PROJECT MANUAL

FOR

MARYVILLE SCHOOL LIFT STATION REPLACEMENT PROJECT

PROJECT #1815

CITY OF GEORGETOWN

SOUTH CAROLINA

DATE OF ISSUE: July 15, 2021

REV	DATE	DESCRIPTION	BY	CHK	APR

CITY OF GEORGETOWN
WATER UTILITIES DEPARTMENT
2377 ANTHUAN MAYBANK DRIVE
GEORGETOWN SC 29440
(843) 545-4500

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(END OF SECTION)

SECTION 00010
ENUMERATION OF THE DOCUMENTS

The drawings, specifications and addenda, which form a part of this contract as set forth in Paragraph 1 of the General Conditions, Contract and Contract Documents are enumerated in Section 00005 - Table of Contents.

The order of precedence when conflicts in the documents occur is as follows:

1. Permits from other Agencies as may be required by law
2. Change Orders and/or supplemental agreements according to the latest date
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The figured dimensions shown on the Drawings and in the Specifications may not, in every case agree with the scale dimension. Figured dimensions take precedence over scaled dimensions and finer scaled drawings take precedence of coarser scaled drawings, i.e. one inch equals twenty feet drawings takes precedence over one inch equals fifty feet drawings.

(END OF SECTION)

SECTION 00015
REFERENCES

The following reference shall be used hereinafter:

Owner: City of Georgetown, SC PO Box 939 Georgetown, SC 29442	The City of Georgetown hereinafter will be referred to as the "Owner" and/or the "City".
City Administrator: Mrs. Sandra Yudice, Ph.D. PO Box 939 Georgetown, SC 29442	Mrs. Sandra Yudice hereinafter will be referred to as the "City Administrator".
Risk Manager: Mrs. Gladys Rutledge-Livingston PO Box 939 Georgetown, SC 29442	Mrs. Gladys Rutledge-Livingston hereinafter will be referred to as the "Risk Manager".
Purchasing Agent: Mrs. Daniella Howard 1134 North Fraser Street Georgetown, SC 29440	Mrs. Daniella Howard hereinafter will be referred to as the "Purchasing Agent".
Water Utilities Director: Mr. Will Gunter Water Utilities Manager	Mr. Gunter hereinafter will be referred to as the "Water Utilities Director".
Project Manager Mr. Orlando Arteaga, P.E. City Engineer	Mr. Arteaga hereinafter will be referred to as the "Project Manager".
Engineer The Wooten Company	The Wooten Company will be referred to as the "Engineer"

(END OF SECTION)

MARYVILLE SCHOOL LIFT STATION #16 REPLACEMENT
CITY OF GEORGETOWN

00020
ADVERTISEMENT FOR BIDS

The City of Georgetown, requests sealed bids from qualified contractors for the above-referenced project.

Maryville School Lift Station Replacement Project #1815 – Request for Bid (RFB)

This project is being funded (in part) by a Rural Infrastructure Authority (RIA) grant. Therefore, bidders must comply with all applicable State and Federal requirements identified in the contract documents.

Bids are due on or before **2:00 pm** local time (EST), **Thursday, August 19, 2021**.

Bidder must make positive efforts to use women-owned or minority-owned businesses.

Bid documents including, but not limited to forms, specifications and milestone events, may be downloaded free of charge from the City website: www.georgetownsc.gov. Select "Bids" from the bottom of the home page. You may also send an email request to purchasing@georgetownsc.gov for a direct link.

Owner: City of Georgetown.

In accordance with the City's Procurement Ordinance, any protest or objection to this RFB selection award process must be submitted in writing to the City of Georgetown, Attn: Daniella Howard, Purchasing Agent, PO Drawer 939, Georgetown, SC 29440, within ten (10) calendar days of the posting of the award notification to the City's website. The City's Procurement Ordinance to include Section 2-194, Protest Procedure, can be found in its entirety on the City's website at: https://www.georgetownsc.gov/wpfb-file/procurement.

Non-Mandatory Pre-Bid Conference
A Non-Mandatory Pre-Bid Conference will be held via GOTOMEETING, **Wednesday, August 4, 2021 at 10:00 am (EST).**

To join the meeting from your computer, tablet or smartphone, click here:
https://global.gotomeeting.com/join/116012445

You can also dial in via phone, (408) 650-3123, using the Access Code: 116-012-445.

Contact Purchasing@georgetownsc.gov or 843.545.4043 **prior to 9:30 am (EST), Wednesday, August 4, 2021,** if you have any questions regarding the GOTOMEETING.

Questions
No answers will be given over the phone.

For questions regarding this RFB, contact purchasing@georgetownsc.gov, no later than 5:00 pm EST (Local Time), Friday, August 6, 2021 .

MARYVILLE SCHOOL LIFT STATION #16 REPLACEMENT
CITY OF GEORGETOWN

Please note - if you do not receive confirmation from the City that your email was received before the deadline, it is the sole responsibility of the proposer to contact the purchasing agent at 843.545.4043.

No questions will be accepted after the aforementioned deadline. All submittals shall include the following in the subject line:

Maryville School Lift Station Project

Answers to questions will be posted on the City's website at www.georgetownsc.gov under "Bids" as an Addendum no later than 5:00 pm EST (local time), August, July 10, 2021

Contractors shall have a classification of:

GENERAL CONTRACTOR-WATER & SEWER PLANTS (WP).

Bid documents will be modified only by written addenda. It is the responsibility of the Bidder to obtain information regarding projects directly from the City's website, www.georgetownsc.gov, under "Bids".

When the Procurement Division is closed due to force majeure, bid openings will be postponed to the same time on the next official business day.

(END OF SECTION)

00100
INFORMATION FOR BIDDERS

1. PROJECT SUMMARY

The project consists of a installing a higher storage capacity wet well, a new sanitary manhole, two new submersible pumps with higher pumping rate, a new valve pit, new valves and accessory piping, force main connection, a new stand-by diesel generator, and control panel.

Rural Infrastructure Authority (RIA) Grant Information
RIA has awarded financial assistance to the City of Georgetown for the construction of the **Maryville School Lift Station Replacement Project #1815**.

2. RECEIPT AND OPENING OF BIDS

The City of Georgetown (hereinafter called the "Owner") invites bids on the form (s) attached hereto, all blanks of which must be appropriately filled in.

Bids **MUST BE** submitted electronically through the City of Georgetown's website, www.georgetownsc.gov, under "Bids". As always, bids received after the due date and time will not be considered for any reason.

The City **WILL NOT** accept bids by:

Hard copy

Fax

Email

Your bid must be submitted electronically to ensure it remains sealed until the scheduled bid opening date and time.

Bid openings will be streamed live via the City's public Facebook page, https://www.facebook.com/cityofgtown/.

To be considered responsive, interested parties **must** comply with the following:

1. Submit bid proposal electronically through the City website, www.georgetownsc.gov, under "Bids". Submittal package must include these items:
    1. Bid Form – See Section 00311
    2. Bid Bond – See Section 00350
    3. Mandatory Vendor Submittal Form – See Section 01000
    4. Certification of Site Visit – See Section 00100

2. Electronic bid proposal must be received electronically through the City's website, www.georgetownsc.gov, no later than the aforementioned deadline. Bids will be publicly opened and read aloud via the City's public Facebook page, https://www.facebook.com/cityofgtown/.

    No bid will be accepted after such time. It is the sole responsibility of the bidder to have their bids delivered to the City before the closing hour and date. The City assumes no responsibility for delivery of bids that are mailed, or submitted electronically. Late bids will not be accepted nor considered. The official clock shall be that of the City's Purchasing Agent, or designee.

    The City reserves the right to accept or reject any or all bids and to waive any informalities and technicalities in the bid process. No additional fees, costs, or any other reimbursable expenses will be allowed.

    The City reserves the right to waive any technicalities or informalities and to accept or reject any and/or all submissions as deemed by its sole judgment to be in its best interest. The City also reserves the right to terminate the selection process without notice, to waive any irregularities in any submittal, and to request additional information from any of the bidders submitting a bid.

    The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. Bid price shall be firm for a period of ninety (90) days

3. PREPARATION OF BID

    Each bid must be submitted on the prescribed form. All blank spaces for bid prices must be filled in with ink or typewritten.

Bids that are incomplete, unbalanced, conditional or obscure, or which contain additions not called for, erasures, alterations, or irregularities of any kind, or which do not comply with the Information for Bidders, may be rejected at the option of the Owner.

The correct total amount bid for the completed work is defined as the correct sum total of the amounts bid for the individual items in the proposal. The correct amount bid for each unit price item is defined as the correct product of the quantity listed for the item by the unit price bid.

4. SUBCONTRACTS

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract must be acceptable to the Owner.

5. QUALIFICATION OF BIDDER AND ITS SUBCONTRACTORS

The Owner may make such investigations as is deemed necessary to determine the ability of the bidder and proposed subcontractors to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request.

The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be acceptable.

6. BID SECURITY

Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of five percent (5%) of the bid. Cash or checks will be returned to all except the three (3) lowest bidders within three (3) days after the opening of bids, and the remaining cash or checks will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within ninety (90) days after the date of the opening of the bids, upon demand of the bidder at any time thereafter so long as bidder has not been notified of the acceptance of its bid.

7. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful bidder, upon failure or refusal to execute and deliver the contract and bonds required within ten (10) days after they have received notice of the acceptance of their bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with the bid.

8. TIME OF COMPLETION AND LIQUIDATED DAMAGES

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within the number of consecutive calendar days thereafter as indicated on the Bid Form. Bidder must agree also to pay as liquidated damages the sum indicated on the Bid Form for each consecutive calendar day thereafter as hereinafter provided in General Conditions.

9. CONDITIONS OF WORK

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the contract.

Insofar as possible, the Contractor in carrying out the work must employ such methods and means as will not cause any interruption of, or interference with, the work of any other contractor.

10. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally. Each request for such interpretation should be in writing and addressed to the Project Manager. To be given consideration, the request must be received at least five (5) days prior to the date fixed for the opening of bids.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be posted in the Project listing that is located at the City of Georgetown website http://www.georgetownsc.gov no later than three (3) days prior to the date fixed for the opening of bids. It shall be the bidder's responsibility to check for addenda before issuing its bid. Failure of any bidder to receive any addendum shall not relieve the bidder from any obligation under its bid as submitted. All addenda so issued shall become part of the contract documents.

11. BID, PAYMENT AND PERFORMANCE BONDS

When a construction contract is awarded in excess of One Hundred Thousand Dollars ($100,000) a payment and performance bond shall be delivered by the successful bidder to the City and shall become binding on the parties upon execution of the contract.

Simultaneously with bidder's delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as secured for the faithful performance of this contract and for the payment of all persons performing labor on the project under this contract, as specified in General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company. An agent must be provided with a South Carolina license authorized to sign and execute the bond(s). Countersignature by an agent residing in South Carolina will not be required, but execution by an agent holding a South

Carolina non-resident license is required. The Bid Bond shall be an amount equal to or at least five percent (5%) of the amount of the bid. The Performance Bond shall be in the amount of one-hundred and ten percent (110%) of the bid and the Payment Bond shall be in the amount of one-hundred percent (100%) of the bid.

12. POWER OF ATTORNEY

Attorneys-in-fact who sign bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

13. NOTICE OF SPECIAL CONDITIONS

Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

A. Inspection and testing of materials
B. Insurance requirements
C. Stated allowances
D. Permits and Rights-of-way
E. Hazardous Gas Safety (Section 01060)

14. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

15. METHOD OF AWARD - LOWEST QUALIFIED BIDDER

It is the intent of the Owner to award the Contract to the lowest responsible Bidder, provided that the Bid has been submitted in accordance to the bidding documents and that the total bid amount, including alternates, does not exceed the funds budgeted for this project. The Owner has the right to reject any or all bids; award the contract on the base bid only; combine base bid with applicable alternates; or negotiate the lowest bid, in the Owner's best interests.

The Owner will decide on the qualifications of the lowest Bidder based on the following elements:

- Maintains a permanent place of business registered with the SC Secretary of State.
- Has successfully completed other similar work with a minumim of five (5) years of practice.
- Has adequate financial, equipment, and personnel resources to meet contractual obligations related to the project.
- Licensed as a general or specialty contractor by the SCLLR.

16. RIGHT TO INCREASE OR DECREASE THE AMOUNT OF WORK

The work comprises approximately the quantities shown in the bid form which will be used as a basis for comparison of Bids and not for final estimate. The Owner does not, by expression or by implication, agree that the actual amount of work shall correspond with the estimated quantities. The Owner reserves the right to increase or decrease the amount of work under the Contract of the work contemplated, at the unit prices quoted in the Bid.

17. OBLIGATION OF BIDDER

At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and been thoroughly familiar with the plans and contract documents, including all addenda. If a site visit is required, contact the Project Manager to schedule a date and time. The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation with respect to its bid.

18. SITE VISIT PRIOR TO BID

At the time of bid, submit "Certification Regarding Site Visit Prior to Bid". See certification form at the end of the Section.

MARYVILLE SCHOOL LIFT STATION REPLACEMENT
CITY OF GEORGETOWN

CERTIFICATION REGARDING SITE VISIT PRIOR TO BID

PROJECT: MARYVILLE SCHOOL LIFT STATION REPLACEMENT

CITY PROJECT NO.: 1815

_____, representing the bidding contractor, visited the project (Name of Representative) site on _____, 2021 and became fully aware of all site conditions pertaining to site access and working conditions associated with the work to be performed on this project. This site condition information has been conveyed to all necessary personnel and sub-contractors preparing the bid for work on this project.

I certify that the bid for this work includes all costs associated with the site conditions, including but not limited to access, and restoration for a complete project.

Submitted by: _____
Signature

_____
Printed Name

_____
Title

_____
Company

(END OF SECTION)

SECTION 00110
CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE REQUIREMENTS

1. As required under Paragraph 29 of the General Conditions, the Contractor shall not commence work under this Contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his Subcontract until all similar insurance required of the Subcontractor has been so obtained and approved.

2. Unless otherwise specified in this Contract, the Contractor shall, at its sole expense, maintain in effect at all times, during the performance of work, insurance coverage with limits not less than those set forth below with insurers and under forms of policies satisfactory to Owner.

3. The Contractor shall deliver Certificates of Insurance to the Engineer no later than ten (10) days after award of the Contract but in any event, prior to execution of the Contract by the Owner and prior to commencing work on the site as evidence that policies providing such coverage and limits of insurance are in full force and effect.

    A. Certificates shall provide not less than thirty (30) days advance notice will be given in writing to the Owner prior to cancellation, termination, or material alteration of said policies of insurance.

    B. Certificates shall identify on their faces the project name "**MARYVILLE SCHOOL LIFT STATION REPLACEMENT PROJECT**" and the "**PROJECT NUMBER 1815**".

4. Additional Insured: The Commercial General Liability, Auto Liability, and Excess Liability (Umbrella) insurance policies shall be endorsed to include the Owner as an additional insured.

5. The Owner is not maintaining any insurance on behalf of the Contractor covering against loss or damage to the work or to any other property of the Contractor unless otherwise specifically stated herein and as may be described by appendix hereto. In the event the Contractor maintains insurance against physical loss or damage to the Contractor's construction equipment and tools, such insurance shall include an insurer's waiver of rights of subrogation in favor of the Owner.

6. The Contractor shall indemnify the Owner and the Engineer, as stated in Part 47 of The General Conditions.

7. Insurance Requirements:
   Contractor shall provide coverage for not less than the following amounts, or greater where required by Laws and Regulations:

   a. Workers' Compensation and Employer's Liability

Workers' Compensation	Statutory
Employer's Liability	
Each Accident	$ 500,000.00
Each Employee	$ 500,000.00
Policy Limit	$ 500,000.00

   b. Commercial General Liability

General Aggregate	$ 2,000,000.00
Products - Completed Operations Aggregate	$ 2,000,000.00
Personal and Advertising Injury	$ 1,000,000.00
Bodily Injury and Property Damage—Each Occurrence	$ 1,000,000.00

   c. Automobile Liability

Combined Single Limit (Bodily Injury and Property Damage)	$ 1,000,000.00

   d. Excess or Umbrella Liability

Per Occurrence	$ 2,000,000.00
General Aggregate	$ 2,000,000.00

(END OF SECTION)

SECTION 00311
BID FORM

MARYVILLE SCHOOL LIFT STATION REPLACEMENT

Date: _____
Project No.: 1815

PROPOSAL OF _____, doing business as a corporation / a partnership / an individual (Strike out inapplicable terms), with its principal office in the City of _____, County of _____, State of _____, (hereinafter called "Bidder").

TO: City of Georgetown, SC

Gentlemen:

The Bidder, in compliance with your invitation for bids for **the Maryville School Lift Station Replacement** having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within **180 consecutive calendar days** thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages the sum of **$500 for each consecutive calendar day** thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

The plans, specifications, and addenda are complementary of each other. What is called for by one shall be as binding as if called for by all. If a conflict between any of the above is discovered by the contractor, the problem shall be referred to the Engineer as soon as possible for resolution by the Engineer. Should a conflict occur which is not resolved before bid time and/or is necessary to comply with mandatory requirements (i.e., codes, ordinances, etc.), it shall be the contractor's responsibility to price and bid the more expensive method.

Bidder acknowledges receipt of the following addendum:

No: _____Dated:_____

No: _____Dated:_____

No: _____Dated:_____

MARYVILLE SCHOOL LIFT STATION REPLACEMENT
CITY OF GEORGETOWN

Bidder agrees to perform the work as described in the specifications and shown on the plans for the following unit or lumps sum (LS) prices:

No.	Description	Qty.	Unit	Unit Price ($)	Cost ($)
1	Mobilization	1	LS		
2	Erosion Control	1	LS		
3	Demolition	1	LS		
4	Bypass Pumping	1	LS		
5	New Wet Well and Existing Wet Well Modifications	1	LS		
6	Valve Vault, Valves, Accessory Piping	1	LS		
7	Pumps and Controls Equipment	1	LS		
8	New 4' Dia. Sanitary Manhole	1	EA		
9	Site Piping	1	LS		
10	Trash Basket	1	EA		
11	Generator and ATS Equipment	1	LS		
12	Electrical Work	1	LS		
13	Chain Link Security Fencing	1	LS		
	TOTAL BID AMOUNT				
	ALTERNATES				
1	Mechanical Grinder	1	EA		
	TOTAL BID AMOUNT INCLUDING ALTERNATE				

Amounts shall be shown in both words and figures. In case of discrepancy, the amount in words shall govern.

Base Bid Lump Sum of:

_____Dollars $ (_____)

Base Bid including Alternates Lump Sum of:

_____Dollars $ (_____)

The lump sum price indicated above shall include all labor, materials, equipment, overhead, profit, insurance, taxes, business license, construction permit fees, etc., to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part of.

The Bidder declares that he/she understands that the quantities shown in the Proposal are subject to adjustment by either increase or decrease and that should the quantities of any of the items of

the work be increased, the undersigned proposed to do the additional work at the unit prices stated herein, and should the quantities be decreased, he also understands that payment will be made on actual quantities at the unit price bid, and will make no claim for anticipated profits for any decrease in the quantities and that actual quantities will be determined upon completion of the work, at which time adjustment will be made to the contract amount by direct increase or decrease.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Paragraph 30 of the General Conditions. The bid security attached in the sum of _____ _____ Dollars _____ _____ Cents ($_____) is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

By submission of this bid, each bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, that this bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this bid, with any other bidder or with any competitor.

[SEAL – (If bid is by a corporation)]

Respectfully submitted:

BY: _____

_____
(Print Name)

_____
(Title)

_____
(Business Address)

_____
(Email)

_____
(Telephone)

SECTION 00350
BID BOND

KNOW ALL MEN BY THESE PRESENT:

That we, the undersigned _____, as Principal, and _____, as Surety, are hereby held and firmly bound unto the City of Georgetown, South Carolina, as Owner, in the penal sum of (5% of total bid) _____ Dollars _____ Cents ($ _____), for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this _____ day of _____, 20_____.

The condition of the above obligation is such that:

WHEREAS, the Principal has submitted to _____ a certain Bid, attached hereby and by reference made a part hereof, to enter into a contract in writing for the **MARYVILLE SCHOOL LIFT STATION REPLACEMENT**.

NOW, THEREFORE,

(A) If said Bid shall be rejected, or

(B) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a Bond for faithful performance of said contract, and for the payment of all persons performing labor furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void; otherwise the same shall remain in force and effect - it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its Bond shall be in no way impaired or affected by an extension of the time within which the Owner may accept such Bid, and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
Principal

(Corporate Seal)

By :_____(L.S)

_____
Surety

(Corporate Seal)

By :_____(L.S)

Important: Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

(END OF SECTION)

SECTION 00500
CONTRACT

STATE OF SOUTH CAROLINA

COUNTY OF GEORGETOWN

THIS AGREEMENT, entered into this _____ day of _____, 20_____ and effective immediately by and between _____ , doing business as a (individual/partnership/corporation), with its principal office in the City of _____, _____ County, _____State,(hereinafter called the "Contractor") and the City of Georgetown, a duly organized and validly existing politic body of the State of South Carolina (hereinafter called "City"),

WITNESSETH THAT WHEREAS, The City desires to engage the services of a professional contractor for the purpose of **Maryville School Lift Station Replacement**, hereinafter referred to as "Project"; and,

WHEREAS, The City has solicited bids for same by that certain Request for Bids for Construction Services, hereinafter referred to as "RFB", a copy of which is attached hereto for all purposes as **EXHIBIT "1"**; and,

WHEREAS, The Contractor has represented to City that it has the qualifications, experience, expertise, training, and personnel to timely perform the Project for City; and,

WHEREAS, The Contractor has expressed its desire to do so by their bid opened _____, 2021, hereinafter referred to as "Bid", a copy of which is attached hereto for all purposes as **EXHIBIT "2"**;and,

WHEREAS, the parties desire to enter in an agreement for the Contractor to perform the Project for City per all the terms and conditions more particularly set out herein below;

NOW, THEREFORE, for and in consideration of the foregoing, and of other good and valuable consideration, the adequacy of which is hereby acknowledged, the parties hereto agree as follows:

(1) **SCOPE OF SERVICES:**

a. Contractor hereby agrees to perform a project for the **Maryville School Lift Station Replacement** as outlined in the Project Manual, incorporated into this Agreement as **ATTACHMENT "A"** and hereinafter referred to as "Work";

b. Contractor further agrees to commence and complete any and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at his/hers (it's or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendents, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal and the General Conditions, Supplemental General Conditions, and Special Provisions of the Contract, the plans, including all maps, plats, blueprints, and other drawings and printed or written explanatory matters thereof, the specifications and contract documents therefore as prepared by the Engineer, and as enumerated in Paragraph 1 of the General Conditions, all of which are made a part hereof and collectively evidence and constitute the Contract.

c. City may, from time to time require changes in the Work of the Contractor to be performed hereunder. Such changes, which are mutually agreed upon by and between City and the Contractor, shall be incorporated by written amendment to this Agreement.

(2) **COMPENSATION:**

a. City agrees to pay Contractor a sum not to exceed _____ dollars ($_____.___) in accordance with the Schedule of Values, incorporated into this Agreement as **ATTACHMENT "B"** and hereinafter referred to as "Compensation";

b. In the event funds are not appropriated or become non-appropriated for an included fiscal year by City, it is agreed by the parties that this Agreement will become null and void and the City's obligations cannot extend beyond the date of non-appropriation.

(3) **PERIOD OF SERVICES:**

a. the Work to be performed hereunder by the Contractor shall begin upon the date outlined to the City's Notice to Proceed letter to the Contractor, incorporated into this Agreement as **ATTACHMENT "C"** and hereinafter referred to as "NTP"

b. The Work shall be completed in accordance with the Schedule, incorporated into this Agreement as **ATTACHMENT "D"** and hereinafter referred to as "Schedule".

c. Modifications to the Schedule may be required Such modifications, which are mutually agreed upon by and between City and the Contractor shall be incorporated by written amendment to this Agreement

(4) **FORCE MAJEURE:**

a. Force majeure includes acts of God, acts of other branches of government in either their sovereign or contractual capacities, or any similar cause beyond the reasonable control of the parties.

b. Any delays in or failure of performance by either party that are caused by a Force Majeure shall not constitute breach of this Agreement.

c. In the event that any event of force majeure, as herein defined occurs, both parties shall be entitled to a reasonable extension of time for performance of its WORK.

(5) **NOTICES:**

a. Any notices, bills, invoices, or reports required by this Agreement shall be sufficient if sent by the parties in the United States mail or electronic mail to the addresses of the Project Manager (See Section 00015)

(6) **RECORDS AND INSPECTIONS:**

a. Contractor shall maintain full and accurate records with respect to all matters covered under this Agreement for a period of one year after the completion of the project.

b. City shall have free access at all proper times to such records, and the right to examine and audit the same and to make transcripts there from, and to inspect all program data, documents, proceedings, and activities.

(7) **COMPLETENESS OF AGREEMENT:**

a. This Agreement and any additional or supplementary document or documents incorporated herein by specific reference contain all the terms and conditions agreed upon by the parties hereto, and no other agreements, oral or otherwise, regarding the subject matter of this Agreement or any part thereof shall have any validity or bind any of the parties hereto
b. This Agreement is entered into with full understanding and awareness of such requirement.
c. City shall be allowed to rely upon the representations of Contractor as set out in the Proposal.
d. With the exception of the foregoing, this Agreement constitutes the entire agreement between the parties hereto and may not be modified or amended except in writing signed by both parties hereto.

(8) **CONFLICTS:**

a. In the case of any conflict between the terms and conditions of this Agreement and the terms of any other agreement between the parties hereto, the terms of this Agreement shall control
b. If there is a conflict between the City's Requests for Bids and this Agreement, then this Agreement shall control.
c. If there is a conflict between the City's Request for Bids and the Contractor's Proposal, the City's Request for Bids shall control.
d. Both parties agree that all conflicts arising under this Agreement that cannot be settled between the parties shall be resolved in the Georgetown County Court of Common Pleas (Non-Jury)

(9) **SEVERABILITY:**

a. If any part or provision of this Agreement is held invalid or unenforceable under applicable law, such invalidity or unenforceability shall not in any way affect the validity or enforceability of the remaining parts and provisions of this Agreement.

(10) **NONWAIVER:**

a. The waiver by City or Contractor of a breach of this Agreement shall not operate as a waiver of any subsequent breach, and no delay in acting with regard to any breach of this Agreement shall be construed to be a waiver of the breach.

b. In no event shall the making of any payment by City to the Contractor constitute or be construed as a waiver by City of any breach of covenant, or any default which may exist on the part of the Contractor.

c. The making of any such payment by City while any such breach or default shall exist in no way impairs or prejudices any right or remedy available to City in respect to such breach or default.

(11) **GOVERNING LAW:**

a. This Agreement and the rights, obligations and remedies of the parties hereto, shall in all respects be governed by and construed in accordance with the laws of the State of South Carolina.

(12) **RESPONSIBILITY:**

a. Each party shall be responsible for its own acts as provided under the law of South Carolina and will be responsible for all damages, costs, fees and expenses which arise out of the performance of this Agreement which are due to that party's own negligence, tortious acts and other unlawful conduct and the negligence, tortious action and other unlawful conduct of its respective agents, officers and employees.

