shop Drawings and Submittals – Complete Set
(With Architect's Review Stamp) | _____ |
| 7. | Construction Site Documentation (if applicable)
(Contractor's Job Log and Photographs) | _____ |

TASK DESCRIPTION	COMPLETED
C. Final Accounting Requirements – by Contractor	_____
1. Contractor's Certification Of Completion Of Work	_____
2. Affidavit of Release of Liens (AIA G706A)	_____
3. Affidavit of Payment of Debts and Claims (AIA G706)	_____
4. Consent of Surety to Final Payment (AIA G707)	_____
5. Final Certified NC Sales Tax Report	_____
6. Final Request for Payment Certified by Designer	_____
D. Final Accounting Requirements – by Designer	_____
1. Cover Letter of Approval - HVAC Test & Balance Report (per item A-3b)	_____
2. Cover Letter of Approval - Operations & Maintenance Manuals (per item B-4)	_____
3. Cover Letter of Approval for Roof Warranty (per item B-5)	_____
4. Final Closeout Letter by Designer to include:	_____
a. Confirmation of Completion of Punch List	_____
b. Final Liquidated Damages Analysis	_____
c. Certification of Final Project Completion	_____
5. Record Drawings (electronic files and 1 reproducible set of all drawings based on Contractor As-Built)	_____
E. Warranty Period	_____
1. Pre-Expiration Warranty Inspection (Inspection 30 days prior to warranty expiration date)	_____

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Contractor shall submit Operation and Maintenance manuals prior to the 80% invoicing.
- B. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

- C. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
 - 2. Data to be bookmarked or separated into files with a clear folder organization system.
- D. Initial Manual Submittal: Submit draft copy of each manual at 80% completion according to billing on Pay Applications. Architect will comment on whether general scope and content of manual are acceptable.
- E. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 14 days of receipt of Architect's comments.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of

contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Architect.
 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.

8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.

6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control

sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. As Built Survey
 - 1. Contractor shall submit an as-built survey of all stairs, ramps, decking finish grades and building finish floor elevations for review and certification by Architect that constructed stairs comply with 2018 NC Building Code tread and riser uniformity requirements, Section 1011 "Stairways", Section 1012 "Ramps" and Section 1014 "Handrails", 2009 ICC A117.1 Section 502 Accessible "Parking Spaces" and Section 406 "Curb Ramps".
 - 2. Contractor shall submit an as-built survey of all Stormwater Control Measures (SCMs) and stormwater piping to indicate, volume, slopes, inverts and overflow devices.
 - 3. Additional as-built survey requirements are listed in Division 02 through Division 33 specifications and Contract Documents.
- B. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.

2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Submit PDF electronic files of scanned marked-up record prints and one paper-copy set of marked-up record prints.
- C. Record Specifications: Submit one paper copy and a PDF electronic file of Project's Specifications, including addenda and contract modifications.
- D. Record Product Data: Submit one paper copy and a PDF electronic file of each submittal.
 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- F. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

- A. General: Provide as-built surveys to scale with finished spot elevations as needed for the Work completed in the Scope of Work. The as-built survey shall be sealed by a professional land surveyor. Provide three(3) copies of the survey along with pdf and Autocad electronic files.
- B. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.

- b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings, completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials,

- and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders and record Drawings where applicable.

- B. Format: Submit record Specifications as annotated PDF electronic file and as a paper copy.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

- B. Format: Submit record Product Data as paper copy.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 – EXECUTION

3.1 MAINTENANCE OF RECORD DOCUMENTS

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit three copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.

- c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
- 2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
- 3. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data." The PDF file shall be indexed and text searchable.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.

- f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

- 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.
 - 1. Submit video recordings on thumb drive or by uploading to web-based Project software site.
 - 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes

the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

- a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. Email address.
- B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- C. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
1. Furnish additional portable lighting as required.
- D. Narration: Describe scenes on video recording. Include description of items being viewed.
- E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- F. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 020050 - MOBILIZATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This work shall consist of the mobilization of the Contractor's forces and equipment necessary for performing the work required under this Contract.
- B. It shall include the purchase of Contract Bonds; transportation of personnel, equipment and operating supplies to the site; establishment of other necessary facilities at the site; and other preparatory work at the site.

1.2 PAYMENT

- A. The amount of mobilization shall not exceed five (5) percent of the total Contract amount. Payment for the bid item "Mobilization" shall be a maximum of 2½ percent of the total amount bid on each of the first two partial pay estimates less retainage provided in the General Conditions.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 020050

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SECTION 020100 - EXISTING CONDITIONS

PART 1 - GENERAL

1.1 GENERAL

- A. Existing conditions are shown on the Contract Drawings. The Contractor shall visit the site, familiarize himself with actual conditions and verify existing conditions in the field.

1.2 PROTECTION

- A. Bench Marks: The Contractor shall maintain carefully all bench marks, monuments and other referenced points. If disturbed or destroyed, the Contractor shall replace as directed at no additional cost to the Owner.
- B. Existing Utilities: The existence and location of underground and other utilities indicated as existing are not guaranteed by the Owner. The Contractor shall verify the existence and location of utilities within the construction limits. The Contractor shall be held responsible for any damage to underground or overhead utility lines and shall promptly repair and restore services at no additional cost to the Owner.
- C. Other Existing Work Remaining: All existing conditions outside the Contract limits, curbs, sidewalks and paving damaged in performance of this work shall be restored without extra cost to the Owner in the manner prescribed by authorities having jurisdiction.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 020100

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SECTION 022220 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes furnishing all labor, materials and equipment necessary to perform all demolition work as required by drawings, as specified, and to complete site improvements and grading work.
- B. Related Items: Preconstruction photographs taken before demolition.
- C. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 2, Section 02200 "Earthwork"
 - 2. Division 2, Section 02230 "Tree Protection, Trimming and Removal"

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated in the drawings or specifications to be removed and salvaged or recycled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.4 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, or as proven to be owned by adjacent property Owners, public utility services, demolition materials shall become Contractor's property and shall be removed from the site. Contractor shall coordinate with property Owners and public utilities for removal from the property.

1.5 SUBMITTALS

- A. Schedule of demolition activities. Indicate the following:

1. Detailed sequence of demolition and removal work, with starting and ending dates of each activity
 2. Interruption of utility services.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Locations of temporary protection and means of egress.
- B. Photographs or videotape, sufficiently detailed of existing conditions of trees and plantings adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.6 PERMITTING

- A. The Contractor shall be responsible for securing all Demolition Permits, where applicable, from appropriate government agencies.

1.7 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in General Conditions. Review methods and procedures related to demolition including, but not limited to the following:
1. Inspect and discuss condition of construction to be demolished.
 2. Review structural load limitation of existing structures.
 3. Review and finalize demolition schedule and verify availability of demolition personnel, equipment and facilities needed to make progress and avoid delays.
 4. Review and finalize protection requirements.
 5. Review items to be salvaged.
 6. Review contractors planned program to contact effected parties described herein.
- D. Tree Pruning Standards: Meet requirements of the Section 02230, Tree Protection, Trimming and Removal.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01200, Project Meetings.

1.8 PROJECT CONDITIONS

- A. Hazardous materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner. Hazardous materials will be removed by Owner under a separate contract.

- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic or pedestrian ways if required by authorities having jurisdiction.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Notify utility locator service of Project limits before beginning site clearing operations.
 - 1. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 2. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 02200, Earthwork.
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

0.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during

construction.

- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 01500 Temporary Facilities and Controls.
- C. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- E. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- F. Locate and clearly flag trees and vegetation to be removed, to remain or to be relocated for Landscape Architects approval prior to demolition or relocation.
- G. Protect existing site improvements to remain from damage during construction
 - 1. Restore damaged improvements to their original condition, as acceptable by Owner.

3.2 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- B. Inventory and record the condition of items to be removed and salvaged.
- C. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Owner.
- D. Verify that hazardous materials have been remediated before proceeding with demolition operations.
- E. Verify that utilities have been disconnected and capped before starting selective demolition operations.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage. Inventory and record the condition of items to be removed and salvaged.

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems.

3.4 TREE PROTECTION

- A. Reference details, plans and Specification Section 02230 "Tree Protection, Trimming, and Removal" for specific demolition procedures around existing trees to remain.
- B. General Tree Protection Fencing: Install fencing located as indicated on the plans or outside the drip line of trees to protect remaining vegetation from construction damage. Do not store construction materials, debris, or excavated material within the fence line or root zone of existing trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.
- C. All Tree Repair work (as a result of damage from construction operations) must be performed by the Contractor promptly, within 24 hours of damage. Contractor shall notify Landscape Architect if existing trees are damaged, and present a written memo which outlines proposed course of action for approval prior to beginning repair. Follow demolition procedures detailed on the plans when working around plant material to remain.
- D. Contractor shall be responsible for any trees damaged during project by careless construction methods or damage above and below grade level by construction equipment. Contractor shall take extra care to minimize damage to existing trees in all cases. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property and dispose of in accepted waste facility.

3.5 PROTECTION

- A. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by Landscape Architect, items may be removed to a suitable, protected storage location during demolition and reinstalled in their original locations after demolition operations are complete.
- B. Existing Utilities: Maintain existing utility services and protect them against damage during demolition operations
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

3. Provide AT LEAST 72 hours' notice to Owner if shutdown of services is required during changeover.
- C. Temporary protection: Erect temporary protection such as walks, fences, and railings where required by authorities having jurisdiction and as indicated. Comply with requirements in general conditions.
 1. Protect existing site improvements, appurtenances, and landscaping to remain.
 2. Erect tree protection fencing as specified.
 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3.6 SELECTIVE DEMOLITION, GENERAL

A. General:

1. Removal of all existing above grade and below-grade elements as indicated and as necessary to facilitate new construction. Remove all below-grade wood, organic material, deleterious material, rubbish, foundations, brick, concrete, asphalt and metal construction to facilitate new construction.
2. Sawcut pavement edges: Sawcut pavements to full depth with clean straight cuts where proposed site improvements meet existing pavements to remain.
3. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
4. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
5. Dispose of demolished items and materials promptly.
6. Locate demolition equipment and remove debris and materials so as to not impose excessive loads on supporting walls, steep slopes or tree protection areas.
7. Site access and temporary controls: conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - a. Use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air, to the lowest level of air pollution practical for the condition of work. Comply with governing regulations.
 - b. Clean adjacent structures and improvements of all dust, dirt, and debris caused by demolition operations, and as directed by Owner. Return adjacent areas to the condition existing prior to the start of work.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain:

1. Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Landscape Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned, and reinstalled in their original locations after selective demolition operations are complete.

3.6 EXPLOSIVE DEMOLITION

- A. Explosives: Use of explosives is not permitted.

3.7 REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials
- C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.8 DISPOSAL

- A. General: Except for items indicated for reuse, salvage or reinstallation, or otherwise indicated to remain in Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
- B. Do not allow demolished material to accumulate on site.
- C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- D. Burning of removed materials will not be permitted on the site.
- E. Transport demolished materials off Owner's property and legally dispose of them offsite.

3.9 FILLING VOIDS

- A. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, roots and other organic matter, and stones larger than 2" in any dimension.
 - 1. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen materials, trash and debris.
 - 2. Place fill materials in horizontal layers not exceeding 6" in loose depth. Compact each layer at optimum moisture content of the fill material to 100% of the Standard Proctor Maximum Dry Density (ASTM D698).
 - 3. After fill placement and compaction, grade the surface to meet adjacent contours and to provide surface drainage.

3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.

END OF SECTION 022220

SECTION 022300 – TREE PROTECTION, TRIMMING, AND REMOVAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 2 – Section 02200 Earthwork

1.2 POTENTIAL AREAS OF BALD EAGLE NEST DISTURBANCE

- A. There are a few locations where park development shall occur within a protected buffer zone of a known bald eagle nest site. Strict adherence to the following requirements shall be the responsibility of the Contractor. Wake County Staff will assist with locating and marking the bald eagle nest and subsequent buffer zones.
 - 1. Breeding season in North Carolina is between November 1 – June 30 (the highest sensitivity is between November–February).
 - 2. **Within 0–330 ft of the eagle nest:** No tree clearing, construction or material staging during the breeding season. The following work is adjacent to this zone: Approximately 140 lf of the greenway trail follows the outside edge of this 330 ft buffer.
 - 3. **Within 330–660 ft of the eagle nest:** Tree clearing should be scheduled outside of the breeding season whenever possible (July–October). The following work is located within this zone: portions of the greenway trail, Sanitary Sewer utility connections, Boardwalk A across Lake Myra, Fishing Pier, and the Boating Access.
 - 4. **The 330' and 660' protected buffers shall be carefully and clearly marked in the areas noted above where tree clearing shall take place.**
 - 5. Additional signage may be required along these edges to ensure tree clearing in these areas adheres to the requirements above.
- B. If tree clearing within the 330-660 ft buffer zone must occur during breeding season:
 - 1. It shall commence as late in the season as possible (ideally April–June).
 - 2. Clearing shall begin at the farthest point away from the nest and progress toward it last.
 - 3. Contractor shall minimize noise and visibility using tree protection and/or silt fencing.
 - 4. Contractor shall avoid clearing within this zone in the two hours after sunrise and before sunset.

1.3 SUMMARY

- C. This Section includes the following:

1. Tree Protection Work
2. Tree Removal and Trimming
3. Tree Root Pruning

1.3 DEFINITIONS

A. The following is a list of definitions specific to this project:

1. Root Protection Zone – Equals one foot of radius for every inch of diameter of existing trees, or six-foot radius, whichever is greater. No disturbance allowed within this area. Area must be protected with both tree protection fence and warning signs.
2. Preserve Trees – Trees that are to be saved in place.
3. Protection Zones/Areas – Any area enclosed partially or completely by a fence shown on the natural resource plans.
4. Tree Protection Fence – Fence protecting natural areas and trees from construction work (see detail in plans).
5. Tree Root Pruning – Tree Root pruning is to remove the roots with a trenching procedure that is less damaging to the roots than regular construction.

1.4 QUALITY ASSURANCE

- A. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated.
- B. Preinstallation Conference: Before starting work on project, General Contractor shall meet with Owner and Designer to review tree protection and trimming procedures and responsibilities and review tree clearing areas. **NO TREE CLEARING SHALL COMMENCE PRIOR TO APPROVAL OF STAKED TREE CLEARING AREAS.** Notify participants at least ten working days before convening meeting. Record discussions and agreements and furnish a copy to each participant.
- a. See Section 1.2 above for specific bald eagle nest protection requirements. These requirements will be discussed at the Preinstallation Conference. Contractor shall propose and present a tree clearing schedule at this meeting that shows adherence with the requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Tree/Silt Protection Fencing: minimum 48" high, with 5' steel posts, woven wire fabric, (minimum 10-gauge line wires with minimum 12-1/2-gauge intermediate wires), silt fence fabric and all other accessories for a complete fence system.
1. Woven wire fabric (min. 10-gauge line wires with min. 12-1/2-gauge intermediate wires)
 2. 5' steel post
 3. Silt fence geotextile fabric

4. Weatherproof Tree Protection Area signs
- B. Tree Protection Fencing: Orange, UV resistant, high-tensile strength, poly barricade fabric; minimum 48" high, with 6' posts, and all other accessories for a complete fence system.
1. Artic vinyl flagging, Color: International Orange
 2. 6' post
 3. Weatherproof Tree Protection Area signs

PART 3 - EXECUTION

3.1 NATURAL RESOURCE PROTECTION SEQUENCE

- A. The sequence of tree treatment and preservation measures shall be:
1. Location and staking of bald eagle nest buffer zones as shown on the plans.
 2. Tree Protection Fencing
 3. Root Pruning
 4. Clearing and Grading
- B. General Contractor's Surveyor shall stake all site improvements in order to facilitate accurate location of trenching and fencing operations. See Section 1.2 above for any work within the eagle nest buffer zones.
- C. Maintain and repair Tree Protection Fencing during site construction operations.
- D. General Contractor's access to fenced tree protection areas will be permitted only with approval of owner's representative. No access shall be provided within the 330' protected bald eagle buffer zone.
- E. Perform any excavation or grading required within the fenced root zone areas by hand. This operation is to be supervised by the Designer.
- F. Limit required grading to 3" cut or fills within the fenced tree root zone areas. All grading to be supervised by the Designer.
- G. Do not install conduit, sprinklers, or any utility line in any critical root zone area without the approval of the owner.

3.2 FENCING

- A. Tree Protection/Silt Fencing: Fencing to be located in field by Contractor and verified by Owner prior to construction. Install fencing located as indicated or outside the drip line of trees to protect remaining vegetation from construction damage.
- B. Do not store construction materials, debris, or excavated material within the fence line or root zone of existing trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.

- C. Excavation or demolition activities required within tree protection zones must be done by hand, so that heavy equipment is kept out of tree protection zones.
- D. Do not allow fires under or adjacent to remaining trees or other plants.

3.3 TREE REMOVALS

- A. Contractor shall remove all trees shown on the plans to be removed. All trees shown to be removed shall be felled with a chain saw and stump removed by Clearing Contractor.
- B. Care must be taken not to damage trees marked for protection.
- C. Clearing Contractor is to haul off all stumps.

3.4 TREE ROOT PRUNING

- A. Trenching and excavation areas shall be determined and approved in the field by the Architect. Any such area shown in the drip line of any tree shall use root-pruning methodologies described herein.
- B. Determine location of root pruning to occur. Mark in place using paint or ball field marking clay. Mark a second line parallel to the first, 6 inches away from the cut slope and toward the tree. This line represents the location of the root pruning trench.
- C. A trencher that will turn at high RPM's is preferred, or an approved root pruning machine such as a pavement saw or a vibrating plow. Trencher is to be approved by the Landscape Architect and will be used to perform all root-pruning operations. A minimum depth of 18 inches is required. Clean cut roots in trench on tree side with loppers or chain saw after trenching is complete.
- D. The trench shall be backfilled with high organic content such as sphagnum, leaf mold or compost and compacted immediately or within 8 hours of opening trench. Only the trench area is to be compacted; no compaction or heavy equipment on tree roots.
- E. Thoroughly wet filled trench area within 8 hours of opening the trench.
- F. Where utility trenches are required within tree protection zones, hand excavate under or around tree roots or tunnel under tree roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- G. Do not allow exposed roots to dry out before placing permanent backfill.

3.5 TREE REPAIR AND REPLACEMENT

- A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots.
- B. Contractor shall remove/trim any trees that have been damaged during construction. Contractor shall be responsible for any trees damaged during project by careless

construction methods or damage above grade level by construction equipment. Contractor shall take extra care to minimize damage to existing trees in all cases.

3.6 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted on Owner's property.
- B. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property and dispose of in accepted waste facility.

END OF SECTION 022300

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Form-facing material for cast-in-place concrete.
 - 2. Form liners.

1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction, movement, contraction, and isolation joints
 - c. Forms and form-removal limitations.
 - d. Shoring and reshoring procedures.
 - e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Concealed surface form-facing material.
 - 2. Form liners.
 - 3. Form ties.

4. Form-release agent.

- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
1. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of the Architect.
 2. Indicate form liner layout and form line termination details.
 3. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
- C. Samples:
1. For Form Liners: 12-inch by 12-inch sample, indicating texture.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing and inspection agency.
- B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC308.
- C. Field quality-control reports.
- D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Form Liners: Store form liners under cover to protect from sunlight.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
 4. Furnish plastic or galvanized ties for concrete permanently exposed to weather.

2.3 RELATED MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 2. Form release agent for form liners shall be acceptable to form liner manufacturer.

- D. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
 - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips
 - 2. Use strike-off templates or compacting-type screeds.

- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
 - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
 - 5. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations. Curing and protection operations need to be maintained at unformed surfaces and applied at formed surfaces immediately after removal of forms, for the remainder of the curing period.
 - 1. Leave formwork for slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work.
 - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 - 1. Align and secure joints to avoid offsets.
 - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:

COUNTY OF WAKE

LAKE MYRA COUNTY PARK PHASE 1

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

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SECTION 032000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel reinforcement bars.
 - 2. Welded-wire reinforcement.
- B. Related Requirements:

1.2 PREINSTALLATION MEETINGS – OMITTED

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
 - 2. Zinc repair material.
 - 3. Bar supports.
- B. Sustainable Design Submittals – Omitted:
- C. Shop Drawings: Comply with ACI SP-066:
 - 1. Include placing drawings that detail fabrication, bending, and placement.
 - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - 3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.
- D. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
 - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
 - 2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:
 - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE – OMITTED

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Store reinforcement to avoid contact with earth.

CONCRETE REINFORCING

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS – OMITTED

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, **Grade 60**, deformed.
- B. Steel Bar Mats: ASTM A184/A184M, fabricated from **ASTM A615/A615M, Grade 60 (Grade 420)**, deformed bars, assembled with clips.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, **Grade 60 (Grade 420)**, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.4 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than **1 inch (25 mm)**, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with **ACI 318 (ACI 318M)**.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or **24 inches (610 mm)**, whichever is greater.
 - 2. Stagger splices in accordance with **ACI 318 (ACI 318M)**.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed **12 inches (305 mm)**.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus **2 inches (50 mm)** for plain wire and **8 inches (200 mm)** for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

CONCRETE REINFORCING

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

- A. Comply with **ACI 117 (ACI 117M)**.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

END OF SECTION 032000

CONCRETE REINFORCING

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SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Curing materials.
5. Accessories.
6. Repair materials.
7. Concrete mixture materials.
8. Concrete mixture class types.
9. Concrete mixing.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for concrete pavement and walks.
2. Section 321316 "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

1.4 ACTION SUBMITTALS

A. Product Data:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral fillers.
10. Admixtures:

- a. Include limitations of use. Admixtures that do not comply with reference ASTM International requirements must be submitted with test data for approval.