(13) **FREEDOM OF INFORMATION ACT (FOIA)**

a. The parties acknowledge that all documents are subject to release under the South Carolina Freedom of Information Act (FOIA) and will be released to the public unless exempt from disclosure under the FOIA.

b. If the Contractor contends a document is exempt from disclosure under the FOIA, it shall mark any such documents plainly, and seek protection from disclosure by filing an appropriate action in Circuit Court and shall bear the cost of the action and any monetary or attorney's fees awarded to the person or entity making the FOIA request.

c. If the Contractor objects to release and litigation is commenced against the City under the FOIA, the City agrees to promptly notify the Contractor, who shall move in intervene as a party. The Contractor agrees to hold the City harmless from and indemnify for all costs (including plaintiff's attorney's fees if awarded by the Court) incurred by the City in defending the lawsuit and the funds necessary to satisfy any judgment and all costs on appeal, if any.

(14) **THIRD-PARTY OBLIGATIONS:**

a. Neither party shall be obligated or liable hereunder to any party other than the second party to this Agreement.

(15) **RESTRICTIONS ON LOBBYING:**

a. The Contractor shall comply with all requirements of Section 1352, Title 31 of the U.S. Code, which prohibits all recipients of federal funds from using appropriated monies for lobbying activities.

(16) **SUCCESSORS AND ASSIGNS:**

a. The rights and obligations herein shall inure to and be binding upon the successors and assigns of the parties hereto.

IN WITNESS WHEREOF, City and the Contractor have executed this agreement as of the date first written above.

CITY OF GEORGETOWN, SOUTH CAROLINA
(OWNER)

_____
(SIGNATURE)

By: _____

(SEAL) Title: _____

_____
(CONTRACTOR)

_____
(SIGNATURE)

By: _____

(CORPORATE SEAL) Title: _____

Attest:

_____
It's Secretary

_____
Witness

(END OF SECTION)

MARYVILLE SCHOOL LIFT STATION REPLACEMENT
CITY OF GEORGETOWN

SECTION 00600.1
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(NAME OF CONTRACTOR)

_____
(ADDRESS OF CONTRACTOR)

A Corporation Partnership, hereinafter called Principal, and

_____
(NAME OF SURETY)

_____
(ADDRESS OF SURETY)

Hereinafter called Surety, are held and firmly bound unto

THE CITY OF GEORGETOWN, SOUTH CAROLINA
(NAME OF OWNER)

PO BOX 939, GEORGETOWN, SC 29442
(ADDRESS OF OWNER)

hereinafter called Owner, in the penal sum of (110% of total bid)
_____ Dollars _____ Cents ($ _____),
in lawful money of the United States, 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 present.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal entered into a certain Contract with the Owner dated the _____ day of _____, 2021, a copy of which is hereto attached and made part hereof for **MARYVILLE SCHOOL LIFT STATION REPLACEMENT**

NOW, THEREFORE, if the Principal shall well, truly, and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract and fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense

which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extensions of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

PROVIDED FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20____.

Signed, sealed and delivered in the presence of:

_____
(PRINCIPAL - CONTRACTOR)

_____

_____
(SIGNATURE)

_____
As to Principal

By: _____

Title: _____

_____
(SURETY)

_____

_____
(SIGNATURE)

_____
As to Surety

By: _____
ATTORNEY-IN-FACT
(Power of Attorney to be attached)

By: _____
(AGENT)

_____
(AGENT COMPANY NAME)

_____

_____
(AGENT COMPANY ADDRESS)

_____

_____
(AGENT ADDRESS)

NOTES:

1. Date of Bond must not be prior to date of Contract.

2. If Contractor is a Partnership, all partners should execute Bond.

3. Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

(END OF SECTION)

MARYVILLE SCHOOL LIFT STATION REPLACEMENT
CITY OF GEORGETOWN

SECTION 00601.1
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(NAME OF CONTRACTOR)

_____
(ADDRESS OF CONTRACTOR)

A Corporation Partnership, hereinafter called Principal, and

_____
(NAME OF SURETY)

_____
(ADDRESS OF SURETY)

Hereinafter called Surety, are held and firmly bound unto

THE CITY OF GEORGETOWN, SOUTH CAROLINA
(NAME OF OWNER)

PO BOX 939, GEORGETOWN, SC 29442
(ADDRESS OF OWNER)

hereinafter called Owner, in the penal sum of (100% of total bid)
_____ Dollars_____ Cents ($ _____),
in lawful money of the United States, 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 present.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal entered into a certain Contract with the Owner dated the _____ day of _____, 2021, a copy of which is hereto attached and made part hereof for **MARYVILLE SCHOOL LIFT STATION REPLACEMENT**.

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension of modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether

by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extensions of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

PROVIDED FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20____.

Signed, sealed and delivered in the presence of:

_____
(PRINCIPAL - CONTRACTOR)

_____

_____
(SIGNATURE)

_____
As to Principal

By: _____

Title: _____

_____
(SURETY)

_____

_____
(SIGNATURE)

_____
As to Surety

By: _____
ATTORNEY-IN-FACT
(Power of Attorney to be attached)

By: _____
(AGENT)

_____
(AGENT COMPANY NAME)

_____

_____
(AGENT COMPANY ADDRESS)

_____

_____
(AGENT ADDRESS)

NOTES:

1. Date of Bond must not be prior to date of Contract.

2. If Contractor is a Partnership, all partners should execute Bond.

3. Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

(END OF SECTION)

SECTION 00601.2

NOTICE OF INTENT TO AWARD

OWNER: City of Georgetown
2377 Anthuan Maybank Drive
Georgetown, SC 29440

PROJECT NO.: 1815

PROJECT DESCRIPTION: Maryville School Lift Station Replacement

TO ALL BIDDERS:

This is to notify all bidders that it is the intent of the Owner to award a contract as follows:

NAME OF BIDDER: _____

DATE BIDS WERE RECEIVED: _____

AMOUNT OF BASE BID: $_____

ALTERNATE(S) ACCEPTED: # $_____

TOTAL AMOUNT OF BASE BID WITH ALTERNATE(S): $_____

The Owner has determined that the above-named Bidder is responsible and has submitted the lowest responsive bid. The Owner may enter into a contract with this Bidder subject to the contract review and approval by the RIA and City Council.

_____ _____
(Print or Type Name) (Title)

_____ _____
(Signature) (Date Posted)

(END OF SECTION)

MARYVILLE SCHOOL LIFT STATION REPLACEMENT
CITY OF GEORGETOWN

SECTION 00602.4
NOTICE OF AWARD

TO:

PROJECT:

PROJECT NO. :

DATE:

The City of Georgetown (Owner) has considered your proposal in response to the Request for Bid (RFB) dated July 15, 2021.

You are hereby notified that Owner has approved your bid in the amount of $_____.

You are required to provide the following documents: W-9 form, Employment Verification Affidavit, City's business license (or per-job business license), Payment and Performance bonds, and Certificate of Insurance naming the City of Georgetown as additionally insured, within ten (10) business days from the date of this notice to you. A Purchase Order and contract agreement will then be prepared once the requested documents are on hand.

Please sign and return this form in acknowledgment of this Notice of Award to the Owner.

CITY OF GEORGETOWN, SOUTH CAROLINA

By: _____

Title: _____

Acceptance of Notice

Receipt of the above Notice of Award is hereby acknowledged this _____day of _____ , 20_____.

_____
(Signature)

By: _____

Title: _____

(END OF SECTION)

SECTION 00604
EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENT

A. Contractor is required to comply with all applicable State and Federal employment eligibility verification requirements including but not limited to the following:

   1. By signing its bid or proposal, Contractor certifies that it will comply with the applicable requirements of Title 41, Chapter 8 of the South Carolina Code of Laws and agrees to provide to the City of Georgetown upon request any documentation required to establish either: (a) that Title 41, Chapter 8 is inapplicable both to Contractor and its subcontractors or sub-subcontractors are in compliance with Title 41, Chapter 8. Pursuant to Section 41-8-70, "In addition to other penalties provided by law, a person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony, and upon conviction, must be fined within the discreti9on of the court or imprisoned for not more than five years, or both. "Contractor agrees to include in any contracts with its subcontractors language requiring its subcontractors to (a) comply with the applicable requirement of Title 41, Chapter 8, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 41, Chapter 8.

B. Contractor is required to complete and submit the attached affidavit along with the executed contract documents.

C. E-Verify.

   1. In addition to completing and maintaining the federal employment eligibility verification form (Form I-9), Contractor must, within three (3) business days after employing a new employee, verify the employee's work authorization through the E-Verify federal work authorization program administered by the U.S. Department of Homeland Security. Employers may no longer confirm a new employee's employment authorization with a driver's license or state identification card.

   2. Contractor shall enroll in E-Verify at www.dhs.gov/e-verify.

CONTRACTOR AFFIDAVIT

SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT (Amended)

In accordance with the requirements of the South Carolina Illegal Immigration Reform Act, Contractor hereby certifies that it is currently in compliance with the requirements of Title 40, Chapter 8 of the S.C. Code Annotated and will remain in compliance with such requirements throughout the term of its contract with the Owner.

The Contractor hereby acknowledges that in order to comply with the requirements of S.C. Code Annotated Section 41-8-20:

(A) All private employers in South Carolina shall be imputed a South Carolina employment license, which permits a private employer to employ a person in this State. A private employer may not employ a person unless the private employer's South Carolina employment license and any other applicable licenses as defined in Section 41-8-10 are in effect and are not suspended or revoked. A private employer's employment license shall remain in effect provided the private employer complies with the provisions of this chapter.

(B) All private employers who are required by federal law to complete and maintain federal employment eligibility verification forms or documents must register and participate in the E-Verify federal work authorization program, or its successor, to verify the work authorization of every new employee within three business days after employing a new employee. A private employer who does not comply with the requirements of this subsection violates the private employer's licenses.

(C) The South Carolina Department of Employment and Workforce shall provide private employers with technical advice and electronic access to the E-Verify federal work authorization program's website for the sole purpose of registering and participating in the program.

(D) Private employers shall employ provisionally a new employee until the new employee's work authorization has been verified pursuant to this section. A private employer shall submit a new employee's name and information for verification even if the new employee's employment is terminated less than three business days after becoming employed. If a new employee's work authorization is not verified by the federal work authorization program, a private employer must not employ, continue to employ, or reemploy the new employee.

(E) To assist private employers in understanding the requirements of this chapter, the director shall send written notice of the requirements of this section to all South Carolina employers and shall publish the information contained in the notice on its website. Nothing in this section shall create a legal requirement that any private employer receive actual notice of the requirements of this chapter through a written notice from the director, nor create any legal defense for failure to receive notice.

(F) If a private employer is a contractor, the private employer shall maintain the contact phone numbers of all subcontractors and sub-subcontractors performing services for the private employer. The private employer shall provide the contact phone numbers or a contact phone number, as applicable, to the director pursuant to an audit or investigation within seventy-two hours of the director's request.

The Contractor agrees to provide to the Owner upon request any documentation required to establish the applicability of the South Carolina Illegal Immigration Reform Act (Amended) to the contractor, subcontractor or sub-subcontractor. The Contractor further agrees that it will upon request provide the Owner with any documentation required to establish that the Contractor and any subcontractors or sub-subcontractors are in compliance with the requirements of Title 41, Chapter 8 of the S.C. Code Annotated.

Date:_____

_____
(Signature)

By: _____

Title: _____

(END OF SECTION)

SECTION 00606
NOTICE TO PROCEED

TO:

OWNER: City of Georgetown, South Carolina

PROJECT:

PROJECT NUMBER:

DATE:

This is your Notice to Proceed with the Work, on the above-mentioned Project, in accordance with

The Agreement dated _____, 20_____. You are authorized to commence

Work on _____ 20_____, and you are required to complete the Work

within **One-Hundred and Eighty (180)** consecutive calendar days thereafter.

The date of final completion for all Work is therefore: _____ 20_____.

Kindly return this Notice to Proceed to the Owner in acknowledgement.

CITY OF GEORGETOWN, SOUTH CAROLINA

_____
(Signature)

By: _____

Title: _____

Acceptance of Notice

Receipt of the above Notice to Proceed is hereby acknowledged this the _____day of _____ , 20_____.

_____
(Signature)

By:_____

Title:_____

(END OF SECTION)

SECTION 00610
APPLICATION FOR PAYMENT

Contractor may submit other Pay Request form for Engineer's approval in lieu of the following:

Owner: City of Georgetown

Contractor:

Contract No.
Pay Estimate No.
Period of Estimate: From _____ to _____

CONTRACT CHANGE ORDER SUMMARY

No.	Approval Date	Additions	Deductions
Totals:			
Net Change:			

ESTIMATE

1. Original Contract	$
2. Change Orders	$
3. Revised Contract (1+2) ...	$
4. Work Completed*	$
5. Stored Materials*	$
6. Subtotal (4+5)	$
7. Retainage	$
8. Previous Payments	$
9. Amount Due (6-7-8)	$

** Detailed breakdown attached*

CONTRACT TIME

Original (days): _____ On Schedule: Yes____ No ____

Revised: _____ Starting Date: _____

Remaining: _____ Projected Completion: _____

Contractor's Certification:

The undersigned certifies that to the best of their knowledge, information, and belief the work covered by this payment estimate has been completed in accordance with the contract documents, that all amounts due subcontractors and suppliers have been paid by the Contractor for work for which previous payment estimates were issued and payments received from the Owner, and that the current payment shown herein is now due.

(Signature): _____

By: _____

Date: _____

Engineer's Certification:

The undersigned certifies that to the best of their knowledge and belief, the quantities shown in this estimate are correct and the work has been performed in accordance with the contract documents. Based on periodic but less than full-time field representation, to the best of our information the quantities, items and schedule of values, work completed and material and equipment delivered are accurate as indicated on this request for payment. Some defects or problems with construction items may not be determined until final testing and operation of the system are performed. The Engineer cannot be held liable for approval for partial payments for the installation of these items from which the evidence of defects or problems were not determined until after the request for payment was approved.

(Signature): _____

By: _____

Date: _____

Approved by Owner:

(Signature): _____

By: _____

Date: _____

PAY ESTIMATE NO. ___________________ DATE _____________________

Page ___ of ___

PROJECT: ____ PROJECT NUMBER: ______________

		CURRENT CONTRACT				TOTAL THIS PERIOD		PREVIOUS TOTAL		TOTAL TO DATE		
Item No	Description	Quantity	Units	Unit Cost	Total Cost	Quantity	Total Cost	Quantity	Total Cost	Quantity	Total Cost	%
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
	TOTALS				$0.00		$0.00		$0.00		$0.00	#DIV/0!

SECTION 00620
CONTRACTOR'S AFFIDAVIT

The State of _____ Date: _____

The County of _____ The City of _____

_____ of _____
(Officer's Name) (Officer's Title) (Contractor's Name)

being duly sworn, deposed and says that _____ has furnished
(Contractor's Name)
Labor and materials entering into the **Maryville School Lift Station Replacement** dated _____ with the City of Georgetown, South Carolina.

_____ states further that this officer has full knowledge of all
(Contractor's Name)
obligations for such labor and materials which have entered into and become part of that certain project known and designated above, and that this officer further deposes and says that all debts and other obligations for such labor and materials have been fully and completely paid for in good and lawful money of the United States of America and that there are no suits for damages against them proceeding, prospective and/or that there are no suits for damages against them proceeding, prospective, or otherwise, in consequence of their operations on the above said project.

The said _____ will hold the Owner, the City of Georgetown
(Contractor's Name)
South Carolina, blameless of any and all mechanic's liens that may be hereafter entered or filed for record, so as to constitute a charge against said premises for work or labor done or materials furnished by them.

IN WITNESS HEREOF, this officer has heretofore put his hand and seal:

_____
(Officer's Name)

I, _____, Notary Public in and for the above named County and State do hereby certify that _____ personally know to me to be the
(Officer's Name)
affiant in the foregoing Affidavit, personally appeared before me this day and, having been duly sworn, deposed and says the facts set forth in the above Affidavit are true and correct.

WITNESS my hand and seal this _____ day of _____ 20_____.

_____

Notary Public for the State of _____

My Commission Expires: _____

SECTION 00630
CONTRACT CHANGE ORDER

DATE: _____ PROJECT: _____
CHANGE ORDER #: _____ PROJECT #: _____

Description of and Reason for Change: _____

_____

_____

_____

Itemization of Proposed Change and Basis for Payment

Original Contract Price . . . . . $_____

Previous Change Orders . . . . . $_____

This Change, (An Addition) (A Deduction) of . . . . . .$_____

Proposed Revised Contract Price . . . . . $_____

Additional funds shall be provided in the following manner: _____

_____

Extension of Contract Time Required: _____ days.

Revised Contract Completion Date: _____

Accepted by the Contractor:

By: _____ Date: _____

Recommended by the Engineer:

By: _____ Date: _____

Approved by the Owner:

By: _____ Date: _____

SECTION 00700
GENERAL CONDITIONS

1. CONTRACT AND CONTRACT DOCUMENTS. The plans, specifications and addenda, hereinafter enumerated in Paragraph 1 of Supplemental General Conditions, shall form part of this contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents titles, heading, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the contract documents and in no way affect, limit or cast light on the interpretations of the provisions to which they refer.

Contents

1. Contract and Contract Documents
2. Definitions
3. Additional Instructions and Detail Drawings
4. Shop Drawings and Samples
5. Materials, Services & Facilities
6. Contractor's Title to Materials
7. Inspection and Testing of Materials
8. "Or Equal" Clause
9. Patents
10. Surveys, Laws, and Regulations
11. Contractor's Obligations
12. Weather Conditions
13. Protection of Work and Property, Emergency
14. Interpretations
15. Reports, Records and Data
16. Superintendence by Contractor
17. Changes in Work
18. Extras
19. Time for Completion and Liquidated Damages
20. Correction of Work
21. Subsurface Conditions Found Different
22. Claims for Extra Cost
23. Right of Owner to Terminate Contract
24. Construction Schedule and Payment Estimates
25. Payments to Contractor
26. Acceptance of Work and Final Payment
27. Acceptance of Final Payment as Release
28. Payments by Contractor
29. Insurance
30. Payment and Performance Bonds
31. Assignments
32. Mutual Responsibility of Contractors
33. Separate Contracts
34. Subcontracting
35. Engineer's Authority
36. Stated Allowances
37. Use of Premises and Removal of Debris
38. Quantities of Estimate
39. Rights-of-Way and Suspension of Work
40. Warranty for One Year After Completion of Contract
41. Notice and Service Thereof
42. Required Provisions Deemed Inserted
43. Protection of Lives and Health
44. Wages and Overtime Compensation
45. Prohibited Interests
46. Conflicting Conditions
47. Indemnification

2. DEFINITIONS. The following terms as used in this contract are respectively defined as follows:

(a) Contractor. A person, firm or corporation with whom the contract is made by the Owner.

(b) Subcontractor. A person, firm or corporation supplying labor and materials, or only labor, for work at the site of the project for and under separate contract or agreement with the Contractor.

(c) Work on or at the Project. Work to be performed at the location of the project, including the transportation of materials and supplies to or from the location of the project by employees of the Contractor and any Subcontractor.

3. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS. The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the Contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry on the work in accordance with the additional detail drawings and instructions. The Contractor and the Engineer will prepare jointly:

(a) A schedule fixing the dates at which special detail drawings will be required; such drawings, if any, to be furnished by the Engineer in accordance with said schedule; and

(b) A schedule fixing the respective dates for the submission of shop drawings, the beginning of manufacture, testing and installation of materials, supplies, and equipment, and the completion of the various parts of the work; each such schedule to be subject to change from time to time in accordance with the progress of the work.

4. SHOP DRAWINGS AND SAMPLES. Submit to the Engineer for approval, in accordance with the requirement of Section 01340.

4.1 Samples. Contractor shall also submit to the Engineer for approval, all samples required by Section 01340. All samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

4.2 Deviations. At the time of each submission, Contractor shall in writing call the Engineer's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Document.

4.3 Engineer's Review. Engineer will review and approve with reasonable promptness Shop Drawings and samples, but his review and approval shall be only for conformance with the design concept of the project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. Contractor shall direct specific attention in writing or on

resubmitted Shop Drawings to revisions other than the corrections called for by Engineer on previous submissions. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and Contract Documents.

4.4 Contractor's Records. Where a Shop Drawing or sample submission is required by the Specifications, no related work shall be commenced until the submission has been approved by Engineer. A copy of each approved shop drawing and each approved sample shall be kept in good order by Contractor at the site and shall be available to Engineer.

4.5 Contractor's Responsibility. Engineer's approval of Shop Drawings or sample shall not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called the Engineer's attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.

5. MATERIALS, SERVICES, AND FACILITIES shall be furnished by the Contractor.

(a) It is understood that except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, gas lights, power, transportation, superintendence, taxes, insurance, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete and deliver the work within the specified time.

(b) Any work necessary to be performed after regular working hours, on Sundays, or legal holidays, shall be performed without additional expense to the Owner.

6. CONTRACTOR'S TITLE TO MATERIALS. No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims or encumbrances.

7. INSPECTION AND TESTING OF MATERIALS. Unless otherwise specifically provided for in the specifications, the inspection and testing of material and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies approved by the Owner. The cost of such inspection and testing shall be paid by the Contractor.

7.1 Certification by Contractor. Where the detailed specifications call for certified copies of mill or shop tests to establish conformance of certain materials with the specifications, it shall be the responsibility of the Contractor to assure delivery of such certifications to the Owner. No materials or finished articles shall be incorporated in the work until such materials and finished articles have passed the required tests. The Contractor shall promptly segregate and remove rejected material and finished articles from the site of the work.

7.2 Guaranty. The testing and approval of materials by the laboratory, or laboratories, shall not relieve the Contractor of any of his obligations to fulfill his contract and guarantee of workmanship and materials as called for in paragraph entitled "General Warranty for One Year After Completion of Contract" herein. The Contractor may, at his option and at his own expense, cause such other tests to be conducted as he may deem necessary to assure suitability, strength, and durability of any material or finished article.

8. "OR EQUAL" CLAUSE. The phrase "or equal" shall be construed to mean that material or equipment will be acceptable only when, in the judgment of the Engineer, they are composed of parts of equal quality, or equal workmanship and finish, designed and constructed to perform or accomplish the desired result as efficiently as the indicated brand, pattern, grade, class, make or model. Written approval will be obtained from the Engineer prior to installation.

9. PATENTS. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents. If the Contractor uses any design, device or material covered by letter, patent, or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood that, with exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringements by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

10. SURVEYS, LAWS AND REGULATIONS. The Contractor shall comply with the following:

10.1 Construction staking shall be in accordance standard construction staking practice or with the requirements of Section 01050 entitled "Field Engineering".

10.2 Laws and Regulations. The Contractor shall keep himself fully informed of all laws, ordinances, and regulations of State, City and County in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same in writing to the Owner. He shall, at all times, himself observe and comply with all such existing and future laws, ordinances and regulations (to the extent that such requirements do not conflict with Federal laws or regulations) and shall protect and indemnify the Owner and its agents against any claims or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

11. CONTRACTOR'S OBLIGATIONS. The Contractor shall, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery,

equipment, facilities, and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time herein specified, in accordance with provisions of this contract and said specifications, and in accordance with the plans and drawings covered by this contract and any and all supplemental plans and drawings and in accordance with the directions of the Engineer as given from time to time during the progress of the work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitation of the contract and specifications, and shall do, carry on and complete the entire work to the satisfaction of the Engineer and the Owner.

12. WEATHER CONDITIONS. In the event of temporary suspension of work or during inclement weather, or whenever the Engineer shall direct, the Contractor will, and will cause his subcontractors to, protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect its work, such materials shall be removed and replaced at the expense of the Contractor.

13. PROTECTION OF WORK AND PROPERTY, EMERGENCY. The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the contract or by the Owner or by his duly authorized representatives. In case of emergency which threatens loss or injury of property and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Engineer, in a diligent manner. He shall notify the Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Engineer for approval. Where the Contractor has not taken action but has notified the Engineer of an emergency threatening injury to persons or damage to the work of any adjoining property, he shall act as instructed or authorized by the Engineer. The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in paragraph entitled "Changes in Work" of these specifications.

14. INTERPRETATIONS. If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of these proposed contract documents, he may submit to the Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt and actual delivery. Any interpretation of such documents will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. The Owner will not be responsible for any other explanation or interpretation of such documents which anyone presumes to make on behalf of the Owner before expiration of the ultimate time set for the receipt of bids.

15. REPORTS RECORDS AND DATA. The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

16. SUPERINTENDENCE BY CONTRACTOR. The Contractor shall employ only competent and skilled men on the work. The Contractor shall have competent Superintendent or Foreman present at all times when the work is in progress, who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who can be

continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll. The Contractor shall, upon demand from the Engineer, immediately remove any superintendent, foreman or workman whom the Engineer may consider incompetent or undesirable.

17. CHANGES IN WORK. No changes in the work covered by the approved contract documents shall be made without having prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of, the following methods:

(a) Unit bid prices previously approved.

(b) An agreed lump sum.

(c) The actual cost of:

1. Labor, including foremen.
2. Materials entering permanently into the work.
3. The ownership or rental cost of construction plant and equipment during the time of use on the extra work.
4. Power and consumable supplies for the operation of power equipment.
5. Insurance.
6. Social security and old age and unemployment contributions.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed 10 percent of the estimated cost of the work. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit and any other general expenses.

18. EXTRAS. Without invalidating the contract, the Owner may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly, and the consent of the surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner, or the Engineer acting officially for the Owner, and the price is stated in such order. Extra work shall be performed only upon the execution of authorized change orders as set forth in the preceding paragraph.

19. TIME FOR COMPLETION AND LIQUIDATED DAMAGES. It is hereby understood and mutually agreed by and between the Contractor and the Owner that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are essential conditions of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the Notice to Proceed.

19.1 Regular Prosecution of Work. The Contractor agrees that said work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for completion of the work described herein is a reasonable time for completion of same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

19.2 Liquidated Damages. If the Contractor shall neglect, fail, or refuse to complete the work within the time herein specified, or any proper extensions

thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticality and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

19.3 Extensions of Time for Completion. It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contractor an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

(a) To any preference, priority or allocation order duly issued by the Government.

(b) To unforeseeable cause beyond the control and without the fault or negligence of the Contractor including, but not restricted to, acts of the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner; fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, hurricanes, tornadoes; and

(c) To any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article.

Provided, further that the Contractor shall, within seven (7) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner in writing of the causes of delay, who shall ascertain the facts and extent of delay and notify the Contractor within a reasonable time of its decision in the matter, and grant such extension of time as the Owner shall deem suitable and just.

Normal weather conditions for the project area are taken into consideration in the time for completion of the contract; therefore, no extension of time will be extended for normal weather conditions, with the exception of hurricanes and tornadoes.

20. CORRECTION OF WORK. All work, all materials, whether incorporated in the work or not, all processes of manufacturer, and all methods of construction, shall be at all times and places subject to the inspection of the Engineer, who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture, and methods of construction of the purposes for which they are used. Should they fail to meet his approval, they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at his own expense. Rejected material shall immediately be removed from the site. If in the opinion of the Engineer, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not

performed in accordance with the contract documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as, in the judgment of the Engineer, shall be equitable.

21. SUBSURFACE CONDITIONS FOUND DIFFERENT. Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the plans or indicated in the specifications, he shall immediately give notice to the Engineer of such conditions before they are disturbed. The Engineer will thereupon promptly investigate the conditions, and if he finds that they materially differ from those shown on the plans or indicated in the specifications, he will at once make such changes in the plans and/or specifications as he may find necessary; any increase or decrease of cost resulting from such changes to be adjusted in the manner provided in paragraph 17 of these specifications.

    (a) Where no specific subsurface conditions are indicated or specified, no increase in cost will be considered in regards to subsurface conditions encountered.

22. CLAIMS FOR EXTRA COSTS. No claim for extra work or cost shall be allowed unless the same was done in pursuance of a written order of the Engineer, as aforesaid, and the claim presented with the first estimate after the changes or extra work is done. When work is performed under the terms of subparagraph 17(c) of these specifications, the Contractor shall furnish satisfactory bills payrolls and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

23. RIGHT OF OWNER TO TERMINATE CONTRACT. In the event that any of the provisions of this contract are violated by the Contractor or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the surety of its intention to terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and unless within 10 days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement or correction be made, the contract shall, upon the expiration of said 10 days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract; provided, however, that if the surety does not commence performance thereof within 10 days from the date of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute same to completion by the contract or by force account for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned thereby, and in such event the Owner may take possession of and utilize in completion the work such materials, appliances and plant as may be on the site of the work and necessary therefore. If the Contractor should die, be declared an incompetent, be declared bankrupt or insolvent, make an assignment for the benefit of creditors during the term of his contract, the Owner may terminate the contract in the manner and under the procedure set forth above with the exception that no notices to the Contractor shall be required, but in lieu thereof the Owner must make a reasonable effort to notify the estate of the Contractor, his guardian, assignee, or legal representative of the intention to terminate and fact of termination, if there is any such guardian, assignee, or legal representative at the time the Owner desires to terminate.

24. CONSTRUCTION SCHEDULE AND PAYMENT ESTIMATES. Immediately after execution and delivery of the contract and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of

commencement and completion of each of the various subdivisions of work required under the contract documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule.

24.1 Contractor's Payment Estimate. The Contractor shall also furnish:

(a) A detailed payment estimate, giving a complete breakdown of the contract price; and

(b) Periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for addition to or deductions from the contract price.

24.2 Equipment Delivery Schedule. The Contractor shall also prepare a schedule of anticipated shipping dates for materials and equipment. It is intended that equipment and materials be so scheduled as to arrive at the job site just prior to time for installation to prevent excessive materials on hand for inventory and the necessity for extensive storage facilities at the job site.

25. PAYMENTS TO CONTRACTOR shall be made according to the following:

(a) Payments to the Contractor will be made within thirty (30) days upon receipt of a duly certified approved estimate of the work performed during the preceding calendar month under this contract, but to insure the proper performance of this contract, the Owner will retain a portion of each estimate until final completion and acceptance of all work covered by this contract in accordance with the following:

1) Retention of up to 10% of payment claimed until construction is complete.

(b) In preparing the payment request, the material delivered on the site and preparatory work done may be taken into consideration.

(c) All material and work covered by partial payments shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all the terms of the contract.

25.1 Owner's Right to Withhold Certain Amounts and Make Application Thereof. The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the contractor, either pay unpaid bills, of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably

sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the contract by the Owner to the Contractor, and the Owner shall not be liable to the Contractor for any such payment made in good faith.

26. ACCEPTANCE OF WORK AND FINAL PAYMENT. Before final acceptance of the work and payment to the Contractor of the percentage retained by the Owner, the following requirements shall be complied with:

(a) Final Inspection. Upon notice from the Contractor that his work is completed, the Engineer will make a final inspection of the work and shall notify the Contractor of all instances where his work fails to comply with the contract drawings and specifications, as well as any defects he may discover. The Contractor shall immediately make such alterations as are necessary to make the work comply with the contract drawings and specifications, and to the satisfaction of the Engineer.

(b) Operating Test. After the alterations for compliance with the contract drawings and specifications have been made, and before acceptance of the whole or any part of the work, it shall be subjected to test to determine that it is in accordance with the contract drawings and specifications. The Contractor shall maintain all work in first class condition for a thirty (30) day operating period after the work has been completed as a whole, the final inspection has been made, and the Engineer has notified the Contractor in writing that the work has been finished to his satisfaction. The retained percentage as provided herein will not become due or payable to the Contractor until after the thirty (30) day operating period has expired.

(c) Cleaning Up. Before the work is considered as complete, all rubbish and unused material due to or connected with the construction must be removed and the premises left in a condition satisfactory to the Owner. Streets, curbs, crosswalks, pavements, sidewalks, fences and other public and private property disturbed or damaged should be restored to their former condition. Final acceptance will be withheld until such work is finished.

(d) Liens. Final acceptance of the work will not be granted and the retained percentage will not be due or payable until the Contractor has furnished the Owner proper and satisfactory evidence under oath that all claims for labor and material employed or used in the construction of the work under this contract have been settled, and that no legal claims can be filed against the Owner for such labor or material.

(e) Final Payment. Upon completion of all cleaning up, alterations and repairs required by the final inspection or operating test, the satisfactory completion of the operating test, and upon submitting proper and satisfactory evidence to the Owner that all claims have been settled, the Contractor shall then prepare his final payment estimate. After review and approval of the final payment estimate by the Engineer and the Owner, the payment shall then become due.

27. ACCEPTANCE OF FINAL PAYMENT AS RELEASE. The acceptance by the Contractor of final payment shall be and shall operate as a release to the owner of

all claims and all liability to the Contractor for all things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or his sureties from any obligations under this contract or the performance and payment bond.

28. PAYMENTS BY CONTRACTOR. The Contractor shall pay:

(a) For all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered;

(b) For all materials, tools, and other expendable equipment to the extent of ninety (90) percent of the cost thereof not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used; and

(c) To each of his subcontractors not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

29. INSURANCE. The Contractor shall procure and shall maintain during the life of this contract, whether such operation be by himself or by a subcontractor or anyone directly or indirectly employed by either of them, such insurance as required by statute and/or ordinance to adequately protect the Owner from any claims or damages, including bodily injury or death, which may arise from them during operations under this contract.

29.1 Limits of Liability. Insurance shall be obtained for not less than the limits of liability as specified in Section 00110-Insurance Requirements.

29.2 Certificates of Insurance. The Contractor shall furnish the Owner, if requested, certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of the policies. Such certificates shall contain substantially the following statement: "The insurance covered by this certificate will not be cancelled or materially altered except after 30 days written notice has been received by the Owner".

30. PAYMENT AND PERFORMANCE BONDS. The Contractor shall furnish a 110 percent performance bond and a 100 percent payment bond as security for the faithful performance of this contract, as security for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract. The performance bond and payment bond shall be in separate instruments. Before the final acceptance, each bond must be approved by the Owner.

31. ASSIGNMENTS. The Contractor shall not assign the whole or any part of this contract or any sums of money due or to become due hereunder without the written consent of the Owner. In case the Contractor assigns all or any part of any sums of money due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that is agreed that the right of the assignee in and to any sums of money due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services

rendered or materials supplied for the performance of the work called for in this contract.

32. MUTUAL RESPONSIBILITY OF CONTRACTORS. If through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

33. SEPARATE CONTRACTS. The Contractor shall coordinate his operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractor, shall keep informed of the progress and the detail work of other contractors and shall notify the Engineer immediately of lack of progress or defective workmanship on the part of other contractors. Failure of a contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

34. SUBCONTRACTING shall comply with the following:

(a) The Contractor may utilize the services of specialty contractors on those parts of the work that under normal contracting practices are performed by specialty subcontractors.

(b) The Contractor shall not award any work to any subcontractor without the prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the subcontractor, which statement shall contain such information as the Owner may require.

(c) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons employed by him.

(d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other contract documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contract under any provisions of the contract documents.

(e) Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

35. ENGINEER'S AUTHORITY. The Engineer shall determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or

payment for work under this contract affected in any manner or to any extent by such question.

35.1 Interpretation of Drawings and Specifications. The Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work that may arise between the Contractor under this contract and other contractors performing work for the Owner shall be adjusted and determined by the Engineer.

36. ALLOWANCES: N/A.

37. USE OF PREMISES AND REMOVAL OF DEBRIS. The Contractor expressly undertakes at his own expense:

(a) To take every precaution against injuries to persons or damage to property.

(b) To store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other contractors.

(c) To place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.

(d) To clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance.

(e) Before final payment to remove all surplus material, falsework, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition.

(f) To effect all cutting, fitting or patching of his work required to make the same conform to the plans and specifications, and, except with the consent of the Engineer, not to cut or otherwise alter the work of any other contractor.

38. QUANTITIES OF ESTIMATE. The estimated quantities of work to be done and materials to be furnished under this contract, shown in any of the documents, including the proposal, are given for use in comparing bids, and the right is specially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this contract, and such increase or diminution shall in no way vitiate this contract, nor shall any such increase or diminution give cause for claims or liability for damages.

39. RIGHT-OF-WAY AND SUSPENSION OF WORK. The Owner shall furnish all land and rights-of-way necessary for the carrying out of this contract and the completion of the work herein contemplated, and will use due diligence in acquiring said land and rights-of-way as speedily as possible. But it is possible that all lands and rights-of-way may not be obtained as herein contemplated before construction begins, in which event the Contractor shall begin his work upon such land and rights-of-way as the Owner may have previously acquired, and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining lands and rights-of-way.

Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of

any litigation or by reason of its ability to procure any lands or rights-of-way for said work, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay or to withdraw from the contract except by consent of the Owner; but time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing.

40. GENERAL WARRANTY FOR ONE YEAR AFTER COMPLETION OF CONTRACT. For a period of at least one year after the completion of the contract, the Contractor warrants the fitness and soundness of all work done and materials and equipment put in place under the contract, and neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting there from, which shall appear within a period of one year from the date of final acceptance of the work, unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness. This warranty period shall be extended as necessary to include additional warranty periods required by permitting agencies.

41. NOTICE AND SERVICE THEREOF. Any notice to any Contractor from the Owner relative to any part of this contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted by registered mail to said Contractor or his authorized representative on the work or is deposited in the regular United States Mail in a sealed, postage prepaid envelope and the receipt thereof is acknowledged by the Contractor.

    41.1 Owner's Notice. All papers required to be delivered to the Owner shall be delivered as indicated in Section 00800 entitled Supplemental General Conditions.

42. REQUIRED PROVISIONS DEEMED INSERTED. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein, and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted or is not correctly inserted, then upon the application of either party the contract shall forthwith by physically amended to make such insertion or correction.

43. PROTECTION OF LIVES AND HEALTH. In order to protect the lives and health of his employees under the contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the contract. The Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage that may result from their failure or their improper construction, maintenance or operation.

44. WAGES AND OVERTIME COMPENSATION. The Contractor and each of his subcontractors shall comply with all applicable State and local laws or ordinances with respect to the hours worked by laborers and mechanics engaged in work on the project and with respect to compensation for overtime.

45. PROHIBITED INTERESTS. No official of the Owner, who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve or to

take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction, or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, engineer, or inspector of and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project shall become directly or indirectly interested personally in this contract or in any part hereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

46. CONFLICTING CONDITIONS. Any provisions in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in these General Conditions shall be void to the extent of such conflict or inconsistency.

47. INDEMNIFICATION

47.1 The CONTRACTOR will indemnify and hold harmless the OWNER, the ENGINEER and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the WORK, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting there from; and is caused in whole or in part by any negligent or willful act of omission of the CONTRACTOR and SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

47.2 In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by an employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employee benefits acts.

47.3 The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ENGINEER, its agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, design or specifications.

(END OF SECTION)

SECTION 00800
SUPPLEMENTARY CONDITIONS

1. WORKING HOURS

   The Contractor is allowed to work during regular working hours from 7:00 AM to 6:00 PM unless warranted due to emergency conditions.

   Weekend work must be approved in advance by the Owner.

2. MARYVILLE ELEMENTARY SCHOOL
   The Contractor is advised that the project site is within the Maryville Elementary School grounds. No staging, deliveries, or field activities are authorized on or around school grounds but only within the lift station assigned area.

3. BUSINESS LICENSE AND PERMITS
   The selected contractor shall be required to obtain a per-job city business license. Contact Jestin Gilliard, Revenues Manager, at 843-545-4041, to obtain a City business license.

4. PROJECT SCHEDULE OF EVENTS

The following is the schedule of events listed in the order of occurrence, showing the major milestones from issuance of the RFB to the contract completion:

No.	PROJECT MILESTONE EVENTS	DATE	LOCAL TIME (EST)
1	Request for Construction Bid (RFB) Release	Thursday, July 15, 2021	
2	Non-mandatory Pre-Bid Meeting via Go To Meeting	Wednesday, August 4, 2021	10:00 AM
3	Deadline for questions - emailed to: purchasing@georgetownsc.gov	Friday, August 6, 2021	5:00 PM
4	Deadline for addenda to be posted to the City's website, www.georgetownsc.gov, under "Bids"	Tuesday, August 10, 2021	5:00 PM
5	Bid due	Thursday, August 19, 2021	On or before 2:00 PM
6	RIA and City Council contract approval (Tentative)	Thursday, September 16, 2021	
7	Construction Notice of Award (Tentative)	October 15, 2021	
8	Construction Notice to Proceed (Tentative)	November 15, 2021	
9	Construction Contract Completion (180 calendar days after NTP)	May 15, 2022	
10	Project Closeout (90 calendar days after completion)	August 30, 2022	

When the Purchasing Division is closed due to force majeure, bid openings will be postponed to the same time on the next official business day.

(END OF SECTION)

SECTION 00900

DRAWING INDEX

TITLE	SHEET NO.
COVER SHEET	C-01
LEGEND, ABBREVIATIONS AND GENERAL NOTES	C-02
LIFT STATION PLAN SHEET	C-03
MISCELLANEOUS DETAILS	C-04
ELECTRICAL PLAN SHEET	E-01

(END OF SECTION)

SECTION 01000
LOCAL VENDOR PREFERENCE OPTION – MANDATORY VENDOR SUBMITTAL FORM

Local Vendor Preference Option

1. A vendor shall be deemed a Local Georgetown City/County vendor for the purposes of this Section if such vendor is an individual, partnership, association or corporation that is authorized to transact business within the State, maintains an office in Georgetown County, and maintains a representative inventory or commodities within the City/County on which the bid is submitted, and has paid all taxes and business license fees duly assessed.

2. This option allows the lowest local bidder whose bid is within five-percent (5%) of the lowest non-local Bidder to match the bid submitted by the non-local Bidder and thereby be awarded the contract. This preference shall apply only when (a) the total dollar purchase is $10,000 or more; (b) the vendor has a physical business address located and operating within the limits of Georgetown County and has been doing business in the City/County for a period of twelve (12) months or more; and (c) the vendor provides proof of payment of all applicable Georgetown City/County taxes, business license and fees if so requested.

3. Should the lowest responsible and responsive Georgetown City/County bidder not exercise its right to match the bid as granted herein, the next lowest qualified Georgetown City/County bidder shall have that right and so on. The right to match the non-Georgetown City/County bidder's bid shall be exercised within 24 hours of notification.

4. In order to qualify for the local preference authorized by this Section, the vendor seeking same shall be required to submit with its bid a statement containing relevant information which demonstrates compliance with the provisions of this Section. This statement shall be on the “MANDATORY VENDOR SUBMITTAL” form included in this bid document. Failure to provide such affidavit at the time the bidder submits its bid shall constitute a waiver of any claim for preference.

5. For all contracts for architecture, professional engineering, or other professional services governed by Section 2-187, Professional and Construction Services, the City shall include the local business status of a firm among the factors considered when selecting which firms are "most highly qualified." In determining which firm is the "most qualified" for purposes of negotiating a satisfactory contract, preference shall be given to a local business where all other relevant factors are equal.

6. Local preference shall not apply to the following categories of contracts:

(a) Goods or services provided under a cooperative purchasing agreement or similar "piggyback" contract;

(b) Contracts for professional services except as provided for in Section 2-187 above;
(c) Purchases or contracts which are funded, in whole or in part, by a governmental or other funding entity, where the terms and conditions of receipt of the funds prohibit the preference;
(d) Purchases or contracts made pursuant to a noncompetitive award process, unless otherwise provided by this section; or
(e) Any bid announcement which specifically provides that the general local preference policies set forth in this section are suspended due to the unique nature of the goods or services sought, the existence of an emergency as found by either
City Council or City Administrator, or where such suspension is, in the opinion of the City Attorney, required by law.

MANDATORY VENDOR SUBMITTAL FORM

AN ORDINANCE TO AMEND

CHAPTER 2 ADMINISTRATION - ARTICLE IV

PROCUREMENT – JANUARY 19, 2017

SECTION 2-185 COMPETITIVE SEALED QUOTES LOCAL VENDOR PREFERENCE

ARTICLE IV.

PROCUREMENT

DIVISION 2. ETHICS IN CITY CONTRACTING

☐ I certify that [Company Name] _____

is a **Resident Bidder** of Georgetown City/County as defined in the City of Georgetown Ordinance Chapter 2 Administration, Article IV Procurement, Section 2-185, and our principal place of business is _____ [City and State].

☐ I certify that [Company Name] _____

is a **Non-Resident Bidder** of Georgetown City/County as defined in the City of Georgetown Ordinance Chapter 2 Administration, Article IV Procurement, Section 2-185, and our principal place of business is _____ [City and State].

(X)_____

Signature of Company Officer

(END OF SECTION)

SECTION 01100

SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Work described in this Project Manual includes the provision of labor, materials, equipment, and services required to complete the replacement of the existing wastewater pump station with a new wet well and submersible pump station equipment at the City of Georgetown's Maryville Elementary School Lift Station.

B. This project is partially financed by the SC Rural infrastructure Authority (RIA); therefor, it is subject to all RIA's project management guidelines.

1.02 CONTRACTS

A. Project construction will be let under one Contract with construction including, but not limited to, the following major work items:

1. Modification of existing wet well and discharge piping to accommodate new duplex submersible pump system
2. Installation of new wet well and pump station
3. Installation of new force main connecting into the existing
4. Associated electrical construction

B. The contract is subject to the approval of city council and RIA prior to the award.

1.03 WORK SEQUENCE

A. Construction Progress Schedule, as required in Section, Submittal Procedures, shall indicate the anticipated items and times that the Work will interfere with normal facility operation.

B. Contractor shall not allow bypassing of sewage during construction. Construction activities that interfere with normal operation of the existing facilities shall be specifically noted on construction schedule. For each of these activities, provide a detailed construction sequence, which shall prevent bypassing of the sewage.

C. Contractor is responsible for all bypass pumping required to construct the project as shown. Construction activities that interfere with normal operation of existing facilities shall be specifically noted on construction schedule. For each of these activities provide a detailed construction sequence showing the bypass pumping arrangement.

D. Indicate switchovers and cut-ins between new work and existing facility on the construction schedule. Submit proposed date for switchover in writing to Engineer and Owner a minimum of seven (7) days and again 24-hours in advance of actual field work. Owner shall have the right to delay Work due to operational requirements, without additional cost to Owner.

E. Perform switchovers and cut-ins during low flow periods at the facility. This shall normally require night / weekend operations by Contractor at no additional compensation.

F. Notice To Proceed shall be based on an agreed upon date between Owner and Contractor.

G. Contractor is responsible for precast concrete wet well design and installation.

H. Contractor is responsible for temporary sheeting, shoring, bracing, and dewatering system design.

I. Submit plans for Owner/ Engineer approval prior to work commencement. An SC licensed engineer shall stamp and sign all contractor's plans.

1.04 OWNER OCCUPANCY

A. Owner will occupy site during entire period of construction.

B. Contractors shall cooperate with Owner to minimize conflict, and to facilitate Owner's operations.

1.05 CONTRACTOR USE OF SITE

A. Only Owner's right to perform construction and maintenance operations with its own forces and to employ separate contractors on portions of the Project limits contractor's use of site during the construction period. Work at the Project site by Owner will be coordinated with the Contractor.

B. Contractor shall provide his own staging area as necessary for his Work.

C. Contractor's use of the site during the construction period may be limited by Owner's necessity to operate the existing facilities.

1.06 WORK BY OWNER

A. The City of Georgetown plans to upgrade the existing power service from 230V to 480V in conjunction with this project.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01230

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for Alternates.

1.02 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 Work:
   1. Section 11080 Bid , Contract
   2. Section 11307 Bid , Contract

1.03 DEFINITIONS

A. Alternate: An Alternate is an item of work or equipment that the Owner is requesting separate bids for as indicated on the Bid Form and defined in the Contract Documents. The Alternates may be "Added To" or "Deducted From" the Base Bid as indicated on the Bid Form.

1.04 QUALITY ASSURANCE

A. Coordinate related Work and modify adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.

B. A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements described under each Alternate.
   1. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to and required for a complete installation as part of the Alternate.

1.05 SELECTION AND AWARD OF ALTERNATES

A. Bid award will be evaluated on the total of the base bid and any of the alternates as selected by the Owner to the extent that project funds are available.

B. Bid award will be evaluated on the base bid. After determination of lowest bidder, alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option.

C. Following the award of the Contract, the Engineer shall prepare and distribute to each Bidder notification of the status of each Alternate. Notification shall indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. It shall also include a complete description of all negotiated modifications to Alternates.

D. Accepted Alternates will be identified in the Owner-Contractor Agreement.

E. Contract I, General
   1. Alternate No. 1, Electric Grinder Pump
      a. The Submersible Pump System shall include, but not be limited to, the following major components, unless indicated otherwise:

1) Immersible Grinder Pump
2) See section 11080 for further specifications

2. Alternate No. 2, Spare Submersible Pump
   a. The spare pump shall meet all the specifications listed in section 11307.

1.06 SCHEDULE OF ALTERNATES

A. Alternate No. 1, Muffin Monster 30005-CFD or approved equal

B. ABS, Inc. model XFP 105J-CB2 or approved equal.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01312

PROJECT COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
   1. Coordination.
   2. Administrative and supervisory personnel.
   3. General installation provisions.
   4. Cleaning and protection.

1.02 GENERAL COORDINATION REQUIREMENTS

A. Responsibilities of Contractor:
   1. Coordinate construction activities for the Project to assure efficient and proper installation of each part of the Work.
   2. Where availability of space is limited, coordinate installation of components to assure maximum accessibility for maintenance. Make adequate provisions to accommodate components scheduled for later installation.
   3. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. A copy of all memoranda shall be submitted to the Engineer.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of schedules.
   2. Installation and removal of temporary facilities.
   3. Delivery and processing of submittals.
   4. Progress meetings.
   5. Installation meetings.
   6. Project Close-out activities.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 SPECIAL REQUIREMENTS

END OF SECTION

SECTION 01314

PROJECT MEETINGS

PART 1 GENERAL

1.01 MEETINGS

A. Pre-construction conference shall be held prior to the beginning of the Work.

B. Construction progress meetings shall be held monthly.

C. Project close-out conference shall be held during the final phases of the Work.

D. Engineer may schedule additional meetings.

E. Meetings scheduled by the Engineer shall be held at **the City of Georgetown office, onsite or virtually.**

F. Contractor's project superintendent shall attend meetings.

G. Notify suppliers and subcontractors to attend meetings as appropriate or as required by Engineer.

H. Contractor shall schedule pre-installation conferences as required in the individual specification sections.

I. Notify Engineer of project meetings scheduled by the Contractor.

J. Engineer will schedule and administer meetings throughout the progress of the Work, except for meetings held by the Contractor for normal coordination of the Work.

K. Meeting agenda shall include, but not be limited to, the following: Project Administration, Submittals, Construction Schedules and Methods, Safety and Health Regulations, Project Coordination, Payment Application, Change Orders, and Site Inspections.

L. Engineer will prepare agenda with copies to participants, preside at meetings, prepare minutes and distribute to participants for meetings scheduled by the Engineer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section includes, but is not limited to, requirements for the following:
   1. Submittal procedures.
   2. Construction progress schedule.
   3. Proposed product list.
   4. Project record documents.
   5. Certificates of compliance.
   6. Catalog data.
   7. Shop drawings.
   8. Manufacturer's installation procedures.
   9. Test reports.
   10. Operation and maintenance instructions.
   11. Warranties.
   12. Spare parts and maintenance materials.

1.02 SUBMITTAL PROCEDURES

A. Transmit each submittal with cover letter to Engineer at The Wooten Company, 1830 Marion St., Suite A, Columbia, SC 29201.

B. Sequentially number transmittal forms. Re-submittals to have original number with an alphabetic suffix.

C. Cover letter for each submittal package shall list the following:
   1. Contractors name:
   2. Owners name: City of Georgetown, SC
   3. Project name: Maryville Lift Station Replacement
   4. Wooten Job No.: 3383-A

D. Individual submittals shall each be listed by the following information:
   1. Submittal reference no.
   2. Specification section number.
   3. Drawing and detail number when appropriate.
   4. Equipment.
   5. Type submittal.
   6. Supplier.
   7. Manufacturer.

E. Apply Contractor's stamp to each submittal, signed or initialed and dated, certifying that Contractor has reviewed submittal for conformance with requirements of Contract Documents, and has coordinated submittal with related work.

F. Schedule submittals to expedite Project, and deliver to coordinate submission of related items. Allow a minimum of ten (10) working days for Engineer's review.

G. Identify variations from Contract Documents and Product limitations as they relate to the satisfactory performance of the Project.

H. Provide space for Contractor and Engineer review stamps.

I. Revise and resubmit submittals as required; identify changes made since previous submittal.

J. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report inability to comply with provisions.

K. Work requiring submittal review by Engineer shall not be started until review has been obtained.

L. Engineer's review of submittals shall not relieve Contractor of responsibility for complete compliance with Contract Documents.

1.03 ADMINISTRATIVE SUBMITTALS

A. Construction Progress Schedule
   1. Submit five (5) copies of the initial progress schedule 15 days after date of Owner-Contractor Agreement. One copy shall be returned to the Contractor.
   2. Progress schedule shall be, as a minimum, a horizontal bar chart with a separate line for each major section of Work. Identify the first work day of each week.
   3. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
   4. Indicate the expected monthly pay requests.
   5. Submit revised schedule with each Application for Payment as required for updating, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.
   6. Indicate submittal dates required for critical shop drawings, product data, samples, and product delivery dates .
   7. Indicate specific work sequences and requirements as indicated in Section, Summary of Work.

B. Schedule of Values
   1. Submit three (3) copies of the schedule of values at least three (3) weeks prior to the first partial payment request. Schedule shall divide the lump sum contract items into major work tasks. Use the table of contents as a guide for itemizing the schedule. Schedule will be used only as a basis for review of the Contractor's request for payment.
   2. Engineer may request additional delineation of work tasks and supporting data of the values, as he deems appropriate. Revise schedule and resubmit.
   3. Revise schedule to list approved Change Orders, with each request for payment.

C. Proposed Product List
   1. Within 15 days after date of Owner-Contractor Agreement, submit a list of the following major products proposed for use, with name of manufacturer, supplier, trade name, and model number of each product:
      a.

D. Project Record Documents
   1. Maintain on site, one set of the following record documents; record actual revisions to the Work:
      a. Contract Drawings.
      b. Project Manual.

c. Addenda.
d. Change Orders and other Modifications to the Contract.
e. Reviewed submittals.

2. Store Record Documents separate from documents used for construction.
3. Record information concurrent with construction progress.
4. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
   a. Manufacturer's name and product model and number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and Modifications.
5. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
   a. Measure elevations of structures in relation to 6.5' datum.
   b. Measure and reference horizontal and vertical locations of underground utilities and appurtenances to existing permanent surface improvements that are indicated on the Drawings.
   c. Measure and reference location of internal utilities and appurtenances concealed in construction to visible and accessible features of the Work.
   d. Field changes from construction Drawings.
   e. Details not on original Contract Drawings.
6. Submit documents to Engineer with final Application for Payment.

1.04 TECHNICAL SUBMITTALS

A. General
   1. Submit the following as required by the individual sections of the technical specifications.
   2. Unless noted otherwise, submit the number of copies that Contractor requires, plus three (3) copies that will be retained by Engineer.