11. Color pigments.
12. Fiber reinforcement.
13. Vapor retarders.
14. Floor and slab treatments.
15. Liquid floor treatments.
16. Curing materials.

- a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

17. Joint fillers.
18. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Calculated equilibrium and fresh density for lightweight concrete.
7. Slump or slump flow limit.
8. Air content.
9. Nominal maximum aggregate size.
10. Steel-fiber reinforcement content.
11. Synthetic microfiber content.
12. Synthetic macrofiber content.
13. Intended placement method.
14. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each class of concrete indicated in "Concrete Mixture Class Types" Article, including the following:

1. Concrete class designation.
2. Location within Project.
3. Exposure class designation.
4. Formed surface finish designation and final finish.
5. Final finish for floors.
6. Floor treatment, if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

B. Material Certificates: For each of the following:

1. Cementitious materials.

2. Admixtures.
3. Curing compounds.
4. Bonding agents.
5. Adhesives.
6. Vapor retarders.
7. Semirigid joint filler.
8. Joint-filler strips.
9. Repair materials.

C. Material Test Reports: For the following:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral filler.
10. Admixtures.

D. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC's Acceptance Criteria AC380.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level 1. Testing agency laboratory supervisor tests to be an ACI-certified Concrete Laboratory Testing Technician, Level 2.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, **[acceptable to authorities having jurisdiction,]** qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

- a. Admixture dosage rates.
- b. Slump.
- c. Air content.
- d. Seven-day compressive strength.
- e. 28-day compressive strength.
- f. Evaluation of permeability-reducing admixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and **ACI 301**.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with **ACI 301** as follows:

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When air temperature has fallen to, or is expected to fall below **40 deg F** during the protection period, maintain delivered concrete mixture temperature within the temperature range required by **ACI 301**.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than **35 deg F**, other than reinforcing steel.

- B. Hot-Weather Placement: Comply with **ACI 301** and **ACI 305.1**, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed [**95 deg F**] [**other permitted limit**].
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with **ACI 301** unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

1. Portland Cement: ASTM C150/C150M, **Type I or Type II**.
2. Blended Hydraulic Cement: ASTM C595/C595M, **Type IP, Portland-pozzolan or Type IL, portland-limestone** cement.

- B. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, **Graded**
2. Maximum Coarse-Aggregate Size: **1 inch** nominal.
3. Fine Aggregate: ASTM C33/C33M.

2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.

2.4 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A. Include manufacturer's recommended thickness and adhesive or pressure-sensitive tape.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately **9 oz./sq. yd.** when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 1. Color:
 - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- D. Curing Paper: **8 ft.** wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable water that does not cause staining of the surface.

2.6 ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: **ASTM D1751, asphalt-saturated cellulosic fiber.**
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, **epoxy resin with a Type A shore durometer hardness of 80** in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and

bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. **Types IV and V, load bearing**, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURE MATERIALS

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with **ACI 301**.
 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:
 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 2. Slag Cement: 50 percent by mass.
 3. Silica Fume: 10 percent by mass.
 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
- D. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXTURE CLASS TYPES

- A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.
 1. Exposure Class: **ACI 318 Class F, Class C1**.
 2. Minimum Compressive Strength: **As indicated** at 28 days.
 3. Maximum w/cm Ratio: **As indicated**.
 4. Slump Limit: **8 inches, plus or minus 1 inch** with verified slump of 2 to 4 inches before adding highrange water-reducing admixture for concrete.
- B. Class C: Normal-weight concrete used for retaining walls.
 1. Exposure Class: **ACI 318 Class F2, Class C1**.
 2. Minimum Compressive Strength: **As indicated** at 28 days.
 3. Maximum w/cm Ratio: **As indicated**.
 4. Slump Limit: **8 inches, plus or minus 1 inch** with verified slump of 2 to 4 inches before adding high range water-reducing admixture for concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

- A. Comply with **ACI 117**.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than **6 inches**, sealing vapor retarder to concrete.
 4. Lap joints **6 inches** and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by **6 inches** on all sides and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.6 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient

- installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 1. If a section cannot be placed continuously, provide construction joints as indicated.
 2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with **ACI 301**.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least **6 inches** into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Scream slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
 1. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 2. Space vertical joints in walls **as indicated on Drawings**. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

3.8 APPLICATION OF CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 1. Comply with **ACI 301** for cold weather protection during curing.
 2. Comply with **ACI 301** and **ACI 305.1** for hot-weather protection during curing.
 3. Maintain moisture loss no more than **0.2 lb/sq. ft. x h**, calculated in accordance with ACI 305R,

before and during finishing operations.

B. Curing Formed Surfaces: Comply with **ACI 308.1** as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with **ACI 308.1** as follows:

1. Begin curing after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than **12 inches**.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 inches**, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
 - a) Water.
 - b) Continuous water-fog spray.
 - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application

without marring concrete surface, install prewetted absorptive cover over entire area of floor.

- a) Lap edges and ends of absorptive cover not less than **12 inches**.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
- 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 inches**, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than **12 inches**.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors To Receive Chemical Stain:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.

3.9 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

- a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and **ACI 301**, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
 - 13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
 4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.
- B. Delivery Tickets: comply with ASTM C94/C94M.
- C. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding **5 cu. yd.**, but less than **25 cu. yd.**, plus one set for each additional **150 cu. yd.** or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests as needed.
 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
 - a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is **40 deg F** and below or **80 deg F** and above, and one test for each composite sample when strength test specimens are cast.

5. Concrete Density: ASTM C138/C138M:
 - a. One test for each composite sample when strength test specimens are cast.
6. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and standard cure two sets of **three 6 inches** by **12-inches** or **4-inch** by **8-inch** cylindrical specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of **three** standard cured specimens at seven days and one set of two specimens at 28 days.
 - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than **500 psi** if specified compressive strength is **5000 psi**, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than **5000 psi**.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:
 - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with **ACI 301**, Section 1.7.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.10 PROTECTION

END OF SECTION 033000

SECTION 057300 – METAL FABRICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal fabrications for handrails and site railings.

1.3 DEFINITIONS

- A. Metal Fabrications include items made from iron and steel shaped, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

1.4 QUALITY ASSURANCE

- A. Shop Assembly: Preassemble items in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrication, including paint product and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Plates, Shapes and Bars: ASTM A 36.
- C. Fasteners, General: Select fasteners for the type, grade and class required as indicated on the drawings.
- D. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
- E. Lag Bolts: Square head type, FS F-B-561.
- F. Machine Screws: Cadmium plated steel, FS FF-S-92.
- G. Wood Screws: Flat head carbon steel FS FF-S 111.
- H. Plain Washers: Round, carbon steel, FS FF-W-92.
- I. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for flood resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for compatibility to provide a sound performance requirements of FS TT-P-645.
- J. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.

2.2 GENERAL FABRICATION

- A. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.

- E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- G. Galvanizing: Provide a Zinc coating for those items indicated or specified to be galvanized, as follows:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
 - 3. ASTM A 386 for galvanizing assembled steel products.
- H. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- I. Shop Painting
- J. Apply shop primer to surface of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No.1" for shop painting.
- K. Strip paint all edges, corners, crevices, bolts, welds, and sharp edges.
- L. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning"

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION

- A. General
 - 1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrication to in-place

construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, and true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
4. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

B. ADJUST AND CLEAN

1. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
2. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 057300

SECTION 061000 –
ROUGH CARPENTRY – SITE STRUCTURAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preservative-treated lumber.
3. Dimension lumber framing.
4. Miscellaneous lumber.

B. Related Requirements:

1. Section 061533 "Wood Patio Decking" for elevated decks, including support framing.
2. Section 064013 "Exterior Architectural Woodwork" for exterior wood stairs and railings.

1.2 DEFINITIONS

- A. Boards or Strips:** Lumber of less than **2 inches nominal** size in least dimension.
- B. Dimension Lumber:** Lumber of **2 inches nominal** size or greater but less than **5 inches nominal** size in least dimension.
- C. Exposed Framing:** Framing not concealed by other construction.
- D. Lumber grading agencies, and abbreviations used to reference them, include the following:**
1. NLGA: National Lumber Grades Authority.
 2. SPIB: The Southern Pine Inspection Bureau.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.**

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

1. For exposed lumber indicated to receive a stained or natural finish, **omit grade stamp and provide certificates of grade compliance issued by grading agency.**
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: **19 percent**.
2. Dimension Lumber: **19 percent** unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWP U1, Use categories as follows:

1. UC3B (All Other Commodity Specifications): Uncoated products excluding sawn products in exterior construction not in contact with ground, exposed to all weather cycles including prolonged wetting. Include **all rough carpentry except piles.**
2. UC4B: Piles.
3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
4. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, **omit marking and provide certificates of treatment compliance issued by inspection agency.**

D. Application: Treat **all rough carpentry unless otherwise indicated**

2.3 DIMENSION LUMBER FRAMING

A. Joist, girder and beam framing by Grade: **No. 2** grade.

1. Application: Boardwalk and bridge framing.
2. Species:
 - a. Southern pine; SPIB.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

- B. Dimension Lumber Items: **No. 2** grade lumber of **the following species**:

- 1. Southern pine; SPIB.

2.5 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than **1-1/2 inches** into wood substrate.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners **with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329**.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on **ICC-ES AC193 or ICC-ES AC308** as appropriate for the substrate.

2.6 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **Simpson Strong-Tie** or comparable product by approved alternate manufacturer:
- B. Materials: Unless otherwise indicated, fabricate from the following materials:
 - 1. Heavy-Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); **G185** coating designation; and not less than **0.036 inch** thick.
 - a. Use for wood-preservative-treated lumber and where indicated.

2.7 MISCELLANEOUS MATERIALS

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.

- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF FLOOR JOIST FRAMING

- A. General: Install floor joists with crown edge up and support ends of each member with not less than **1-1/2 inches** of bearing on wood. Attach floor joists as follows:
 - 1. Where supported on wood members, by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than **2 inches** from top or bottom.
- C. Provide solid blocking of **2-inch nominal** thickness by depth of joist at ends of joists unless nailed to header or band.

END OF SECTION 061000

SECTION 061715

ENGINEERED STRUCTURAL WOOD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural composite lumber.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for dimension lumber items associated with engineered structural wood.

1.2 PREINSTALLATION MEETINGS – OMITTED

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on adhesives, fabrication, and protection.
 - 2. For preservative-treated wood products, include manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 3. For connectors, include installation instructions.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

1.5 QUALITY ASSURANCE - OMITTED

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of engineered wood product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable design stresses, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.3 STRUCTURAL COMPOSITE LUMBER

- A. Treated Parallam Plus PSL Lumber SL2 (Wolmanized PSL): **Structural** composite lumber made from wood veneer strands, evaluated and monitored in accordance with ASTM D5456, and treated in accordance with AWPA Standard U1 for SL1 use category.
 - 1. Allowable Stresses:
 - a. Extreme Fiber Stress in Bending, Edgewise (Fb): **1885 psi.**
 - b. Modulus of Elasticity, Edgewise (E): **1,490,000**
 - c. Minimum Modulus of Elasticity (Em): **759,000 psi.**
 - d. Horizontal Shear (Fv): **180 psi.**
 - e. Tension Parallel to Grain (Ft): **1,595 psi.**
 - f. Allowable Compression Stress, Parallel to the Grain (Fc): **1,310 psi.**

ENGINEERED STRUCTURAL WOOD

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2.4 PREFABRICATED WOOD I-JOISTS – OMITTED

2.5 PRESERVATIVE TREATMENT – OMITTED

2.6 FASTENERS

- A. General: Fasteners are to be of size and type indicated and to comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than **1-1/2 inches** into wood substrate.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon Steel Bolts: ASTM A307 with **ASTM A563 (ASTM A563M)** hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on **ICC-ES AC01** as appropriate for the substrate.

2.7 METAL FRAMING ANCHORS – OMITTED

2.8 MISCELLANEOUS MATERIALS - OMITTED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that joist flange widths match hanger widths.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Do not install in direct contact with concrete or masonry.

3.3 INSTALLATION OF STRUCTURAL COMPOSITE LUMBER

- A. Install to comply with ESR report, manufacturer's written instructions, and applicable code.
 - 1. Install in dry, covered conditions where average in-service moisture content of lumber is 16 percent or less.
 - 2. Install metal framing connections in accordance with AWC's "National Design Specification (NDS) for Wood Construction." Install fasteners through each fastener hole.
 - a. Connections based on NDS or manufacturer's test or code reports.
 - 3. Install lumber plumb and level. Accurately fit, align, securely fasten, and install free from distortion or defects.
 - 4. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
- B. Cutting: Confirm size and location of field cutting, notching, and drilling with ESR report, registered design professional, and manufacturer.

3.4 INSTALLATION OF PREFABRICATED WOOD I-JOISTS – OMITTED

3.5 INSTALLATION OF ENGINEERED RIM BOARDS – OMITTED

3.6 PROTECTION - OMITTED

- A. Protect wood that has been treated with SBX from weather. If, despite protection, SBX-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

ENGINEERED STRUCTURAL WOOD

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END OF SECTION 061715

ENGINEERED STRUCTURAL WOOD

061715 - 1

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SECTION 069500 - TIMBER CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Scope

1. Furnish labor, equipment, and materials necessary to complete the construction of horizontal timber edging and retaining walls.

1.2 PAYMENT

- B. Payment for this item is included in the Base Bid.

PART 2 - PRODUCTS

- 2.1 Lumber may be recycled or new but shall be sound, well-manufactured pressure-treated Southern yellow pine, S4S, Kiln-dried, with a maximum moisture content of 19 percent, with no excessive checks, splits or surface irregularities. 6" x 6" timbers shall have received a 0.40 PCF pressure-treated, complying with AWWA LP-22. Timbers shall be #2 grade. Warped lumber may not be used.

- 2.2 All fasteners and hardware shall be galvanized steel, unless otherwise noted. #4 Rebar shall be used to anchor timbers.

- 2.3 Stone used for backfilling behind retaining walls and used for footing foundations shall be #57 washed stone, as defined by NCDOT specifications.

- 2.4 Filter fabric used to wrap backfill behind retaining walls shall be supac 5NP, Trevira 1120, Amoco 4551, or approved equal.

PART 3 - EXECUTION

- 3.1 Timber construction work shall be set accurately to required levels and lines as shown on the drawings. Field location will be staked by the Contractor for inspection and written approval of the Landscape Architect prior to installation.

COUNTY OF WAKE

LAKE MYRA COUNTY PARK PHASE 1

Members shall be set plumb and true, and shall be accurately and neatly cut and fitted. Fasteners shall be installed without splitting of the wood, pre-drilling as required. Use galvanized washers under bolt heads, and pull bolt nuts tight with heads and washers in close contact with wood.

Chamfer or rout exposed edges of top timbers of walls as directed on plans or as shown in details. All rough ends, edges and/or cuts shall be belt-sanded to smooth.

Field cut lumber shall receive a job site treatment of the preservative, same as for pressure treatment.

END OF SECTION 069500

SECTION 099000 - PAINTING

PART 1 - GENERAL

1.1 Description of Work

- A. Work included in this Section shall consist of providing all painting, as indicated on Drawings and as specified.

1.2 Definition

- A. Term "Paint" as used herein includes emulsion, enamels, paints, varnishes, stains, oils, and other coatings used as prime, intermediate, or finish coats.

1.3 Surfaces to be Painted

- A. Complete coverage of all exposed surfaces is intended. Without restricting the extent of the work to be performed, the work shall include but is not limited to the following:
 - 1. Ferrous Metal: All exposed surfaces of all ferrous metal work, including galvanized, which is not finished painted under other sections.

1.4 Related Documents: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.5 Quality Assurance

- A. Standard: All painting work shall be done only by skilled mechanics using adequate tools for work to be done.
- B. Acceptable Manufacturers: Products of the following manufacturers similar to those specified herein and meeting all requirements of these specifications will also be acceptable for use on Project:
 - 1. Sherwin-Williams
 - 2. Glidden
 - 3. Pratt & Lambert
- C. Source: Products for use on this Project for each type of surface to be coated shall be of one manufacturer unless noted specifically otherwise herein.

1.6 Submittals

- A. Color Samples: (If requested) Submit to the Landscape Architect in triplicate a range of the manufacturer's color samples for color selection. Contractor will receive complete approved color schedule prior to ordering paint. Samples shall be a minimum of 6"x6".

1.7 Product Handling

- A. Storage of Materials: Paints, enamels, lacquers, sealers, stains, varnish, paste fillers and similar materials shall be delivered in original sealed containers that plainly show designated name, formulas, or specification number, batch number, color, date of manufacturer, manufacturer's directions, and name of manufacturer.

Store all materials in single, heated space, provided by General Contractor.

1.8 Environmental Conditions

- A. General: Exterior painting shall not be performed when the temperature is below 50 degrees F., while the surface is damp, during cold, rains, or frosty weather, or when temperature is likely to drop to freezing within 24 hours. Avoid painting surfaces while they are exposed to hot sun.
- B. Cleaning Area: Before painting is started in any area, the area shall be broom cleaned. Dust shall be removed from all areas to be painted.

1.9 Protection

- A. Drop Cloths: Protect adjacent areas and installations by use of drop cloths or other approved precautionary measures.

1.10 Extra Stock

- A. Extra Stock: Contractor shall turn over to the Owner one gallon of each type and final color of paint used on project. Furnish updated color schedule showing manufacturer, line or quality of paint, and color used.

PART 2 - PRODUCTS

2.1 Paint Materials

- A. All materials used for work shall be types specified in this Section. Paint shall arrive at project site, ready-mixed, except for tinting of undercoats, and thinning, if directed by manufacturer's printed instruction. Tinting materials shall be as recommended by manufacturer for particular materials to be tinted.

2.2 Thinner:

- A. Type and product recommended by manufacturer of finishing material.
 - 1. Turpentine: Pure gum spirits of turpentine, ASTM Specification D13.
 - 2. Mineral Spirits: ASTM Specification D13.

2.3 Putty:

- A. Commercial grade of putty composed of linseed oil, whiting, and white lead.

2.4 Application Equipment:

- A. Equipment shall be adequate and in keeping with Work and workmanship required herein.

PART 3 - EXECUTION

3.1 Inspection of Surfaces:

- A. Before starting any Work, examine surfaces to receive paint finish for defects which cannot be corrected by procedures specified and which might prevent satisfactory results. Do not proceed with Work until such conditions are corrected. Commencing of Work shall constitute acceptance of surfaces, and thereafter the Contractor shall be fully responsible for satisfactory Work.

3.2 Preparation of Surfaces:

- B. Paints shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch. In no case shall paint be applied to surfaces upon which there is visible frost or ice.
 - 1. Ferrous Surfaces: Surfaces that have not been shop-coated shall be solvent cleaned to remove oil and grease. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be mechanically cleaned by power wire brushing or sandblasting.

After cleaning, apply one coat of ferrous metal primer to all ferrous surfaces that are to receive paint other than asphalt varnish. Protect shop-coated metal from corrosion before and after installation by treating corroded areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be wire brushed and touched up with the same materials as the shop coat. All edges of repair in need of touch up shall be carefully feathered out on exposed surfaces.

2. Galvanized Surfaces: Galvanized surfaces to be painted shall be solvent cleaned and treated in accordance with paint Manufacturer's directions.

3.3 Application

- A. Method of Application: All exterior paint shall be applied by brush, rollers, or sprayers in accordance with manufacturer's recommendations for the particular surface to be painted.
- B. Sequence of Coats: Allow sufficient time between successive coats to permit proper drying. Modify as necessary to suit adverse weather conditions.

If the Landscape Architect so directs, succeeding coats shall not be applied until he/she has had opportunity to inspect completed coat.

- C. General Requirements for Workmanship: Where color, stain, dirt, or undercoats show through final coat of paint, surface shall be covered by additional coats until paint film is of uniform finish, color, appearance, thickness, and coverage, at no additional cost to Owner.

Give special attention to ensure that edges, corners, crevices, welds, and rivets receive film thickness equivalent to that of adjacent painted surfaces.

Touch up all scarred and abraded areas on shop-primed work after cleaning and smoothing down to avoid shoulders.

Rate of application shall not exceed average rate of coverage recommended by manufacturer for type of surface involved.

Finished surfaces shall be free from runs, drops, ridges, waves, laps, sags, brush marks; and free of variations in color, texture and finish.

3.4 Painting Schedule

- A. Painting Schedule – Exterior:

1. Ferrous Metal Work:
 - a. One (1) Coat Galvanized Metal Primer
 - b. Two (2) Coats Semi-Gloss Alkyd Enamel

The General Contractor shall ensure that the paint systems specified and used are compatible with primers applied under other sections of the specifications.

END OF SECTION 099000

SECTION 116800 – PLAYGROUND EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes playground equipment as follows:
 - 1. Owner Furnished / Contractor Installed (OFCI) Freestanding playground equipment.
 - 2. Owner Furnished / Contractor Installed (OFCI) Composite playground equipment.

1.3 DEFINITIONS

- A. Definitions in ASTM F 1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and testing agency.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. Installer Qualifications: An entity that employs installers and supervisors who are Certified installers by the playground equipment manufacturer and with the following minimum experience requirements:

1. A minimum of (3) installed public playgrounds in North Carolina satisfying U.S. CPSC Public Playground Safety Handbook recommendations.
2. A minimum of (3) Owner references for each installed playground.

PART 2 - PRODUCTS

2.1 FREESTANDING PLAYGROUND EQUIPMENT

1. Owner provided – new
2. Owner provided - reclaimed

2.2 COMPOSITE PLAYGROUND EQUIPMENT

1. Owner provided – new
2. Owner provided - reclaimed

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
 1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.