B. Certificates of Compliance
   1. Certificates shall certify that the Products delivered to the project are in conformance with the specifications.
   2. Certificates may be recent or previous test results on Product, but must be acceptable to Engineer.
   3. Certification shall not relieve the Contractor of responsibility for complying with requirements of the specifications.
   4. When using federal CWSRF and / or DWSRF funds, a Certification will be required for all products including iron and steel to document conformance to the American Iron and Steel (AIS) requirement. This shall be in the form of a step certification. It shall be on company letterhead from each different manufacturer in the process (e.g., melting, bending, coating, galvanizing, etc.). At a minimum, the certification shall state that the products and / or materials for the subject project are in full compliance with the AIS requirements as mandated by EPA's State Revolving Fund programs and shall include the company name, company address, list the items/materials, where the process took place (physical location).

C. Catalog Data
   1. When shop drawings are not required, the catalog data shall include the following as a minimum:
      a. Parts schedule that identifies the materials to be used in each of the various parts.

b. Sufficient detail to serve as a guide for assembly and disassembly of the product and to serve as guide for ordering parts.

2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Work in the Shop Drawing submittal.

D. Shop Drawing
1. Shop drawings shall consist of drawings, diagrams, illustrations, schedules, performance charts, brochures and other data, prepared specifically for a portion of the Work.
2. Shop drawings shall indicate the type, size, quantity, arrangement, location, mode of operation, component materials, utility connections, wiring and control diagrams, anchorage's, supports, factory applied coatings, and other information necessary to ensure satisfactory fabrication, installation and operation of the completed Work.
3. Shop drawings shall establish the actual detail of manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure, and incorporate minor changes to design and construction to suit actual requirements.

E. Manufacturer's Installation Procedures
1. Installation procedures should indicate manufacturer’s recommendations for proper installation of Product.

F. Test and Start-Up Reports
1. Submit three (3) copies of report to the Engineer within seven (7) days of performing the test.
2. Report shall include the following as a minimum:
   a. Owners name: City of Georgetown
   b. Project name: Maryville Lift Station
   c. Wooten job number: 3383
   d. Firm performing work.
   e. Individual performing work.
   f. Specification section no.:
   g. Product tested or started.
   h. Date and time of work.
   i. Type of test or start-up.
   j. Specific location in the Project: (i.e. Structure name and location within the structure by a rough sketch.)
   k. Results.
   l. Opinion of firm doing the work as to the test or start-up being in compliance with the Contract Documents.
3. When requested by Engineer, the testing or start-up firm shall provide additional interpretation of results.

G. Operation and Maintenance Instructions
1. Submit three (3) copies of operation and maintenance instructions within 45 days after approval of the shop drawings.
2. Submit instructions in a navy blue vinyl, loose leaf binder containing the name of the equipment covered on the front and the spine of the binder. Provide tab dividers appropriately labeled.
3. As a minimum, the submittal shall contain complete operation and maintenance instructions, drawings, and complete parts list.

4. In addition, for equipment requiring periodic lubrication, provide two (2) lubrication charts; one shall be included in the binder, and the other shall be provided in weatherproof 10 mil. laminated plastic and shall be permanently affixed to the equipment. Charts shall contain pertinent information concerning the lubricating requirements including manufacturer's name, name of equipment, recommended service interval, and recommended lubricant, location of each of the points of lubrication.

H. Warranties
   1. Provide duplicate notarized copies.
   2. Assemble documents from Subcontractors, suppliers, and manufacturers.
   3. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
   4. Submit prior to final Application for Payment.
   5. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

I. Spare Parts and Maintenance Materials
   1. Provide products, spare parts, maintenance, and extra materials in quantities specified in individual specification Sections.
   2. Deliver to Project site and place in location as directed by the Owner. Obtain Owner's signature and date bill of materials as delivered to the site as required by this paragraph. Provide a copy of signed bill of materials to Engineer with request for payment.
   3. Provide recommended manufacturer's list of spare parts, maintenance, and extra material as specified in individual specification sections.
   4. Submit to Engineer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01450

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. Inspection and testing laboratory services.

C. References.

D. Field samples.

E. Manufacturers' field services and reports.

1.02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Manufacturer shall have the minimum number of years of proven successful experience required in each section in the design, manufacture, and servicing of Products specified.

B. In lieu of the required experience, manufacturer may provide a cash deposit or bond equal to the cost of the Product, but pro-rated to the number of years of actual experience.

C. Products from a manufacturer who does not meet the experience requirements must meet technical requirements.

D. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

E. Comply fully with manufacturers' instructions, including each step in sequence.

F. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

G. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

H. Perform work by persons qualified to produce workmanship of specified quality.

I. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 INSPECTION AND TESTING LABORATORY SERVICES

A. Contractor shall provide the services of an independent firm to perform inspection and testing specified in the individual specification sections that are not listed above.

B. Provide the services of an independent firm to perform soil and material inspections, testing and other services specified in the individual specification sections of this Contract Document.

C. Testing laboratory shall be authorized to operate in the state in which Project is located.

D. Testing laboratory shall have a full-time registered Engineer on staff to review services.

E. Testing equipment shall be calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards (NBS) standards or accepted values of natural physical constants.

F. Prior to start of Work, submit testing laboratory name, address, and telephone number, names of full-time registered engineer, field inspector, and responsible project manager. Laboratory subject to the approval of the Engineer.

G. The same independent firm shall perform retesting. Contractor shall pay for retesting required by the failure of the initial test to meet the requirements of the specifications.

1.04 LABORATORY RESPONSIBILITIES

A. Testing Laboratory shall have the following responsibilities for the Project:
   1. Attend pre-construction conferences and progress meetings as required by the Engineer.
   2. Collect and test samples of mixes.
   3. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
   4. Perform inspection, sampling, and testing in accordance with Contract Documents and specified standards.
   5. Ascertain compliance of soil compaction and material mixes with requirements of Contract Documents.
   6. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or Products.
   7. Perform additional inspections and tests required by Engineer when specified tests have failed.

1.05 LIMITS ON TESTING LABORATORY AUTHORITY

A. The authority of the Testing Laboratory is limited as follows:
   1. May not alter requirements of Contract Documents.
   2. May not approve or accept any portion of the Work.
   3. May not assume duties of Contractor.
   4. Has no authority to stop the Work.

1.06 LABORATORY REPORTS

A. After each inspection and test, the independent testing firm shall submit report(s) as specified in Section, Submittal Procedures.

1.07 CONTRACTOR RESPONSIBILITIES

A. Unless specified otherwise, deliver to laboratory at designated location, adequate samples of materials proposed to be used that require testing. The proposed mix designs shall be included with delivery.

B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities as specified.

C. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site and at source of products to be tested, to facilitate tests and inspections, storage, and curing of test samples.

D. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

1.08 REFERENCES

A. Conform to reference standard by date of issue current to date of Bid opening.

B. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Contractual relationship of parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.09 FIELD SAMPLES

A. Install field samples at site as required by individual specification sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Remove field samples and clean area prior to final inspection unless specified otherwise in the individual specification sections.

1.10 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Require suppliers and manufacturers to provide a qualified technician for required services as outlined by the individual equipment and material specification sections.

B. Submit qualifications of technician to Engineer 30 days in advance of required work. Technician subject to approval of Engineer.

C. Technicians shall report observations, site decisions, and instructions given to Contractor, installers, and Owner's staff that are supplemental or contrary to manufacturers' written instructions directly to the Engineer.

D. Submit test and start-up report as specified in Section, Submittal Procedures.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, telephone service, water, and sanitary facilities.

B. Work on public right-of-way.

C. Traffic control.

D. Temporary Controls: Barriers, enclosures and fencing, water control, dust control, erosion and sediment control, and protection of the work.

E. Construction Facilities: Access roads, parking, progress cleaning, project signage, and field offices.

1.02 TEMPORARY UTILITIES

A. Electricity
   1. Provide and pay for required power service for construction from Utility source.

B. Electricity
   1. Electrical Contractor shall make arrangements for and provide equipment necessary for temporary electrical service to the site for the use of all Contractors at the Site.
   2. General Contractor shall pay the monthly cost for the temporary electrical service, which will include the electrical usage by all contractors, Owner and Engineer at the site.
   3. Electricity: Obtain power for construction from existing building power systems through use of drop cords or from portable generators furnished by the using contractor. Each contractor shall provide drop cords for power and lighting as required for individual construction needs

C. Lighting
   1. Provide and maintain lighting for construction operations as required by Contractor.
   2. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes as required by Contractor.

D. Telephone Service
   1. Provide, maintain and pay for telephone service to field office as required by Contractor.

E. Water
   1. Provide, maintain, and pay for suitable quality water, including any necessary service(s) required for construction operations. Exercise measures to conserve water during construction.
   2.

F. Sanitary Facilities
   1. Provide and maintain required facilities and enclosures as necessary to comply with the laws and ordinances of the authority having jurisdiction and the State of South Carolina.

2. General Contractor shall provide the above sanitary facilities for all contractors, sub-contractors, Owner and Engineer at the Project Site.

G. By-Pass Pumps
1. See Section 015140 Temporary Bypass Pumping

1.03 TEMPORARY CONTROLS

A. General
1. Temporary controls shall be the responsibility of each Contractor for their respective work unless noted otherwise.

B. Barriers
1. Provide barriers to prevent unauthorized entry to construction areas for the safety of the public, the protection of the work, and to protect existing facilities and adjacent properties from damage from construction operations.
2. Provide barricades required by agency in 1.4.A for public rights-of-way and for public access to existing buildings.
3. Provide protection for plant life designated to remain. Replace damaged plant life.
4. Protect vehicular traffic, stored materials, site, and structures from damage.

C. Water Control
1. Grade site to drain. Provide, operate, and maintain pumping equipment to maintain excavations free of water.
2. Protect site from running water.

D. Dust Control
1. Execute Work by methods designed to minimize raising dust from construction operations.
2. Provide positive means to prevent airborne dust from dispersing into atmosphere.

E. Erosion and Sediment Control
1. Provide Erosion and Sediment Control as indicated on the Drawings and specified in Section, Erosion Control.

F. Protection of Installed Work
1. Protect installed Work and provide special protection where specified in individual specification Sections.
2. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
3. Prohibit traffic from landscaped areas.

1.04 CONSTRUCTION FACILITIES

A. General
1. Construction facilities shall be the responsibility of each Contractor for their respective work unless noted otherwise.

B. Access Roads
1. Maintain temporary drives as necessary to access public thoroughfares and existing drives to serve the construction area.
2. Provide means of removing mud from vehicle wheels before entering streets.

C. Parking
1. When site space is not adequate, arrange for temporary off site surface parking areas to accommodate construction personnel.

2. Do not allow vehicle parking in existing right-of-way or to block existing drives.
3. Do not allow vehicle parking on private property without prior approval.

D. Progress Cleaning
1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
2. Remove waste materials, debris, and rubbish from site periodically and dispose off site.

E. Project Signage
1. Contractor shall provide project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter. Submit layout based on example in Supplementary General Conditions, to Engineer for approval. Project signage is also subject to RIA's approval.
2. List title of Project, name of Owner, Engineer, and Contractor.
3. Erect on site at location established by Engineer.
4. No other signs are allowed, without Owner's permission, except those required by law.

1.05 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, and materials, prior to Final Inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 015140
TEMPORARY BYPASS PUMPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnishing, installing, and testing temporary sewage bypass pumping systems that divert wastewater around a work area.

1.02 REFERENCES

A. Publications are referred to in the text by basic designation only.
   1. American Society for Testing and Materials (ASTM)
      a. D1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
      b. D2657 Heat Fusion Joining of Polyolefin Pipe and Fittings
      c. D3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

1.03 GENERAL

A. Contractor shall maintain sewer service at all times.

B. Provide all materials, labor, equipment, power, maintenance, associated items and superintendence to implement temporary pumping systems for diverting flow as required to maintain continuous operation of existing facilities prior to completion. Provide all additional temporary pumping systems needed to meet Contractor's means and methods at no additional cost to Owner.

1.04 DEFINITIONS

A. Bypass Pumping System - The bypass pumping system shall consist of all equipment, pipe, valves, plugs, power supplies and other appurtenances required to divert sewer flow from sewer or sewer pumping stations. The bypass pumping system shall be comprised of pumping setups in addition to all bypass pipe necessary to complete the work.

B. Bypass Pipe - Any bypass pipe shall consist of the pipe, valves and other appurtenances including, but not limited to, air relief valves and dewatering connections. The bypass pipe includes both the suction and discharge pipe for each bypass setup.

C. Primary Pump Setup - The primary pump setup shall be capable of pumping the peak flow, be connected to the bypass pipe, have an isolation valve, have a check valve, and be complete with power supplies.

D. Backup Pump Setup - The backup pump setup is located at each Primary Pump Setup. The backup pump setup shall be capable of pumping the peak flow, be operational, be connected to the bypass pipe, have an isolation valve, have a check valve, and be complete with power supplies.

E. Discharge Connection - The discharge connection is where the pumped flow exits the bypass pipe and is introduced into a gravity sewer or force main.

F. Peak Flow or Peak Wet Weather Flow - The peak flow that may occur in a sewer inclusive of wet weather flow produced by groundwater infiltration, precipitation and snow melt. This value shall also include peak infiltration and inflow.

G. Operational Test - The period of specified duration that the installed system is tested to verify operational integrity of a system prior to placing the system in service. Operational testing requires that representatives of the equipment manufacturer be on site for timely identification and resolution of system issues.

H. Low Flow Period - The time of day when the wastewater system flow rate reaches the diurnal minimum. It typically occurs between the hours of ** 12 AM and 6 AM **.

1.05 SUBMITTALS

A. Submittals are to be in accordance with Section 013300 – Submittal Procedures.

B. Submit a bypass pumping plan. No construction shall begin until all provisions and requirements have been reviewed by the Engineer. The submittal shall include, but not be limited to, the following:

1. A written description of the bypass pumping plan for each location where bypass pumping may be used.
2. Schedule separated by site.
3. Security of the pump system(s).
4. Quantity, capacity and location of all pumping equipment.
5. Pump performance curves and head capacity curves demonstrating the capability to meet all required flows.
6. The size, type, and routing of all suction and discharge pipe and the means of connecting the system.
7. Calculations of static lift, frictional losses and flow velocity.
8. Sewer plugging plan, including type, location, and manufacturer of plugs with emergency release procedures.
9. Any temporary pipe supports, location, and anchoring requirements.
10. Description of controls, monitoring, and emergency power source.
11. Provide evidence that the bypass pipe material and thickness can withstand all normal operating and surge pressures with a safety factor of 2.0.
12. Denote any conditions that will cause pumps to lose suction lift (prime) and describe procedures to rectify.
13. Show that the emergency switchover from primary to backup pumping will be automatic should primary pumps fail.
14. Show emergency plan to be used if stream flooding occurs at work site. Provide evidence that Contractor is insured in the event of flooding resulting in the damage or loss of bypass pump and equipment.
15. Show suction and discharge piping is protected from possible damage from varying stream flows and construction activities.

C. The plan must be signed and sealed by a South Carolina registered Professional Engineer.

D. Engineer’s and/or Owner’s review will be limited to verification of compliance with performance requirements only.

1.06 PERFORMANCE REQUIREMENTS

A. Design the installation and operation of temporary pumping systems in accordance with Laws and Regulations, including local noise and light ordinances.

B. The bypass system must be designed by the Contractor and provide for uninterrupted service to the existing sewer system.

C. For all bypass pump setups, multiple pumps are necessary as follows.

1. For each Primary Pump Setup a Backup Pump Setup sized to meet the peak flow shall be installed at each bypass pump location, ready for use in the event of a primary pump failure.
2. The Backup Pump Setup shall be provided with separate suction pipe and connected to the discharge header with controls that allow the pump to be automatically placed in service.

D. The following table identifies bypass pump requirements.

Location	Manhole Diameter (FT)	Sewer Diameter (IN)	Peak Wet Weather Flow (GPM)	Speed (Constant or Variable)
Maryville Lift Station	4	12"	1000	variable

E. Peak wet weather flows are estimated. In some instances, the Owner may have additional data that defines diurnal variations and this information can be made available to the Contractor, if requested. The Contractor shall verify peak wet weather flow prior to bypass pumping plan submittal.

F. The temporary Bypass Pumping System shall be monitored continuously (24 hours per day, 7 days per week) during operation by an on-site representative of the Contractor trained and certified by the pump supplier.

G. Install, test and maintain telemetry to monitor operation of the pumps and manhole water levels. The telemetry system shall first notify the Contractor's local representative designated to monitor the pumps, then other individuals so designated by the Contractor and finally up to two individuals so designated by the Owner. The telemetry system does not replace the requirement for continuous on-site monitoring.

H. Primary pumps shall be equipped with noise reduction features that limit the noise output to 70 dbA at 30 feet from the equipment. Backup pumps do not have to be critically silenced.

I. Provide pressure and vacuum gauges on the suction and discharge headers.

1.07 SPECIAL PRECAUTIONS

A. Contractor is responsible for fines levied on Owner by State, Federal, and/or other

agencies due to spills caused by failure of temporary pumping systems.

B. Provide barriers in all locations where temporary pumps, pipe and other accessories are located in roadways, driveways and other vehicle-accessed areas.

C. When overnight pumping is necessary, provide security fencing to prevent tampering when not located within a secured area or continuously monitored by Contractor personnel posted at the pump location.

PART 2 - PRODUCTS

2.01 PUMPS

A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the required flow ranges without surging, cavitation or vibration. Pumps shall not overload drivers at any point on the pump operating curve.

B. Pumps shall be suitable for use with raw, unscreened sewage and have a minimum solids passing capability of 3-inches.

C. Pumps shall be self-contained units designed for temporary use.

D. Pumps shall have fully automatic self-priming units that do not require the use of foot-valves, vacuum pumps or diaphragm pumps in the priming system. Alternatively, pumps can be submersible type.

E. All pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of flows.

F. Provide the necessary start/stop/variable speed and level controls for each pump.

G. The primary pumps shall be diesel powered.

1. Contractor shall be responsible for providing and storing a sufficient quantity of diesel fuel on site to continually operate the primary pumps for at least 3 consecutive days.
Contractor shall check the pump fuel levels and shall refill the tanks to full capacity on a daily basis.

H. Each pump and driver shall be rated for continuous duty operation over the specified range of conditions without cavitating, overheating, excessive vibration and noise. In addition, each pump and driver shall be rated to operate intermittently at shut off head against a closed discharge valve for periods of not less than 5 minutes without excessive cavitation, overheating, or vibration.

I. Contractor will not be permitted to stop or impede the main flows under any circumstances except as otherwise defined under the Sequence of Construction.

2.02 PIPE

A. In order to prevent accidental spillage, all bypass pipe must be rigid or semi-rigid pipe with positive, leak proof connections. All pipe materials and joints for temporary

pipe systems must be:

1. High Density Black Polyethylene Pipe - ANSI/ASTM D1248, butt heat fusion type joint fittings shall conform to ASTM D2657 and D3261.
2. Quick-disconnect galvanized steel pipe, 8-inch diameter maximum.

B. Layflat flexible hose is not permitted, except for pumping wastewater from a single lateral when necessary.

C. If the Contractor elects to route pipe through box culverts or large diameter storm drains to traverse under roads, HDPE pipe is required regardless of bypass pipe diameter.

D. Pipe shall be rated for at least twice the operating pressure.

2.03 TEMPORARY PLUGS

A. Provide temporary plugs, as required, for successful operation of the temporary pumping systems.

B. Plugs shall be designed for the specific purpose of providing temporary plugging of active pipes.

C. All plugs shall be firmly attached to a stationary object at ground level by a cable in order to prevent loss of plugs in pipelines.

D. Sewer plugs shall be capable of accommodating the maximum allowable surcharge heads within the sewer system that may be experienced during construction.

E. The plugs shall be readily removed from the system during emergency shutdowns.

F. Sewer plugs shall be pneumatic.

2.04 PIPE SUPPORTS

A. Pipe supports shall be provided for all pipe that is elevated above the ground.

2.05 TELEMETRY SYSTEM

A. The telemetry system shall consist of high water float(s) and automatic dialer with a battery backup.

B. The dialer system shall be provided with either cellular or satellite phone.

PART 3 EXECUTION

3.01 GENERAL

A. Install, operate and maintain temporary pumping systems and appurtenances, including but not limited to, associated pipe, valves, instrumentation, controls and accessories, in accordance with the manufacturer's instructions.

B. Provide all oil, fuel, grease, lubricants, tools and spare parts required for operation

and maintenance of the temporary pumping systems for the duration of use.

C. Adequate hoisting equipment for each pump and accessory shall be maintained on site.

D. The Bypass Pumping System shall remain operable until all components of new work requiring the temporary pumping system have been completed and tested to the satisfaction of the Owner/Engineer.
   1. When the bypass pumping system is for Work on a mechanical system (i.e. a pump station, bar screen, motorized diversion structure, etc.), the bypass pumping system shall remain in place and ready for automatic operation for at least 7 calendar days once the mechanical systems are placed back into reliable service.

E. Some pipe types require deflection testing 30 days after completion of backfill (reference Section 33 31 11, Sanitary Sewer System). Temporary bypass pumping may be discontinued after successful completion of all testing except for the 30-day deflection test. Bypass pumping will be required during the 30-day deflection testing to eliminate flow on the new line during the testing. Bypass pumps for temporarily bypassing the flow of a new line for performing the deflection test may be sized for peak anticipated flow during the test period. Backup pumps are not required for this testing operation.

F. The design of the bypass pumping system must allow for prompt dewatering of the system during periods of non-use or if leakage occurs.

G. The Contractor will not be permitted to stop or impede the sewer flow under any circumstances without having the primary pumps operational.

H. Contractor shall provide or fabricate a fall protection covering for openings at suction or discharge piping connections (i.e., open manhole risers, etc.). Covering shall remain in place at all times unless installing or removing temporary bypass system.

3.02 PREPARATION

A. Precautions

   1. The Contractor is responsible for locating any existing utilities in the area selected for installation of the bypass pumps and pipelines. The Contractor shall minimize the disturbance to existing utilities and shall obtain approval from the Owner for any relocation of the bypass pipeline. All costs associated with the relocation of utilities and obtaining approvals shall be paid by the Contractor.
   2. During all bypass pumping operations, the Contractor shall protect the bypass pumping facilities and existing collection system from damage inflicted by equipment. The Contractor shall be responsible for all intentional or accidental physical damage to the bypass pumping system caused by human or mechanical failure or interference.
   3. During installation of the bypass pumping pipes, the Contractor shall make every effort to minimize the disruption of private property and the

inconvenience for neighborhood residents.

4. The Contractor shall protect all mature vegetation and structures or other obstacles in the path of the bypass pipe from damage through use of shields and buffering devices. All private property that must be relocated to construct the work must be stored at a location acceptable to the property owner.
5. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharge or damage to tributary sewers and that will protect public and private property from damage.

3.03 INSTALLATION AND REMOVAL

A. The temporary bypass pumping system shall be tested before placing the system in operation. Testing periods shall begin between the hours of 8:30 a.m. and 3:00 p.m., Monday through Thursday. Testing of bypass pumping system shall NOT be allowed Friday through Sunday, on the Owner's scheduled Holidays, or on the day immediately prior to an Owner's scheduled Holiday. In addition, testing of bypass pumping system shall only be performed during the Owner's normally scheduled work days. Testing shall include leakage testing, pressure testing, and operational testing.

1. Leakage and pressure test: Contractor shall perform leakage and pressure testing using clean water (potable or stream). Perform testing at the peak wet weather design flow condition when sufficient clean water is available. When sufficient clean water is not readily available to cause the setup to operate at the peak wet weather flow condition, perform testing using the maximum available clean water. Visually inspect the bypass pump setup and entire bypass pipe for leaks.
2. Operation test: Contractor shall operate the temporary bypass pumping system for a continuous 2 hours to demonstrate reliable operation of the entire system, including but not limited to pumps and controls, to the satisfaction of the Owner, before removing existing sanitary sewer from service. Ensure consecutive pump operation occurs by activating each float/pressure sensor in the sequence intended.

B. When plugging is no longer needed for performance of the work, the plugs are to be removed in a manner that permits the wastewater flow to slowly return to normal without surge, exceeding downstream pipe or pumping station capacity, or causing other major disturbances downstream.

C. When bypass pump operations affect areas outside of the alignment including private property, upon completion of the bypass pumping operations, the Contractor shall remove all pipe, restore all property to pre-construction condition or better, and shall restore all pavement and sidewalks. The Contractor is responsible for obtaining any approvals for placement of the bypass pipe within public rights-of-ways.

D. Upon system removal, all wastewater must be discharged into the wastewater collection system and temporary bypass pipes flushed with clean water.

3.04 QUALITY CONTROL AND MAINTENANCE

A. Inspection during bypass pumping operations: Contractor shall inspect the Bypass Pumping System every two (2) hours to ensure that the system is working correctly.

B. Logging of Inspections: Contractor shall maintain a written log of all inspections on a two (2) hour basis during all temporary bypass pumping operations.

C. Maintenance service: Contractor shall ensure that the temporary pumping system is properly maintained and that a responsible and competent mechanic/operator shall be on call at all times.

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.02 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components specified in the Contract Documents for reuse.

1.03 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Ship fabricated assemblies in largest sections permitted by carrier regulations and properly marked for ease of field erection.

C. Promptly inspect shipments to assure that Products comply with specified requirements, quantities are correct, and Products are undamaged.

D. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

A. Keep on site storage of material to a minimum.

B. Store and protect Products in accordance with manufacturer's instructions in unopened original packages, with seals and labels intact and legible. Store sensitive Products in weather-tight, climate-controlled enclosures.

C. For exterior storage of fabricated Products, place on sloped supports, above ground.

D. Provide off site storage and protection when site does not permit on site storage.

E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

F. Store loose granular Products on solid flat surfaces in a well drained area. Prevent mixing with foreign matter.

G. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are maintained under specified conditions.

1.05 DAMAGED PRODUCTS

A. Remove damaged Products from Project site.

1.06 PRODUCT OPTIONS

A. Products Specified by Reference Standards: Product meeting standard and specific requirements of these specifications.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming Three Manufacturers with an "or equal" Provision for Substitutions: Submit a request for substitution for manufacturer not named during the shop drawing submittal.

1.07 SUBSTITUTIONS

A. Engineer will consider requests for Substitutions for items not listed in Section, Equipment Materials List or included in the Bid Form Attachment, during the regular shop drawing submittal process. Submit "or approved substitute" Products listed on the Equipment Materials within thirty (30) days from the date of Owner-Contractor Agreement.

B. Substitutes shall not be allowed from the list submitted with the Bid Form, except for the following reasons:
   1. Item of equipment is no longer available.
   2. "Or approved substitute" product is not approved by Engineer.

C. Submit the following information for review and approval by Engineer of "or approved substitute" pieces of equipment as listed in the Equipment Materials List:
   1. Name of product.
   2. Name of manufacturer.
   3. List a minimum of five (5) similar installations.
   4. Length of experience in the manufacturer of the specified equipment.
   5. Basic product data.
   6. Identify variations in methods and materials of construction, mode of operation, and performance characteristics of the "or approved substitute" Product from the named manufacturers equipment.
   7. Additional information as required by Engineer to verify the "or approved substitute" ability of the proposed equipment.

D. Substitution submittal procedure for products not on Equipment Material List or Bid Form Attachment during shop drawing review:
   1. Submit written request for substitution with shop drawing submittal.
   2. Submit data outlined in paragraph "C" above.
   3. Submit number of copies as required by the shop drawing submittal.
   4. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence as required by the specifications.