- D. Post Set with Concrete Footing: Comply with Section 033000 "Cast-in-Place Concrete" dry-packaged concrete-mix manufacturer's written instructions for measuring, batching, mixing, transporting, forming, and placing concrete.
 - 1. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
 - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
 - 2. Embedded Items: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
 - 3. Finishing Footings: Smooth top, and shape to shed water.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of the Owner Furnished play equipment manufacturer factory-authorized service representative.
 - 1. Contractor shall perform inspection and testing by personnel with Certified Playground Safety Inspector (CPSI) Certification for each type of installed playground equipment according to ASTM F1487.
- B. Playground equipment items will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Notify Landscape Architect and Owner 48 hours in advance of date(s) and time(s) of testing and inspection.

**PLAYGROUND EQUIPMENT SUBCONTRACTOR'S QUALIFICATION STATEMENT FOR
INSTALLATION OF PLAYGROUND EQUIPMENT AND PLAY SURFACING**

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

ORGANIZATION:

How many years has your organization been in business as a playground equipment installation contractor?

LICENSING AND CERTIFICATIONS:

List jurisdictions and trade categories in which your organization is legally qualified to do business and indicate registration or license numbers.

Is your Organization a Landscape Structures Certified Installer of Landscape Structures Playground Equipment which will be utilized on this project?

Does your organization have staff who have obtained Certified Playground Safety Inspector (CPSI) Certification?

EXPERIENCE:

List all playground projects installed by your organization that includes play equipment and play surfacing installation in the last five years and satisfies U.S. CPSC Public Playground Safety Handbook recommendations. Include date of completion, duration, project size, location and references

CLAIMS AND SUITS:

Any pending arbitration or mediation cases or lawsuits. This may include all arbitration, mediation and lawsuits settled or resolved within last ten (10) years.

SIGNATURE:

Dated

Name of Organization:

By:

Title:

END OF SECTION 116800

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SECTION 130000 – TRAIL BUILDING SUBCONTRACTOR QUALIFICATION REQUIREMENTS

The Bidder shall furnish the following information designed to assist the Owner in determining whether or not the Bidder is qualified to perform the work described in the Bid and Contract Documents (*specifically trail building*):

1. List three references with contact person and telephone number who are qualified to objectively judge the results of similar work, including trail building, performed by the bidder in the last five years.

A.	_____	_____
	NAME AND TITLE	TELEPHONE NUMBER
	_____	_____
	PROJECT TITLE/DESCRIPTION	DATE OF COMPLETION
	_____	_____
B.	_____	_____
	NAME AND TITLE	TELEPHONE NUMBER
	_____	_____
	PROJECT TITLE/DESCRIPTION	DATE OF COMPLETION
	_____	_____
C.	_____	_____
	NAME AND TITLE	TELEPHONE NUMBER
	_____	_____
	PROJECT TITLE/DESCRIPTION	DATE OF COMPLETION
	_____	_____

2. List previous contracting experience, including contract dollar amounts:

END OF SECTION 130000

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 COMPLIANCE

- A. All work associated with the potable water system is to be completed in accordance with the City of Raleigh Standards and Specifications.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
 - 1. Wiring Diagrams: Power, signal, and control wiring for alarms.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
 - 1. Notify Architect and Construction Manager no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of water-distribution service without Architect's and Construction Manager's written permission.

1.9 COORDINATION

- A. Coordinate connection to water main with the City of Raleigh.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Application" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

2.3 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Gaskets: AWWA C111, rubber.
- C. Flanges: ASME 16.1, Class 125, cast iron.
- D. Pipe lining shall be cement mortar with a seal coat of bituminous material in accordance with AWWA C104. All buried ductile iron pipe shall have a bituminous exterior coating in accordance with AWWA C151.

2.4 PE PIPE AND FITTINGS

- A. PE, ASTM Pipe: ASTM D2239, SDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 200 psig.
 - 1. Insert Fittings for PE Pipe: ASTM D2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
 - 2. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig.
 - 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig.

2.5 GATE VALVES

- A. AWWA, Cast-Iron Gate Valves:
 - 1. Nonrising-Stem, Resilient-Seated Gate Valves:
 - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - 1) Standard: AWWA C509.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.

2.6 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Tapping-Sleeve Assemblies:
 - 1. Description: Sleeve and valve compatible with drilling machine.

- a. Standard: MSS SP-60.
 - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
 - c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
 - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.7 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
 - 1. Operation: Continuous-pressure applications.
 - 2. Configuration: Designed for horizontal, straight through flow.
 - 3. Accessories:
 - a. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

2.8 WATER METER BOXES

- A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.
- B. Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
- C. Description: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.

2.9 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.

1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
2. Manhole: ASTM A 48/A 48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.
 - a. Dimension: 24-inch minimum diameter, unless otherwise indicated.
3. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
 - a. Dimension: 24-inch-minimum diameter, unless otherwise indicated.
4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.10 PROTECTIVE ENCLOSURES

A. Freeze-Protection Enclosures:

1. Description: Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.
 - a. Standard: ASSE 1060.
 - b. Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.
 - c. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
 - 1) Housing: Reinforced-aluminum or –fiberglass construction.
 - a) Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
 - b) Drain opening for units with drain connection.
 - c) Access doors with locking devices.
 - d) Insulation inside housing.
 - e) Anchoring devices for attaching housing to concrete base.
 - 2) Electric heating cable or heater with self-limiting temperature control.

B. Enclosure Bases:

1. Description: 4-inch-minimum thickness precast concrete, of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.

2.11 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Standards: UL 246, FMG approved.
 - b. Pressure Rating: 250.
 - c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
 - e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
 - f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.12 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections

1. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-high brass sleeve; and round escutcheon plate.

2.13 ALARM DEVICES

- A. Alarm Devices, General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.
- B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with 2 single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.
- C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.
- D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type K.
- F. Underground water-service piping NPS 4 to NPS 8 shall be any of the following:
 - 1. Soft copper tube, ASTM B 88, Type K.
 - 2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
- G. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 shall be same as underground water-service piping.
- H. Underground Fire-Service-Main Piping NPS 4 to NPS 12 shall be the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed and mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
- I. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 12 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, non-rising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, non-rising-stem, resilient-seated gate valves with valve box.

3.4 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. Make connections larger than NPS 2 with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- D. Make connections NPS 2 and smaller with drilling machine according to the following:
 - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
 - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 - 4. Install corporation valves into service-saddle assemblies.
 - 5. Install manifold for multiple taps in water main.
 - 6. Install curb valve in water-service piping with head pointing up and with service box.
- E. Install PE pipe according to ASTM D2774 and ASTM F645.
- F. Bury piping with depth of cover over top at least 48 inches.
- G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- H. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
 - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.5 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
 - 1. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
 - 2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
 - 3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
 - 4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Heat-fused joints.
 - 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 - 2. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

3.8 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.

3.9 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.10 VACUUM BREAKER ASSEMBLY INSTALLATION

- A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.11 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.12 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

3.13 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.

3.14 PROTECTIVE ENCLOSURE INSTALLATION

- A. Install concrete base level and with top approximately 2 inches above grade.
- B. Install protective enclosure over valves and equipment.
- C. Anchor protective enclosure to concrete base.

3.15 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- C. AWWA Fire Hydrants: Comply with AWWA M17.

3.16 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install ball drip valves at each check valve for fire department connection to mains.
- B. Install protective pipe bollards on three sides of each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.17 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
 - 2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.
- C. Locking and Sealing: Secure unsupervised valves as follows:
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.
- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.
- F. Connect alarm devices to building fire alarm system.

3.18 CONNECTIONS

- A. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.
- B. Connect water-distribution piping to interior domestic water and fire-suppression piping.

- C. Connect waste piping from concrete vault drains to storm-drainage system. See Section 33 42 00 "Stormwater Conveyance" for connection to storm-sewer piping.

3.19 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.20 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 31 20 00 "Earth Moving."

3.21 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

SECTION 221313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 COMPLIANCE

- A. All work associated with the sanitary sewer system is to be completed in accordance with the City of Raleigh Standards and Specifications.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Ductile-iron, gravity sewer pipe and fittings.
 - 2. PVC pipe and fittings.
 - 3. Cleanouts.
 - 4. Manholes.
 - 5. Concrete.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Pipe and fittings.
 - 2. Cleanouts.
- B. Shop Drawings: For manholes. Include plans, elevations, sections, details, frames and covers.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:
 - 1. Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
 - 2. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet and to vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

- B. Product Certificates: For each type of pipe and fitting.
- C. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

1.7 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect and Construction Manager no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Architect's and Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM C150 and C151.
- B. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153/A21.53, ductile iron, for push-on joints.
- D. Gaskets: AWWA C111/A21.11, rubber.
- E. For 10-inch diameter and smaller gravity sewer mains, pipe lining shall be cement mortar with a seal coat of bituminous material, all in accordance with AWWA C104.

2.2 PVC PIPE AND FITTINGS

- A. PVC Cellular-Core Sewer Piping:
 - 1. Pipe: ASTM F891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
 - 2. Fittings: ASTM D3034, SDR 35, PVC socket-type fittings.
- B. PVC Profile Sewer Piping:

1. Pipe: ASTM F794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D3034, PVC with bell ends.
3. Gaskets: ASTM F477, elastomeric seals.

C. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F477, elastomeric seals for gasketed joints.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.

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10. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch-minimum-width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

2.5 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350, and the following:

1. Cement: ASTM C150/C150M, Type II.
2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 2 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of **1** percent unless otherwise indicated.
 - 2. Install piping with 48-inch minimum cover.
 - 3. Install ductile-iron, gravity sewer piping according to ASTM A746.
 - 4. Install PVC cellular-core sewer piping according to ASTM D2321 and ASTM F1668.
 - 5. Install PVC profile sewer piping according to ASTM D2321 and ASTM F1668.
 - 6. Install PVC gravity sewer piping according to ASTM D2321 and ASTM F1668.
- G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
 - 2. Join PVC cellular-core sewer piping according to ASTM D2321 and ASTM F891 for solvent-cemented joints.
 - 3. Join PVC profile sewer piping according to ASTM D2321 for elastomeric-seal joints or ASTM F794 for gasketed joints.
 - 4. Join PVC gravity sewer piping according to ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasket joints.

3.4 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.
- E. Install manhole-cover inserts in frame and immediately below cover.

3.5 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.6 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Heavy-Duty, top-loading classification cleanouts in all areas.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.7 CONNECTIONS

- A. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."
- B. Connect force-main piping to building's sanitary force mains specified in Section 221316 "Sanitary Waste and Vent Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and

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encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 CLOSING ABANDONED SANITARY SEWER SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:
 1. Remove manhole and close open ends of remaining piping.
 2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Section 312000 "Earth Moving."

3.9 IDENTIFICATION

- A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
 1. Use warning tape or detectable warning tape over ferrous piping.
 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.10 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 1. Submit separate report for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.

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- b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Test plastic gravity sewer piping according to ASTM F1417.
 - b. Test concrete gravity sewer piping according to ASTM C1628.
 7. Manholes: Perform hydraulic test according to ASTM C969.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.11 CLEANING

- A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION 221313

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SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Poles and accessories.
- C. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.
- E. Section 26 51 00 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2025).
- B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.
- C. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.
- D. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).
- E. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- F. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- G. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019 (Reaffirmed 2025).
- H. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- I. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- K. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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- M. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
- D. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide 5-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

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- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LUMINAIRES

- A. Manufacturers:
 - 1. Acuity Brands, Inc
 - 2. Cooper Lighting, a division of Cooper Industries
 - 3. Hubbell Lighting, Inc
 - 4. RAB Lighting, Inc
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- I. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 POLES

- A. Manufacturers:
 - 1. Acuity Brands, Inc
 - 2. Cooper Lighting, a division of Cooper Industries
 - 3. Hubbell Lighting, Inc
 - 4. RAB Lighting, Inc
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. All Poles:
 - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
 - 2. Structural Design Criteria:
 - a. Comply with AASHTO LTS.
 - b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
 - 3. Material: Steel, unless otherwise indicated.
 - 4. Shape: Square straight, unless otherwise indicated.
 - 5. Finish: Match luminaire finish, unless otherwise indicated.

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6. Unless otherwise indicated, provide with the following features/accessories:
 - a. Top cap.
 - b. Anchor bolts with leveling nuts or leveling shims.
- C. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires in accordance with NECA/IESNA 501.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- H. Pole-Mounted Luminaires:
 1. Maintain the following minimum clearances:
 - a. Comply with IEEE C2.
 - b. Comply with utility company requirements.
 2. Foundation-Mounted Poles:
 - a. Install foundations plumb.
 - b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - c. Tighten anchor bolt nuts to manufacturer's recommended torque.
 3. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 - b. Provide supplementary ground rod electrode as specified in Section 26 05 26 at each pole bonded to grounding system as indicated.
 4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

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- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Install lamps in each luminaire.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.04 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION 26 56 00

SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Stripping and stockpiling rock.
 - 6. Removing above- and below-grade site improvements.
 - 7. Disconnecting, capping or sealing, and **removing site utilities or abandoning site utilities in place.**
 - 8. Temporary erosion and sedimentation control.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify **utility locator service** for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control **and plant-protection** measures are in place.
- D. Retain "Tree- and Plant-Protection Zones" Paragraph below if required according to Section 015639 "Temporary Tree and Plant Protection."
- E. Tree-and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earthwork."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed **or abandoned in place**.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than **two** days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots, obstructions, and debris to a depth of **18 inches** below exposed subgrade.
 - 3. Use only hand methods for grubbing within protection zones.
 - 4. Chip removed tree branches and **dispose of off-site**.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of **6 inches** in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to **72 inches**
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
 - 4. Stockpile surplus topsoil to allow for resspreading deeper topsoil.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated on contract drawings.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. No burning will be permitted.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.
9. Excavating well hole to accommodate elevator-cylinder assembly.

- B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
3. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Section 01 22 00 "Unit Prices."
- B. Quantity allowances for earth moving are included in Section 01 21 00 "Allowances."
- C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.

1. 24 inches outside of concrete forms other than at footings.
2. 12 inches outside of concrete forms at footings.
3. 6 inches outside of minimum required dimensions of concrete cast against grade.
4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches beneath bottom of concrete slabs-on-grade.
6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.
 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.

- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.5 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct pre-excavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.
 - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
 - d. Extent of trenching by hand or with air spade.
 - e. Field quality control.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D698.
- C. Blasting plan approved by authorities having jurisdiction.
- D. Seismic survey report from seismic survey agency.
- E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
 - 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 - 2. Seismographic monitoring during blasting operations.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
 - 1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 - 2. Seismographic monitoring during blasting operations.
- C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify utility locator service or "One Call" for area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 01 50 00 "Temporary Facilities and Controls" and Section 31 10 00 "Site Clearing" are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Section 01 56 39 "Temporary Tree and Plant Protection" are in place.

- F. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification GW, GP, GM, GC, SW, SP, SM, SC, ML, CL, CL-ML according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils (in the upper 3 feet of final subgrade elevation): Soil Classification MH and CH according to ASTM D2487.
- D. Unsatisfactory Soils: Soil Classification OL, OH, and PT according to ASTM D2487.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90

percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

- H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Course: Narrowly graded mixture of washed crushed stone or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- K. Sand: ASTM C33/C33M; fine aggregate.
- L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Survivability: As follows:
 - a. Grab Tensile Strength: 157 lbf; ASTM D4632.
 - b. Sewn Seam Strength: 142 lbf; ASTM D4632.
 - c. Tear Strength: 56 lbf; ASTM D4533.
 - d. Puncture Strength: 56 lbf; ASTM D4833.
 - 3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
 - 4. Permittivity: 0.5 per second, minimum; ASTM D4491.
 - 5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Survivability: As follows:
 - a. Grab Tensile Strength: 247 lbf; ASTM D4632.
 - b. Sewn Seam Strength: 222 lbf; ASTM D4632.
 - c. Tear Strength: 90 lbf; ASTM D4533.

- d. Puncture Strength: 90 lbf; ASTM D4833.
- 3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
- 4. Permittivity: 0.02 per second, minimum; ASTM D4491.
- 5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

2.3 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXPLOSIVES

- A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
 1. Perform blasting without damaging adjacent structures, property, or site improvements.
 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 - 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells,

joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.

- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring, bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 03 30 00 "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 03 30 00 "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill:
 - 1. Soil Backfill: Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 - 2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- G. Final Backfill:
 - 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
 - 2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
 - 2. Under walkways, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
 - 3. Under turf or unpaved areas, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1 inch.
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.
 2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 2. Place base course material over subbase course under hot-mix asphalt pavement.
 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698.

- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
 - 3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.20 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material classification and maximum lift thickness comply with requirements.
 - 3. Determine, during placement and compaction that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold milling of existing hot-mix asphalt pavement.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt paving.
 - 4. Hot-mix asphalt paving overlay.
 - 5. Asphalt surface treatments.
 - 6. Pavement-marking paint.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.
- C. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by NCDOT.
- B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

- C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of NCDOT and the City of Raleigh for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- E. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Prime Coat: Minimum surface temperature of 60 deg F.
 - 2. Tack Coat: Minimum surface temperature of 60 deg F.
 - 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 - 4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials or 55 deg F for water-based materials], and not exceeding 95 deg F.

- C. Imprinted Asphalt Paving: Proceed with coating imprinted pavement only when air temperature is at least 50 deg F and rising and will not drop below 50 deg F within 8 hours of coating application. Proceed only if no precipitation is expected within two hours after applying the final layer of coating.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22.
- B. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.
- C. Prime Coat: Asphalt emulsion prime coat complying with NCDOT requirements.
- D. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- E. Fog Seal: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- F. Water: Potable.
- G. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

- C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- D. Joint Sealant: ASTM D 6690, hot-applied, single-component, polymer-modified bituminous sealant.
- E. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.
- F. Wheel Stops: Solid, integrally colored, 96 percent recycled HDPE or commingled postconsumer and postindustrial recycled plastic; UV stabilized; 4 inches high by 6 inches wide by 72 inches. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by NCDOT and designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
- D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Re-compact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Spread mix at minimum temperature of 250 deg F.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent nor greater than 100 percent.
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
 2. Surface Course: 1/8 inch.
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.8 WHEEL STOPS

- A. Install wheel stops in bed of adhesive as recommended by manufacturer.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of un-compacted paving mixtures and compacted pavement according to ASTM D 979.
1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.10 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow milled materials to accumulate on-site.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Driveways and roadways.
 - 2. Parking lots.
 - 3. Walkways.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Obtain Architect's approval of mockups before starting construction.
 - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 - 5. Demolish and remove approved mockups from the site when directed by Architect.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete producer.
 - d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

- F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- H. Deformed-Steel Wire: ASTM A 496.
- I. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- J. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.
- K. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- L. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- M. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- N. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.
- O. Zinc Repair Material: ASTM A 780.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
- C. Water: ASTM C 94/C 94M.

- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

- E. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

2.8 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: According to NCDOT standard specifications and details.

2.9 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
 - 1. Compressive Strength (28 Days): As specified on the Drawings.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
 - 3. Slump Limit: 4 inches.
 - 4. Air Content: 5 percent plus or minus 1.5 percent.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and sub-base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared sub-base surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll sub-base in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
 - 3. Sub-base with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.
 - 3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from sub-base surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten sub-base to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

- J. Screed pavement surfaces with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact sub-base and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 10. Joint Width: Plus 1/8 inch, no minus.

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 3.12 REPAIRS AND PROTECTION
- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
 - B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321713 - PARKING BUMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Precast concrete wheel stops.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Precast concrete wheel stops.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

- A. Precast Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete; 4000-psi minimum compressive strength; manufacturer's standard height and width. Provide chamfered corners and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
 - 1. Source Limitations: Obtain wheel stops from single source from single manufacturer.
 - 2. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
 - 3. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.
- B. Install wheel stops in bed of adhesive before anchoring to substrate.
- C. Securely anchor wheel stops to substrate with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes painted markings applied to asphalt and concrete pavement.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For pavement markings.
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the City of Raleigh and NC Department of Transportation for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials or 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.
 - 1. Color: As indicated.
- B. Pavement-Marking Paint: MPI #32, alkyd traffic-marking paint.
 - 1. Color: As indicated.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than three minutes.
 - 1. Color: As indicated.
- D. Pavement-Marking Paint: MPI #97, latex traffic-marking paint.
 - 1. Color: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Unitary, seamless surfacing.

1.3 DEFINITIONS

- A. Definitions in ASTM F 2223 apply to Work of this Section.
- B. Critical Height: Standard measure of shock attenuation according to ASTM F 2223; same as "critical fall height" in ASTM F 1292. According to ASTM F 1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."
- C. SBR: Styrene-butadiene rubber.
- D. Unitary Surfacing: A protective surfacing of one or more material components bound together to form a continuous surface; same as "unitary system" in ASTM F 2223.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of protective surfacing.
 - 1. Include plans, sections, placement and penetration details, and attachment to substrates.
 - 2. Include accessories and edge terminations.
 - 3. Include patterns made by varying colors of surfacing and details of graphics.
 - 4. Include fall heights and use zones for equipment and structures specified in Section 116800 "Playground Equipment and Structures," coordinated with the critical heights for protective surfacing.
- C. Samples for Initial Selection: For each type of exposed finish.
 - 1. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type of protective surfacing and exposed finish.
 - 1. Include Samples of accessories to verify color and finish selection.

2. Unitary, Seamless Surfacing: Minimum 6 by 6 inches.
 3. Stabilizing Mats: Minimum 12 by 12 inches.
 4. Drainage/Separation Geotextile: Minimum 12 by 12 inches.
- E. Product Schedule: For protective surfacing. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of unitary surfacing product.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. A minimum of (3) installed public playground poured in place rubber surfacing in North Carolina satisfying U.S. CPSC Public Playground Safety Handbook recommendations.
 2. A minimum of (3) Owner references for each installed playground surfacing.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for materials and execution.
 1. Build mockups for protective surfacing including accessories.
 - a. Size: 48 inches by 48 inches.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Reduction in impact attenuation as measured by reduction of critical fall height.
 - b. Deterioration of protective surfacing and other materials beyond normal weathering.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain protective surfacing materials from single source from single manufacturer.
 - 1. Provide geosynthetic accessories of each type from source recommended by manufacturer of protective surfacing materials.

2.2 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: Critical fall height tested according to ASTM F 1292.
- B. Accessibility Standard: Minimum surfacing performance according to ASTM F 1951.

2.3 UNITARY, DUAL-DENSITY, SEAMLESS SURFACING

- A. Description: Manufacturer's standard, site-mixed and applied, two-layer material with wearing layer over cushioning layer, with combined, overall thickness as required, tested for impact attenuation according to ASTM F 1292 and for accessibility according to ASTM F 1951.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Surface America, Inc.; Playbound
 - b. Child Safe Products, Inc; Everguard
 - c. GameTime, a PlayCore, Inc. company; GT Impax Poured Rubber
 - d. Safe Guard Surfacing Corp, Poured-in-Place.
 - e. Xgrass Pour in Place Playground Safety Surfacing.
 - 2. Wearing Layer: Formulation of EPDM rubber particles with a minimum of 20 percent and maximum of 26 percent of ethylene propylene-diene-saturated polymethylene main chain, binder, and other organic and inorganic components.

3. Cushioning Layer: Manufacturer's standard formulation of SBR particles and binder.
4. Binder: Weather-resistant, UV-stabilized, flexible, nonhardening, 100 percent solids polyurethane complying with requirements of authorities having jurisdiction
5. Lacquer Topcoat: Manufacturer's standard polyurethane-based formulation.
6. Critical Height:
 - a. accommodate playground manufacturer's critical fall height within the fall protection zone for each playground equipment and account for increases in critical fall height due to changes in finish grade of play surface below playground equipment.
 - b. 6'-0" outside fall protection zones for each playground equipment.
7. Overall Thickness: Not less than as required for critical height indicated.
8. Primer/Adhesive: Manufacturer's standard primer and weather-resistant, moisture-cured polyurethane adhesive suitable for unit, substrate, and location.
9. Wearing Layer Color(s): As selected by Landscape Architect from manufacturer's full range.
 - a. Design: Where colored pattern is required, provide as indicated on Drawings.

- B. Leveling and Patching Material: Portland cement-based grout or epoxy- or polyurethane-based formulation suitable for exterior use and approved by protective surfacing manufacturer.

2.4 GEOSYNTHETIC ACCESSORIES

- A. Drainage/Separation Geotextiles: Comply with Section 312000 "Earth Moving."
- B. Drainage/Separation Geotextile: Nonwoven, needle-punched geotextile, manufactured for drainage applications and made from polyolefins or polyesters; with the following minimum properties:
 1. Weight: 4 oz./sq. yd.; ASTM D 5261.
 2. Water Flow Rate: 100 gpm/sq. ft. according to ASTM D 4491.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.
 1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary, protective surfacing installation and that substrate surfaces are dry, cured, and uniformly sloped to

drain within recommended tolerances according to protective surfacing manufacturer's written requirements for cross-section profile.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.
- B. Hard-Surface Substrates: Clean surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with protective surfacing.
 - 1. Repair: Fill holes and depressions in unsatisfactory surfaces with leveling and patching material.
 - 2. Treatment: Mechanically abrade or otherwise prepare concrete substrates according to protective surfacing manufacturer's written instructions to achieve adequate roughness.
 - 3. Terminal Edges: Saw cut concrete for terminal edges of protective surfacing.
 - 4. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through protective surfacing.

3.3 INSTALLATION OF GEOSYNTHETIC ACCESSORIES

- A. Install geosynthetic accessories before edging and according to playground surface system manufacturer's and geosynthetic manufacturer's written instructions and in a manner that cannot become a tripping hazard.
 - 1. Drainage/Separation Geotextile: Completely cover area beneath protective surfacing, overlapping geotextile sides and edges a minimum of 8 inches with manufacturer's standard treatment for adhesively bonded or taped] seams.
 - 2. Weed-Control Barrier: Completely cover area beneath loose-fill installation, overlapping barrier edges a minimum of 8 inches with manufacturer's standard treatment for adhesively bonded or taped seams.

3.4 INSTALLATION OF SEAMLESS SURFACING

- A. Mix and apply components of seamless surfacing according to manufacturer's written instructions to produce uniform, monolithic, and impact-attenuating protective surfacing of required overall thickness.
 - 1. Substrate Primer: Apply over prepared substrate at manufacturer's standard spreading rate for type of substrate.
 - 2. Poured Cushioning Layer: Spread evenly over primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints.
 - 3. Intercoat Primer: Over cured cushioning layer, apply primer at manufacturer's standard spreading rate.
 - 4. Wearing Layer: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and, except

where color changes, with no cold joints. Finish surface to produce manufacturer's standard wearing-surface texture.

- a. Design: Where colored pattern is required, place colored, design material as soon as previously placed material is sufficiently cured, using primer or adhesive if required by manufacturer's written instructions.
5. Lacquer Topcoat: Spray or roller applied at manufacturer's standard coating rate in one continuous operation.
6. Edge Treatment: As indicated on Drawings. Fully adhere edges to substrate with full coverage of substrate. Maintain fully cushioned thickness required to comply with performance requirements.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Perform the following tests with the assistance of a factory-authorized service representative:
 1. Perform "Installed Surface Performance Test" according to ASTM F 1292 for each protective surfacing type and thickness in each playground area.
 2. Perform installed-surface-performance tests at no less than one series of tests for each 1000 sq. ft. of each type and thickness of in-place protective surfacing or part thereof.
- C. Playground protective surfacing will be considered defective if it does not pass tests.
- D. Prepare test reports.

3.6 PROTECTION

- A. Prevent traffic over seamless surfacing for not less than 48 hours after installation.

END OF SECTION 321816.13

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SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl chain-link fences.
 - 2. Swing gates.
 - 3. Horizontal-slide motor-operated gates.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete for cast-in-place concrete post footings.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review coordination of interlocked equipment specified in this Section and elsewhere.
 - 2. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Gates and hardware.
- B. Shop Drawings: For each type of fence and gate assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include accessories, hardware, gate operation, and operational clearances.
- C. Samples for Initial Selection: For each type of factory-applied finish.

- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
 - 1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.
- E. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For factory-authorized service representative.
- B. Product Certificates: For each type of chain-link fence and gate.
- C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.
- C. Mockups: Build mockups to set quality standards for fabrication and installation.
 - 1. Build mockup for typical chain-link fence and gate, including accessories.
 - a. Size: 10-foot length of fence.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.
- B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.
 - 1. Design Wind Load: 90 mph.
 - a. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.
- C. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
 - 1. Fabric Height: As indicated on Drawings.
 - 2. Steel Wire for Fabric: No. 11 gauge core size.

- a. Mesh Size: 2-inches diamond woven mesh.
 - b. PVC Coated Fabric: ASTM F 668, Class 2b over zinc-coated steel wire.
 - 1) Color: Black, according to ASTM F 934.
 - c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
3. Selvage: Twisted top and knuckled bottom.

2.3 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
- 1. Fence Height: As indicated on Drawings.
 - 2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.
 - a. Line Post: 2.375-inch O.D. PVC-coated, galvanized piping. 2.375 inches in diameter.
 - b. End, Corner, and Pull Posts: 4.0 inches in diameter.
 - 3. Horizontal Framework Members: Intermediate, top, and bottom rails according to ASTM F 1043.
 - a. Top Rail: 1.66 inches in diameter.
 - 4. Brace Rails: ASTM F 1043.
 - 5. Metallic Coating for Steel Framework:
 - a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating according to ASTM A 653/A 653M.
 - 6. PVC coating over galvanized piping.
 - a. Color: Black to match chain-link fabric, according to ASTM F 934.

2.4 TENSION WIRE

- A. Polymer-Coated Steel Wire: 0.177-inch-diameter, tension wire according to ASTM F 1664, Class 2b over zinc-coated steel wire.
- 1. Color: Black to match chain-link fabric, according to ASTM F 934.

2.5 SWING GATES

- A. General: ASTM F 900 for gate posts and [single] [double] swing gate types.

1. Gate Leaf Width: As indicated on Drawings.
2. Framework Member Sizes and Strength: Based on gate fabric height.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
2. Gate Posts: Round tubular steel.
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded or assembled with corner fittings.

D. Hardware:

1. Hinges: 360-degree inward and outward swing.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Lock: Manufacturer's standard internal device.
4. Closer: Manufacturer's standard.

2.6 HORIZONTAL-SLIDE GATES

A. General: ASTM F 1184 for gate posts and [single] [double] sliding gate types.

1. Classification: Type II Cantilever Slide, Class 2 with internal roller assemblies.
 - a. Gate Frame Width and Height: As indicated on Drawings.

B. Pipe and Tubing:

1. Zinc-Coated Steel: Protective coating and finish to match fence framework.
2. Gate Posts: ASTM F 1184. Provide round tubular steel posts.
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded or assembled with corner fittings.

D. Hardware:

1. Latch: Permitting operation from both sides of gate.
2. Lock: Manufacturer's standard internal device.

2.7 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide weather-tight closure caps on all posts, same material as posts.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
 - a. PVC coating over metallic coating.
2. Aluminum: Mill finish.

2.8 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

2.9 GROUNDING MATERIALS

- A. Comply with requirements in [Section 260526 "Grounding and Bonding for Electrical Systems."](#)
- B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.

1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Concealed Concrete: Place top of concrete 2 inches below grade to allow covering with surface material.
- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of **[15 degrees or more] [30 degrees or more] [as indicated on Drawings] <Insert requirement>**. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

- E. Line Posts: Space line posts uniformly as indicated on the drawings.
- F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
 - 1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- I. Intermediate and Bottom Rails: Secure to posts with fittings.
- J. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- K. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.
- L. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- M. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 GROUNDING AND BONDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fence and Gate Grounding:
 - 1. Ground for fence and fence posts shall be a separate system from ground for gate and gate posts.
 - 2. Install ground rods and connections at maximum intervals of 1500 feet.
 - 3. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
 - 4. Ground fence on each side of gates and other fence openings.
 - a. Bond metal gates to gate posts.
 - b. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
- C. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a ground rod located a maximum distance of 150 feet on each side of crossing.
- D. Fences Enclosing Electrical Power Distribution Equipment: Ground according to IEEE C2 unless otherwise indicated.
- E. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
 - 1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
 - 2. Make grounding connections to each barbed tape coil with connectors designed for this purpose.
- F. Connections:
 - 1. Make connections with clean, bare metal at points of contact.
 - 2. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 4. Make above-grade ground connections with mechanical fasteners.

5. Make below-grade ground connections with exothermic welds.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Prepare test reports.

3.7 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust and maintain chain-link fences and gates.

END OF SECTION 323113

SECTION 323300 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Recycled Plastic Benches.
 - 2. Rectangular picnic tables.
 - 3. Round picnic tables.
 - 4. Bicycle racks.
 - 5. Trash and recycling receptacles.
 - 6. Hand pump for water play.
 - 7. Gates for water play.
 - 8. Grill.
- B. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete footings.
 - 2. Section 310000 "Earthwork" for excavation for installation of concrete footings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For units with factory-applied color finishes.
- C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- D. Material Certificates: For site furnishings, signed by manufacturers.
 - 1. Recycled plastics.
- E. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Bench Replacement Planks: No fewer than two full-size units for each size indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Structural Pipe and Tube: ASTM B 429.
 - 4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 5. Castings: ASTM B 26/B 26M.
- B. Steel and Iron: Free of surface blemishes and complying with the following:
 - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
 - 3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
 - 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
 - 5. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
 - 6. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.
- C. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
 - 1. Polyethylene: Fabricated from virgin plastic HDPE resin.
 - 2. Recycled Polyethylene: Fabricated from not less than 100 percent recycled, purified, fractional-melt plastic resin HDPE.
- D. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.

- F. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- G. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
 - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M

2.2 RECYCLED PLASTIC BENCHES

- A. Product: 6-FT long Pilot Rock RJ Thomas Mfg. Co, Inc. (#1-800-762-5002) Contour Park Bench – Multi-Pedestal Model# WRB or approved equal. Color shall be **Brown**.
- B. In ground mounted as per manufacture recommendations.
- C. Concrete footing shall be double the dia. of the post and shall be 3000 PSI concrete.

2.3 RECTANGULAR PICNIC TABLES

- A. Products:
 - 1. Pilot Rock. #1-800-762-5002: Model UT and UTH End Accessible Picnic Table or approved equal. – Color: Submit standard color options to Owner for selection.
- B. Frame: All welded 1-5/8" OD steel pipe end frames (1.660" OD, 11 ga. wall, 1-1/4" ID nom. pipe specifications). All 3/8" dia. galvanized carriage bolt fasteners.
 - 1. Frame Finish: Hot dip galvanized after fabrication.
- C. Recycled Plastic Seat and Tabletop: As per manufacturer Color to be determined by owner.
 - 1. Description: Per manufacturer.
- D. Installation Method: Per manufacturer, surface mounted (anchored) to concrete sidewalk.
- E. Anchors, Fasteners, Fittings, and Hardware: Commercial quality; tamperproof, vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site and street furnishings' assembly, mounting, and secure attachment per manufacturer.

1. Material: Manufacturer's standard, corrosion-resistant-coated or non-corrodible materials.
- F. Non-shrink, Nonmetallic Grout: ASTM C 1107; for exterior applications.
- G. Erosion-Resistant Anchoring Cement: Factory-packaged formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended for exterior applications.

2.4 ROUND PICNIC TABLES

- A. Products:
 1. Kay Park 46" Round Perforated Table, Thermoplastic. Model: 4-seat option MC46PSRTP and Model: 3-seat option MC46PSRTPADA3 or approved equal. – Color: Submit standard color options to Owner for selection.
- B. Top and seats: ½" punched steel
- C. Frame: ¾" x 2" Angle Iron Outer Frame, 2" Round Tubing Frame Material
 1. Frame Finish: Hot dip galvanized after fabrication.
- D. Thermoplastic Coated Seat and Tabletop: As per manufacturer Color to be determined by owner.
 1. Description: Per manufacturer.
- E. Installation Method: Per manufacturer, surface mounted (anchored) to concrete sidewalk.

2.5 BICYCLE RACKS

- A. Products: Landscape Forms 'Ride' Bike Rack or approved equal
- B. Bicycle Rack Construction:
 1. Frame: Aluminum Casting
 2. Style: Double-side parking
 - a. Overall Height: 26"
 - b. Overall Length: 28"
 - c. Overall Depth: As indicated by manufacturer
 - d. Capacity: Designed to accommodate no fewer than two bicycles
 3. Installation Method: Embedded
- C. Finish: factory applied powdercoat (primer plus two finish coats) Color to be selected by owner.

2.6 TRASH AND RECYCLING RECEPTACLES

- A. General: 32-gallon, powder coat finished, heavy-duty steel receptacle with rain bonnet and 32-gallon liner. Color: **Green for Recycle, Tan for Waste**. Receptacles to be designed for surface mounting to concrete sidewalk.
- B. Products:
 - 1. Pilot Rock. #1-800-762-5002), 32-gallon receptacle with dome lid and weld steel frame ring. (model TRH #SPC-TR-004) or approved equal.
 - a. Trash Lid Model #CN-PD-27.
 - b. Recycle Lid Model #CN-PC Series.
 - c. Inner Liner Model #CNG-2310C
 - 2. Installation method – Surface Pedestal Mount
 - 3. Finish: 100% Recycled Plastic slats with solid color and U.V. stabilizer for ultraviolet protection. (see above for colors)

2.7 HAND PUMP FOR WATER PLAY

- A. Product: Goric Winder Pump Model E5662900, to use onsite potable water connection or approved equal.
 - 1. Installation method – Surface pedestal mount
 - 2. Finish: Stainless Steel

2.8 GATES FOR WATER PLAY

- A. Product: Goric Balance Gate Model E5663010, Flap Gate Model E5663040, and Draw Gate Model E5663030, or approved equal.
 - 1. Installation method – Embedded
 - 2. Finish: Stainless Steel

2.9 GRILL

- B. Products: Pilot Rock Model N-20, Multilevel Park Grill or approved equal
- C. Grill Construction:
 - 1. Firebox – 3/16" plate steel

2. Grate – 5/8" dia. A-36 steel bars for support handles and 1/2" dia. A-36 steel bars spaced 1-1/8" on center, permanently attached to firebox
 3. Size:
 - a. Overall Height: 36 3/16"
 - b. Overall width: 25 3/8"
 4. Installation Method: Embedded in a 12" dia., 36" deep concrete footing
- D. Finish: Stainless steel

1.2 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

1.3 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1.4 ALUMINUM FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

1.5 STEEL AND GALVANIZED STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

1.6 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and

spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

2.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 323300

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 3. Section 329300 "Plants" for placing planting soil for plantings.

1.3 1.03 EXTENT OF SOIL PREPARATION

- A. As defined by Sheet L-XXX in the Construction Drawings.

1.4 CONTRACTOR'S RESPONSIBILITY

- A. It is the contractor's responsibility to prepare those areas identified for specified soil preparation including the provision and installation of imported soil material as specified. Following installation and approval by Landscape Architect, soil will be sampled and tested for further amendments and fertilization. Following soil testing, it is the contractor's responsibility to amend the soil per the soil test's recommendations, fine grade by raking, seeding, plant installation and mulching.

1.5 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.6 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
 - F. Imported Soil: Soil that is transported to Project site for use.
 - G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
 - H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
 - I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
 - J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
 - K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
 - L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
 - M. SSSA: Soil Science Society of America.
 - N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
 - O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
 - P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
 - Q. USCC: U.S. Composting Council.
- 1.7 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site.
- 1.8 ACTION SUBMITTALS
- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.

4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Samples: For each bulk-supplied material, 1-Quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.9 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Preconstruction Test Reports: Soil test

1.10 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
 1. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.11 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
 1. Number and Location of Samples: Minimum of six representative soil samples from varied locations where directed by Landscape Architect for each soil to be used or amended for landscaping purposes.
 2. Procedures and Depth of Samples: Samples to be a depth of 8".
 3. Labeling: Label each sample with the date.

1.12 TESTING REQUIREMENTS

- A. Chemical Testing:
 1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
 3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
 4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.
- B. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol including the following:
1. Percentage of organic matter.
 2. CEC, calcium percent of CEC, and magnesium percent of CEC.
 3. Soil reaction (acidity/alkalinity pH value).
 4. Buffered acidity or alkalinity.
 5. Nitrogen ppm.
 6. Phosphorous ppm.
 7. Potassium ppm.
 8. Manganese ppm.
 9. Manganese-availability ppm.
 10. Zinc ppm.
 11. Zinc availability ppm.
 12. Copper ppm.
 13. Sodium ppm and sodium absorption ratio.
 14. Soluble-salts ppm.
 15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
 16. Other deleterious materials, including their characteristics and content of each.
- C. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- D. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for six (6") inch depth of soil.
 2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for six (6") inch depth of soil.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Do not move or handle materials when they are wet or frozen.
 - 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. Planting-Soil Type for all areas where lawn, plant beds or now mow or meadow seed mix is designated on the plans, and areas previously paved: Contractor is responsible for importing a soil mix that consists of 1/3 compost, 1/3 manure, and 1/3 topsoil.
 - 1. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - 2. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of eight (8%) percent by dry weight of the imported soil.
 - 3. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding two (2") inches in any dimension.

2.2 IMPORTED SOIL COMPONENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
 - 1. Reaction: pH of 5.5 to 8.
 - 2. Soluble-Salt Concentration: Less than 4 dS/m.
 - 3. Moisture Content: 35 to 55 percent by weight.
 - 4. Organic-Matter Content: 100% percent of dry weight.
 - 5. Particle Size: Minimum of 98 percent passing through a 1-inchesieve.

- B. Topsoil: Soil with a pH of 5.8-6.2; of uniform texture and free of chips, stones, sticks, soil, or toxic materials. Particle size limited to 98% passing through one-half (1/2") inch sieve.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of six (6") inches in shrub, groundcover and native grass areas prior to four (4") inch amended soil addition. Remove stones larger than one-and-one-half (1-1/2") inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread unamended soil to total depth of four (4") inches but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 FIELD QUALITY CONTROL

- A. Soil will be considered defective if it does not meet final grade elevations and is not smooth, consistent and free of extraneous materials or is not installed to required depths as determined by Landscape Architect.

3.4 PROTECTION

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Landscape Architect and replace contaminated planting soil with new planting soil.

3.5 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

END OF SECTION 329113

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SECTION 329119 - LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Special fine grading of all planted areas
- B. Related Sections:
 - 1. Section 015639 – Temporary Tree and Plant Protection
 - 2. Section 323300 – Site Furnishings
 - 3. Section 321313 – Concrete Paving
 - 4. Section 329200 – Turf and Grasses
 - 5. Section 329300 – Plants
- C. Existing Conditions:
 - 1. Contractor shall accept actual conditions at the project site and do work specified without additional compensation for possible variation from grades and conditions shown, whether surface or subsurface. All grading work shall be unclassified except for rock removal as described herein.
- D. Protection:
 - 1. Benchmarks and Monuments: Maintain carefully all benchmarks, monuments and other reference points. If disturbed or destroyed, replace as directed. If found at variance with the drawings, notify the Project Coordinator before proceeding to lay out work.
 - 2. Protection of Existing Work Remaining: All existing curbs, sidewalks, driveways and paving damaged in performance of this work shall be restored without additional cost to the Owner in the manner prescribed by authorities having jurisdiction.
 - 3. Tree Preservation and Protection: During all phases of earthwork and site grading, the Contractor shall comply with Section #015639 Temporary Tree and Plant Protection.