E. Requests for substitutions constitutes a representation that Contractor:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of specified product.
   2. Shall provide the same warranty for Substitution as for specified product.
   3. Shall coordinate installation and make changes to other Work which may be required for Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Shall reimburse Owner for review associated with reapproval by authorities.

F. Additional requirements are indicated in Section, Quality Control, Article 1.02.

G. Engineer is sole judge of equality for proposed "or approved substitute" equipment. Should an "or approved substitute" item be rejected by Engineer, Contractor is responsible for providing the specified equipment without an increase in Contract Price or Time.

H. Substitutions will not be considered without separate written request, or when acceptance will require revision to the Contract Documents.

1.08 SUBSTITUTIONS

A. Engineer will consider requests for Substitutions only within 30 days after date of Owner-Contractor Agreement.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. Request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Shall provide same warranty for Substitution as for specified product.
3. Shall coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Shall reimburse Owner for review or redesign services associated with reapproval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit shop drawings, product data, and certified test results attesting to proposed product equivalence.
3. Engineer will notify Contractor, in writing, of decision to accept or reject request.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01700

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination.

B. Cutting and patching.

C. General installation provisions.

D. Cleaning and protection.

E. Final inspection and tests.

F. Adjusting.

G. Close-out procedures.

1.02 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specifications sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

1.03 CUTTING AND PATCHING

A. General
   1. Do not cut, or alter the work of other contractors without written approval of the Engineer.
   2. Work removed shall be replaced or repaired by the Contractor who removed or damaged the work, and a craftsman, skilled in the trade that the particular replacement requires, shall do the work. (i.e.: A mason, not an electrician, shall replace masonry removed by the Electrical Contractor.)
   3. Conduct removal operations in a manner that will eliminate hazards to persons and property and prevent the release of dust and rubbish into the air. Existing work, which is to remain and is damaged by contract operations shall be replaced with new materials at no additional cost to the Owner.
   4. For replacement of work removed, comply with specifications for type of work to be done.

B. Inspection
   1. Inspect existing conditions of work including elements subject to movement or damage during cutting and patching, and excavating and backfilling.
   2. After uncovering work, inspect conditions affecting installation of new products.

C. Preparation prior to cutting
   1. Provide shoring, bracing, and support as required to maintain structural integrity of project.

2. Provide protection for other portions of project.
3. Provide protection from elements.

D. Performance
1. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.
2. Execute cutting and demolition by methods to prevent damage to other work and provide proper surfaces to receive installation of repairs and new work.
3. Execute excavating and backfilling as specified in Section, Trenching for Utilities.
4. Restore work, which has been cut or removed; install new products to provide completed work in accordance with requirements of contract documents.
5. Refinish entire surfaces as necessary to provide an even finish.
a. Continuous Surfaces: To nearest intersections.
b. Assembly: Entire Refinishing.

1.04 GENERAL INSTALLATION PROVISIONS

A. Require Installer of each major component to inspect conditions under which Work is to be performed. Clean substrate surfaces prior to applying next material or substance. Do not proceed until unsatisfactory conditions have been corrected.

B. Comply with manufacturer's recommendations to the extent that they are more explicit or stringent than requirements contained in Contract Documents.

C. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

D. Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Engineer for final decision.

E. Check dimensions before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

H. Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer for final decision.

1.05 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration.

B. Clean and maintain completed construction as frequently as necessary through the construction period. Adjust and lubricate components as required to ensure proper operation.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, or dangerous exposure

during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Air contamination or pollution.
6. Water or ice.
7. Abrasion.
8. Heavy traffic.
9. Misalignment.
10. Improper shipping or handling.
11. Theft.
12. Vandalism.

D. Clean Project prior to final inspection. Project clean up shall include, but not be limited to, the following:

1. Clean glass.
2. Clean surfaces exposed to view as recommended by manufacturer.
3. Remove temporary labels.
4. Vacuum carpeted areas.
5. Clean fixtures to a sanitary condition.
6. Repaint damaged paint surfaces.
7. Clean debris from roofs, gutters, down spouts, and drainage systems.
8. Sweep paved areas.
9. Rake clean landscaped surfaces.
10. Remove waste and surplus materials.
11. Remove temporary construction facilities.

1.06 FINAL INSPECTION AND TESTS

A. Prior to final acceptance place equipment in operation and make necessary adjustments for proper operation. Test equipment under normal operating conditions in the presence of Engineer. Test shall show conclusively that requirements of the specifications have been fulfilled.

B. Complete punch list items within 30 days of receipt from Engineer. Owner may have work not completed within 30 days performed by others with the cost deducted from Contractor’s final payment. Additional engineering and inspection services required as a result of Contractor not completing punch list within 30 days shall be at Contractor's expense.

1.07 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

B. Provide proper fluids in equipment.

C. Provide proper filters in equipment.

1.08 CLOSE-OUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Engineer's inspection.

B. Provide submittals to Engineer that are required by governing or other authorities.

C. Submit set of Record Documents indicating changes during construction as required in Section, Submittal Procedures.

D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and final amount due.

E. Submit the following with final Application for Payment:
   1. Affidavit of Release of Liens
   2. Consent of Surety for Final Payment
   3. Affidavit of Payment of Debts and Claims
   4. Final Certified Payroll Information

F. Submit warranties as required by individual equipment specifications.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 02220

MINOR DEMOLITION

PART 1 GENERAL

1.01 SCOPE

A. Removal of designated equipment and structures.

B. Identification of existing utilities.

1.02 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 01100 Summary of Work

1.03 SUBMITTALS

A. Submit the following in accordance with Section, Submittal Procedures:
   1. Schedule
      a. Indicate demolition and removal sequence.
   2. Record Drawings
      a. Accurately record locations of capped utilities, subsurface obstructions, and other pertinent items uncovered during demolition.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, safety of structure, dust control and work safety requirements.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct egress width to exits.

E. Do not disable or disrupt building fire or life safety systems without 3 day prior written notice to the Owner.

F. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.05 SCHEDULING

A. Schedule Work and notify Owner in accordance with Section, Summary of Work.

B. Scheduling of work shall be done with the approval of Owner.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PREPARATION

A. Provide, erect, and maintain temporary barriers as required for demolition and as indicated on the Drawings.

B. Erect and maintain weatherproof closures for exterior openings.

C. Erect and maintain temporary partitions to prevent spread of dust, odors and noise to permit continued Owner occupancy of the facility.

D. Protect existing materials and areas which are not to be demolished.

E. Prevent movement of structure; provide required bracing and shoring.

F. Mark location of utilities.

3.02 DEMOLITION

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Identify, disconnect, remove and cap designated utilities within demolition areas.

C. Demolition of structures shall include the complete removal of the structure foundation.

D. Demolish in an orderly and careful manner. Protect existing supporting structural members and equipment. Cease operations immediately if structure appears to be in danger. Notify Engineer. Do not resume operations until directed.

E. Except where noted otherwise, remove demolished materials from site as work progresses. Do not burn or bury materials on site.

F. Upon completion of work, leave areas in clean condition.

G. Remove temporary Work.

3.03 EQUIPMENT TO OWNER

A. The following equipment shall be turned over to the Owner after removal from the existing facility. The equipment shall be stored at a location on the site as designated by the Owner.
   1. Temporary onsite generators.
   2. Bypass pumping equipment.

END OF SECTION

SECTION 02315

TRENCHING FOR UTILITIES

PART 1 GENERAL

1.01 SCOPE

A. Provide labor, equipment, and material to perform required excavating, backfilling, and compacting for utilities and related structures as specified herein and indicated on the Drawings. Work shall include, but not be limited to, the following:
   1. Survey staking as required for construction.
   2. Protection of existing improvements.
   3. Location of installed utilities.
   4. Use of explosives.
   5. Dewatering.
   6. Excavating, backfilling, and compacting for utilities.
   7. Installation of warning / identification tape and tracer wire.
   8. Borrow material.
   9. Disposal of surplus material.
   10. Demolition and removal of existing structures.

1.02 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 02230 Clearing and Grubbing
   2. Section 02370 Erosion Control
   3. Section 02530 Sanitary Sewer System
   4. Section 02920 Lawns and Grasses

1.03 DEFINITIONS

A. Backfill: A specified material used in filling the excavated trench and placed at a specified degree of compaction.
   1. Materials: Materials listed herein include processed materials plus the soil classifications listed under the Unified Soil Classification System, (USCS) (Method D2487 and Practice D2488). The soil materials are grouped into five broad categories according to their suitability for this application.
      a. Class I: Angular, 6 to 40-mm (1/4 to 1-1/2-in), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shell.
      b. Class II: Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 in.), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.
      c. Class III: Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC are included in this class.
      d. Class IV: Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL

are included in this class. These materials shall not be used for bedding, haunching, or initial backfill.

e. Class V: This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rock larger than 40 mm (1 1/2 in.) in diameter, and other foreign materials. These materials shall not be used for bedding, haunching, or initial backfill.

2. Backfill Zones: Each backfill zone shall extend the full width of the trench bottom.
   a. Foundation: Extending down from the bottom of bedding zone as defined below.
   b. Pipe Embedment
      1) Bedding: Extending from 4 inches below the pipe bottom to the pipe bottom for 30-inch diameter and smaller and 6 inches below the pipe bottom for pipes larger than 30 inches in diameter.
      2) Haunching: Extending from the bedding (bottom of the pipe) to the pipe spring line.
      3) Initial Backfill: Extending from the haunching (pipe spring line) to 1 foot above the top of the pipe.
   c. Final Backfill: Extending from the initial backfill to the finish ground elevation.

B. Laying Conditions:
   1. Type 1: Flat bottom trench with loose backfill.
   2. Type 2: Flat bottom trench with backfill lightly consolidated to centerline of pipe.
   3. Type 3: Pipe bedded in 4 inches minimum of loose soil and backfill lightly consolidated to top of pipe.
   4. Type 4: Pipe bedded on Class I material to 1/8 pipe diameter (4 inch minimum) Backfill compacted to top of pipe a minimum of 80 percent of standard proctor.
   5. Type 5: Pipe bedded in compacted Class I material to pipe centerline with 4-inch minimum under pipe. Backfill to top of pipe with Class I, II, or III and compact to 90 percent of standard proctor.

C. Compaction: Process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of compaction" shall be expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D698 (Standard Proctor).

D. Excavation: The removal of soil or rock to obtain a specified depth or elevation.

E. Hard Material: Solid, homogeneous material which is not included in the definition of "rock" but which may require the use of heavy excavation equipment with ripper teeth. Amount must exceed 1 cubic yard in volume. Material having a standard penetration resistance as determined by ASTM D1586 between 60 and 150 blows per foot is defined as "hard material."

F. Lift: Layer of soil placed on top of a previously prepared or placed soil.

G. Rock: Solid, homogeneous material which cannot be removed without the systematic drilling and blasting exceeding 1 cubic yard in volume. Material having a standard penetration resistance as determined by ASTM D1586 greater than 150 blows per foot is defined as "rock." Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

H. Pipe Springline: A line running horizontally through the center of the pipe.

I. Topsoil: Natural, friable soil, representative of productive soils in the vicinity of the site. Topsoil shall be free from roots, stones larger than 1 inch, objectionable weed seeds, toxic substances, and materials that hinder grading, planting, and maintenance operations.

1.04 SUBMITTALS

A. Submit the following in accordance with Section, Submittal Procedures:
   1. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following. Clearly indicate equipment to be furnished for the Project including options to be provided.
      a. Warning / Identification tape.

PART 2 PRODUCTS

2.01 STONE

A. Class I material shall be #57 or #67M stone in accordance with SCDOT specifications Section 1005, General Requirements for Aggregate.

2.02 WARNING AND IDENTIFICATION TAPE

A. Tape shall be a minimum 3-inch wide polyethylene plastic tape manufactured specifically for identification of buried utilities with means of enabling detection by a metal detector to a minimum depth of 3 feet. Tape shall be color coded and continuously imprinted with warning and identification markings in bold black letters to read "CAUTION - BURIED (utility) LINE BELOW." Color and printing shall be permanent, unaffected by moisture or soil and shall be as follows:

	Utility	Color	Marking
1.	Water	Blue	Caution - Buried Water Line Below
2.	Gravity Sewer	Green	Caution - Buried Sewer Line Below
3.	Force Main	Green	Caution - Buried Force Main Below
4.	Electric	Red	Caution - Buried Electric Line Below
5.	Gas	Yellow	Caution - Buried Gas Line Below
6.	Telephone	Orange	Caution - Buried Telephone Line Below
7.	SCADA	Orange	Caution - Buried SCADA Line Below

B. Tape shall be by Blackburn Manufacturing, Joseph G. Pollard Co., or Reef Industries Inc.

2.03 TRACER WIRE

A. Tracer wire shall be #12 solid copper wire. All connections shall be by wire nuts and taped.

B. Splices in tracer wire are to be kept to a minimum and joined with copper split nuts of appropriate size.

PART 3 EXECUTION

3.01 PROJECT SAFETY

A. Contractor is responsible for Project safety.

B. Perform work in conformance with applicable State and Federal safety regulations including, but not limited, to the following:
   1. South Carolina Safety and Health Standards for the Construction Industry (29CFR 1926 Subpart P).
   2. SC OSHA Industry Guide No. 14, Excavations.
   3. SC OSHA Industry Guide No. 20, Crane Safety.

C. Provide barriers, warning lights, and other protective devices at excavations as necessary for safety of workers and the public.

D. Provide sloping of bank, shoring, sheeting, or other means of maintaining the stability of the trench in accordance with the requirements of the Associated Contractor's Manual of Accident Prevention OSHA, Part 1926.P.

3.02 PROTECTION OF UNDERGROUND FACILITIES

A. Investigate underground facility locations prior to the start of construction.

B. Repair damage to existing facilities at no additional cost to the Owner.

C. A change in conditions may be considered due to the location of the existing facilities as allowed in the General Conditions. This does not include the cost for repair of damaged facilities not properly located in advance of construction.

D. Separation distances shall be in accordance with utilities requirements.

3.03 CONSTRUCTION STAKING

A. Provide construction staking as dictated by field conditions. Engineer will only provide key reference points and benchmarks.

B. Contractor shall report to Engineer whenever a reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations. Contractor shall be responsible for the accurate replacement or relocation of such reference points or property monuments by a registered professional surveyor in the State of South Carolina.

3.04 LOCATION OF INSTALLED UTILITIES

A. Contractor shall be responsible for locating contract installed utilities as requested by third parties proposing to dig in the contract area until the date that the entire contract is recommended for final payment by Engineer to Owner.

3.05 WATER CONTROL

A. Prevent surface water from entering the trench.

B. When trench bottom is below the existing ground water table, install a dewatering system to maintain water table 1 foot below trench bottom. Provide a man experienced in dewatering work at the job site.

C. Maintain dewatering until backfilling has proceeded above the existing ground water level.

D. Dispose of water from dewatering operations in accordance with the South Carolina Sedimentation Pollution Control Act and SCDHEC Standards.

3.06 USE OF EXPLOSIVES

A. Explosives may not be used on the Project.

3.07 EXCAVATING

A. Excavation shall be by open cut, unless otherwise indicated on the Drawings or specified herein. Short sections of trench may be tunneled or direct bored with the approval of the Engineer.

B. Stockpile excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger Work, impair the use or appearance of existing facilities, or be detrimental to the completed Work.

C. Contractor shall segregate excavated material so as to maintain material suitable for backfill separate from material that is unsuitable.

D. Trench dimensions at the pipe embedment and foundation zone unless noted otherwise shall be as follows:
   1. Minimum width: Pipe outside diameter plus 8 inches.
   2. Maximum width: Pipe outside diameter plus 24 inches.
   3. Sides shall be vertical to a minimum of one foot above the top of pipe.

E. Shape trench bedding to provide uniform bearing for the full pipe length. Bottom shall be free of protrusions that could cause point loading on pipe. Provide bell holes as required for properly making pipe joint.

F. Do not over excavate. Excavation below grade without approval of Engineer shall be backfilled with Class I material at no additional cost.

G. Undercut soils that become unsatisfactory by construction activity or by being left exposed to the weather and backfill with Class I material at no additional cost.

H. Remove shoring, bracing, and sheeting, unless otherwise noted, as the trench is backfilled. Engineer shall have the authority to require that the sheeting be left in place.

I. Excavation of trench shall not advance more than 200 feet ahead of the installation. In no case should the excavation extend beyond that which can be backfilled by the end of the workday.

J. Correct unstable soil conditions encountered at trench foundation by one of the following methods:
   1. Excavate below grade as approved by Engineer and backfill with Class I material or approved substitute material at unit price bid or the cost to be included in pipe unit bid price as indicated in Section, Unit Prices.
   2. Provide piling and / or timber cradles in a manner approved by the Engineer. Payment will be made as a change to the Contract Price.
   3. Provide concrete cradle or encasement of concrete at unit price bid or the cost to be included in the lump sum price as indicated in Section, Unit Prices.

K. Rock and Hard Material
   1. Excavate rock and hard material to a minimum depth of 4 inches below the pipe for pipes smaller than 30 inches and 6 inches for pipes 30 inches and larger.

L. Pressure Lines:
   1. Provide a minimum 3 feet of cover, unless indicated otherwise on the Drawings.
   2. Excavate trenches to provide vertical curve chords that will not exceed the pipe manufacturer’s recommended joint deflection.
   3. Provide concrete thrust blocks having a compressive strength of 3,000 psi at 28 days at change in horizontal and vertical direction and reduction in the pipe size, unless other restraint systems are indicated otherwise on the Drawings.

Cut trench sides vertical and square to receive concrete. Provide bearing area against trench wall as indicated on the Drawings.

M. Gravity Lines:
   1. Excavate trench to the alignment and grade indicated on the Drawings.

N. Utility Structures: Provide a minimum of 12 inches below subgrade and backfill with Class I compacted to 95 percent maximum density. If the soil conditions are found to be unsuitable for structural stability of the manhole, Engineer may require additional depth of Class I material.

3.08 BACKFILLING

A. Weather Limitations: Proceed with backfill operations based on the following weather conditions:
   1. Temperature must be above freezing and rising.
   2. In windy, hot, or arid conditions with a high rate of evaporation add moisture to the material to maintain the optimum moisture content.
   3. Do not proceed in rain or on saturated subgrade.
   4. Do not place material on surfaces that are muddy, frozen, or contain frost.

B. General
   1. Maintain backfill operation within 200 feet from pipe laying operation.
   2. Backfill trench to existing ground surface with select excavated material at the specified compaction.
   3. If excavated material is unsuitable to obtain specified compaction, provide suitable off-site borrow material for backfill.
   4. Re-excavate trenches improperly compacted. Backfill and compact as specified.
   5. Provide appropriate tamping equipment, and water to obtain proper moisture content, to achieve specified compaction of backfill.
   6. Conduct operation of heavy equipment above pipe installation as to prevent damage to pipe.
   7. Install warning / identification tape over utilities. Bury tape one foot below finished grade above the utility.
   8. Install tracer wire for non-metallic pressure pipe. Bury tracer wire with pipe. Wire shall be looped into valve boxes to allow access for direct contact location.

C. Backfill in pipe embedment zone (bedding, haunching, and initial backfill).
   1. General:
      a. Backfill with material as specified below. Material shall be free from objects larger than 2 inches.
      b. Where rock and hard material has been excavated below pipe bottom, backfill and compact bedding with Class I material. Class II or III material may be used for bedding with Engineer's approval.
      c. Place backfill material to assure placement of material under pipe haunches.
      d. Take care during placement and compacting of material to avoid movement of pipe.
   2. Place backfill in bedding and haunching zones in 6 inch maximum lifts and compact to 90 percent density. Place initial backfill in one lift do not compact. Provide backfill material in pipe embedment zone as specified below.

a. Pressure Lines (Flexible and Rigid Pipe)
    1) Excavation in Class I, Class II, and Class III soils suitable for bedding, the bedding surface shall provide a firm foundation of uniform density. Backfill with select excavated material.
    2) Excavation in Class IV or Class V, running water, and other unstable soil conditions, excavate a minimum of 4 inches below pipe bottom and provide Class I material for bedding and haunch zone. Backfill with Class I, II, or III material in initial backfill.
b. Gravity Sewer Lines, Rigid pipe (concrete and ductile iron)
    1) Excavation in Class I, Class II, Class III, and stable Class IV soils suitable for bedding, the bedding surface shall provide a firm foundation of uniform density. Backfill with select excavated material.
    2) Excavation in Class V, unstable Class IV soils, running water, and other unstable soil conditions, excavate a minimum of 4 inches below pipe bottom and provide Class I material for bedding and haunch zone. Backfill with Class I, II, or III material in initial backfill.
    3) Ductile Iron over 16 inch
        i) Depth 0 - 12 feet: Type 2 laying conditions same as for pressure pipe.
        ii) Depth over 12 feet: Provide Class I material for bedding and 4 inches up from bottom of pipe.
c. Gravity Sewer Lines, Flexible (PVC SDR 35)
    1) Depth 0 to 14 ft: Provide Class I material for bedding and haunching. Backfill with Class I, II, or III material in initial backfill.
    2) Depth over 14 ft: Provide Class I material for bedding, haunching, and initial backfill.
d. Gravity Sewer Lines, Semi-rigid pipe (PVC and ABS Truss Pipe)
    1) Depth 0 to 14 ft: Provide Class I material for bedding and haunching. Backfill with Class I, II, or III material in initial backfill.
    2) Depth over 14 ft: Provide Class I material for bedding, haunching, and initial backfill.

D. Final Backfill
1. Backfill with materials free of stones and free of debris larger than 6 inches in dimension. Place backfill in lifts not exceeding the thickness and compacted to the minimum density specified below.
2. Trench backfilled with noncohesive materials may be compacted with water flooding; except under roadways, shoulders of roadways, and other areas subject to vehicular movement, provided the method of compaction is approved by the Engineer and provides the degree of compaction required.
3. Lifts and density:
    a. Undeveloped areas (i.e., forests, fields, and, croplands): Trench may be filled with bulldozer blade provided material fall will not damage pipe. Mound soil over the trench area sufficiently to settle level over time. Degree of compaction shall be 85 percent.
    b. Lawns: Backfill in 12-inch lifts and compact to 90 percent. Top 12 inches shall be free of material with a dimension over 2 inches.
    c. Roads (including Rights-of-way), drives, parking areas (including areas within 20 feet), and adjacent to existing utilities: Backfill in 6 inch lifts compact to 95 percent.
    d. Within 20 feet of foundations: Backfill in 6-inch lifts compacted to 95 percent.

E. Utility Structures: Bring backfill to grade in even lifts on all sides. Lift depths and compaction densities shall be as specified according to area of installation for pipe above. Backfill against cast-in-place concrete structure only after concrete has attained the specified 28-day compressive strength.

3.09 SOIL TESTING

A. Compaction tests may be made at the option of Engineer. An independent testing laboratory will perform tests. Contractor will pay for cost of the initial tests.

B. For each test that fails the compaction requirements, the testing firm at the direction of the Engineer shall make two additional tests. Contractor shall pay cost of additional tests made because of failure of compaction test.

C. Correct deficiencies in compaction.

3.10 GRADING AND CLEAN-UP:

A. Provide for testing and clean up as soon as practicable, so these operations do not lag far behind the pipe installation. Perform preliminary clean up and grading as soon as backfill is complete.

B. Provide positive drainage of finished grade and drain away from structures. Finished grade shall be reasonably smooth, compacted, free from irregular surface changes and comparable to the adjacent existing ground surface.

C. Seed disturbed areas in accordance with Section, Lawns and Grasses.

D. Upon completion of backfilling, remove and properly dispose of excess material and waste.

END OF SECTION

SECTION 02370

EROSION CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work shall include, but not be limited to, the following:
   1. Erosion control at project site.
   2. Erosion control at borrows and disposal areas as required by Contractor. Cost shall include erosion control permits as necessary for borrow and disposal areas.
   3. Removal of surface debris.
   4. Temporary and permanent ground cover.
   5. Maintain and remove erosion control devices.
   6. Self Inspection and Monitoring

1.02 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 02920 Lawns and Grasses

1.03 REFERENCED STANDARDS

A. “Erosion and Sediment Control Planning and Design Manual,” issued by the N. C. Sedimentation Control Commission.

1.04 QUALITY ASSURANCE

A. Conform to rules and regulations of the Erosion Control Laws of the State of South Carolina, specifically the SC Code of Laws Section 48-14, and the local jurisdiction where the project is located.

B. Post a copy of the approved erosion control permit, furnished by Owner, at the site prior to starting work. Maintain a copy of the approved erosion control plan at the site.

C. Provide permanent ground cover as soon as possible, and no later than 15 working days after completion of work in a specific area.

1.05 WARRANTY

A. Contractor is liable for damages to public and private property and fines as may be placed on the Project by the governing agencies due to failure to provide adequate erosion control devices.

PART 2 PRODUCTS

2.01 MATERIALS

A. Matting / Erosion Control Fabric (ECF): Matting and ECF shall be heavy jute mesh over mulch held in place by staples. Commercially available ECFs may be used upon approval of the engineer. Approval of fabrics will require manufacturer's design

data regarding velocity, ditch slopes, method of installation, decay cycle, repair techniques, and grass growth enhancement characteristics.

B. Matting / Erosion Control Fabric (ECF): Matting and ECF shall be a 70% straw and 30% coconut blanket encased in a medium weight plastic netting (both sides). Matting shall be fully degradable but suitable until vegetation has been established. Installation of ECF shall be done with staples per temporary liner detail in the construction drawings. Commercially available ECFs may be used upon approval of the engineer. Approval of fabrics will require manufacturer's design data regarding velocity, shear strength, ditch slopes, method of installation, decay cycle, repair techniques, and grass growth enhancement characteristics.

C. Wire Staples: 16 gauge steel wire, with minimum of 3" top and 4" long legs.

D. Gravel for Stone Filters: #57 crushed stone.

E. Filter Fabric: 7-1/2 oz. burlap fabric or other silt filtering fabric.

F. Riprap:
   1. Class A: Stone shall conform to SCDOT standards and shall range in size from 2 to 6-inches with the stone gradation being equally distributed within the required size range.
   2. Class B: Stone shall conform to SCDOT standards and shall range in size from 5 to 12-inches with the stone gradation being equally distributed within the required size range.
   3. Type 1: Stone shall conform to SCDOT standards and shall range in size from 5 to 17-inches with the stone gradation being equally distributed within the required size range.

PART 3 EXECUTION

3.01 INSTALL EROSION CONTROL DEVICES

A. Install erosion control devices, which shall be in place and operational prior to other land disturbing activity.

B. After installing erosion control devices as indicated on the Drawings, verify that reasonable measures have been taken to prevent the sedimentation of nearby watercourses, existing and new facilities, and adjacent property.

C. Should Contractor believe that additional measures are necessary to adequately prevent erosion, immediately notify Engineer. If rain is predicted before the Engineer can be notified, take measures as necessary to prevent siltation of nearby water courses and work will be paid for as provided in the General Conditions.

D. After installing erosion control devices, request an inspection by the local agency having jurisdiction and the Engineer.

E. Incorporate permanent erosion control work into the project at the earliest practicable time. Coordinate temporary erosion control measures with permanent erosion control measures and other work on the project to assure effective and continuous erosion control throughout the construction and post construction period.

F. Maintain erosion control devices during construction until the disturbed areas are stabilized and the agency having jurisdiction and the Engineer have approved the removal of the erosion control devices.