1.2 DEFINITIONS

- A. Planar Slope: A uniformly flat slope or surface regardless of orientation (i.e., not curved or parabolic)
- B. Parabolic Slope: A typical, non-uniform slope with smooth curve transitions at the toe and crest of the slope.
- C. Flat Grade: Uniform (constant) grade sloping in one direction.
- D. Level Grade: Perfectly horizontal, i.e., no slope.
- E. Finish Grade: Elevation of finished surface of topsoil or planting soil (excluding sod or mulch layer).

1.3 QUALITY ASSURANCE

- A. Utilize equipment of proper size and in good working condition to prosecute work to full completion in a satisfactory manner.
- B. Utilize experienced personnel familiar with equipment, methods and procedures for job.
- C. Acceptance Prior to Planting Operations:

1. NOTE: All site grading must be approved by the Landscape Architect prior to any sodding, seeding or planting operations. Inspection will be made by Landscape Architect upon written notice by Contractor at least three (3) days prior to start of planting.
2. Landscape Architect reserves the authority to require adjustments, in the field, to the finish grading of all lawn and planted areas.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. Topsoil and Planting Mix: See Section 329113 Soil Preparation.
- B. Non-woven Filter Fabric: Fabric for wrapping perforated pipe and washed stone shall be the nonwoven filter type, Mirafi 140NL, Webtec NO-4, Linq 130 EX, or an approved equal.
- C. Surplus Material: Contractor shall remove unsuitable materials and surplus excavated materials from the site and legally dispose of it.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall accept actual conditions at the project site and do work specified without additional compensation for possible variation from grades and conditions shown, whether surface or subsurface. All grading work shall be unclassified except for rock removal as described herein.
- B. Verify that existing conditions are as shown on site survey. Inform Architect immediately if discrepancies are found.
- C. Notify Architect immediately if conflicts, omissions, mis-alignments or redundancies exist among drawings.

3.2 INSPECTION:

- A. Examine the areas and UPM under which earthwork and site grading is to be performed and notify the PM/Landscape Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Soil Preparation
 1. Soils for all landscaped areas will conform to section 329113 for all soil types, either topsoil or planting mix

3.3 PREPARATION

- A. Do not work ground while in a wet or frozen state.

3.4 FINISH GRADING

- A. Grading:
 1. Eliminate all bumps and depressions while maintaining the degree of compaction specified in Section 329113 - Planting Soil Mixes.

2. Achieve uniform slopes as shown in drawings along the entire face of the landform.
3. Achieve smooth transitions of top and bottom of slopes as shown on the Drawings.
- B. Gently spray water on all soil areas after fine-grading is complete to moderately consolidate the upper few inches of soil and to control loss of soil by wind.
- C. Do not operate heavy machinery within the root zones of large trees to remain or within the root zones of transplanted mature trees. All grading within the root zones of large trees to remain shall be done by hand.
- D. Clean-Up:
 1. Keep area clean at all times
 2. Promptly remove any soil, manure, peat, mulch, branches or similar material that has been brought onto paved areas by work operations
 3. Upon completion of planting, remove all excess soils, stones, and debris from site and properly dispose
 4. Restore all ground areas disturbed as a result of planting operations to their original condition or to desired new appearance as appropriate

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with requirements of Section 017419 - Waste Materials Management and Disposal for removal, recycling, and disposal of construction debris and waste.

END OF SECTION 329119

SECTION 329200 - TURF AND GRASSES

GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- B. Section Includes:

1. Lawn Seeding.
2. No Mow and Pollinator Shade Mix Seeding.
3. Plugging.
4. Turf renovation.

- C. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants.

1.3 REFERENCES AND AGENCY STANDARDS

- A. Some products and execution are specified in this section by reference to published specifications or standards of the following:

1. N.C. Department of Agriculture (NCDA)
2. U.S. Department of Agriculture (USDA)
3. Association of Official Seed Analysts (AOSA)

1.4 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 SUBMITTALS

- A. Qualification Data: For Landscape Installer. All work shall be under the supervision and guidance of a Landscape Contractor holding a valid NC License. Submit name and license number of Landscape Contractor with qualification information after bidding, before award of contract. Include key personnel background and list of similar projects, minimum three (3) projects completed and five (5) years of experience in landscape installation by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Certification of Grass Seed, No Mow, and Pollinator Shade Seed Mix: Submit seed vendor's certified statement, product labels, and tags as well as any other data from all bags for grass and native pollinator seed mixtures, stating botanical and common names, percentage by weight and percentages of purity, germination, and weed seed to the Landscape Architect for approval. Only Blue Tag Certified varieties shall be accepted.
- C. Samples: Submit three samples and Manufacturer's certified, guaranteed analysis of the following items:
 - 1. Soil amendments;
 - 2. Mulch;
 - 3. Fertilizers and chemicals.
- D. Product Data: For each type of product indicated, including planting soil.
- E. Product Certificates: For each type of manufactured product, soil amendments, fertilizers, pesticides and herbicides, signed by product manufacturer. Include product label and manufacturer's application instructions specific to this Project. Comply with the following:
 - 1. Manufacturer's certified analysis for standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- F. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the North Carolina Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- G. Soil and Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant nutrient content of all existing or imported soil on the site.

1. Based on the test results, state recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments shall be added to produce satisfactory planting soil.
 2. Contractor shall report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide recommendations for corrective action.
 3. Soil Report for existing site soil must be submitted 14 days prior to any soil preparation Work taking place on site.
- H. Maintenance Instructions: Submit recommended procedures to be established by Owner for maintenance of turf during a typical calendar year. Submit prior to substantial completion.
- I. Redline drawings of changes: Submit a neatly prepared set of red line drawings showing all changes to the Contract Drawings that were made in the field during installation. Include measurements and dimensions to show locations of changes, as well as quantities, varieties, etc. Submit prior to substantial completion.

1.7 QUALITY ASSURANCE

- A. It is required that the Work specified herein be observed by the Landscape Architect. The Contractor shall request observance at least 24 hours in advance of the time such observance is required. Observance can be requested during the following portions of the Work:
1. Preliminary grading and soil preparation;
 2. Staking and layout of native pollinator seed mix seeded areas;
 3. Observation of the size and condition of seed and rejection of unsatisfactory or defective material;
 4. When finish grading has been completed, and before the planting of seed or sod; and
 5. When seeding and sodding have been completed.
- B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment. All Work shall be under the supervision and guidance of a qualified and Registered North Carolina Licensed Landscape Contractor with documented experience in performing Landscape Work of comparable size, scope, and quality. Submit name and license number of Landscape Contractor with qualification information after bidding, before award of Contract.
1. Experience: Five years' experience in turf installation.
 2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 3. Personnel Certifications: Installer's field supervisor shall have certification with the Turfgrass Council of North Carolina.
 4. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable. Only use fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analyst's (AOSA's).
- B. Notify Landscape Architect of sources of planting materials seven (7) days in advance of delivery to site. Submit name and type of seed, location, contact person and phone number.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

- A. Planting Restrictions: Plant during the following period. Coordinate planting periods with initial maintenance periods to provide required maintenance until Final Acceptance. Variation in schedule shall be pre-approved by Owner.
 - 1. Plant seed only after finish grades are established. Landscape Work shall not begin until structures, utilities, paving, and other improvements, which require access to or through planting areas, have been installed and accepted by the Landscape Architect.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.
- C. No execution of seeding shall occur on frozen ground or when wind velocity exceeds five (5) miles per hour. Seeding shall not be performed during any other weather conditions which may adversely affect landscape materials and planting conditions.
- D. Plant seed only after finish grades are established. Landscape Work shall not begin until structures, utilities, paving, and other improvements, which require access to or through planting areas, have been installed and accepted by the Owner.

1.10 MAINTENANCE SERVICE

- A. Provide complete maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established and until Final Acceptance, or as directed by Owner.

PART 2 - PRODUCTS

2.1 LAWN SEED MIXTURE

- A. The following type of permanent seed shall be planted in areas denuded by construction or as shown on Contract Drawings:
 - 1. Tall Fescue, blend, Blue Tag Certified seed only. (NO KENTUCKY 31 IS ALLOWED.)
- B. All seed shall have a minimum purity of 98 percent (98%) and a germination rate of 85 percent (85%).
- C. Provide fresh, clean, new crop seed complying with the tolerance for purity and germination established by the Association of Official Seed Analysts of North America (AOSA). Provide seed of the grass species, proportions and minimum percentages of purity, germination and maximum percentage of weed seed, as specified.
- D. All seed shall be labeled to show that it is within the requirements of the United States Department of Agriculture (USDA) or North Carolina Department of Agriculture (NCDA) as to purity, germination and presence of restricted or prohibited weeds. All seed shall be Blue Tag Certified. Tags or copies of tags from all seed bags shall be submitted to the Landscape Architect.
- E. Common weeds that are restricted or prohibited include: Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy, Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimblewill, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass, and any other noxious weeds as identified by the North Carolina Department of Agriculture (NCDA).

2.2 NO MOW AND MEADOW SEED MIXTURE

- A. The designated seed mixture shall be planted in areas shown on Contract Drawings and the Contractor shall use the seed mixture detailed on the plans.

2.3 PLUGS

- A. Plugs: Certified Low Growing Prairie Plug Mix, Prairie Plug Mix, and SCM Plug Mix. Furnish viable plants of uniform density, color, and texture that are cut into square or round plugs, strongly rooted, and capable of vigorous growth and development when planted.

2.4 PLANTING SOIL

- A. Topsoil shall not contain stones, lumps, roots or any other extraneous material harmful to plant growth larger than 1/2 inch in any dimension and shall conform to ASTM D 5268, pH range of 5.5 to 7 pH. When the topsoil has less than a 5.5 pH value, it shall be increased by applying pulverized limestone at a rate necessary to attain an approximate 6.5 pH value.

- B. Material stripped from the following sources shall not be considered suitable for use as topsoil:
 - 1. Chemically contaminated soils.
 - 2. Areas from which the original surface has been stripped and/or covered over as borrow pits, open mines, demolition sites, dumps and sanitary landfills.
 - 3. Wet excavation or soil obtained from agricultural land, bogs, or marshes.
 - 4. Topsoil furnished from sources outside the limits of the Project shall have a minimum organic content of not less than six percent (6%) by weight.

2.5 FERTILIZERS

- A. The quality of all fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and with the rules and regulations, adopted by the North Carolina Board of Agriculture (NCBA) in accordance with the provisions of said law, in effect at the time of sampling. All fertilizer shall be subject to sampling and testing by the Landscape Architect, or by an authorized representative of the North Carolina Department of Agriculture (NCDA), or both.
- B. Dry fertilizer shall have been manufactured from cured stock. During handling and storing the fertilizer shall be cared for in such a manner that it shall be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original condition before being used.
- C. Liquid fertilizer shall be stored and cared for after manufacture in a manner that shall prevent loss of plant food values, and a homogeneous blend of plant food elements shall be maintained or rebled to the original condition immediately before use. Fertilizer shall be delivered to the site accompanied by a delivery slip, in an unopened original container, bearing the Manufacturer's guaranteed chemical analysis of the composition of the fertilizer.
- D. Fertilizer for establishing turf shall have a commercial designation of 10-10-10 or any 1-1-1 ratio fertilizer containing a minimum ten percent (10%) nitrogen, ten percent (10%) available phosphoric acid and ten percent (10%) soluble potash.
- E. If the fertilizer is to be applied with mechanical spreader in the dry form, a minimum of 75 percent (75%) shall pass a No. 8 sieve and a minimum of 75 percent (75%) shall be retained on a No. 16 sieve, and the maximum free moisture content shall be two percent (2%).
- F. If fertilization is planned to take place after April 15, first consult with the Landscape Architect since adjustments in this operation may be necessary for the late spring and summer season.

2.6 LIME

- A. The quality of all limestone and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and with the rules and regulations, adopted by the North Carolina Board of Agriculture in accordance with the provisions of said law, in effect at the time of sampling. All limestone shall be

subject to sampling and testing by the Landscape Architect, or by an authorized representative of the North Carolina Department of Agriculture (NCBA), or both.

- B. Pulverized, agricultural grade, dolomitic limestone shall be composed of not less than 85 percent (85%) calcium and magnesium carbonates to not less than 40 percent (40%) calcium and magnesium oxides. Lime shall be ground to such fineness that 60 percent (60%) shall pass through a 100 mesh sieve and 100 percent (100%) shall pass through a ten (10) mesh sieve. Coarser material shall be acceptable, provided the specified rates of application are increased proportionately on the basis of quantity passing the 100-mesh sieve.
- C. The Contractor shall be responsible for determining lime and nutrient application rates based on the recommendations of laboratory soil tests. The Contractor shall take site samples as necessary to be representative of any significant variations in site soils. The test results shall indicate recommendations for lime, phosphorus, and potassium. The results of the tests shall be submitted to the Landscape Architect along with the Contractor's proposal for rate of lime and nutrient application.
- D. Each delivery of pulverized limestone shall be accompanied by a delivery slip indicating its weight and certified analysis of its chemical composition and gradation, including calcium and magnesium oxide equivalents.

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Straw mulch shall be threshed stalks of oats, wheat, rye, or barley reasonably free from mildew, mature seedbearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sandbur, Wild Garlic, Wild Onion, Bermuda Grass, Crotalaria, and Witchweed, and free from an excessive amount of restricted noxious weeds according to the most current definition by the North Carolina Board of Agriculture (NCBA), and also there shall be compliance with all applicable State and Federal domestic plant quarantines. Mulch shall have been approved by the Landscape Architect before being used. Straw shall be clean and air dry.
- C. Straw mulch that is matted or lumpy shall be loosened and separated before being used.
- D. Binders for mulch shall be one of the following:
 - 1. Emulsified asphalt, Grades CSS-1, CSS- 1H, SS-1, or SS- 1H. Emulsified asphalts of the slow-setting (SS) types shall conform to AASHTO M140. Cationic emulsified asphalts of the slow setting (CSS) types shall conform to AASHTO M 208 emulsified asphalt Grade SS-1 shall conform to ASTM D977 and be non-toxic and free of plant growth or germination inhibitors.
 - 2. Fiber mulch made from wood or plant fibers containing no growth or germination inhibiting materials.
 - 3. Synthetic plastic emulsion shall be mixable with all normally available water when diluted to any proportions. After drying, the synthetic plastic binder shall no longer be soluble or dispersible in water but shall remain tacky until the grass seed has

germinated. The plastic binder shall be physiologically harmless to humans or animals, and shall not have phytotoxic or crop-damaging properties.

4. Vegetable based gels which can be classified as naturally occurring, powder based hydrophilic additives formulated to provide gels, which, when applied under curing conditions shall form membraned networks of water insoluble polymers. The vegetable gel shall be physiologically harmless to humans or animals, and shall not have phytotoxic or crop damaging properties.

2.8 HERBICIDES AND PESTICIDES

- A. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-emergent herbicide shall be used as recommended by a licensed Pesticide Consultant and approved by the Landscape Architect.
- C. Herbicides, including pre-emergent herbicide, shall be compatible with indicated materials.
- D. The herbicide program shall specify the waiting period between spraying and seeding and sodding.
- E. Herbicides shall not sterilize the soil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work. Grade according to the proposed grading plan.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after Landscape Architect approves the subgrade and unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
 - 3. Any damage inflicted by the Contractor shall be repaired without any additional cost to the Owner.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Contractor is responsible for the protection of existing trees or vegetation to remain. Any damage inflicted by the Contractor shall be repaired without any additional cost to the Owner.
- D. Prior to beginning work, Contractor must verify that all underground utilities are in place.

3.3 EXCAVATION AND BACKFILL

- A. Excavate and backfill areas to be seeded as indicated and specified herein and in Section 329113 Soil Preparation.
- B. Excavations for soil removal shall be to within six inches (6") of back of curb or edge of walk. The Contractor shall be responsible for protecting and maintaining the integrity of compacted base rock and subgrade materials under paving and curbs, and for protecting all other structures in the excavated areas. Do not undercut sides of excavation. Damage to base rock, subgrade, paving, curbs or structures shall be repaired or replaced at no cost to the Owner. Remove and legally dispose of asphalt debris, concrete and base rock from the site.
- C. Deeper excavations shall be required if obstructions, contaminated soils, or aggregate base are encountered at bottom of excavations. Construction debris, contaminated soils, and aggregate base which have been exposed by construction operations shall be removed, and topsoil shall be provided to fill such holes and depressions.
- D. Backfill areas to be seeded with topsoil. Prior to installing topsoil, scarify the bottom of the excavation to a six-inch (6") depth and haul off all construction debris before spreading the topsoil. No scarification or subsoiling should be done within the dripline of any existing tree. Scarify or undercut sides of excavations. The Contractor shall be responsible for protecting base rock and subgrade compaction under adjacent paving and curbs. Provide topsoil backfill in three-inch (3") lifts and continue adding soil in three-inch (3") lifts until finished grade is established. Incorporate the first three-inch (3") lift of topsoil into the existing soil at the bottom of the excavation and tamp firmly.

3.4 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.

- B. A Rotovator, chisel plow or cultivator shall be used to work the soil to a depth of six inches (6"). After this operation, all stones, one inch (1") or larger in any dimension, and other debris such as wires, cables, tree roots, pieces of concrete, clods, weeds, vegetation, grass, and lumps shall be removed. Hand rake tree protection areas to a depth of one inch (1"). If necessary, additional topsoil shall be used to fill depressions that might collect water, except where depressions exceed eight inches (8") in depth. In this case, subsoil shall be added and covered with four inches (4") of topsoil.
- C. Protect structures, utilities, sidewalks, pavements, vehicles, trees, shrubs, and plantings from damage caused by soil preparation.
- D. All waste material and debris resulting from preparation of existing soil shall be legally disposed of off-site at no expense to the owner.
- E. The storage piles of topsoil and the areas from which stored topsoil has been removed, within the property limits of the Project, shall be fertilized and seeded as indicated on Contract Drawings.
- F. A minimum of four inches (4") of topsoil shall be applied to all disturbed areas. The topsoil shall be spread on a previously prepared surface in a uniform layer, to produce a compacted minimum thickness of four inches (4") in depth, which shall be incorporated into the soil. Contractor shall take exceptional care when spreading topsoil around existing tree protection areas. Soil around existing trees should not exceed the grade which existed prior to construction. Tractor drawn raking equipment that compacts turf areas shall not be allowed.
- G. Areas with topsoil outside the limits of work shall be protected against damage caused by the delivery, handling and/or storage of materials, by washouts or to drainage diversion, by workmen, or by equipment. Any such damage shall be repaired by grading, fertilizing, seeding or sodding, replanting, and mulching at no cost to the owner.
- H. Where either embankment or excavation slopes become eroded during the Work and before acceptance, repairs shall be made at no cost to the owner.
- I. When weeding and soil conditioning have been completed and soil has been thoroughly water settled, all landscaped areas shall be finish graded for placement of plant materials.
- J. Tops and bottoms of all Slopes: Round tops and bottoms of slopes and drainage swales. Adjust and warp slopes at intersections of cuts and fills to flow into each other or into the existing natural ground surface without a noticeable break. Cuts and fills shall have a maximum slope of three feet (3') horizontally to one foot (1') vertically, unless otherwise shown on the Contract Drawings.
- K. Finished grades shall be in accordance with the grading details in the Contract Drawings. All seeded areas shall slope uniformly for positive drainage. Grades not otherwise indicated on the Contract Drawings shall be uniform levels or slopes between points where elevations are given, or between points established by walks, paving, curbs or catch basins. Finish grades shall be smooth, even, and on a uniform plane with no abrupt change of surface and no erosion scars.

- L. Grading shall provide for natural runoff of water without low spots or pockets. Flow line grades shall be accurately set and shall be not less than two percent (2%) gradient unless otherwise indicated and approved by the Landscape Architect.
 - M. Finish grade of earth in landscaped areas shall be one-fourth inch ($\frac{1}{4}$ ") below the top of adjacent pavement, curbs or headers, pull and utility boxes, and utility structures unless indicated otherwise on the Contract Drawings.
 - N. Tractor drawn raking equipment or any other construction equipment that compacts planting areas shall not be allowed.
 - O. Where beds are intended to drain across pavements, the uphill grade shall be flush with the pavement; the downhill grade shall be one-half inch ($\frac{1}{2}$ ") to three-fourths inches ($\frac{3}{4}$ ") below the pavement grade.
 - P. Maintain ground surfaces to the finish grades as shown on the Contract Drawings, and add or remove any topsoil that may be required to correct any settlement or erosion that occurs prior to the date of Final Acceptance.
 - Q. Placing Planting Soil: Mix planting soil before spreading or spread topsoil, apply soil amendments and fertilizers on the surface, and thoroughly blend planting soil mix.
 - 1. Delay mixing fertilizer with planting soil if planting will not proceed with a few days.
 - 2. Mix lime with dry soil before mixing fertilizer.
 - R. Spread planting soil mix to a minimum 6-inch depth but not less than required to meet finish grades after light rolling and natural settlement.
 - 1. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - 2. Spread approximately one-half of the thickness of planting soil mix over loosened subgrade. Thoroughly mix into the top 4 inches before spreading the remainder of the planting mix.
 - 3. Reduce elevation of planting soil to allow for soil thickness of sod.
 - S. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
 - T. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- 3.5 DRY APPLICATION METHOD OF LIME AND FERTILIZER
- A. Fertilizing shall be carried out as soon as possible.
 - B. Only seed areas as indicated on the Contract Drawings shall be fertilized per this specification.
 - C. Soil Amendments, Fertilizers, and Cultivating:

1. Provide soil amendments, chemicals, and fertilizers for both imported and approved on-site soils. These are minimum requirements. Provide such additional amendments and chemicals as are required by the soil reports.
 2. Spread soil amendment and fertilizer evenly over all turf areas at the rates required by the soil report.
 3. After approval of amendment and fertilizer applications by the Landscape Architect, incorporate soil amendments and fertilizers into the top six inches (6") of soil by repeated rotary-hoe cultivation.
- D. When the soil has a pH value of less than 5.5 pH, sufficient pulverized dolomitic limestone shall be evenly spread to increase the soil pH value to an optimum 6.5 pH.
- E. The quantity of pulverized limestone required shall be in proportion to its magnesium and calcium oxide content.
- F. Mechanical seeders, seed drills, landscape seeders, cultivator seeders, and fertilizer spreaders may be used when fertilizer is applied in dry form. Hand operated seeding devices may be used when fertilizer is applied on areas which are inaccessible to mechanical seeders.
- G. Soil shall be lightly rolled with a lawn roller that has been filled one-third (1/3) full of water to firm and settle the soil.
- H. Watering: At completion of soil amendment and fertilizer installation, water the soil in all landscaped areas for a period of 14 days. Maintain sufficient soil moisture at all times to induce weed seed germination, but not to saturate the soil. Soil shall be moist to a minimum depth of 24 inches.

3.6 SEEDING

- A. Rough grade all areas prior to any seeding. Fill depressions with soil as needed or remove surplus soil and float areas to a smooth uniform grade. Slope all turf areas to drain. Roll, scarify, rake, and level as necessary to obtain true, even surfaces. Rough grading shall be inspected and approved by the Landscape Architect before soil preparation begins.
- B. Sowing of seed shall be done only after the prepared topsoil, to which lime, fertilizer and other amendments have been added as specified, has been thoroughly settled by rainfall or artificial watering. Seeded areas shall be thoroughly wetted down.
- C. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- D. Sow seed at the rate recommended by seed manufacturer and as required to achieve 95% coverage over any 10 sq. ft.

- E. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- F. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- G. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.
- H. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 - 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- I. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 1/4 inch, and roll surface smooth. Water daily or more frequently as necessary to maintain moist soil to a minimum depth of 2 inches.
- J. Straw mulch shall be left in place and allowed to disintegrate.
- K. If any straw mulch is displaced before the grass has made a growth of 1-1/2 inches, the area shall be refertilized, reseeded and remulched without additional compensation.
- L. Watering shall be performed as necessary until a firm root mass is established. Each watering shall be performed until water infiltrates through the root zone and into the topsoil zone. Watering shall be performed in a manner that provides equal distribution and coverage to all areas seeded.
- M. After a firm root mass is established and before the turf reaches the height of three inches (3"), the area shall be mowed with a machine that does not produce ruts, contribute to soil compaction, or in any way damage the turf. At the time of Final Acceptance, all turf shall be alive, healthy, and established.

3.7 PLUGGING

- A. Plant plugs in holes or furrows, spaced 12 to 18 inches apart in triangular pattern. On slopes, contour furrows to near level.

3.8 TURF RENOVATION

- A. Renovate existing turf where indicated.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 2. Install new planting soil as required.
- C. Remove and dispose of all sod and vegetation from diseased or unsatisfactory turf areas legally off site at no expense to the Owner; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new topsoil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches. Do not cultivate under the drip line of existing trees to be preserved.
- I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into the top 4 inches of existing soil. Install new planting soil to fill low spots and depressions and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new turf according to specifications.
- K. Water newly planted areas and keep moist until new turf is established.

3.9 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Until the Project is finally accepted, the Contractor shall be required to mow as needed and maintain seeded lawn between two inches (2") and four inches (4") in height. The Contractor shall be required to repair or replace, or both, all seeding and mulching that is defective or becomes damaged.
- D. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow Tall Fescue to a height of 2 to 4 inches.
- E. If seeding must occur out-of-season for permanent grass, appropriate temporary seeding shall be done and the Contractor shall be responsible for permanent seeding as specified in season at no additional cost to Owner. Do not allow temporary cover to grow over 12 inches in height before mowing.
- 3.10 SATISFACTORY TURF
- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
1. Satisfactory Seeded Turf: At the end of the maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 95 percent (95%) over any 10 sq. ft. and bare spots not exceeding five inches (5") by five inches (5").
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.
- 3.11 PESTICIDE APPLICATION
- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.
- 3.12 CLEANUP AND PROTECTION
- A. The Contractor shall dispose of excess materials, soils, stones, debris, branches, paper, leaves, and rubbish resulting from this Work. Promptly remove soil and debris created

by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

- B. Thoroughly clean all pavements, walks, building surfaces, or automobiles parked nearby.
- C. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- D. The Contractor shall remove from the site all equipment and other articles used.
- E. Upon completion of Work, the site shall be left in a neat and orderly condition.
- F. All damage to existing construction caused by landscaping operations shall be repaired to the satisfaction of the Owner at the Contractor's expense.
- G. Protect all Landscape Work and materials from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged Landscape Work as indicated.
- H. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- I. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after turf is established.
- J. Remove nondegradable erosion-control measures after grass establishment period.

3.13 PRELIMINARY TO FINAL INSPECTION

- A. At completion of the Work of this Section, the Contractor shall request a preliminary inspection to determine the condition of the turf areas.
- B. Inspection shall be requested two (2) working days in advance.
- C. The Contractor and Landscape Architect shall be represented at the inspection.
- D. Construction considered ready for inspection shall conform to the following requirements:
 - 1. All turf shall be healthy and free of infestations and weeds.
 - 2. Debris shall be removed and legally disposed of from the turf area, pavements shall be broom cleaned, and foliage shall be washed clean.
 - 3. All turf shall be installed in place as indicated and specified on Contract Drawings.
 - 4. All equipment shall be removed from the site.

3.14 FINAL INSPECTION

- A. Final inspection shall be for the completed Landscape Work and shall be made at the conclusion of the Landscape Work upon written notice requesting such inspection

submitted by the Contractor to the Landscape Architect, at least seven (7) days prior to the anticipated date.

- B. At the final inspection, the Landscape Architect shall determine the condition of the turf areas. Acceptance of this Work shall be contingent upon proper maintenance and the establishment of vigorous turf materials. Turf areas which are dead, unhealthy, or missing, whether by disease, neglect, vandalism, or any other reason, shall be replaced with the same seed originally specified and following these same specifications for installation.
- C. Contractor shall prepare four (4) neatly prepared copies of all final submittals required for submission to the Landscape Architect. See related section herein for a list of submittals.
- D. Acceptance After Inspection: The Contractor shall be notified in writing of acceptance of all Work of this section for maintained turf. Maintenance or other remaining Work to be done shall be subject to re-inspection before acceptance.

END OF SECTION 329200

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SECTION 329300 - PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. Scope

1. Furnish labor, equipment, and materials necessary to complete the removal of some existing plants, protection of some existing plants, and installation of new plants, including watering, maintaining, and guaranteeing of plants as specified herein. This Section includes Trees, Shrubs, Groundcover, Plants, and Mulch.

1.2 RELATED SECTIONS

A. Other Sections containing requirements that relate to this Section include, but are not limited to, the following:

1. Section 329219 Seeding

1.3 REFERENCES AND AGENCY STANDARDS

A. References: Some products and execution are specified in this section by reference to published specifications or standards of the following:

1. N.C. Department of Agriculture (NCDA)
2. U.S. Department of Agriculture (USDA)

1.4 SUBMITTALS

- A. All work shall be under the Supervision and guidance of a Landscape Contractor holding a valid NC License. Submit name and license number of Landscape Contractor with qualification information after bidding, before award of contract. Qualification information includes name and license number, five (5) years' experience of similar type work, three (3) favorable references for similar type work, and a list of five (5) similar type projects.
- B. Product Data: For each type of product indicated.
- C. Samples for Verification: For each of the following:
 3. 1/2 lb. of each soil amendment and mulch, in labeled plastic bags, describing material, source and phone number of source.
- D. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Soil Report: Submit 14 days prior to any soil preparation Work taking place on site.
- F. Planting Schedule: Submit schedule indicating anticipated planting dates for exterior plants.
- G. Maintenance Instructions: Submit recommended procedures to be established by Owner for maintenance of landscape plants during a typical calendar year. Submit prior to substantial completion.
- H. Redline drawings of changes: Submit a neatly prepared set of red line drawings showing all changes to plans that were made in the field during installation. Include measurements and dimensions to show location of plants that were adjusted in the field, as well as quantities, species, varieties, sizes, etc. Submit prior to substantial completion.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified and Licensed North Carolina Landscape Contractor whose work has resulted in successful establishment of exterior plants will be required for project supervision.
1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.
- B. Soil and Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of all soil existing or imported on the site.
1. Report suitability of soils for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.
- C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in the latest edition of ANSI Z60.1, "American Standard for Nursery Stock."
- D. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

- E. Observation: Landscape Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - 1. Notify Landscape Architect of sources of planting materials seven (7) days in advance of delivery to site. Submit list of plants, location, contact person and phone number.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver exterior plants freshly dug.
- B. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.
- C. Handle planting stock by root ball, not by trunk.
- D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.
 - 3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 SITE CONDITIONS AND SCHEDULING

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.
- B. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Landscape Architect.
 - 1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

PART 2 - PRODUCTS

2.1 PLANT LIST: A list of required plants is included on the Drawings.

2.2 NOMENCLATURE

- A. The names of plants required under this contract conform to those given in the Standardized Plant Names, latest edition, prepared by the American Joint Committee on Horticultural Nomenclature. Names of varieties not included therein conform generally with names accepted in the nursery trade.

2.3 QUANTITIES

A. Quantities necessary to complete the plantings as specified on the Drawings shall be furnished. In case of discrepancy between the drawn plants and the plant list, the Contractor shall supply the number of plants shown on the drawings.

2.4 QUALITY AND SIZE

- A. Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the Plant List, which are minimum acceptable sizes. They shall be measured before pruning is done at time of planting.
- B. Requirements for the measurements, branching, grading, quality, balling and burlapping of plants in the Plant List, shall follow the code of standards currently recommended by the American Association of Nurserymen, Inc., in the American Standard for Nursery Stock.
 - 1. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.
 - 2. All trees, shrubs and groundcovers shall be symmetrically shaped, well balanced specimens.
 - 3. All trees shall have one single, straight leader unless otherwise specified on the plans. Trees shall have a uniform branching arrangement and crown that are proportionate to the size of the root ball or container and the height of the tree. The tree form shall be appropriate for the tree type. Branches shall be spaced at least six (6) inches apart along the trunk. No branches shall be greater than 2/3 the diameter of the trunk. The tree shall have no vertical branches. Branches shall be evenly distributed around the tree trunk with no major branches touching. The crown shall be densely foliated.
 - 4. All trees shall be free of injuries including wounds, improper pruning, and disease or insects.
 - 5. All trees shall have adequate sized root balls to support healthy growth of the tree, as outlined in the American Standards for Nursery Stock. No major roots shall be growing around the exterior edge of the root ball, and no major roots shall be growing out of the root ball that exceed 1/5 the size of the tree trunk. No

crushed or circling roots shall be accepted. The trunk flare should be visible at the top of the soil line and should not be buried. The top of the root ball shall be flat.

2.5 SUBSTITUTIONS

- A. Substitutions of plant material after bidding will NOT be permitted. If plant material is not available, a substitution may be allowed only upon submission of proof that any plant as specified is not obtainable during the scheduled planting season.
- B. Written authorization by the Landscape Architect shall be required for any substitution.
- C. The nearest equivalent obtainable size or variety of plant having the same essential characteristics shall be used. An equitable adjustment of the contract price shall be negotiated if the difference warrants a change.

2.6 BALLED AND BURLAPPED MATERIALS

- A. Plants designated "B&B" in the Plant List shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be firmly wrapped with burlap or similar material and bound with twine, cord, or wire mesh. Where necessary to prevent breaking or cracking of the ball during the process of planting, the ball may be secured to a platform. Balls must be kept moist and shaded until they are planted.

2.7 CONTAINER-GROWN MATERIALS

- A. Plants designated "cont." or "gal." in the Plant List are container grown plants. Any container plants available in "B&B" may be substituted at the Contractor's option. If stored on the site, they must be watered thoroughly at least once every 48 hours. Root systems of container grown plants shall be well developed but not in "pot bound" condition of dense encircling roots.
- B. The root zone of all plants not yet installed must be protected from freezing, drying and direct sunlight.

2.8 SOIL MIX FOR FILL AROUND PLANTS

- A. Shrubs: The soil removed for placement of shrubs shall be mixed with 1/4 composted ground pine bark mulch.
- B. Trees: The soil excavated for tree installation shall be amended with pine bark mulch.
- C. Contractor shall have soil analysis conducted for various types of plantings, and amend the soil with lime and fertilizer as recommended by NCDA. A copy of the soil tests shall be sent to the Landscape Architect.

2.9 MULCH

A. Triple shredded hardwood mulch shall be used as the mulch for all plant beds and mulch beds indicated on the Drawings, including areas within plant saucers. All natural areas on plans shall be mulched.

PART 3 - EXECUTION

3.1 PLANTING SEASON

- A. The normal planting season is September 15 through April 15. After notification to proceed, planting operations shall be conducted under favorable weather conditions during the normal planting season.
- B. At the option of and on the full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

3.2 WEATHER CONDITIONS

A. Planting shall not take place when soils on site are frozen or wet and in poor tilth.

3.3 PLANTING OF BALLED AND BURLAPPED MATERIALS

A. Circular pits shall be excavated for all trees. The diameter of pits for trees shall be at least two (2) times the diameter of the ball. The depth of pits for trees shall be enough to accommodate the ball of roots when the plant is set such that the top of the root ball is a minimum of 2" or a maximum of 3" above finished grade. The bottom of the root ball shall rest on firm, level native soil. Scarify plant pit walls.

3.4 PLANTING OF CONTAINER-GROWN MATERIALS

A. Circular holes shall be excavated for all plants. The diameter of the planting holes shall be at least twice the diameter of the root ball. The depth of the planting hole shall accommodate the root ball so that the top of the ball is a minimum of 1" and a maximum of 2" above finished grade. Scarify plant pit walls. The bottom of the root ball shall rest on firm, level native soil. The root ball of the plant shall be loosened to alleviate encircling roots and to provide an increased root interface with fill soil.

3.5 PLANTING IN BEDS

A. Most shrub and groundcover plantings shall be grouped in mass beds. Individually dug holes are not permitted for groundcover or bulb mass plantings. The entire planting bed shall be prepared in a continuous fashion by tilling to a depth of six inches. A two-inch (2") layer of pine bark soil conditioner and 4" layer of topsoil will be added and tilled thoroughly into the soil. Lime, fertilizer, and water retention products will be added as required by soil test recommendations, and thoroughly mixed by tilling.

3.6 LAYOUT

- A. New plantings shall be located according to the Drawings. The Contractor shall stake the plant locations, and shall then contact the Landscape Architect for written approval.

- B. In the event that unsuitable subsurface conditions are found, planting in that area shall be immediately halted and the Landscape Architect notified so that the extent of the problem can be determined and, if necessary, alternative solutions formulated.

3.7 SETTING PLANTS

A. All plants shall be planted in prepared soil beds, and set on firm, native soil to such depth as indicated elsewhere in these specifications. No burlap shall be pulled from under the balls. Roots on bare-root plants shall be spread in their normal position. All broken or frayed roots shall be cut off cleanly. Topsoil or prepared soil shall be placed and compacted carefully to avoid injury to roots, to fill all voids and to minimize rocking of the root ball. Add water and tamp the backfill until the backfill is completely saturated, then allow it to soak away. Fill the hole to finished grade, and form a shallow saucer around each plant by placing a ridge of topsoil around the edge of each pit. After the ground settles, additional soil shall be filled in to the level of the finished grade. B & B plants will have the burlap turned down 1/3 the total height of the root ball. Wire baskets will be removed to 2/3 of the total height of the root ball. No synthetic fabric is allowed.

3.8 BACKFILLING

- A. Backfill shall consist of thoroughly broken up native soil. Additional soil may be needed for planting beds. Additional soil shall be topsoil as specified below.
 - 1. Topsoil: ASTM D 5268, pH range of 5.5 to 6.5, a minimum of 6 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 2. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
 - 3. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 4. Soil should be tested and amended with lime and fertilizer according to NCDA procedures and recommendations. Total volume of backfill should be amended with up to one fourth (1/4) composted pine bark organic material, with no pieces larger than 1". Contractor shall amend with lime and fertilizer as recommended by NCDA based on a soil analysis. Terra-Sorb, or approved equal shall be added per manufacturer's recommendations in areas that are not irrigated.

3.9 MULCHING

- A. Plant beds, plant saucers and mulch areas shown on plans shall be mulched with three (3) inches of triple shredded hardwood mulch.
- B. Leave area adjacent to newly planted trees and shrubs unmulched to 6" from trunk so that flare at crown of tree is revealed.

3.10 GUYING TREES

A. The Contractor is responsible for keeping the trees upright and plumb in all directions throughout the one-year warranty period.

PART 4 - MAINTENANCE

4.1 OVERVIEW

- A. Maintain work of this section from time of installation until the final inspection, and for one year after acceptance. Maintenance shall include watering, keeping plants plumb, weeding, fertilizing, restoring plant saucers, tightening and repairing supports, resetting to proper grades and vertical position, and protection of plantings as well as any other necessary operations for the period of one year.

4.2 IRRIGATION

A. Contractor is responsible for watering plants to sustain their health as needed, which includes supplying, paying for and transporting water for this purpose. In areas not under irrigation, Contractor will supply "Gator" watering bags and keep them operational as needed. Contractor shall also incorporate Terra-sorb (or approved equal) as per manufacturer's recommendations in areas that are not irrigated. Contractor may establish a temporary irrigation system to aid in this, providing the system is attractive and safe. Obtain written permission of Landscape Architect if temporary irrigation is to be used.

4.3 GENERAL

A. When the tree and shrub plantings are ready for final inspection, all mulched areas shall be free from weeds and mulched to the extent indicated in these specifications. Plant tags shall be left on the plants by the Contractor prior to the inspection for acceptance, but will be removed after final acceptance.

PART 5 - FINAL INSPECTION, CLEAN-UP AND COMPLETION

5.1 FINAL INSPECTION

- A. Final inspection shall be for the completed landscape and shall be made at the conclusion of the landscape work upon written notice requesting such inspection submitted by the Contractor to the Landscape Architect, at least seven (7) days prior to the anticipated date.

5.2 MAINTENANCE

A. Contractor shall remove all wires, arbor tape, stakes, tree wrap and tree gators prior to final inspection. All bed areas shall be free from weeds and litter.

5.3 SUBMITTALS

- A. Contractor shall prepare four (4) neatly prepared copies of all final submittals required for submission to Landscape Architect. See Section 1.04 for list of submittals.

5.4 ACCEPTANCE AFTER INSPECTION

- A. The Contractor shall be notified in writing of acceptance of all work of this section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies of the requirements of completion of the work. Maintenance or other remaining work to be done shall be subject to re-inspection before acceptance.

5.5 CLEAN-UP AND COMPLETION

- A. Upon completion of work, remove from the site all equipment and other articles used. All excess soil, stones and debris shall be removed and legally disposed of. All work areas shall be left in a clean and neat condition.

PART 6 - WARRANTY

6.1 TREE, SHRUB AND GROUNDCOVER PLANTING

- A. After acceptance at the time of final inspection, all plants shall be guaranteed for one (1) year. Plantings shall be alive and in satisfactory vigor at the end of the guaranty period.
- B. Landscape Contractor shall provide routine maintenance for the upkeep of the plantings up to final acceptance. This includes pruning, watering, fertilization and weeding.
- C. At the end of the guaranty period, inspection shall be made by the Owner or Landscape Architect upon written notice requesting such inspection submitted by the Contractor at least ten days before the anticipated date. Any plant required under this contract that is dead or in poor vigor as determined by the Owner or Landscape Architect shall be removed from the site; these and any plants missing, due to the Contractor's negligence, shall be replaced as soon as conditions permit, but during the normal planting season.
- D. All replacements shall be plants of the same kind as originally planted and shall be of size equal to that attained by adjacent plants of the same kind at the time replacement is made. They shall be furnished and planted as specified under PART 3 of this section and the cost shall be borne by the Contractor. Only one replacement in conformance with the provision of this section will be required for each plant declared dead, in an unhealthy or badly impaired condition, or missing at the time of final inspection.

END OF SECTION 329300

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SECTION 331010 - DISINFECTION OF POTABLE WATER SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. Provide labor, material, and equipment required for the disinfection by chlorination of the potable water system installed under this contract.

1.2 RELATED SECTIONS

- A. The following Sections have work that is directly related to this Section. This does not relieve the Contractor of his responsibility of proper coordination of all the work:
 - 1. Section 221113 – Facility Water Distribution Piping
 - 2. Section 331413 – Submersible Well Pump

1.3 REFERENCE STANDARDS

- A. The latest revision, at the time of bidding, of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
 - 1. American Water Works Association (AWWA) Standards
 - a. B300 Hypochlorites
 - b. B301 Liquid Chlorine
 - c. C651 Disinfection of Water Mains
 - d. C652 Disinfection of Water Storage Facilities
 - e. C653 Disinfection of Water Treatment Plants
 - f. C654 Disinfection of Wells

1.4 SUBMITTALS

- A. Submit the following in accordance with Section, Submittal Procedures:
 - 1. Test Report:
 - a. Field test report indicating the measured chlorine residual.
 - b. Bacteriological test.

PART 2 - PRODUCTS

2.1 DISINFECTANT

- A. The following products may be used as the disinfectant:
 - 1. Chlorine, liquid: AWWA B301.