3.02 BORROW AND DISPOSAL AREAS:

A. Obtain and pay for erosion control permit for borrow and disposal areas as required by Contractor.

B. Install and maintain erosion control devices in accordance with Contractor's approved plan.

3.03 MAINTENANCE

A. Inspect erosion control devices after each rainfall. Make required repairs immediately. Remove sediment deposits when deposits reach approximately one-half of the capacity of the erosion control device.

B. Respread accumulated sediments on the project site in a manner that will not adversely affect erosion control facilities and permanent ground cover.

C. Silt Fence: Should the filter fabric decompose or become ineffective before approval of its removal by the Engineer, replace fabric immediately at no additional cost to the Owner.

D. Temporary Construction Entrance: Maintain entrance in a condition that will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 2 inches of stone, as conditions require, at no additional cost to the Owner.

3.04 SEEDING

A. Disturbed areas not covered by new construction shall be seeded.

B. Provide temporary and permanent seeding in accordance with Section, Lawns and Grasses.

3.05 STABILIZATION AND CLEAN-UP

A. Remove erosion control devices upon the approval of the permanent stabilization of this site by the agency having jurisdiction of the area and the Engineer. Dress sediment deposits remaining in place after the erosion control devices are removed to conform to the existing grade, prepared and seeded. Include cost of removal and cleanup in the cost of the installation of the device.

3.06 SELF INSPECTION AND MONITORING

A. Provide self-inspection and reporting as required by the Sedimentation Pollution Control Act for the duration of the project. These inspections will performed to ensure that the approved sedimentation and erosion control measures on the Drawings are installed, maintained, and working adequately.
   1. The inspections need to be conducted after each phase of the project, and continue until permanent ground cover is established.
   2. The self-inspection forms and information regarding this program are available at the following website: https://scdhec.gov/bow/stormwater/applications-forms-stormwater
   3. Documentation of inspections shall be recorded on a single copy of the approved erosion and sedimentation control drawings. These Drawings and inspection reports shall be made available at the project site.

B. Provide weekly self-monitoring in accordance with the NPDES Stormwater permit for all construction activities.

END OF SECTION

SECTION 02530

SANITARY SEWER SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work under this section includes, but is not limited to, piping, valves, and appurtenances for a complete sanitary sewer collection system.

1.02 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 02315 Trenching for Utilities
   2. Section 02445 Bore & Jack of Conduits.

1.03 REFERENCES

A. Publications are referred to in the text by basic designation only.
   1. American Society for Testing and Materials (ASTM)
      a. A126 Gray iron Castings and Valves, Flanges and Pipe Fittings.
      b. C361 Reinforced Concrete Low-Head Pressure Pipe.
      c. C443 Flexible Watertight Joints for Precast Manhole Sections
      d. C478 Precast Reinforced Concrete Manhole Sections
      e. C828 Low-Pressure Air Test of Vitrified Clay Pipe Lines (4 to 12 inch)
      f. C890 Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
      g. C923 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
      h. C1244 Test Method for Concrete Sewer Manholes by the Negative Air Pressure
      i. D1248 Polyethylene Plastics Molding and Extrusion Materials
      j. D1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
      k. D2241 Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)
      l. D 2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
      m. D2680 Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Pipe
      n. D3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
      o. D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
      p. D3350 Polyethylene Plastics Pipe and Fittings Materials
      q. F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
      r. F794 Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
      s. F949 Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
      t. F894 Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
      u. F1483 Specification for Oriented Poly(Vinyl Chloride) PVCO, Pressure Pipe

2. American Water Works Association (AWWA)
    a. C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
    b. C105 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
    c. C110 Ductile-Iron and Gray-Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids
    d. C115 Flanged Ductile-Iron Pipe with Threaded Flanges
    e. C151 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
    f. C153 Ductile-Iron Compact Fittings, 3 inch through 16 inch, for Water and Other Liquids
    g. C504 Rubber-Seated Butterfly Valves
    h. C507 Ball Valves, 6 inch through 48 inch
    i. C508 Swing-Check Valves for Waterworks Service, 2 inch Through 24 inch NPS
    j. C509 Resilient-Seated Gate Valves for Water Supply Service
    k. C512 Air-Release, Air / Vacuum, and Combination Air Valves for Waterworks Service
    l. C550 Protective Epoxy Interior Coatings for Valves and Hydrants
    m. C600 Standard for Installation of Ductile Iron Water Mains and Their Appurtenances
    n. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
    o. C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 12 inch, for Water Distribution
    p. C906 Polyethylene (PE) Pressure Pipe and Fittings 4 inch through 63 inch for Water Distribution
    q. C909
    r. M23 PVC Pipe - Design Installation
3. National Sanitation Foundation (NSF) Standards
    a. 14 Plastic Piping Components and Related Materials
4. UNI-BELL Plastic Pipe Association (UNI)
    a. B-5 Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Sewer Pipe
    b. B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

1.04 SUBMITTALS

A. Submit the following in accordance with Section, Submittal Procedures:
    1. Affidavit of Compliance: Affidavit shall attest that supplied products conform to the referenced standard and this specification and that tests set forth in each applicable referenced publication have been performed and that test requirements have been met. Submit for each of the following materials:
        a. Pipe
            1) Ductile iron
            2) Polyvinyl Chloride (PVC) pressure pipe
                i) AWWA C900
                ii) AWWA C909 Oriented PVC
                iii) ASTM F1483 Oriented PVC
                iv) Pressure rated
                v) Schedule 40 & 80

3) Polyvinyl Chloride (PVC) gravity sewer pipe
    i) SDR 35
    ii) Schedule 40, drain, waste, and vent (DWV) pipe
    iii) Composite (Truss)
    iv) Ribbed
4) Polyethylene gravity sewer pipe
5) Cast iron soil pipe

b. Pre-cast concrete manholes
c. Valves
    1) Resilient-seated gate
    2) Plug
    3) Check
    4) Air Release

2. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following. Clearly indicate equipment to be furnished for the Project including options to be provided.
    a. Pipe
        1) Ductile iron
        2) Ductile Iron with restrained joints
        3) Polyvinyl Chloride (PVC) pressure pipe
            i) AWWA C900
            ii) AWWA C909 Oriented PVC
            iii) ASTM F1483 Oriented PVC
            iv) Pressure rated
            v) Schedule 40 & 80
        4) Polyvinyl Chloride (PVC) gravity sewer pipe
            i) SDR 35
            ii) Schedule 40, drain, waste, and vent (DWV) pipe
            iii) Composite (Truss)
            iv) Ribbed
        5) Polyethylene gravity sewer pipe
        6) Cast iron soil pipe
    b. Pre-cast Concrete Manholes and the following appurtenances:
        1) Manhole steps
        2) Pipe connectors
        3) Joint material
        4) Castings
    c. Service saddles
    d. Valves
        1) Resilient-seated gate
        2) Plug
        3) Check
        4) Air Release
3. Reports:
    a. Field test report for each section of pipe for the following:
        1) Pressure test for force mains.
        2) Low-pressure air test for gravity mains.
        3) Vacuum test for manholes.
4. Operation and Maintenance Instructions: Submit complete operation and maintenance manual for the following:
    a. Valves.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide a suitable pipe hook or rope sling when handling the pipe with a crane. Lifting of the pipe shall be done in a vertical plane. Under no conditions shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to both tongue and groove ends.

B. Deliver pipe in the field as near as practicable to the place where it is to be installed. Distribute pipe along the side of the trench opposite to the spoil bank. Where necessary to move the pipe longitudinally along the trench, it shall be done in such a manner as not to injure the pipe or coating.

C. Shield PVC pipe and fittings stored on site from the sun's ultraviolet rays by suitable cover, or indoor storage.

PART 2 PRODUCTS

2.01 DUCTILE-IRON PIPE

A. Pipe and fittings shall conform to the following requirements:
   1. Size shall be as indicated on the Drawings.
   2. Pipe shall be epoxy lined.
   3. Suitable for a system working pressure of 200 psi.
   4. Cement-mortar lined with seal coat in accordance with AWWA.
   5. Interior of pipes and fittings shall be lined with virgin polyethylene complying with ASTM D1248, compounded with an inert filler and with sufficient carbon black to resist ultraviolet rays during above ground storage of the pipe and fittings. The polyethylene shall be bonded to the interior of the pipe or fitting by heat. The lining shall be 40 mils nominal thickness and a minimum of 30 mils. The lining shall be American Polybond, U.S. Polylined or equal.
   6. Interior of pipes and fitting shall be Protecto 401 lined per Section, Sanitary Sewer Pipe Liner.
   7. Interior of pipes and fittings shall be coal tar epoxy lined.

B. Ductile-iron pipe for below ground service shall have push-on or mechanical joints, unless noted otherwise on the Drawings, conform to AWWA C151, and to the following requirements:
   1. Pipe thickness class shall be suitable for a laying condition as specified in Section, Trenching for Utilities, at the depth indicated on the Drawings, and at the system working pressure specified above.
   2. Provide mechanical joint fittings, unless noted otherwise on the Drawings.
   3. Encase pipe in polyethylene conforming to AWWA C105.

C. Ductile-iron pipe for above ground service shall have flanged joints, unless noted otherwise on the Drawings, and conform to AWWA C115.
   1. Pipes to be painted shall have only a shop primer on the outside by the manufacturer. Verify that proposed manufacturer's primer is compatible with the proposed paint system.

D. Fittings for ductile-iron pipe shall conform to AWWA C110, or C153 and to the following requirements:
   1. Joint type shall be as specified above for the supplied ductile-iron pipe.
   2. Fittings shall be made of gray-iron or ductile-iron.

E. Ductile iron pipe on piers shall have Mech-Lok™ rigid restrained joint by Griffin Pipe Products Co. or approved substitute. Provide necessary expansion couplings as recommended by Pipe Manufacturer and approved by Engineer.

F. Special Pipe Joints
   1. River Crossing (Ball Joint)
      a. Boltless
      b. Bolted
   2. Restrained
      a. Provide restrained joint pipe at fittings and valves where indicated on the Drawings. Length of restrained pipe shall be as shown. Restrained joints shall be Snap-Lok (Griffin Pipe), Flex Ring and Lok-Ring (American), TR Flex (U.S. Pipe) or approved equal.
      b. Restrained joint pipe and fittings shall meet all AWWA standards and other requirements as specified above for standard ductile iron pipe and fittings unless addressed herein.
      c. Field made joints are allowable but should be avoided where possible. Careful planning to locate field cuts in standard pipe sections is preferred. For field made joints in restrained piping, use field weldments or an insert equal to TR Flex Gripper Rings or approved equal. Gasket type field made joints will not be allowed.
      d. Restrained joint fittings shall be provided by the restrained joint pipe supplier where located within restrained joint pipe sections. Fittings shall be of the same model / type as the pipe supplied from the pipe manufacturer.
      e. Restrained joint fittings may be push-on joint type.
      f. Megalugs, Series 1100, as manufactured by EBAA Iron Sales or approved equal shall be allowable for restraint where fittings or valves are not available with restrained joints from the pipe manufacturer.
      g. Where additional fittings/valves are required and not shown on Drawings, consult with Engineer for length of restrained joint pipe necessary each side of fittings/valve prior to installation of pipe/fitting.
      h. Contractor shall develop a field layout schedule and drawing for restrained joint pipe installations.

2.02 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

A. General
   1. Pipe and fitting size shall be as indicated on the Drawings.
   2. PVC materials shall comply with ASTM D1784 with a cell classification of 12454-B.
   3. Pipe used for wastewater system use shall be green in color.
   4. Pipe used for reclaimed water system shall be colored purple (Pantone 522) and embossed on opposite sides every three feet with the words “Caution – Reclaimed Water – Do Not Drink.”

B. AWWA C900: C900 PVC pipe 4-inch to 12-inch shall conform to AWWA C900 and the following requirements:
   1. Outside diameter shall conform to ductile-iron pipe.
   2. Pipe shall be pressure class 200 with a standard dimension ratio of DR 21.
   3. Pipe shall have plain end and elastomeric-gasket bell ends.

4. Fittings shall conform to AWWA C110, or C153 and have mechanical joints. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104.

C. Ultra Blue Cast Iron OD: Ultra Blue PVCO pressure pipe 6-inch to 12-inch shall be manufactured from a Rigid Poly (Vinyl Chloride) compound in accordance with ASTM F1483 and shall conform to the following requirements.
   1. Outside diameter shall conform to cast iron size.
   2. Pipe shall be pressure class 150.
   3. Pipe shall have an integral elastomeric-gasket bell end. The gasketed joint system shall conform to ASTM D3139.
   4. Fittings shall conform to AWWA C110, or C153 and have mechanical joints. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104.

D. Ultra Blue IPS: PVCO pressure pipe 6-inch to 12-inch shall be manufactured from a Rigid Poly (Vinyl Chloride) compound in accordance with ASTM F1483.and shall conform to the following requirements.
   1. Outside diameter shall conform to iron pipe size.
   2. Pipe shall be pressure-rating 200.
   3. Pipe shall have an integral elastomeric-gasket bell end. The gasketed joint system shall conform to ASTM D3139.
   4. Fittings shall conform to AWWA C110, or C153 and have mechanical joints. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104. Cast Iron OD transition gaskets shall be used with MJ fittings.

E. Pressure Rated: Pressure Rated (PR) PVC pipe 1-1/2-inch to 12-inch shall conform to ASTM D2241 and the following requirements:
   1. Pipe shall be pressure rated 200 with a standard dimension ratio of SDR 21.
   2. Pipe shall have an integral elastomeric-gasket bell end. The joints and gaskets shall comply with ASTM D3139 and ASTM F477.
   3. Fittings for pipe 3-inch and larger shall conform to AWWA C110, or C153 and have mechanical joints with transition gaskets as required for the pipe outside diameter. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104.

F. Schedule 40 & 80: Schedule 40 & 80 PVC pipe ½-inch to 12-inch shall conform to ASTM D1785 and the following requirements:
   1. Outside diameter shall conform to iron pipe.
   2. Pipe shall be schedule 40 or 80.
   3. Pipe shall have an integral elastomeric-gasket bell end or solvent weld joints.
   4. Fittings for the pipe shall conform to ASTM D2466 or D2467 as appropriate for the pipe schedule.

2.03 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

A. General
   1. Pipe and fitting size shall be as indicated on the Drawings.
   2. PVC materials shall comply with ASTM D1784 with a cell classification of 12454-B.
   3. Pipe shall have an integral elastomeric-gasket bell end. Gaskets shall be in conformance with ASTM F477.

4. See Section, Trenching for Utilities, for trench bedding and haunching requirements.

B. SDR 35: PVC SDR 35 gravity sewer pipe 4-inch to 15-inch and related fittings shall conform to ASTM D-3034 and the following requirements:
   1. Pipe shall have standard dimension ratio of SDR 35.
   2. Nominal pipe length shall be a minimum of 13 feet.

C. PVC Composite: PVC Composite (Truss) gravity sewer pipe 6-inch to 15-inch and related fittings shall conform to ASTM D2680.

D. PVC Ribbed: PVC Ribbed gravity sewer pipe 8-inch to 24-inch and related fittings shall conform to ASTM F794.

2.04 CAST IRON SOIL PIPE

A. General: Pipe and fitting size shall be as indicated on the Drawings.

B. Cast iron soil pipe shall be service weight hub and spigot meeting Federal WW-401.

C. The joints shall be rubber-type elastomeric as per ASTM C425.

2.05 MANHOLES

A. Provide manholes made of precast concrete sections in conformance with ASTM C478, SC Department of Transportation, and the following requirements:
   1. General
      a. Provide manholes to the depth as indicated on the Drawings. Manhole inside diameter shall be 4 feet unless noted otherwise on the Drawings.
      b. Precast concrete manholes shall be as manufactured by Adams Concrete, Carolina Precast Concrete, Inc., D & M Concrete Specialties, Inc., N. C. Products Corp., Stay Right Tank, Tindall Concrete Products, Inc. or approved substitute.
   2. Precast Concrete Sections
      a. Minimum wall thickness shall be 5-inches.
      b. Base: Cast monolithically without construction joints or with an approved PVC waterstop in the cold joint between the base slab and the walls. The width of the base extensions on Extended Base Manholes shall be no less than the base slab thickness.
      c. Riser: Minimum lay length of 16 inches.
      d. Eccentric Cone: Top inside diameter shall be 24 inches. Width of the top ledge shall be no less than the wall thickness required for the cone section.
      e. Transition Cone: Provide an eccentric transition from 60-inch and larger manholes to 48-inch diameter risers, cones, and flat slab top sections. Minimum slope angle for the cone wall shall be 45 degrees.
      f. Transition Top: Provide an eccentric transition from 60-inch and larger manholes to 48-inch diameter risers, cones, and flat slab top sections. Transition Top sections shall be furnished with vents as shown on the manhole details. Tops shall not be used in areas subject to vehicle traffic.
      g. Flat Slab Top: Designed for HS-20 traffic loadings as defined in ASTM C890. Items to be cast into Special Flat Slab Tops shall be sized to fit within the manhole ID and the top and bottom surfaces. Provide a float finish for exterior slab surface.
      h. Precast or core holes for pipe connections. Diameter of hole shall not exceed outside diameter of pipe by more than 3-inches.

i. Grade Rings: May be used to adjust frame and cover to finished grade. Grade Rings shall be no less than 4 inches in height.
j. Lifting Devices: Devices for handling precast components shall be provided by the precast manufacturer and comply with OSHA Standard 1926.704.
k. Finish wet wells with interior epoxy coating.

3. Joints
   a. Manufacturer in accordance with tolerance requirements of ASTM C 990 for butyl type joints.
   b. Minimize number of joints. Do not use riser section for manholes up to 6 feet tall and no more than one riser for each additional 4 feet in height.
   c. Flexible Joint Sealants: Preformed butyl rubber based sealant material conforming to Federal Specification SS-S-210A, Type B and ASTM C990.
   d. External Seal: Polyethylene backed flat butyl rubber sheet no less than 1/16-inch thick and 6-inches wide.
4. Inverts
   a. Brick and mortar or precast concrete invert.
   b. Form and finish invert channel to provide a consistent slope from inlet(s) to outlet up to 4-inches.
   c. Channel walls shall be formed to 3/4 of the height of the outlet pipe diameter.
   d. Finish benches with a minimum uniform 1.5:12 slope. Provide a 1/4-inch radius at the edge of bench and trough.
5. Flexible Pipe Connectors: Provide flexible connectors for pipe to manhole that conform to ASTM C923. Location of connectors shall vary from Project Drawings no more than 1/2-inch vertically and 5 degrees horizontally. Provide stainless steel pipe clamp type band around flexible connection to sewer pipe.
6. Manhole Steps:
   a. Steps shall be in accordance with ASTM C478 and made of 1/2-inch grade 60 steel encapsulated by co-polymer polypropylene and have serrated tread and tall end lugs.
   b. Secure steps to the wall with compression fit in tapered holes or cast-in-place. Align steps along a vertical wall and shall not be located over a pipe opening. First step shall be a maximum of 26 inches from the bottom.
   c. Steps shall be by American Step Co., Inc., Bowco Industries, Inc., M. A. Industries, Inc. or approved substitute.

2.06 CASTINGS

A. General
   1. Made of gray iron, ASTM A-48 - class 30, or ductile iron, ASTM A536, grade 65-45-12.
   2. Castings shall be free from imperfections not true to pattern. Casting tolerances shall be plus or minus 1/16-inch per foot of dimension. Top shall set neatly in frame, with edges machined for even bearing and proper fit to prevent rattling and flush with the edge of frame.
   3. Castings shall be as manufactured by Neenah Foundry Co., U.S. Foundry & Manufacturing Corp., or Vulcan Foundry

B. Manhole Frame and Cover:
   1. Minimum clear opening shall be 22 inches.
   2. Minimum weight for frame and cover shall be 300 pounds and suitable for Heavy Duty Highway Traffic Loads of H-20.

3. Frame shall have four 3/8-inch anchor bolt holes equally spaced.
4. Cast “Sanitary Sewer” on the cover. Casting shall bear the name of the manufacturer and the part number.
5. Provide solid cover.
6. Provide cover with two 1-inch perforated holes unless noted as watertight on the Drawings.
7. Provide the following where indicated on the Drawings:
    a. Ring and cover shall be watertight.
    b. Bolt down cover. Bolt down covers shall be provided with four (4) 3/8-inch stainless steel hex head bolts at 90 degrees.

2.07 TRANSITION COUPLINGS FOR GRAVITY SEWER PIPE

A. Pipe material changes between manholes may be permitted provided there is not a substantial difference in inside diameters, a smooth uniform flow line is maintained and a watertight rubber sleeve or mechanical coupler conforming to ASTM C-425 is used to make the transition. Metal hardware shall be stainless steel. Transition sleeves shall be manufactured by Fernco, Indiana seal or approved equal.

2.08 SEWER SERVICE

A. Sewer force mains shall be PVC C900, DR25 in green color.

B. Provide PVC service wye the same material as the main. Saddles shall be solvent welded and fastened with double stainless steel bands.

C. Inserta Tee or approved equal shall be used for connection to PVC ribbed pipe.

D. Service saddle for cast iron soil pipe services may be “ROMAC C” sewer saddles consisting of a virgin SBR gasket compounded for sewer service, a ductile iron saddle casting, a 304 stainless steel adjustable strap for fastening the gasket and the saddle casting to the sewer main, and a 304 stainless steel adjustable circle clamp for securing the service line into the SBR gasket.

2.09 VALVES

A. General: Valves shall meet the following requirements:
    1. Size shall be as required for the pipe size and material as indicated on the Drawings and specified.
    2. Use Mueller Square Nut or approved equal for 2” and up.
    3. Use Hammond or approved equal for under 2”.
    4. Open by counterclockwise rotation.
    5. Standard system working pressure is pressure psi.
    6. Equip valves with a suitable means of operation.
    7. For buried valves over 5 feet deep, provide extension stems of cold rolled steel to bring the operating nut to within 2 feet of the ground surface.
    8. Provide valve accessories as required for proper valve operation for valve locations as indicated on the Drawings and as recommended by valve manufacturer.
    9. Valve accessories shall be compatible to proper valve operation.
    10. Similar valve types shall be of one manufacturer.

B. Gate Valves, Resilient-Seated: Gate valves 3-inch to 20-inch shall conform to AWWA C509 or AWWA C515 and to the following requirements:
    1. O-ring stem seal on non-rising (NRS) stem valves.

2. Ends shall be mechanical joint for underground locations and flanged joint for above ground locations.
3. Valves shall be non-rising stem (NRS) with wrench nut for underground locations and Outside Screw and Yoke (OS&Y) with handwheel for above ground locations unless noted otherwise on the Drawings.
4. Be of one manufacturer.
5. Special material for bolts and nuts.

C. Plug Valves: Plug valves shall conform to the following requirements:
1. Plug valves shall be of the non-lubricated, eccentric type designed for a working pressure of 175 psi for valves 12 inch and smaller, 150 psi for vales 14 inch and larger.
2. Valves shall provide tight shut-off at rated pressure.
3. The plug valve body shall be cast iron ASTM A126 Class B with a welded-in overlay of not less than 90% nickel alloy content on all the surfaces contacting the face of the plug.
4. The valve plug shall be constructed of cast iron conforming to ASTM A126 Class B, with Buna N resilient seating surface to mate with the body seat.
5. Valve flanges shall be in accordance with ANSI B16.1 Class 125.
6. Shaft bearings shall be sleeve-type, sintered, oil impregnated, and permanently lubricated stainless steel.
7. Plug valve shaft seals shall be of the multiple V-ring type and shall be adjustable. Sealing system shall conform to AWWA C504 and C507 standards. All packing shall be replaceable without removing the bonnet or actuator and while valve is in service.
8. Valves 6” and larger shall be provided with gear actuators.
9. Provide levers or hand wheels to operate the valve as recommended by the manufacturer.
10. Full ported (i.e,. 100% flow area) and piggable.

D. Swing Check Valves: Swing check valves from 2 to 24 inch shall conform to AWWA C508 and to the following requirements:
1. Provide lever and weight for swing check control.
2. Resilient material to Metal seat construction.
3. Ends shall be flanged.

2.10 AIR VALVES

A. Provide air valves in conformance with AWWA C512 and the following:
1. Valve type shall be a combination valve.
a. Inlet size: 2 inch
b. Large orifice minimum: 1 inch
c. Small orifice minimum: 1/8 inch
2. Valve shall be designed for the following automatic operation:
a. Release of large quantities of air during the filling of the main.
b. Permit air to enter the main when it is being emptied.
c. Release accumulated air while the main is in operation and under pressure.
3. Valve shall be designed for a system pressure 150 psi. Valve shall also operate at a minimum system pressure of 20 psi.
4. Provide threaded inlet.
5. Provide stainless steel ball float and wetted internal parts.
6. Provide isolating bronze ball valve for connection to main line.

7. For sewage force mains provide tall body to minimize possibility of sewage plugging orifice or linkage.
8. Sewage force main valve shall include backwash accessories. They shall include bronze flushing ball valves and 5 feet of rubber hose with quick-connect coupling on each end.

2.11 VALVE BOX

A. Valve Box, Below Ground: Boxes shall be high strength cast iron of the screw or telescopic type. Box shall consist of a base section, center extension as required, and a top section with cover marked “SEWER.”

2.12 THRUST BLOCKING

A. Provide concrete thrust blocking for pressure lines in accordance with the detail on the Drawings.

B. Thrust blocking is not required where restrained joint fittings and equivalent length of restrained joint pipe are used unless shown otherwise on the Drawings.

PART 3 EXECUTION

3.01 GENERAL

A. Pipe installation shall meet the following general guidelines:
1. Lay pipe in the presence of Engineer, unless specifically approved otherwise.
2. Handle pipe and accessories in accordance with manufacturer’s recommendations. Take particular care not to damage pipe coatings.
3. Carefully inspect pipe immediately prior to laying. Do not use defective pipe. Replace pipe damaged during construction.
4. Lay pipe to grade and alignment indicated on the Drawings.
5. Provide proper equipment for lowering pipe into trench.
6. Provide tight closure pipe ends when work is not in progress.
7. Keep pipe interior free of foreign materials.
8. Do not lay pipe in water or when the trench or weather conditions are unsuitable for the work.
9. Clean bell and spigots before joining. Make joints and lubricate gasket in accordance with pipe manufacturer recommendation.
10. Block fittings with concrete, or restrained as indicated on the Drawings or as required to prevent movement.

B. Gravity Pipe: Gravity pipe installation shall meet the following general guidelines:
1. Lay pipe upgrade from the lower end and at the grades and alignment indicated on the Drawings.

3.02 RELATION OF WATER MAINS TO SEWERS

A. Lateral Separation: Lay water mains at least 10 feet laterally from existing and proposed sewers. Where existing conditions prevent a 10-foot lateral separation, the following shall be followed with approval of the Engineer:
1. Lay water main in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.
2. Lay water main in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.

B. Crossing Separation: Lay bottom of water main at least 18 inches above the top of the sewer. Where existing conditions prevent an 18-inch vertical separation, construct both the water main and sewer of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.

C. Crossing a Water Main Under a Sewer: When it is necessary for a water main to cross under a sewer, construct both the water main and the sewer of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.

3.03 SEWER PIPE

A. Lay sewer pipe to true lines and grades by use of laser beam equipment or other acceptable means.

B. Minimum Separation Distances:
   1. 100-foot horizontal separation from wells or other water supplies.
   2. 24-inch vertical separation from storm sewers or ferrous pipe shall be used.
   3. For separation from water mains see paragraph 3.02 above.