2. Hypochlorite, calcium and sodium: AWWA B300.

3.1 POTABLE WATER MAINS

- A. After satisfactory completion of the pressure test, disinfect new potable water mains and existing mains that have required repair in accordance with AWWA C651 and as specified herein. Disinfect water mains in a maximum length per day of 2,000 feet.
- B. Keep the pipe interior clean during construction to minimize the amount of water required for flushing and disinfection.
- C. After satisfactory flushing of the main, disinfect by the injection of a chlorine solution. Induce chlorine in sufficient quantity to maintain a chlorine residual of at least 50 ppm throughout the system to be tested. Maintain the chlorine solution in the system for at least 24 hours.
- D. Valves: Open and close valves on the mains being disinfected a minimum of three times during the chlorine contact period and a minimum of three times during flushing
- E. Prior to flushing, the free chlorine residual shall be a minimum of 10 ppm. Flushing of the lines shall proceed until the lines contain the normal chlorine residual of the system.

3.2 WATER TREATMENT FACILITIES

- A. Disinfect well house piping from the well to the pressure tank before they are placed into service in accordance with AWWA C653 and as specified herein.
- B. Proper cleaning is necessary for the entire treatment facility, including treatment units not subject to disinfection by this standard.
- C. Piping must be chlorinated with a high dose of chlorine as described in this section. Retention of chlorinated product water containing low level free chlorine is not sufficient to ensure disinfection of water treatment units that may be contaminated during installation or maintenance operations.

3.3 WATER SUPPLY WELLS

- A. New wells shall be disinfected before they are placed into service in accordance with AWWA C654 and as specified herein.
- B. Add chlorine to the well in sufficient quantities to produce a chlorine residual of at least 100 ppm in the well. Agitate water in the well to insure thorough dispersion of chlorine. Maintain chlorine solution in the well for at least 24 hours
- C. After 24 hours pump well to waste until a zero-chlorine residual is obtained.
- D. Disinfect equipment and material just prior to installation in the well by dusting exposed areas with calcium hypochlorite powder or by spraying with a solution having a chlorine residual of not less than 200 ppm.

3.4 POTABLE WATER STORAGE TANKS

- A. Disinfect storage facilities prior to placing into service in accordance with AWWA C652 and as specified herein.
- B. Allow for minimum paint system dry time as recommended by manufacturer prior to disinfection.
- C. Remove material not part of the structural or operating facilities of the tank. Thoroughly clean interior surfaces and operating facilities of the storage tank using a high-pressure water jet, sweeping, scrubbing, or other means as approved by the Engineer. Remove foreign material accumulated in this cleaning operation from the storage facility.
- D. Disinfection by Filling of Tank (AWWA C652, Method 3)
 - 1. A chlorine solution, in concentrations sufficient to produce a chlorine residual of at least 50-ppm, shall be introduced to a minimum 5 percent of the tank volume. The chlorine solution shall remain in contact with the interior surfaces for a period of not less than 6 hours.
 - 2. The tank shall be filled to overflow with potable water and be held in the tank for a period of not less than 24 hrs. Chlorine should be added during this process to assure a free chlorine residual solution of not less than 2 ppm.
- E. Disinfection by Spraying of Tank (AWWA C652, Method 2)
 - 1. Apply a solution of 200-ppm available chlorine directly to surfaces of the storage facility that would be in contact with water when the storage facility is full to the overflow elevation.
 - 2. Chlorine solution may be applied with suitable brushes or spray equipment. Solution shall thoroughly coat surfaces to be treated, including inlet and outlet piping, and shall be applied to any separate drain piping such that it will have available chlorine of not less than 10 ppm when filled with water. Overflow piping need not be disinfected.
 - 3. Disinfected surfaces shall remain in contact with strong chlorine solution for a minimum of 30 min.
 - 4. Purge highly chlorinated water from the tank and associated piping with water from an approved potable water source.

3.5 DISPOSAL OF CHLORINATED WATER

- A. If there is any question whether the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize the residual chlorine. Federal, state, or local environmental regulations may require special provisions or permits prior to disposal of highly chlorinated water.

3.6 BACTERIOLOGICAL TESTING

- A. Required location for obtaining water samples:

1. Mains
 - a. A minimum of one from each building connection and water fountain.
 - b. Time between samples to be determined by Engineer in field.
 2. Wells
 - a. From the well head.
 3. Pressure Tanks
 - a. At effluent.
- B. A laboratory, certified for the required testing by the State of North Carolina, shall collect the sample and perform the testing. The laboratory shall be the same for both sampling and testing.
- C. Obtain two water samples at each specified location for the bacteriological testing. Take the first sample immediately after flushing the chlorinated water and again in 24-hours.
- D. Recommended additional samples. During the required sampling of water from the new system, it is recommended that samples be taken from the existing potable water source to determine if coliforms are present.
- E. Care in sampling. No hose shall be used for the collection of samples. Take samples from an approved sample tap, water fountain, or building fixture. Operation shall be to ensure that the sample collected is from water that has been in the new system.
- F. Test samples for the presence of coliform organisms in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater. Testing method used shall be the multiple-tube fermentation technique, the membrane-filter technique, or presence/absence.
- G. Test for odor. The water in the new system should also be tested to ensure that no offensive odor exists due to chlorine reactions or excess chlorine residual.
- H. If samples show the presence of coliform, procedure 1 or 2 described below shall be followed, with the approval of the Owner, before placing the unit or facility in service.
1. Take repeat samples at least 24 hours apart until consecutive samples do not show the presence of coliform.
 2. Again, subject the system to chlorination and sampling as described in this section.
- I. If samples are free of coliform, and with the approval of the Owner, the potable water system may be placed in service.

3.7 CONTAMINATION

- A. If, in the opinion of the Engineer, possible contaminants have entered the existing water system, or water samples show the water in the existing system to be unsafe on completion of the work, the existing water system shall be disinfected as specified herein and shall include all contaminated components. Disinfection of the existing system shall be coordinated with the Owner.

END OF SECTION - 331010

SECTION 331100 - SUBMERSIBLE WELL PUMP

PART 1 - GENERAL

1.1 SCOPE

- A. Provide the pump, motor, and controls as indicated on the Drawings and specified herein.
- B. Work specified under this section includes, but is not limited to, the following:
 - 1. One (1) Well Pump for the Potable Water Well
 - 2. Pump Control Panel

1.2 SYSTEM DESCRIPTION

- A. Potable Water Supply Well for Lake Myra Park
 - 1. Pump Capacity/Head 20 gpm @ 120 feet TDH
 - 2. Pump Setting 80 feet (below existing grade)
 - 3. Static Water Level 12.60 feet (below existing grade)
 - 4. Minimum Bowl Efficiency 62% @ design point
 - 5. Minimum Stages 11
 - 6. Impeller Type 304 Stainless Steel
 - 7. Pump Column 3-inch Galvanized pipe
 - 8. Pump Check Valve 3-inch, Ductile iron or Galvanized body, 1-required on column riser at the pump
 - 9. Discharge Outlet 3-inch
 - 10. Shaft 416 Stainless Steel
 - 11. Motor Horsepower 1.5 HP
 - 12. Maximum Motor Speed 3450 rpm
 - 13. Motor Operating Voltage 230 volt, 1 phase, 60 Hz
 - 14. Motor shall be non-overloading over the entire pump curve.

1.3 QUALITY ASSURANCE

- A. Quality assurance shall be as required below.
 - 1. The pump and motor for the drinking water well shall be manufactured by Franklin Electric Pump 20FV15P4-2W230 Series V, or approved equal.
 - 2. Product manufacturer shall have a minimum of five (5) years of experience.
 - 3. Certified Well pump Installer

1.4 REFERENCES STANDARDS

- A. Publications are referred to in the text by basic designation only.

1. AIEE
2. North Carolina Administrative Code, Title 15A (NCAC)
3. American Society for Testing and Materials (ASTM)
4. American Water Works Association (AWWA)
5. ANSI
6. NEMA

1.5 SUBMITTALS

- A. Submit the following in accordance with Section, Submittal Procedures:
1. Manufacturers Data: Submit manufacturer's standard drawings or catalog cuts for the following:
 - a. Individual components of the submersible turbine pump.
 - b. Air Valve
 - c. Check Valves
 2. Shop Drawings: Submit project specific shop drawings for the following:
 - a. Base Plate Connection
 - b. Water level measurement device
 - c. Electrical diagram(s) for complete operating system.
 3. Operation and Maintenance Manuals for all equipment (e.g., pumps, etc.) and spare parts catalog.
 4. Spare Parts: Provide one set of spare parts normally required for one year's operation for the pump, properly packaged for storage and marked for usage. Include spare parts catalog.
 5. Certification:
 - a. Submit certified pump curves after approval of Manufacturer's Data and Shop Drawings and prior to purchase.
 - b. Provide certification of installed and properly operating adjustable frequency drive.

1.6 PRODUCT DELIVERY AND STORAGE

- A. The pumps and controls shall be delivered to the job site in as large of units as practical to require the minimum amount of field connection and assembly.
- B. The equipment shall be protected and stored on the job in accordance with the manufacturer's recommendations. As a minimum, the equipment shall be stored off the ground and adequately protected from the weather.
- C. Product shall be handled in accordance with Section, Product Requirements.

PART 2 - PRODUCTS

2.1 DRINKING WATER WELL PUMP

A. Pump Construction:

1. Bowl Assembly: The bowls shall be vitreous enamel, glass lined cast iron conforming to ASTM A48 Class 30. Castings shall be free from blowholes, sand holes and shall be accurately machined and fitted to close dimensions. Bowls shall be designed with smooth passages to ensure efficient operation. The casing shall be hydrostatically tested to 1.5 times the design head or 1.25 times the shutoff head whichever is greater.
2. Impellers: The impeller shall be of 304 stainless or better construction conforming to ASTM B584, C83600. They shall be of one-piece construction, single suction, enclosed vane, and radial flow design. The waterways through the impeller shall have extremely smooth contours, devoid of sharp corners, so as to promote maximum efficiency. The impeller is to be balanced and secured to the shaft. Impellers shall be adjustable by means of a top shaft-adjusting nut.
3. Impeller Shaft: The Impeller shaft shall be of sufficient diameter to withstand the maximum allowable combined shear stress under any operating condition at the smallest net diameter. Impeller shaft shall be of type 304 stainless steel or better construction conforming to ASTM A582. The shaft shall be supported by bronze bearings located on both sides of each impeller. Impeller shaft coupling shall be of type 304 stainless steel or better construction conforming to ASTM A582. The size of the shaft shall be no less than that as determined by AWWA E101. The motor coupling shall be constructed of Type 304 stainless steel or better and either keyed or spliced as needed to fit the motor shaft.
4. Column Shaft: The column shafting shall be turned, ground and polished precision shafting of ample size to operate the pump without distortion or vibration. The shafts shall be furnished in interchangeable sections not over 10 feet in length and shall be coupled with extra-strong threaded steel couplings machined from solid bar steel. The shaft shall be fitted with hardened stainless steel journals. The column assembly shall have bronzed guides fitted into the coupling and secured in place by the butted pipe ends. Each guide shall contain a water lubricated cutting rubber bearing designed for vertical turbine pump service.
5. Submersible Motor: The motor Horsepower, RPM, voltage, and phase shall be as specified in paragraph, System Description above with an outside diameter not to exceed 6" inches. It shall be a submersible type designed for continuous underwater operation and with a service factor of 1.15 minimum. The motor shall be of the water-filled type and fitted with a segmented plate type thrust bearing capable of 3500 pounds continuous downthrust. Motor leads shall be of sufficient length so that they may be spliced above the bowl assembly and the leads shall be protected by a stainless steel cable guard for the entire bowl length. The motor rating shall be selected so that the load at design is not greater than the nameplate rating at 1.0 service factor and at no point on the curve shall the load exceed the nameplate rating plus 10 percent.

- ### B. Surface (Base) Plate:
- The surface plate shall be fabricated from steel with a flat face base flange to match the well casing flange, short radius 90 degrees ductile iron elbow terminating in raised faced steel discharge flange. The surface plate shall be fitted with properly sized electrical junction box to allow for splicing surface cables and well cables. It shall also be tapped for a well vent and air line to the size as indicated on the Drawings and shall be provided with lifting lugs of sufficient strength to lift the entire pump and

motor assembly including the riser pipe. A 12 inches nipple shall extend below the surface plate for connection to the riser pipe.

- C. Discharge Column: The discharge column shall be standard A53 steel pipe of the length indicated. The column pipe shall be of the diameter and weight indicated in the respective pump data. The pipe shall be furnished in interchangeable sections not over 10 feet in length. The sections shall be connected with threaded, sleeve-type couplings as indicated. The pipe shall be intended for potable water use and shall be certified for conformance with NSF61. Contractor shall confirm, prior to ordering pipe, that the pipe with couplings and other items (e.g., pump cable) can be installed in the existing well casing.
- D. Motor Adapter: A motor adapter of stainless steel with rabbeted fits shall be supplied to connect the submersible motor to the bowl assembly. It shall include the motor adapter bearing assembly and a corrosion resistant metal strainer whose free area shall be at least three times the impeller suction eye area. The maximum strainer opening shall not be more than 75 percent of the minimum opening or water passage through the bowl or impeller.
- E. Power Cable: The power cable shall be heavy-duty double jacketed wire. Cables shall be designed specifically for submersible pump service and shall consist of either single conductors individually insulated or multiple conductors individually insulated and the whole covered with an outer jacket.

2.2 RISER CHECK VALVE

- A. After 4-inch spring loaded line check valves on the pump discharge riser pipe at the pump. Check valves shall be ductile iron and threaded male and female ends. Valve shall be Model 80MDI as manufactured by Flowmatic Corp. or approved equal.

2.3 CONTROL PANEL

- A. Control panel shall be a NEMA 4X enclosure. Panel shall be UL labeled, as a complete unit, following assembly. Panel shall be suitable for a single 220 Vac, 1 phase power supply with fault up to 22,000 AIC. Panel shall include, but not be limited to, the following items:
 - 1. Enclosure shall be supplied with a door clamp assembly and hasp and staple for padlocking.
 - 2. Main power terminal block.
 - 3. Solid State reduced voltage starter with shorting contactor, heavy duty and suitable for 6 starts per hour.
 - 4. Surge arrester.
 - 5. Surge capacitor.
 - 6. Phase monitor relay. Motor shall automatically shut down upon loss of phase, under voltage, or phase reversal.
 - 7. Control power transformer fused on primary and secondary. Control power shall be obtained by tapping the 'A' and 'C' phase conductors of the pump motor circuit.
 - 8. Separate circuit breaker with handle projecting through the door for the following:
 - a. Pump Motor

9. Mount the following devices on door:
 - a. Hand-off-automatic (H-O-A) control switch for pump.
 - b. Non-resettable elapsed time meter for pump. Meter shall read in tenth of hours through 99,999 hours total time.
 10. Mount operating and warning lights on door for the following. Color indicate required lens color.
 - a. Power on (white).
 - b. For pump.
 - 1) Running (red).
 - 2) Off (green)
 - c. Phase monitor (amber).
 - d. No flow condition (amber).
 11. Alarm horn and light (red) mounted on building exterior. Horn sound level shall be a minimum of 100 decibels at 10 feet. Provide horn silence switch on inside panel. Alarm horn and light shall be activated by the following alarms: no flow and loss of phase.
 12. Auxiliary contacts for remote signaling of the following:
 - a. Pump run status, three DPDT contacts.
 - b. Loss of power.
 - c. Loss of phase to indicate over / under voltage, phase loss, or phase reversal.
 - d. No flow condition.
 13. Provide laminated plastic labels to identify all control components.
 14. Provide a plastic laminated electric diagram with wire / terminal numbers and color codes permanently fastened to inside of enclosure door.
 15. Provide two sets of normally open auxiliary contacts for electrical interlock with Corrosion Inhibitor pump and chlorine feed pumps to start chemical feed when well pump is operating. Corrosion inhibitor and chlorine feed shall stop when well pump shuts down.
- B. Switches, push buttons, and indicator lights shall be oil tight / watertight units. Lights shall be push-to-test type. Lights shall be 30.5 mm and LED.
- C. Wire shall be sized as required for load and application according to NEC. Wiring shall be neatly bundled and continuous from point to point. Wiring shall be totally accessible with permanent marking on each end to match the schematic drawing. Control and signal wire shall be a minimum of #14 AWG, stranded, 90 degree insulated and color-coded. Color coding shall be as follows:
1. Red AC control
 2. Blue DC control
 3. Yellow External source control
 4. White AC neutral
 5. Green Ground

2.4 AIR VALVES

- A. Provide air valves in conformance with AWWA C512 and the following:
1. Valve type shall be an Air Vacuum valve with a double acting throttling device for well applications.

- a. Inlet size: 1-inch
2. Shall be designed for the following automatic operation:
 - a. Release large quantities of accumulated air during well pump start-up and allow large quantities of air to re-enter during pump shutdown.
3. Valve shall be designed for a system pressure 250 psi.
4. Provide threaded inlet.
5. Provide stainless steel, center guided, ball float and internal trim.
6. Provide isolating bronze ball valve for connection to main line.
7. Valve shall be APCO Series 140DAT as manufactured by Valve and Primer Corporation, Val-matic "Well Service" Air valve as manufactured by Val-matic Valve and Manufacturing Corporation or approved equal.

PART 3 - EXECUTION

3.1 DISINFECTION

- A. During pump installation, well shall be disinfected before they are placed into service in accordance with AWWA C654 and Section 331010, Disinfection of Potable Water System.

3.2 INSTALLATION

- A. Pump shall be provided as indicated on the drawings, plumbed and leveled.
- B. Pressure gauges shall be mounted on the discharge as required for the respective pump installation.
- C. Stilling tube for measuring the well water level shall be installed with the pump and column. The tube shall be attached to the pump column by means approved by the Engineer. Tube shall hang vertically and shall not spiral inside the well casing. The connections at the ground must be airtight.

3.3 START-UP SERVICES

- A. Submit copies of tests and checks performed in the field, complete with meter readings and recordings, where applicable, to the Engineer.

3.4 TEST

- A. The pump shall be run under actual field service to demonstrate that the pump installed performs to the criteria set forth in this specification. During the field test, adjustments shall be made to correct the problems noted. All adjustments or parts renewal shall be at the Contractor's expense.

END OF SECTION - 331100

SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Ductile-iron culvert pipe and fittings.
 - 2. PE pipe and fittings.
 - 3. PVC pipe and fittings.
 - 4. Concrete pipe and fittings.
 - 5. Cleanouts.
 - 6. Drains.
 - 7. Manholes.
 - 8. Polymer-concrete, channel drainage systems.
 - 9. Plastic, channel drainage systems.
 - 10. Catch basins.
 - 11. Stormwater inlets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes in accordance with manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets in accordance with manufacturer's written rigging instructions.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
 - 1. Notify Architect and Construction Manager no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Architect's and Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

- A. Pipe: ASTM A716, for push-on joints.
- B. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153/A21.53, for push-on joints.
- D. Gaskets: AWWA C111/A21.11, rubber.

2.2 CORRUGATED-PE PIPE AND FITTINGS

- A. Corrugated-PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252, Type S, with smooth waterway for coupling joints.
- B. Corrugated-PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294, Type S, with smooth waterway for coupling joints.
- C. Corrugated-PE Silttight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
- D. Corrugated-PE Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings.

2.3 PVC PIPE AND FITTINGS

- A. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
- B. PVC Cellular-Core Piping:

1. PVC Cellular-Core Pipe and Fittings: ASTM F891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
2. Fittings: ASTM D3034, SDR 35, PVC socket-type fittings.

C. PVC Profile Sewer Piping:

1. Pipe: ASTM F794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D3034, PVC with bell ends.
3. Gaskets: ASTM F477, elastomeric seals.

D. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F477, elastomeric seals for gasketed joints.

2.4 CONCRETE PIPE AND FITTINGS

A. Source Limitations: Obtain concrete pipe and fittings from single manufacturer.

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76.

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443, rubber gaskets or sealant joints with ASTM C990, bitumen or butyl-rubber sealant.

2.5 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.6 DRAINS

A. Cast-Iron Area Drains:

1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round grate. Include bottom outlet with inside caulk or spigot connection, of sizes indicated.
2. Top-Loading Classification(s): Heavy Duty.

B. Cast-Iron Trench Drains:

1. Description: ASME A112.6.3, 6-inch-wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular, secured grate. Include units of total length indicated and quantity of bottom outlets with inside caulk or spigot connections, of sizes indicated.
2. Top-Loading Classification(s): Heavy Duty.

C. Steel Trench Drains:

1. Description: Factory fabricated from ASTM A242/A242M, welded steel plate, to form rectangular body with uniform bottom downward slope of 2 percent toward outlet, anchor flange, and grate. Include units of total length indicated, bottom outlet of size indicated, outlet strainer, acid-resistant enamel coating on inside and outside surfaces, and grate with openings of total free area at least two times cross-sectional area of outlet.

2.7 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: [ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

2.8 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318, ACI 350, and the following:

1. Cement: ASTM C150/C150M, Type II.
2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 2 percent through manhole.

2.9 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

5. Joint Sealant: ASTM C990, bitumen or butyl rubber.
 6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
 9. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.
- B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent unless otherwise indicated.
- C. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.10 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone in accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control."
- C. Filter Stone: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, non-pressure drainage piping in accordance with the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
 - 3. Install PE corrugated sewer piping in accordance with ASTM D2321.
 - 4. Install PVC cellular-core piping in accordance with ASTM D2321 and ASTM F1668.
 - 5. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
 - 6. Install PVC profile gravity sewer piping in accordance with ASTM D2321 and ASTM F1668.
 - 7. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure drainage piping in accordance with the following:
 - 1. Join ductile-iron culvert piping in accordance with AWWA C600 for push-on joints.
 - 2. Join ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
 - 3. Join corrugated-PE piping in accordance with ASTM D3212 for push-on joints.
 - 4. Join PVC cellular-core piping in accordance with ASTM D2321 and ASTM F891 for solvent-cemented joints.
 - 5. Join PVC corrugated sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.