3.04 DUCTILE IRON PIPE

A. Install pipe in conformance with AWWA C600 and the following:
   1. For laying pipe in a vertical or horizontal curve, each full length pipe may be deflected by the following offset distance:
      a. Push-on joint
         1) 3 to 12-inch pipe: 14-inch offset
         2) 14 to 36-inch pipe: 8-inch offset
      b. Mechanical joint
         1) 3 to 6-inch pipe: 20-inch offset
         2) 8 to 12-inch pipe: 15-inch offset
         3) 14 to 20-inch pipe: 8-inch offset
         4) 24 to 36-inch pipe: 6-inch offset
   2. For laying restrained joint pipe in a vertical or horizontal curve, except for horizontal directional drills (HDD), each full length pipe may be deflected by the following offset distance:
      a. 6 to 12-inch pipe: 11-inch offset
      b. 16 to 20-inch pipe: 7-inch offset
      c. 24 to 30-inch pipe: 5-inch offset
      d. 36-inch pipe: 4-inch offset
      e. 42 to 48-inch pipe: 1 ¼ -inch offset

3.05 PVC PRESSURE PIPE

A. Install PVC C900 pipe in conformance with AWWA C605.

B. Solvent Weld: Where indicated in these specifications or on the plans, solvent weld type joints shall be used. Field cut ends shall be sanded to roughing the surface. Joints shall be cleaned of foreign material. Solvent shall be applied to the joint and joint made as recommended by the manufacturer. Excess solvent shall be wiped off. The joint should not be moved until sufficiently set up.

C. Bell and Spigot Joints: Clean bell and spigot ends prior to jointing. Ends of field cut pipe shall be beveled with file. Gasket shall be clean and lightly lubricated. Joint shall be made as recommended by the manufacturer.

3.06 POLYETHYLENE GRAVITY SEWER PIPE

A. Install polyethylene gravity sewer pipe in accordance with the above gravity sewer general requirements and in accordance with ASTM D2321.

3.07 VALVES AND FITTINGS

A. Install buried valves on top of an 18-inch square, 3-inch thick, solid concrete pad (minimum dimensions). The concrete pad may be provided by a pre-cast manufacturer or cast-in-place in the field above grade. Concrete used for the pads shall be a minimum 3,000 psi mix. The pads may not be cast-in-place in the pipe trench. Connection to pipe shall be such that there shall be no stress at the joint caused by misalignment or inadequate support of pipe or valve.

B. Install fittings as recommended by the manufacturer. Fittings shall be blocked or otherwise restrained from movement.

C. Valve Boxes: Set valve boxes flush with finished grade. Box shall be supported so that no stress shall be transmitted to the valve. Operating nut shall be centered in box.

D. Install valves, gates, and accessories indicated on the Drawings and in complete accordance with the manufacturer's recommendations.

E. Valve boxes shall be set straight with the operating nut centered and supported on (2) 4" concrete blocks, to prevent load transfer onto valve body or pipe line. Set top of box at finished grade. Provide a 24-inch x 24-inch wide by 6-inch thick concrete pad at top of valve boxes outside paved areas.

3.08 AIR VALVES

A. Main shall be drilled for a two inch connection.

B. Valve shall be installed on the main line with a service saddle.

C. Install air valve in a flat top manhole.

3.09 MANHOLES

A. Set base plumb and level. Align manhole invert with pipe invert.

B. Secure pipe connectors to pipe in accordance with manufacturer's recommendation.

C. Clean bells and spigots of foreign material that may prevent sealing. Unroll the butyl sealant rope directly against base of spigot. Do not stretch. Follow manufacturer's instructions when using O-ring seals.

D. Set precast components so that steps align.

E. Plug lift holes using a non-shrink grout. Cover with a butyl sealant sheet on the outside and seal on the inside with an application of an epoxy gel 1/8-inch thick extending 2 inches beyond the opening.

F. Set manhole frames to grade with grade rings. Seal joints between cone, adjusting rings, and manhole frame with butyl sealant rope and sheet.

G. Apply external seal to the outside of joint.

H. Finish the interior by filling fractures greater than 1/2-inch in length, width or depth with a sand cement mortar.

I. Clean the interior of the manhole of foreign matter.

3.10 PAINTING

A. Equipment shall receive the manufacturer's standard coating for the intended application. Coatings shall be suitable for the intended application.

B. Repaint damaged paint services.

C. Above ground piping and piping within vaults shall be painted in accordance with Section, Painting.

3.11 TESTING

A. General
1. Clean and flush pipe system of foreign matter prior to testing.
2. Notify Owner and Engineer a minimum of 48 hours prior to testing.
3. Perform tests in the presence of Engineer.
4. Length of line to be tested at one time shall be subject to approval of Engineer.
5. Pipe sections shall not be accepted and placed into service until specified test limits have been met.
6. Repair defects in the pipe system. Make repairs to the same standard as specified for the pipe system.
7. Retest repaired sections until acceptance.
8. Repair visible leaks regardless of the test results.

B. Pressure Mains
1. The Engineer shall approve the source, quality, and method of disposal of water to be used in test procedures.
2. Obtain Owner’s permission 48 hours prior to filling or flushing of pipe system with water from Owner’s water system. Owner shall operate valves connected to the existing water system. Keep pipe interior clean during construction to minimize the amount of water required for flushing. Where large quantities of water may be required for flushing, Engineer reserves the right to require that flushing be done at periods of low demand.
3. Pressure test in accordance with AWWA C600 for ductile iron pipe and AWWA C605 and M23 for PVC pipe and the following.
4. Make pressure tests between valves. Furnish suitable test plugs where line ends in “free flow.”
5. Provide air vents at the high points in the line section to be tested for releasing of air during filling. Service corporation stops may be used for air vent when located at a high point. Include cost of air vents in price of testing. Leave corporation stops in place after testing and note locations on As-Built Drawings.
6. Allow concrete blocking to reach design strength prior to pressure testing.
7. Force main shall be completely filled with water, all air expelled from the pipe, and the discharge end of the pipeline shall be plugged and adequately blocked before hydrostatic test begins.
8. Upon completing a section of pipe between valves, test pipe by maintaining for a two hour period the following hydrostatic pressure for each main:
   a. Force main: psig
9. Test pressure shall not vary by more than +/- 5 psi for the duration of the test.

10. No length of line shall be accepted if the leakage is greater than that determined by the following formula based on the appropriate test pressure:
    L = Allowable leakage per 1,000 feet of pipe in gallons per hour.
    D = Nominal diameter of the pipe in inches.
    100 psi: L = D x 0.07
    150 psi: L = D x 0.08
    200 psi: L = D x 0.09
    250 psi: L = D x 0.10

C. Gravity Sewer Mains
    1. Test gravity lines between manholes.
    2. Light Testing: Engineer will check for displacement of pipe as follows:
        a. A light will be flashed between the ends of the pipe section being tested.
        b. If the illuminated interior shows misalignment, or other defects as designated by Engineer, defects shall be repaired.
    3. General
        a. Infiltration shall not exceed 100 gallons per inch of diameter, per mile of pipe, per 24 hours. Engineer may require flow measurement for verification of infiltration.
        b. Verify that maximum infiltration rate shall not be surpassed by air testing as follows.
    4. Low Pressure Air Test:
        a. Air testing of sewer mains shall conform to UNI-B-6 and the following requirements:
        b. Perform initial air test when each section of main is complete including services to right of way. Test as construction proceeds.
        c. Wet interior surfaces of porous pipe material prior to testing.
        d. Safety
            1) Provide a superintendent who has experience in low pressure air testing of gravity sewer mains.
            2) Follow safety recommendations of air testing equipment manufacturer.
            3) Properly brace sewer plugs during testing. Test plugs prior to use in air testing.
            4) No one shall be allowed in manhole or trench when pipe is under pressure.
            5) Pressurizing equipment shall include a regulator and a pressure relief valve, which are set no higher than 9 psig. Monitor gauges continuously to assure that the pressure does not exceed 9 psig.
        e. Equipment
            1) Sewer plugs shall be specifically designed for low pressure air testing.
            2) Use two separate air hoses.
                i) One to connect the control panel to the sealed line for introducing the air.
                ii) One from the sealed line to the control panel to provide constant monitoring of the air pressure in the line.
                iii) If Pneumatic plugs are used a separate line shall be used to inflate the plugs.
            3) As a minimum the above ground air testing equipment shall include a shutoff valve, pressure regulating valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psig.

4) Continuous monitoring pressure gauge shall be at least 4 inches in diameter with minimum divisions of 0.10 psi and an accuracy of +/- 0.04 psi.
5) Monitoring gauges shall be subject to calibration as deemed necessary.
6) Air used for testing shall pass through a single above ground control panel.

f. Testing
1) Groundwater Determination: Immediately prior to each air test, determine groundwater level by a method acceptable to the Engineer. Adjust pressure used in air test in accordance with groundwater level.
2) Apply air slowly to the test section until the pressure reached is 4.0 psi plus an adjustment of 0.433 psi for each foot of ground water above the crown of the pipe. Internal air pressure, including adjustment for ground water, should never exceed 9.0 psi.
3) When the above required pressure is reached, throttle air supply to maintain internal pressure for at least two minutes to permit stabilization.
4) When pressure has stabilized at required pressure, shut off air supply.
5) While observing the continuous monitoring pressure gauge, decrease pressure approximately 0.5 psi from required pressure.
6) At this reading timing shall commence with a stop watch and allowed to run until pressure has dropped 1.0 psi or allowable time has lapsed. Line shall be “Acceptable” if the pressure drop does not exceed 1 psig in the time prescribed for the test in Table 1, Low Pressure Air Testing for Gravity Sewer Mains, at the end of this section.

5. Deflection Test for SDR 35 and Ribbed (ASTM F 949) PVC pipe.
a. Measure for deflection of pipe no sooner than thirty days after installation and backfill.
b. Deflection shall not exceed 5 percent of pipe diameter. Maximum allowable long term deflection shall be 5 percent.
c. Measure deflection with an approved “GO-NO-GO GAUGE” method or by an approved recording deflectometer. Verify gauge on site prior to testing.

NOTE -

6. Hydrostatic Test for Gravity Sewers
a. The source, quality, and method of disposal of water to be used in test procedures shall be approved by the Engineer.
b. Obtain Owner’s permission 48 hours prior to filling or flushing of pipe system with water from Owner’s water system. Owner of water system shall operate valves connected to the existing water system.
c. Air test line, as described above, prior to hydrostatic testing.
d. Provide taps for filling and pressurizing the line. Service corporation stops may be used. Include cost of taps in price of testing. Leave corporation stops in place after testing and note locations on As-Built Drawings.
e. Suitable means for thrust restraint shall be installed for testing.
f. Test for each manhole reach.
g. Test pipe by maintaining for a two-hour period a hydrostatic pressure of 150 psig.
h. Test pressure shall not vary by more than +/- 5 psi for the duration of the test.

i. Pressure test in accordance with AWWA C600 for ductile iron pipe and as described above.
j. Hydrostatic testing for gravity sewers within 100 feet of a water supply well shall be paid for as described in Section, Basis for Payment.

D. Vacuum test each manhole in accordance with ASTM C1244 and the following:
1. No personnel shall be allowed in manhole during testing.
2. Test manhole after assembly and prior to backfilling.
3. Plug pipes with suitably sized and rated pneumatic or mechanical pipeline plugs. Brace plugs to prevent displacement.
4. Position vacuum test head assembly to seal against interior surface of the top of cone section in accordance with manufacturer's recommendation.
5. Draw vacuum of 10 inches of mercury on manhole. Shut off the vacuum pump and close valve on vacuum line.
6. Measure time for vacuum to drop to 9 inches of mercury. Manhole shall pass if time meets or exceeds the following:

Manhole I.D. (inches)	48	60	72	84	96	120
Seconds	60	75	90	105	120	150

7. If manhole fails test, remove head assembly, coat interior with a soap and water solution, and repeat vacuum test for approximately 30 seconds. Leaking areas will have soapy bubbles. Make necessary repairs to the satisfaction of Engineer and repeat test until manhole passes.

END OF SECTION

SECTION 02820

FENCING
(CHAIN LINK)

PART 1 GENERAL

1.01 SCOPE

A. Provide chain link fencing where indicated on the Drawings and specified herein.

B. Work shall include, but not be limited to, the following major items and necessary accessories for a complete and operational system:
   1. Clearing as necessary for installation of fence.
   2. Fence post, frame, and concrete foundation.
   3. Chain link fabric and barbed wire.
   4. Gates.

1.02 SYSTEM DESCRIPTION

A. Fencing Location
   1. Function: Keep out unwanted people and animals
   2. Fence Height: 6 ft
   3. Provide posts, bottom intermediate and top rails as indicated. Provide corner and brace assemblies.
   4. Provide fabric gauges as indicated and install fabric on outside of fence and anchor to framework such that fabric remains in tension after pulling force is released.

B. Fencing Location
   1. Function: Keep out unwanted people and animals
   2. Athletic field backstop, sideline and outfield fencing heights shall be as indicated in the Drawings and details.
   3. Provide posts, bottom intermediate and top rails as indicated. Provide extended posts, braces, cables, turnbuckles and boundary netting overhang as indicated on Drawing details.
   4. No center rail required. Provide corner and end brace assemblies.
   5. Provide fabric gauges as indicated on Drawings. Install fabric on the ball field side of all framework except on the outfield arcs. Fabric shall be installed on the outside of the framework on the outfield arcs such that the tension will be directed on the framework.

1.03 SUBMITTALS

A. Submit the following in accordance with Section, Submittal Procedures:
   1. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following. Equipment to be furnished for the Project shall be clearly indicated including all options to be provided.
      a. Individual components of the fencing system.
   2. Shop Drawings: Submit Project specific shop drawings for the following:
      a. Layout drawing showing spacing of posts and location of gate, corner, end, and pull posts.
   3. Manufacturer's Installation Procedures.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who has at least three years' experience and has completed at least five chain link fence projects with the same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.

PART 2 PRODUCTS

2.01 FABRIC

A. Selvage: Fabric shall be knuckled at both selvages. Fabric shall be knuckled at one selvage and twisted and barbed at the other selvage. Fabric shall be twisted and barbed at both selvages. Both selvages of meshes less than 2 inches shall be knuckled. Bottom tension wire shall be 7 gauge and shall terminate at posts.

B. Galvanized Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufactures Institute (CLFMI) "Product Manual" and with requirements indicated below:
   1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter (9 gage).
   2. Mesh and Wire Size: 2-inch mesh, 0.192-inch diameter (6gage).
   3. Coating: ASTM A 392-74, Class 2, galvanized.

C. Safety Netting: Black all weather boundary netting, 1- inch mesh 320 lb. Breaking strength.

2.02 FRAMING

A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts are often referred to in ASTM standard specifications by Nominal pipe sizes (NPS) or the equivalent trade sized inches. The following indicates these equivalents all measured in inches:

Actual OD Size (in)	NPS Size	Trade
1.660	1 1/4	1 5/8
1.900	1 1/2	2
2.375	2	2 1/2
2.875	2 1/2	3
4.000	3 1/2	4

B. Type I Round Posts: Standard weight (schedule 40) galvanized-steel pipe conforming to ASTMF 1083, according to heavy industrial requirements of ASTM F 669. Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per square foot. Type coating inside and outside according to ASTM F 1234, as determined by ASTM A 90, and weights per foot as follows:

Actual OD Size (in)	Weight (lb/ft)	NPS Size
1.660	2.27	1-1/4
1.900	2.72	1-1/2
2.375	3.65	2
2.875	5.79	2 1/2
4.000	9.11	3 1/2

C. Top Rail: Manufacturer's longest lengths (21 feet) with expansion-type coupling, approximately 6 inches long for joining. Provide rail ends of other means for attaching top rail securely to each gate, corner, pull, and end post.
   1. Round Steel: 1.660-inch OD Type.

D. Steel posts for fabric heights up to 6 feet:
   1. Round Line or Intermediate Posts: 2.375-inch OD Type I steel pipe.
   2. Round End, Corner, and Pull Posts: 2.875-inch OD Type I steel pipe.

E. Steel posts for fabric heights over 6 feet:
   1. Round Line or Intermediate Posts: 2.375-inch OD Type I steel pipe.
   2. Round End, Corner, and Pull Posts: 2.875-inch OD Type I steel pipe.
   3. Backstop: 4 inch OD Type I steel pipe (all posts).

F. Swing Gate Posts: Furnish post to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows.
   1. Steel posts for fabric height of 8 feet or less and gate leaf width:
      a. Up to and including 4 feet: 2.875-inch OD pipe weighing at least 5.79 lb per feet.
      b. Over 4 to 10 feet: 4.000-inch OD pipe weighing at least 9.11 lb per ft.

2.03 FITTINGS AND ACCESSORIES

A. Material: Comply with ASTM F 626. Galvanized iron or steel to suit manufacturer's standards.
   1. Steel and Iron: Unless specified otherwise, hot-dip galvanize steel or cast-iron fence fittings and accessories with at least 1.2 oz. Zinc per sq. ft. as determined by ASTM A 90.

B. Post and Line Caps: Provide weather-tight closure cap for each post. Provide line post caps with loop to receive top rail.

C. Post Brace Assembly: Manufacturer's standard adjustable brace. Use material specified below for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast iron or cast-aluminum cap for each end.
   1. Round Steel: 1.6600-inch OD Type I steel pipe.

D. Bottom and Center Rail: (Where indicated on drawings). Same material as top rail unless indicated otherwise. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.

E. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4, and a minimum of 1.2 oz of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.

F. Tension and Brace Bands: 3/4 –inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of Zinc coating per sq. ft.
   1. Tension Bands: 0.074-inch thick (14 gauge) minimum.
   2. Brace Bands: 0.105 inch thick (gauge) minimum

G. Tension Wire: 0.177-inch-diameter metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.
   1. Coating Type II zinc in the following class as determined by ASTM A 90.

a. Class 2, with a minimum coating weight of 1.20 oz. per sq. ft. of uncoated wire surface.

H. Tie Wire: (9-gauge) aluminum wire alloy 1350-H19 or equal.

2.04 CONCRETE

A. Concrete: Provide concrete consisting of Portland cement per ASTM C150, aggregates per ASTM C 33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi. Use at least four sacks of cement per cu. yd., 1-inch maximum size aggregate, 3-inch maximum slump.

B. Package Concrete Mix: Mix dry-packaged normal-weight concrete conforming to ASTM C 387 with clean water to obtain a 2- to 3- slump.

2.05 GATES

A. General: Fabricate perimeter frames of gates from same material and finish as fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members a maximum of 8 feet apart unless otherwise indicated.
   1. Fabric: Same as for fence unless otherwise indicated. Secure fabric at vertical edges with tension bars and bands and to top and bottom of frame with tie wires.
   2. Bracing: Install an adjustable truss rod diagonally on gates six foot wide and greater to prevent sagging.

B. Swing Gates: Comply with ASTM F 900.
   1. Framework: Fabricate using 1.660-inch minimum OD Type I steel pipe or 1-inch-square galvanized steel tubing weighing 1.84 lb per sq. ft.
   2. Gate Hardware: Provide galvanized hardware and accessories for each gate according to the following:
      a. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.
      b. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as an integral part of latch.
      c. Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.
      d. Gate stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. Include a locking device and padlock eyes as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameter and spacings indicated, in firm, undisturbed or compacted soil.
   1. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
   2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.
   1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and hold in position during placement and finishing operations.
      a. Pour concrete footings to a level 2” below finished grade and cover with fresh earth from excavation.
      b. Crown concrete footings at top to shed water.

D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

E. Center Rails: Install center rails in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings where indicated.

F. Brace Assemblies: Install braces at end and gateposts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric. Install so posts are plumb when diagonal rod is under proper tension.

G. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum or 24 inches o.c.

H. Fabric: Pull fabric taut and tie to post, rails, and tension wires.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and Gateposts with tension bands spaced not over 15 inches o.c.

J. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.
   1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

L. Netting Ties: Fasten safety netting to tension cable and fence top rail with cable ties at 12” o.c.

M. Barbed Wire: Install three parallel wires on each extension arm on security side of fence, unless otherwise indicated. Pull wires taut.

N. Gates: Install gates plumb, level and secure for full opening without interference. Install ground set items in concrete for anchorage as recommended by the manufacturer.

END OF SECTION

SECTION 02920

LAWNS AND GRASSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work shall include, but not be limited to, the following:
   1. Surface preparation of subsoil.
   2. Placing topsoil.
   3. Addition of lime and fertilizer.
   4. Seeding.
   5. Maintenance to produce a permanent stand of grass.

1.02 PAYMENT PROCEDURES

A. Base bid for the work on the specified quantities of lime, fertilizer, and seed. After the specified soil tests have been made, Engineer may vary specified quantities. Should the actual quantities applied in the field vary appreciably from those specified, an adjustment in the contract price may be made.

1.03 REFERENCES

A. S.C. Department of Agriculture - SCDA

B. U.S. Department of Agriculture - USDA

1.04 PERFORMANCE REQUIREMENT

A. Grassed area shall be considered established when it presents a green appearance from eye level 50 feet away and the grass is vigorous and growing well in each square foot of seeded area. It is not required that the seeded area be thick and heavy as an old established lawn.

B. Should the permanent seed not germinate and produce a strand of grass, reseed affected areas until a permanent stand is established.

1.05 SUBMITTALS

A. Not less than 6 weeks prior to seeding, obtain representative soil samples from areas to be seeded and deliver the properly packaged samples with an information sheet for each sample properly filled out to the Soils Division of the SC Department of Agriculture or a private laboratory. Based on the test results, submit to the Engineer a recommendation as to the quantity and type of lime, fertilizer and seed for the area covered by the test.

1.06 QUALITY ASSURANCE

A. Quality of fertilizer, lime, and seed, and operations in connection with the furnishing of this material, shall comply with the requirements of the S.C. Fertilizer, Lime and Seed Law; and with the requirements of the rules and, regulations adopted by the SC Department of Agriculture in accordance with the provisions of the said law.

B. Seed containers shall bear an official "Certified Seed" label as inspected by the S.C. Crop Improvement Association.

C. Packages for soil conditioners and fertilizer shall bear manufacturer's guaranteed analysis.

D. Do not apply lime, fertilizer or seed in strong wind, when the soil is extremely wet, or otherwise unworkable. No rolling shall be done if precipitation after seeding would make the operation detrimental to the seed bed.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Deliver grass seed mixture in sealed containers showing percentage of seed mix, year of production, net production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.08 MAINTENANCE SERVICE

A. Maintain seeded areas until grass is well established and exhibits a vigorous growing condition for a minimum of two cuttings. Mow grass at regular intervals to a maximum height of 3 inches. Hand clip where necessary.

B. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

C. Water areas seeded between May 1 and July 15 at such intervals as to maintain the seeded area in a moist condition until the grass is established and accepted by the Engineer. Provide equipment to transport and distribute the water to the seeded areas. Areas seeded between September 1 and November 1 need not be irrigated beyond the initial watering specified above except that the Contractor may apply water at his own discretion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds, and roots; pH value of minimum 5.4 and maximum of 7.0.

B. Lime: Ground Dolomitic agricultural limestone, not less than 85 percent total carbonates, ground so that 50 percent passes 100 mesh sieve and 90 percent passes 30 mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing No. 100 mesh sieve.

C. Fertilizer: Mixed, commercial, fertilizer containing 10-10-10 percentages of available nitrogen, phosphoric acid, and potash respectively, plus superphosphate with 20 percent P2O5 content. Fertilizer shall be dry, in granular (pellet) form, shall be delivered to the site in the manufacturer's original bag or container which shall be plainly marked as to formula.

D. Seed: Fresh seed guaranteed 95 percent pure with a minimum germination rate of 85 percent within one year of tests. Provide the following seed mixtures with lime and fertilizer in disturbed areas including SDOT Rights-of-Way:

Temporary Seeding – Coastal

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sandy, Droughty Sites													
Browntop Millet	40 lbs./ac.												
Rye, Grain	56 lbs./ac.												
Ryegrass	50 lbs./ac.												
Well drained, clayey/loamey Sites													
Browntop Millet or Japanese Millet	40 lbs./ac.												
Rye, Grain or Oats	56 lbs./ac. 75 lbs./ac.												
Ryegrass	50 lbs./ac.												

Permanent Seeding - Coastal

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sandy, Droughty Sites													
Browntop Millet Bahiagrass	10 lbs./ac. 40 lbs./ac.												
Browntop Millet Bahiagrass Sericea Lespedeza	10 lbs./ac. 30 lbs./ac. 40 lbs/ac.												
Browntop Millet Atlantic Coastal Panicgrass	10 lbs./ac. 15 lbs./ac. PLS												
Browntop Millet Switchgrass (Alamo) Little Bluestem Sericea Lespedeza	10 lbs./ac. 8 lbs./ac. PLS 4 lbs./ac. 20 lbs./ac.												
Browntop Millet Weeping Lovegrass	10 lbs./ac. 8 lbs./ac.												
Well drained, clayey/loamey Sites													
Browntop Millet Bahiagrass	10 lbs./ac. 40 lbs./ac.												
Rye, Grain Bahiagrass Clover, Crimson (Annual)	10 lbs./ac. 40 lbs./ac. 5 lbs./ac.												
Browntop Millet Bahiagrass Sericea lespedeza	10 lbs./ac. 30 lbs./ac. 40 lbs./ac.												
Browntop Millet Bermuda, Common Sericea lespedeza	10 lbs./ac. 10 lbs./ac. 40 lbs./ac.												
Browntop Millet Bermuda, Common Kobe Lespedeza (Annual)	10 lbs./ac. 12 lbs./ac. 10 lbs./ac.												
Browntop Millet Bahiagrass Bermuda, Common Sericea lespedeza	10 lbs./ac. 20 lbs./ac. 6 lbs./ac. 40 lbs./ac.												
Browntop Millet Switchgrass Little Bluestem Indiangrass	10 lbs./ac. 8 lbs./ac. PLS 3 lbs./ac. PLS 3 lbs./ac. PLS												

Fifty (50) pounds of Bahiagrass may be substituted for either Centipede or Bermudagrass, but only with Engineer’s approval.

On cut and fill slopes 2:1 or steeper, Centipede shall be applied at the rate of 5 pounds per acre and add 20 pounds of Sericea Lespedeza from January 1 – December 31.

E. Matting / Erosion Control Fabric (ECF): Matting and ECF shall be heavy jute mesh over mulch held in place by staples. Commercially available ECFs may be used upon approval of the engineer. Approval of fabrics will require manufacturer's design data regarding velocity, ditch slopes, method of installation, decay cycle, repair techniques, and grass growth enhancement characteristics.

F. Wire Staples: 16 gauge steel wire, with minimum of 3" top and 4" long legs.

G. Mulch: Threshed straw of oats, wheat, or rye; free from seed of obnoxious weeds; or clean salt hay. Straw which is fresh and excessively brittle or straw which is in such an advanced stage of decomposition as to smother or retard growth of grass will not be acceptable.

H. Water: Water shall be free from substances harmful to growth of grass.

PART 3 EXECUTION

3.01 PREPARATION OF SUBSOIL

A. Complete operations in the area to be seeded and prepare subsoil to eliminate uneven areas and low spots. Bring surface to the approximate design contours.

B. Scarify subsoil to a depth of 3 inches. Remove weeds, roots, stones and foreign materials 1-1/2 inches in diameter and larger.

3.02 PLACING TOPSOIL

A. Place topsoil during dry weather and on dry unfrozen subsoil.

B. Spread topsoil to a minimum depth of 4 inches. Remove vegetable matter and foreign non-organic material from topsoil while spreading. Grade surface to provide positive drainage and prevent water ponding. Lightly compact topsoil with at least one pass of a cultipacker or similar equipment

C. Maintain the finished surfaces by protecting and replacing topsoil and subsoil as necessary until the area is accepted under the contract.