6. Join PVC sewer piping in accordance with ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasketed joints.
7. Join PVC profile gravity sewer piping in accordance with ASTM D2321 for elastomeric-seal joints or ASTM F794 for gasketed joints.
8. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual."

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use Heavy-Duty, top-loading classification cleanouts in all areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
 1. Use Heavy-Duty, top-loading classification drains in all areas.
- B. Embed drains in 4-inch-minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch-minimum concrete around bottom and sides.

3.6 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.8 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete in accordance with ACI 318.

3.10 CONNECTIONS

- A. Connect non-pressure, gravity-flow drainage piping in building's storm building drains specified in Section 22 14 13 "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase

entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

- a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.11 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
1. Remove manhole or structure and close open ends of remaining piping.
 2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade in accordance with Section 31 20 00 "Earth Moving."

3.12 IDENTIFICATION

- A. Materials and their installation are specified in Section 31 20 00 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
1. Use warning tape or detectable warning tape over ferrous piping.
 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.13 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Re-inspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping in accordance with ASTM F1417.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.
- 3.14 CLEANING
- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334200

SECTION 463310 - SODIUM HYPOCHLORITE SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. Provide a complete chemical system suitable for receiving, storing and feeding sodium hypochlorite up to a 15 percent concentration. System shall include, but not be limited to, the following components:
 - 1. Day tank
 - 2. Chemical metering pump
 - 3. Valving, and piping.

1.2 SYSTEM DESCRIPTION

- A. Feed system shall be capable of feeding to the following locations:
 - 1. Well House
 - a. Maximum feed rate = 0.1gals / hr
 - b. Backpressure = 100psi
- B. Feed system shall have the following major components, operational capabilities and capacities:
 - 1. Day Tank
 - a. Number Required: 1
 - b. Nominal Capacity: 55 gallons.
 - c. Dimensions:
 - 1) Inside Diameter: 2 feet
 - 2) Straight Shell: 3 feet
 - 2. Chemical Metering Pumps
 - a. Number required: 2 (one in operation and one for standby.)
 - b. Type: Peristaltic metering pump.
 - c. Feed rate control manual adjustment or automatic 4-20 ma signal adjustment with selectable maximum pump speed.
 - d. Capacity: 0.02 gal/hr
 - e. Maximum discharge pressure: 100 psig
 - f. Adjustment Range: 250 to 1
 - g. Voltage: 120 Volt with US plug.
 - h. Pumps shall operate on/off as follows:
 - 1) Chemical feed Pump shall operate when the well pump is in operation.
 - i. Provide the piping and valves as indicated on the drawings.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 Submittals:
 - 1. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following:
 - a. Day Tank
 - b. Metering pump.
 - c. Valves and piping.
 - 2. Certification: Statement that the tank, chemical feed pumps, and tubing supplied are suitable for 15 percent sodium hypochlorite
 - 3. Shop Drawings: Submit project specific shop drawings for the following:
 - a. Bulk storage tank and accessories.
 - b. Complete system layout showing all piping, valves and equipment with the detailed interconnection and installation data.
 - 4. Operation and Maintenance Manuals: Submit complete operation and maintenance manual for the total System, which shall include, but not be limited, to the following:
 - a. Metering pump.

1.4 QUALITY CONTROL

- A. Quality assurance shall be as required in Section, Quality Control and the following requirements.
 - 1. Product manufacturer shall have a minimum of five (5) years of experience in the manufacturing of high density crosslinked polyethylene storage tanks for the specified chemical storage.

1.5 WARRANTY

- A. Manufacturer shall warrant the tank to be free from defects in materials and workmanship and to be suitable for the application and chemical as specified in this section. Warranty shall be for a period of five (5) years from the date of installation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products with surfaces intended to be in contact with the chemical shall be certified and listed in accordance with NSF 61 for potable drinking water.

2.2 DAY TANK

- A. General: Day tank shall be designed for the storage of the chemical specified in this section.

2.3 METERING PUMP

- A. Metering pump shall be a standard metering solution pump suitable for the chemical specified and operate at the capacity and pressure requirements indicated in paragraph, System Description. Pump shall be a ProMinent Fluid Controls, Inc, Acrison, Pulsafeeder, Inc., Stenner or equal.
- B. Pump shall have a feed range of 25 to one based upon the maximum capacity listed above. The feed rate shall be infinitely adjustable over the range specified through a stroke speed adjustment and/or stroke length adjustment.
- C. Controller shall be in a NEMA 1 enclosure and shall include an on-off switch.

2.4 PIPE AND VALVING

- A. Pipe Insulation:
 - 1. Piping and valves located outside of a heated areas shall be insulated with 1-inch thickness of fiberglass insulation. The outside cover for the insulation shall be covered with an asphalt saturated weather-proof jacket for all weather protection.
 - 2. Piping and valve shall be wrapped with FPE heat tape, rated at 6 watts per foot. The tape used shall have an automatic, preset thermostat set at the factory. The tape shall be run parallel to the pipe with the thermostat being in contact with the pipe. Freeze protection shall be to -5 F ambient temperature.
- B. Valves: Shall be PVC bodied with corrosion resistant assemblies. Ball valves shall be true union type with teflon seats.
- C. Piping: Suction and discharge piping shall be rigid Schedule 80 PVC. Joints shall be solvent welded with heavy duty PVC cement and cleaned and primed with purple primer. Pipe and fittings shall be prepared and joined in accordance with manufacturer's requirements.

2.5 SAFETY EQUIPMENT

- A. Provide emergency shower / eye wash where indicated on the Drawings. Unit shall have the following features as a minimum:
 - 1. Unit shall meet all ANSI and OSHA requirements.
 - 2. Unit shall be Guardian 1540 or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Tank:

1. Handle and install in accordance with manufacturers written instructions.
2. Install pipe fitting connections with flexible connections in accordance with manufacturer's requirements.

3.2 START UP SERVICES

- A. Owner shall provide chemical for testing and initial start up of the system. Notify Engineer in writing two (2) weeks prior to the date chemical shall be necessary for testing.
- B. Provide for a manufacturer's representative to check equipment installation, supervise initial start-up, and instruct Owner's personnel in proper operation and maintenance of equipment. A minimum of one trip to the site will be required, consisting of a minimum of one 8-hour working day.
- C. Regardless of the time spent at the site, services will not be considered complete until the system operates as intended for a minimum of one (1) week of plant operation.
- D. Submit copies of tests and checks performed in the field, complete with meter readings and recordings, where applicable, to the Engineer.

END OF SECTION 463310

SECTION 463338 - LIQUID PHOSPHATE (CARUS 8500) FEED SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. Provide a complete chemical system suitable for receiving, storing and feeding Carus 8500 liquid phosphate. System shall include all necessary accessories and appurtenances as shown on the drawings and specified herein. System shall include, but not be limited to:
 - 1. Chemical metering pump.
 - 2. Storage Tank.
 - 3. Valving and piping.
 - 4. Pedestal Mounted Emergency Eyewash

1.3 SYSTEM DESCRIPTION

- A. Feed system and tanks shall provide total system to store and feed chemical to the Well No. 4 discharge line as indicated on the Drawings.

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 01330 Submittals:
 - 1. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following:
 - a. Storage tank and accessories.
 - b. Metering pumps.
 - c. Valves, piping and appurtenances.
 - 2. Certification: Statement that the tank supplied is suitable for alum.
 - 3. Shop Drawings: Submit project specific shop drawings for the following:
 - a. Storage tank and accessories.
 - b. Metering pumps.
 - c. Valves, piping and appurtenances.
 - 4. Operation and Maintenance Manuals: Submit complete operation and maintenance manual for the total System, which shall include, but not be limited, to the following:
 - a. Storage tank and accessories.
 - b. Metering pumps.
 - c. Valves, piping and appurtenances.
 - 5. Warranty: Submit all warranty documentation.

1.5 QUALITY CONTROL

- A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc, Acrison, Pulsafeeder, Inc. or equal.
- B. All pumps shall be shop-tested for capacity and pressure prior to shipment with documented results provided.
- C. Quality assurance shall be as required in Section 01450, Quality Control and the following requirements.
 - 1. The liquid chemical feed equipment specified in this section shall be furnished by one chemical metering pump manufacturer who will provide all components of the metering pump feed system.
 - 2. These specifications cover the intended function of the equipment, but do not necessarily cover all details necessary for a complete, operable and functional system. The supplier shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.

1.6 WARRANTY

- A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.
- B. Tank manufacturer shall warrant the tank to be free from defects in materials and workmanship and to be suitable for the application and chemical as specified in this section. Warranty shall be for a period of five (5) years from the date of installation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products with surfaces intended to be in contact with the chemical shall be certified and listed in accordance with NSF 61 for potable drinking water.

2.2 STORAGE TANK

- A. General: Bulk storage tank shall be designed for the storage of the chemical specified in this section.
- B. Tank Construction:
 - 1. Number Required: 1
 - 2. Nominal Total Capacity: 50 gallons with minimum 6-inch freeboard.
 - 3. Tank shall be molded from Metallocene High Density Crosslinked Polyethylene. Resin used shall be Paxon 7004.

4. Tank interior shall have an anti-oxidant resistant LLDPE liner.
5. Tank shall be constructed by the rotational molding process.
6. Minimum wall thickness shall be 1/4-inch.
7. Tank manufacturer shall have a minimum of five (5) years of experience in the manufacturing of high density cross linked polyethylene storage tanks for the specified chemical storage.
8. Tank shall have graduations molded in the side.
9. Tank cover shall have a 2-inch screened quick connect inlet for chemical delivery to tank and provided with a threaded hole and busing to accommodate suction piping.
10. Tank shall be manufactured by PolyProcessing Co., Snyder Industries Inc., Assmann Corp or equal.

2.3 METERING PUMP

A. Application

1. Quantity: Two (2) (one duty, one spare)
2. Chemical Service: Carus 1000 (35% Active Concentration)
3. Capacity (US gph): 0-0.7 gallons per day (0-2 mL/min)
4. Backpressure (psig): 150 PSIG

B. Pump Description

1. The chemical metering pump shall be microprocessor-controlled, solenoid driven, reciprocating, diaphragm type. The pump shall have corrosion resistant housing with a minimum IP65 protection rating.
2. All pumping functions shall be set by the membrane switch keypad and click wheel and status shall be displayed on an illuminated LCD. The keypad shall allow for simple scrolling and display of programmed parameters.
3. The pump shall be fully tested by the manufacturer prior to shipment to meet rated flow and pressure.
4. The pump shall have a universal power supply that allows it to operate at a supply voltage in the range of 100-230 VAC +/- 10%, 60 Hz, single phase.
5. The diaphragm shall be constructed of a solid core, vulcanized into nylon-reinforced EPDM, with a PTFE-faced fluid contact surface. The diaphragm shall have a convex design fitting into a concave liquid end to minimize dead volume and promote the flow of solids in suspension. The pump shall also have a diaphragm failure detector with a visible indicator of a diaphragm rupture. There shall also be an option for a fault indication or pump shut down in the case of a diaphragm rupture.
6. The liquid end shall be physically separated from the drive unit by a back plate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the drive if the primary diaphragm fails.
7. The liquid end shall be either virgin PVDF or 316 stainless steel as required by the application. Pumps with PVDF liquid ends shall be NSF 61 Certified for use with standard water treatment chemicals. Pumps with 316 stainless steel liquid ends shall have suction and discharge valves made of stainless steel with Teflon seals and stainless steel valve balls.

8. Stroke length control shall be electronically adjustable by means of the click wheel, in increments of 1%, from 1% to 100% of strike length. Stroke length shall be controlled by the pump solenoid without the use of mechanical stops and provide accurate feedback to the electronics of the pump for calibration for LCD display of stroke length.
9. Stroke frequency shall be adjustable via the click wheel and membrane switch keypad from 1 to 12,000 strokes per hour (0.0167 to 200 strokes per minute).
10. It shall be possible to selectively slow the discharge and/or the suction stroke speed of the pump to accommodate application requirements and process fluid viscosity and off-gassing conditions.
11. Provision shall be made to allow for input of chemical concentrations for simple adjustment with volume proportional metering applications.
12. Utilizing the electronic solenoid the pump shall monitor discharge pressure and adjust pump flow accordingly to compensate for changes in the downstream pressure of the system. In addition, the pump shall detect hydraulic defects such as over pressure, under pressure, vapor lock, loss of prime, etc. and facilitate alarm indication.
13. The system shall be equipped with an output relay which shall be programmable for any of the following indications:
 - a. Fault Indication
 - b. Fault indication and pacing relay.
 - c. mA Output – The current output signal indicates the pump's actual calculated metering volume.
14. For simplified operator monitoring the pump shall be equipped with a three LED Display (red, yellow & green) to locally indicate normal operation, fault conditions and warning conditions. The indicator lights shall be visible 360 degrees around the pump.
15. Operating Modes – The pump shall have the following operating modes available:
 - a. Manual operating mode permitting the operation of the pump stroke and speed controls manually.
 - b. Contact operating mode providing the option of controlling the pump externally by means of potential-free contacts. The number of pump strokes per input contact can be scaled by a factor ranging from 0.01 to 99.99 to tailor the pump feed rate to the application.
 - c. Analog operating mode allows the capacity and/or stroke rate to be controlled via an analog (4-20 mA) current signal via the "external control" socket. The processing of the current signal can be preselected via the control unit.

C. Accessories To Be Included as Part of the Pumping System

1. A multi-function valve mounted directly on the liquid end of the pump for backpressure, anti-siphon, pressure relief, priming and draining the discharge line. Materials in contact with chemicals:
 - a. Valve body – PVDF
 - b. Diaphragm – PTFE coated
 - c. O-rings – Viton or EPDM
 - d. DN 10 adapter - PVC
2. A Y-strainer, constructed of materials compatible with chemical to be used, shall be provided with each feed system.

3. A universal control cable with 5-pole round plastic connector and 5-wire cable with loose ends shall be provided with each pump. An adjustable discharge flow monitoring device, compatible with chemical to be used, shall be provided with each pump. The flow monitor shall be capable of signaling a fault condition to the pump.
4. A diaphragm failure detector shall be provided to ((open/close)) a contact for alarm in the event of a diaphragm failure.
5. An adjustable-pressure, diaphragm-type back pressure/anti-siphon valve, constructed of materials compatible with chemical to be used, shall be provided in each feed system discharge line.
6. An air-charged, bladder-type pulsation dampener, constructed with materials compatible with chemical to be used, shall be provided. The pulsation dampener shall be sized to reduce pulsations by at least 90% at full pump capacity.
7. A clear PVC calibration column with FNPT fitting on top and bottom shall be provided with each pump. The column shall be sized to provide at least 2 minutes draw down at maximum pump capacity.
8. The metering system shall incorporate 4.5" liquid filled pressure gauges on each system discharge. Each gauge shall be protected by a glycerin filled gauge protector that is capable of operation from 0 to 160 psig. The casings of the gauge shall be phenolic and accuracy shall be 2% or better.

2.4 ACCESSORIES

- A. Provide drum pump to deliver chemical to day tank. Pump shall be constructed of PVC and capable of pumping a minimum of 22 oz. per stroke. Pump shall be equipped with an angled spout to prevent dripping and a polyethylene extension tube.

2.5 PEDESTAL MOUNTED EMERGENCY EYEWASH

- A. Ball Valve: 1/2" stay-open eye wash valve manufactured of the following materials and supplied with 316 stainless steel pull rod and handle.
 1. Chrome-plated brass
 2. Type 316 stainless steel
- B. Eyewash: The eyewash shall include an integral 5.1 gpm flow control, providing water at a safe velocity while maintaining its effectiveness. Eyewash is protected by flip open dust covers that open when the product is activated. Safe, steady water flow under varying water supply conditions from 30-90 psi is assured by integral flow control in the sprayhead assembly.
- C. Bowl: Bowl is constructed of Type 316 corrosion-resistant stainless steel.
- D. Activation: Type 316 stainless steel push handle with Type 316 foot pedal.
- E. Backflow Prevention: Series N9 dual-check backflow preventer has a chrome-nickel plated brass body and includes atmospheric vent for continuous pressure applications. The check valve comes with 3/8" female dual NPT inlet and outlet connections. It shall be able to sustain a maximum pressure of 125 psi.

2.6 PIPE AND VALVING

A. Pipe Insulation:

1. Piping and valves located outside of a heated area shall be insulated with 1-inch thickness of fiberglass insulation. The outside cover for the insulation shall be covered with an asphalt saturated weather-proof jacket for all weather protection.
2. Piping and valve shall be wrapped with FPE heat tape, rated at 6 watts per foot. The tape used shall have an automatic, preset thermostat set at the factory. The tape shall be run parallel to the pipe with the thermostat being in contact with the pipe. Freeze protection shall be to -5 F ambient temperature.

B. Valves: Shall be PVC bodied with corrosion resistant assemblies. Ball valves shall be true union type with teflon seats.

C. Piping: Suction and discharge piping shall be rigid Schedule 80 PVC. Joints shall be solvent welded with heavy duty PVC cement and cleaned and primed with purple primer. Pipe and fittings shall be prepared and joined in accordance with manufacturer's requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Handle and install all equipment and appurtenances in accordance with manufacturers written instructions.
- B. Install tank and pipe fitting connections with flexible connections in accordance with manufacturer's requirements.

3.2 FIELD TESTING

- A. Tank and connecting piping shall be tested by filling with water. Tank and fittings shall hold water without loss or evidence of weeping for a period of 24 hours prior to acceptance.
- B. Clean and dry tank after testing.

3.3 START UP SERVICES

- A. Owner shall provide chemical for testing and initial start up of the system. Notify Engineer in writing two (2) weeks prior to the date chemical shall be necessary for testing.
- B. Provide for a manufacturer's representative to check equipment installation, supervise initial start-up, and instruct Owner's personnel in proper operation and maintenance of equipment. A minimum of one trip to the site will be required, consisting of a minimum of one (1) 8-hour day.

- C. Regardless of the time spent at the site, services will not be considered complete until the system operates as intended for a minimum of one (1) week of operation.
- D. Submit copies of tests and checks performed in the field, complete with meter readings and recordings, where applicable, to the Engineer.

END OF SECTION 463338

SECTION 464117 - WAFER STYLE INJECTION MIXER

PART 1 - GENERAL

1.1 SCOPE

- A. Provide wafer style injection mixer in the location indicated on the Drawings and specified herein. This section includes the furnishing, installation, and testing of wafer style mixers for the injection of water treatment chemicals into water treatment plant site pipelines.
- B. Work shall include, but not be limited to the following items and necessary accessories for one mixer:
 - 1. Wafer static mixer and injection assembly for injection of Carus 8500 Blended Phosphate product.

1.2 RELATED SECTIONS

- A. The following sections specify equipment and accessories that are directly related to this section. This does not relieve the contractor of his responsibility for the proper coordination of the equipment to be supplied.
 - 1. Section 221113 Facility Water Distribution Piping

1.3 SYSTEM DESCRIPTION

- A. Injection Mixer 1
 - 1. Service Blended Phosphate Feed
 - 2. Chemical Injected in Mixer 35% Active Carus 8500 (50/50 blend)
 - 3. Number of Units 1
 - 4. Flow 225 GPM
 - 5. Line Pressure 150 psi
 - 6. Mixer Plate Material Stainless Steel
 - 7. Number of injection ports 2 (one operation, one spare)
 - 8. Pipe diameter 6"
 - 9. Connecting Pipe type Ductile Iron
 - 10. Connections Transition couplings
 - 11. Max. pressure drop 3 psi

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 01330, Submittals:
 - 1. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following. The equipment to be furnished for the Project shall be clearly indicated including all options to be provided.
 - a. Static Mixer for Caustic Soda, Polyphosphate, and Sodium Hypochlorite.
 - 2. Shop Drawings: Submit Project specific dimensioned shop drawings for each mixer service
 - 3. Manufacturer's installation instructions.
 - 4. Operation and Maintenance Instructions: Submit complete operation and maintenance manuals

1.5 QUALITY ASSURANCE

- A. Wafer Injection Mixer manufacturer shall have been engaged in producing mixers for a minimum of five (5) years. This experience shall consist of installations where equipment of same size and design has been in operation successfully in a similar process for a minimum of three (3) years.
- B. Manufacturer of static mixer shall be Westfall or equal. Manufacturer of injection assembly shall be Safe-T-Flo or equal.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver static mixers as complete units for installation in the pipeline.

1.7 WARRANTY

- 1. Provide standard manufacturer's warranty but shall not be less than one year. Warranty shall start from date of substantial completion of the project.

PART 2 - PRODUCTS

2.1 WAFER STYLE STATIC MIXERS

- A. The wafer style injection mixer shall be of a compact ring body design for mounting between two standard pipe 150 lb flanges. The ring body shall be a minimum thickness of 2.875 inches and shall be fabricated from PVC. Ring type NSF-61 EPDM gaskets shall be furnished and adhered to both sides of the mixer body. The body shall include two (2) ¾" injection ports that will have PVC housing. The second injection port is a spare and shall have a leak proof PVC plug.

B. Mixer Plate

1. 316 Stainless Steel. The mixer plate shall be computer designed to provide a geometric shape which will create the mixing vortices to effectively mix the injected fluid with the main process fluid. The average variation in the process stream of the injected fluid, shall be within 5% of the mean value at 10 pipe diameters downstream of the mixer. The mixing plate shall be no less than 0.375 inches thick and shall be formed from 316 Stainless Steel. The mixer plate shall be mounted in a machined cavity on the upstream side of the ring body.

- C. Provide chemical injection assembly that consists of retractable injector rated at 150 psi. Provide ball valve and check valve, solution tube, tube adaptor, and packing nut in CPVC material and provide stainless steel restraining hook and limit chain. Provide 3/4" main male connection to injector body, 3/8" solution tube and 1/2" male inlet to assembly. Solution tube to be minimum 6 inches long.

PART 3 EXECUTION – NOT USED

END OF SECTION 464117