3.03 APPLICATION OF LIME

A. Liming shall be done immediately after grading has reached the fine grading stage, even though actual seeding may not be done until several months later.

B. Spread lime evenly by means of a mechanical distributor.

C. When lime is distributed by commercial liming dealers, sales slips showing the tonnage delivered shall be filed with the Engineer and shall show the full tonnage required for the acres treated.

D. Incorporate lime in the top 2 to 3 inches of soil by harrowing, disking, or other approved means.

3.04 APPLICATION OF FERTILIZER

A. Spread fertilizer not more than 2 weeks in advance of seeding.

B. To verify application rate, determine acreage to be fertilized and provide Engineer with total weight of fertilizer applied to the area.

C. Provide mechanical spreader for even distribution and spread half of the rate in one direction, and the other half at right angles to the first. Mix thoroughly into upper 2 to 3 inches of soil by disking, harrowing or other approved methods.

3.05 SEEDING

A. Accomplish seeding by means of an approved power-drawn seed drill, combination corrugated roller-seeder, approved hand operated mechanical seeder, or other approved methods to provide even distribution of seed.

B. Do not seed when ground is excessively wet or excessively dry. After seeding, roll area with a roller, not less than 18 inches in diameter and weighing not more than 210 pounds per foot of width. Upon completion of rolling, water area with a fine spray.

C. Immediately following seeding apply mulch or matting. Do not seed areas in excess of that which can be mulched on same day.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil depth

3.06 MULCHING AND MATTING

A. Apply mulch or matting as required to retain soil and grass, but no less then the following:
   1. Slopes from 0 to 20 percent by spreading a light cover of mulch over seeded area at the rate of not less than 85 lbs. per 1000 sq. ft.
   2. Slopes greater than 20 percent mulch with matting. Pin matting to the ground with wire staples at 5-foot intervals, immediately after seeding.
   3. Use tack to prevent disruption of mulch.

B. For tack use an asphalt tie-down of emulsified asphalt grade AE-3 or cut-back asphalt grade RC-2 or other approved equal. The application rate shall be 0.10 gal/sy (11 gal / 1000 sq ft). An approved jute mesh or net may be used in lieu of tacking straw mulch.

C. Other types of mulch and anchoring methods may be used upon approval by the Engineer.

3.07 PROTECTION

A. Protect seeded areas from damage by barricades, signs, and other appropriate means. Maintain and protect slopes from weather damage.

END OF SECTION

SECTION 03100

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE

A. Provide labor, materials, and equipment required for placement of cast-in-place concrete.

B. Work included under this section includes, but is not limited to, the following:

1. Concrete materials
2. Concrete
3. Reinforcement
4. Form work
5. Grout
6. Mixing, placing and curing
7. Concrete finishing

1.02 REFERENCED 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 Concrete Institute (ACI)
   a. 301
   a. 318
2. American Society of Testing Materials (ASTM)
   a. A307 Carbon Steel Externally Threaded Standard Fasteners.
   b. C39 Test for Compressive Strength of Cylindrical Concrete Test Specimens.
   c. C94 Ready Mixed Concrete
   d. C143 Test for Slump of Portland Cement Concrete.
   e. C171 Sheet Materials for Curing Concrete.
   f. C192 Making and Curing Concrete Test Specimen.
   g. C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   h. C309 Liquid Membrane-Forming Compounds for Curing.
   i. C920 Elastomeric Joint Sealants.
   j. D1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
3. S. C.. Department of Transportation - Standard Specifications for Roads and Structures SC DOT).
4. Concrete Reinforcing Steel Institute (CRSI)

1.03 QUALITY ASSURANCE

A. Concrete work shall conform to the requirements of ACI 318, ACI 301 and CRSI “Manual of Standard Practice” as a minimum.

B. Methods and materials of work shall conform to the requirements of the standards and codes and recommended practices as referred to within this section.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures:

1. Test Reports:
    a. Laboratory Mix Design: Mix design shall be in accordance with ACI 318, Section 5.3 (Field Experience and / or Trial Mixtures). Design mixes shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce specified concrete.
    b. Concrete Tests: Reports for 7-day and 28-day concrete compressive strengths.
2. Catalog Data: Manufacturer standard drawings or catalog cuts for the following. Clearly indicate equipment to be furnished for the Project including options to be provided for the following.
    a. Water stops.
    b. Forming accessories
    c. Admixtures
    d. Patching compounds
    e. Joint systems
    f. Curing compounds
    g. Dry-shake finish materials.
3. Shop Drawings: Project specific shop drawings for the following:
    a. Reinforcing Steel: Shop drawings shall comply with ACI SP-66 “ACI Detailing Manual”. Shop drawings shall be drawn to a scale of 1/4" = 1' - 0" or larger. Where necessary for clear delineation, complicated wall steel shall be shown on inside and outside elevations. Bars shall be clearly shown, accurately located, and dimension on the plans, elevations, and sections.
4. Delivery Tickets: Submit copy of delivery tickets to the Engineer for each batch of ready mixed concrete in accordance with ASTM C-94. Indicate total water content.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Reinforcement Steel: Store reinforcement in a manner that will avoid excessive rusting or coating by grease, oil, dirt, and other objectionable materials. Store in separate piles so as to avoid confusion or loss of identification after bundles are broken.

B. Protect cement from contamination or damage during handling. Do not use cement which has been damaged, is partially set, lumpy or caked. If the damaged cement is in bags, the entire contents of the bag shall be rejected. Do not use cement salvaged from used bags or reclaimed from cleaning bags.

PART 2 MATERIALS

2.01 CEMENT

A. Portland cement shall comply with ASTM C-150, Type I unless otherwise specified.

1. Different brands of cement, different types of cement, or the same brand of cement from different mills shall not be mixed, nor shall they be used alternately, except when authorized by the Engineer.
2. Measure cement by the bag as packaged by the manufacturer, or by weight; one bag of cement shall be considered to contain 94 pounds net. A barrel is equivalent to 4 bags or 376 pounds net.
3. When bulk cement is used, the weighing and handling shall be inspected by the Engineer prior to use.
4. Pozzolans or fly ash conforming to ASTM C618 may be blended with the cement. The maximum pozzolan or fly ash content shall not exceed 25 percent by weight of the total cement material.

B. A concrete mix design utilizing expansive or shrinkage compensating concrete may be proposed for use in large concrete structures.

2.02 ADMIXTURES

A. Air-entraining admixtures shall conform to ASTM C-260. Testing in accordance with ASTM C-233 will be waived provided the admixture has been tested and accepted by the Bureau of Public Roads, U.S. Department of Transportation, or provided a statement is submitted by the manufacturer that the admixture to be furnished for the project has been tested and conforms to ASTM C-260.

B. Water-reducing admixture shall conform to ASTM C-494, Type A or Type D and shall be chloride free.

C. Non-corrosive accelerator admixture shall conform to ASTM C-494, Type C or E, and have long term test data proving its non-corrosive effect on metal deck and reinforcing steel. Admixture shall be "Accelguard" by the Euclid Chemical Company, "Darex Set Accelerator" by W. R. Grace and Company, or equal.

D. Shrinkage reducing admixture shall be “eclipse shrinkage reducing admixture” by Grace Construction Products or equal.

2.03 AGGREGATES

A. Fine aggregate for use in classes of concrete (except lightweight concrete) and Portland cement mortars, except mortars for masonry work, shall conform with ASTM C33 and as specified in accordance with SCDOT Section 701.2, "Portland Cement and Portland Cement Concrete- Materials", Para. 1014-1, "Fine Aggregate",

and graded as specified in 701.2.12.2 of Section 701. Fine aggregate for lightweight concrete shall be as specified above or lightweight sand as necessary to meet the required density and compressive strength.

B. Coarse aggregate for normal concrete, except as specified otherwise herein, shall be in accordance with ASTM C33 and graded as specified in SCDOT Table 305.2.5.5 of Section 305. Coarse aggregate for lightweight concrete shall be as specified in ASTM C-330 as required to meet the density and compressive strength requirements.

2.04 HIGH EARLY STRENGTH CONCRETE

A. High early cement (Type III), the non-corrosive accelerator added to the normal cement (Type I) or high strength concrete shall be used only where specified or in an emergency when approved by Engineer. In such cases, the requirements for proportioning and mixing shall be as specified herein.

2.05 REINFORCEMENT

A. Metal reinforcement shall be Grade 60 and conform to ASTM A615. Bars shall be deformed except 1/4 inch round bars which may be plain. Bars shall be formed to the dimensions indicated and approved on the shop drawings. Fabrication and details on reinforcement shall conform to the requirements of the ACI 318, Chapter 7, "Details of Reinforcement". Heating for bending shall be employed only when approved by Engineer.

B. Welded wire fabric shall conform to ASTM A185 or A497. Where the size and weight of welded wire fabric is not indicated or specified, it shall be 6 x 6 inch mesh of 0.192 inch nominal-diameter wire and shall weigh approximately 42 pounds per 100 square feet.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.06 FORMS

A. Forms except as otherwise specified shall be of plywood, steel or other approved material. Plywood shall be concrete form plywood, not less than 5/8 inch thick. Surfaces of steel forms shall be free from irregularities, dents, and sags.

2.07 MISCELLANEOUS PRODUCTS

A. Bonding and patching compounds: Compounds for bonding, patching, and structural repairs, shall be “Euco Weld” by Euclid Chemical Company, "Colma Dur Mortar", "Sikadur Hi-Mod" by Sika Chemical Corporation, or equal.

B. Non-shrink Grout: Factory premixed non-shrink, non-metallic grout with minimum compressive strength of 5,000 PSI at 24 hours and 9,000 PSI at 28 days. Grout shall be "Euco N-S" by The Euclid Chemical Company, "Masterflow 713" by Master Builders, Sonogrout by Sonneborn Company, or equal.

C. Waterstops: Vinyl meeting U.S. Corps of Engineers' Specification CFD-C572-71, 6 inch minimum width and 3/8 inch thickness, of the rib-center bulb or dumbbell type.

D. Expansion Joint Filler: Bituminous impregnated, preformed type conforming to ASTM D 1751.

E. Concrete curing paper: Conform to ASTM C 171, Type 1, Waterproof Paper, shall be used. Polyethylene or similar plastic sheets shall not be used for concrete curing. Sisalkraft "Orange Label," Ludlow Papers, Inc., "Scuf-Champ," "Glas-Kraft" Grade A, or equal.

F. Joint sealer: Shall conform to ASTM C 920, Type M, Grade P, Class 25, Use T. Joint sealer for water containment structures shall be Polysulfide Type. Provide concrete primer as recommended by sealant manufacturer and compatible with the substrate.

G. Anchor bolts: Shall conform to ASTM A 307, Section 1c,Grade A.

H. Plain washers for anchor bolts: Shall conform to "Plain Washers," ANSI B18.22.l-1965 (R1975), Type A. Furnish one washer with each anchor bolt, unless otherwise noted on the Drawings.

I. Membrane forming curing compound: Liquid membrane forming curing compounds shall be wax free resin-type capable of retaining 95 percent of the moisture for the specified curing period and shall conform to ASTM C309, Type l-D, and shall contain a red fugitive dye. Curing compound applied to surfaces to be left permanently exposed to view shall not cause permanent discoloration or otherwise adversely affect the appearance of surface.

J. Curing compound: Shall be "Super Floor Coat" or "Super Pliocure" by Euclid Chemical Company, "Masterseal" by Master Builders, Kure-N-Seal by Sonneborn, or equal. Compound shall conform to Federal Specification TT-C-800A, 30% solids content minimum.

K. Abrasive aggregate for non-slip finish: Crushed ceramically bonded aluminum oxide grits as abrasive aggregate for non-slip finish. Material shall be factory-graded, packaged, rust-proof and non-glazing, and unaffected by freezing moisture and cleaning materials and equal to "Frictex" by Sonneborn Building Products, Inc., "Korundum" by Concrete Service Materials Company, "Non-Slip" by Euclid Chemical Company.

L. Liquid chemical floor hardener: Colorless, aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent,

containing not less than 2 pounds of fluosilicate per gallon. Material shall be "Hornolith" by A. C. Horn Co., "Saniseal 50" by Master Builders Co., or "Lapidolith" by Sonnebom Building Products, Inc or equal.

M. Stone under slab: Clean SC DOT size No.67 coarse aggregate.

N. Vapor barrier under slabs: "Moistop," by the Fortifiber Corporation or equal.

O. Structural steel shapes and plates to be embedded in or anchored to the concrete shall conform to ASTM A 36-93.

PART 3 EXECUTION

3.01 GENERAL

A. Provide a minimum of 4 inches of stone under concrete slabs on grade unless noted otherwise on Drawings.

B. Provide a vapor barrier under interior concrete slabs on grade unless noted otherwise on drawings.

C. Provide a two coat treatment of a liquid chemical floor hardener to interior concrete floor surfaces to be left permanently exposed to view.

D. Provide a "dry shake" application of abrasive aggregate for non-slip finish on exterior concrete platforms, steps and landings, and interior and exterior concrete ramps. shall receive a Ceramically bonded aluminum oxide grits as abrasive aggregate for non-slip finish.

E. Provide joint sealing compound at locations indicated on the Drawings and at joints in interior and exterior floor slabs to be left permanently exposed to view. Color of joint sealing compound for exposed joints shall match concrete color.

F. Install waterstops in accordance with manufacturer's instruction and securely anchor to reinforcing bars or forms to prevent displacement during placing of concrete.

G. Provide joint sealer locations indicated on the Drawings and between points of contact between slabs and vertical surfaces. Provide joint filler between horizontal concrete surfaces at expansion and isolation joints, unless otherwise noted on the Drawings.

3.02 CONCRETE MIX

A. General: Provide normal weight, air-entrained concrete except where specified or indicated on the Drawings to be lightweight concrete. Interior slabs, subject to abrasion, shall have a maximum air content of 3 percent. Concrete shall contain the specified water-reducing admixture. Thin slabs (less than 8 inches thick) placed below 50 degrees F shall contain a non-corrosive accelerator. Each mix shall be proportioned as specified by weight and use the aggregate and cement proposed for the project. Mix designs shall be in accordance with ACI specifications.

B. Design of Concrete: Provide concrete mix designs and engage an independent testing laboratory, approved by the Engineer, to prepare the mix designs for the classes of concrete specified in the "Properties and Location of Concrete" table which follows. Materials and proportioning shall be in accordance with the ACI Specifications, unless otherwise specified.

1. Submit mix designs, test data, laboratory strength tests and certificates of analysis for cement and aggregates prior to the placement of concrete.
2. Proportion concrete mixes to be placed by pumping for the type of equipment to be used so as to have a continuous flow of concrete through the pumping system.

Properties and Location of Concrete:

Concrete Class (Location)	Min 28-day Compressive Strength (6"x 12" Cylinders)	Maximum Allowable Course Aggregate Size & Type	Slump	Total Air Content By Volume	*Max W/C Ratio
Liquid Retaining Structures	4,500 psi	1-1/2" Stone	2"-4"	4-1/2% $\pm$ 1 1/2%	0.35
Exterior Slabs	3,500 psi	3/4" Stone	2"-5"	6% $\pm$ 2%	0.40
Interior Slabs	3,500 psi	3/4" Stone	2"-5"	N/R	0.40
Footings - Building	3,000 psi	1-1/2" Stone	2"-4"	Not Reqd	0.58
All Other Concrete	3,000 psi	3/4" Stone	2"-4"	5% $\pm$ 1 1/2%	0.46

* Including free surface moisture on aggregates and liquid admixtures. W/C ratio is maximum permissible ratio for concrete when strength data from field experience or trial mixtures are not available. Higher ratios may be acceptable provided documentation is submitted in accordance with ACI Specifications. The maximum permissible W/C ratio for liquid retaining structures shall be 0.45.

3. If expansive or shrinkage compensating concrete or shrinkage reducing admixtures are proposed for use in concrete for liquid retaining structures, increased spacing of construction joints may be proposed. Submit request for modification along with recommendation from material supplier for review along with mix design.

3.03 MEASUREMENT OF MATERIALS, MIXING AND EQUIPMENT

A. Concrete shall be machine mixed except in emergencies mixing may be by hand as directed. Except when ready-mixed concrete is used, provide an approved type of batch mixer at the site equipped with an accurate water measuring and control device and capable of producing a homogeneous concrete mixture of uniform color. Apparatus provided for weighing aggregate and cement shall be designed especially for this purpose. Weigh fine and coarse aggregate and cement separately. Cement in standard packages need not be weighed, but bulk cement or fractional packages shall be weighed. Accuracy of measuring devices shall be such that successive quantities can be measured to within one percent of required amount. Measuring devices shall be subject to verification. Do not exceed rated capacity of mixer. Time

of mixing after cement and aggregates are in the mixer drum shall not be less than one minute for one cubic yard or less and increased 15 seconds for each additional cubic yard or fraction thereof in capacity. The total required water shall be in the drum before one-fourth of the mixing time has elapsed. Mixer drum shall rotate at a peripheral speed of about 200 feet per minute throughout the mixing period. Discharge entire contents of mixer drum before recharging. Provide necessary equipment and establish accurate procedures subject to Engineer's approval for determining the quantity of free moisture in the aggregates. Moisture determination shall be made at intervals as directed by Engineer. The retempering of concrete which has partially hardened, i.e., mixing with or without additional cement, aggregate, or water, will not be permitted.

3.04 READY-MIXED CONCRETE

A. Ready-mixed concrete plant shall be properly equipped for the accurate proportioning and proper mixing and delivery of the concrete, including the proper water measurements and controls, as specified above. Plant shall have sufficient capacity and transportation equipment to deliver the concrete at the required rate. Plant shall be subject to inspection and approval of the Engineer.

B. Mix and handle ready-mixed concrete in accordance with ASTM C-94.

3.05 CONVEYING

A. Convey concrete from mixer to its final position as rapidly as practicable by approved methods which will not cause segregation or loss of ingredients. Deposit concrete as nearly as practicable in its final position to avoid rehandling. Free vertical drop of concrete shall not exceed 3 feet. Chuting will be permitted only where the concrete is deposited into a hopper before it is placed in the forms. Clean conveying equipment before each run. Deposit concrete as soon as practicable after the forms have been coated and the reinforcement placed. Place concrete before the initial set and not later than 30 minutes after mixing or agitating. Concrete which has segregated in conveying shall not be used.

3.06 PLACING

A. Place concrete in accordance with ACI 301, Chapter 8.

B. Accomplish compaction by use of a mechanical vibrator having a frequency of not less than 8000 cps. Vibration shall not be used to flow concrete horizontally more than 2 feet.

3.07 PLACEMENT IN EXTREME WEATHER

A. Placing Concrete in Cold Weather: Do not place concrete when the atmospheric temperature is below 40 degrees F, or when the concrete is likely to be subjected to freezing temperatures within 24 hours after placement. Heat concrete as necessary to maintain a concrete temperature of between 60 and 80 degrees F when placed. Remove frozen material from aggregates before placing in the mixer.

B. Placing Concrete in Hot Weather: When the outdoor ambient temperature is over 90 degrees F or as directed by the Engineer, provide methods so the temperature of the concrete as placed shall not exceed 90 degrees F. Shade concrete after placing and start curing as soon as the surface of the fresh concrete is sufficiently hard to permit it without damage. Unless specified otherwise, the control of hot weather concreting and the methods employed to control the temperature of the material both during placing and curing operation shall be in accordance with ACI 305R, Hot Weather Concreting.

3.08 CURING AND PROTECTION

A. General: Protect concrete, including areas to be given a special finish, from damage by the sun, rain, flowing water, frost, and mechanical injury. Do not allow concrete to dry out for a minimum of seven days from the time it is placed. Provide water curing by keeping the surface of the concrete continuously wet by covering with water, with an approved water saturated covering, or by spraying. Water used for curing shall be fresh water. Where water curing is not used, provide curing by sealing the water in the concrete so that it cannot evaporate. This may be done by leaving the forms in place, covering with a waterproof curing paper laid with airtight joints, use of a curing compound, or by other approved means.

B. Do not use liquid membrane-forming curing compounds where terrazzo, hard tile or cementitious floor finish materials are to be installed. See finish schedule.

C. Apply curing compound immediately after final finishing.

D. Keep wood forms sufficiently damp to prevent drying out of the concrete.

E. Portions of the time during which either moisture or warmth is lacking shall not be counted effective for curing. When concrete is placed in cold weather, make provisions for maintaining the temperature of the air in contact with the concrete at not less than 50 degrees F for a period of not less than 7 days after placing, or at not less than 70 degrees F for a period of not less than 3 days after placing. Heating of the concrete in place shall be affected by salamanders or steam coils under canvas covers or by other approved means. Temperature within enclosures shall not exceed 100 degrees F, and apply adequate moisture during the heating period to prevent concrete from drying out. Rate of cooling after the protection period shall be approximately 1 degree F per hour for the first 23 hours and 2 degrees F per hour thereafter.

3.09 REMOVAL OF FORMS AND PROTECTION

A. General: Remove forms in a manner which will not damage the concrete. Do not remove forms for the following minimum times:

	Days after Placing
1. Side forms on beams, girders, columns, and walls (lifts 15 ft and under)	24 hours provided patching and finishing may be completed in 8 hours and the work immediately recovered with approved curing media.

2. Columns and walls (lifts over 15 ft)	5
3. Supporting forms for arches, beams, girders, and slabs	14

B. Provide sufficient shoring members to support dead load plus construction loads on beams, girders, slabs, and arches until concrete has reached the full specified strength.

C. Special Requirements for High-Early Strength Concrete: The curing periods, minimum periods during which supporting forms and shores shall be left in place, and minimum periods for maintaining curing temperatures shall be not less than one-quarter of those specified for concrete using Type 1 cement, but in no case less than 24 hours.

3.10 CONSTRUCTION JOINTS

A. General: Provide construction joints where indicated on the Drawings or as otherwise approved.

B. Prepare construction joint surfaces for placement of concrete by cleaning with compressed air and water. Remove stains and foreign material from the surface and coat with a bonding compound. Place new concrete after bonding compound has dried.

C. Where new concrete is to be bonded to existing concrete, clean existing surface and roughened thoroughly, remove loose particles, dampen surface, and apply bonding compound. Place new concrete after bonding compound has dried.

D. Where construction joints are indicated on the Drawings for slabs on grade, control joint indicated on the Drawings may be used instead. This provision does not apply when the construction joint occurs directly under CMU walls.

1. Control Joints: Saw cut slab after concrete has hardened sufficiently to prevent dislodging of aggregate and while the temperature of the fresh concrete is still rising. Complete cutting of slabs within twenty four hours of concrete placement. Flush out joints immediately after cutting with air or water under pressure to remove sawing residue.
2. Keep joints clean and protected from debris, grease, and oil. No earlier than thirty days after concrete placement, fill joints with a flexible epoxy joint filler and compatible back up material intended for this purpose. Prepare joint and apply filler in accordance with manufacturer's recommendations.

3.11 FINISHING CONCRETE

A. General: As soon as forms are removed, patch defective areas and fill tie holes with cement mortar of the same composition as that used in the concrete. Cut out defective areas to solid concrete but to a depth of not less than 1 inch. Edges of the cut shall be perpendicular to the surface of the concrete. Area to be patched and at least 6 inches adjacent thereto shall be dampened and apply bonding compound. Place patching mortar after bonding compound has dried. Mix mortar approximately

one-half hour before placing and remix occasionally during this period with trowel without the addition of water. Compact mix into place and screed slightly higher than the surrounding surface. Finish patches on exposed surfaces to match the adjoining surfaces after they have set for a period of an hour or more. Cure patches as specified for concrete. Wet tie holes with water and fill solid with mortar. Fill holes extending through the concrete by means of a plunger type gun or other suitable device from the exposed face. Wipe excess mortar off the exposed face with a cloth. Protect finish surfaces from stains and abrasions.

B. Surface Finishes: Exposed concrete surfaces, except floors, bottom slabs, and walking surfaces, shall receive the following finish.

1. As soon as the pointing and patching has set sufficiently to permit it, thoroughly wet surface with a brush and rub with a No. 16 carborundum stone or other equally good abrasive, bringing the surface to a paste. Continue rubbing sufficiently to remove form marks and projections, producing a smooth dense surface without pits or irregularities.
2. Carefully spread or brush material, which in the above process has been ground to a paste, uniformly over the entire surface and allowed to reset. After the rubbing is complete, thoroughly drench and keep surface wet for a period of 7 days, unless otherwise directed. Obtain final finish by a thorough rubbing with a No. 30 carborundum stone or other equally good abrasive. Continue rubbing until entire surface is a smooth texture and uniform in color.
3. Adjoining or adjacent work which has been disfigured by the above specified work shall be thoroughly cleaned by approved methods so that the complete unit presents the same appearance.
4. In lieu of the procedure described in items 1, 2, and 3 above, grind all fins smooth and use a cementious type concrete coating, color as selected by the Owner. Apply cementious type concrete coating in strict accordance with the manufacturer's recommendation. Acceptable manufacturers shall be Thoroseal, Euclid Company, Old North Manufacturing Company or equal.

C. Floor and Roof Slab Finishes:

1. Finished floor and roof slab surfaces shall be true plane surfaces, with a tolerance of 1/8 inch in 10 feet unless otherwise indicated. Pitch surfaces to drains. Dusting of finish surfaces with dry materials will not be permitted.
2. Monolithic Finish: Floor and roof slabs shall be placed, consolidated, struck off and leveled to the required elevation. When the concrete has stiffened sufficiently to bear a man's weight without deep imprint, float surface, at least twice, to a uniform sandy texture. Steel trowel surface to a smooth, even, impervious finish, free from trowel marks.
3. Surface of slabs, except roof slabs, shall be given a second steel-troweling to a burnished finish.

D. Sidewalk, platform, and wearing surfaces not otherwise specified shall receive a broom finish. Slab shall receive a float finish, as indicated above, and then lightly brush surface with a hair broom to leave a slightly rough, non-slip surface. Brooming shall be done in one direction and leave a uniform neat pattern.

E. Concrete bottom slabs in channels, clarifiers, wet wells, and chlorine contact chamber shall receive a steel troweled finish. Surface shall be smooth, true to established planes and conforming to lines and slopes as indicated on the Drawings. Care shall be taken to produce a surface of maximum smoothness, and care shall be taken to protect surface from damage during later work.

3.12 FORMS

A. General: Form concrete unless specified or directed otherwise. Set forms true to line and grade within the allowable tolerances specified for finishes and shall be mortar-tight. Arrange bolts and rods used for internal ties so that when forms are removed, metal will have the minimum specified cover.

B. Where water-tightness is required, do not use bolts or rods which are withdrawn when the forms are removed. Do not use wire ties where the concrete surface will be exposed to weathering and where discoloration will be objectionable. Provide form work with adequate clean-out openings to permit inspection and easy cleaning after reinforcement has been placed. In columns, walls, and similar members of small dimensions, the height of forms for each vertical lift shall not exceed 6 feet unless suitable openings are provided at not more than 6 foot vertical intervals to permit proper placing of the concrete. Where forms for continuous surfaces are placed in successive units, fit forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Install panel forms to provide tight joints between panels. Install forms so they can be removed without damaging the concrete. Chamfer exposed joints, edges, and external corners. Forms for heavy girders and similar members shall be constructed with a camber, as directed. When placing concrete in excavations, forms shall be not less than 3 inches outside the concrete lines indicated.

C. Coating: Before placing the concrete, coat contact surfaces of forms with a non-staining mineral oil or two coats of nitrocellulose lacquer, except for unexposed surfaces when the temperature is above 40 degrees F sheathing may be wetted thoroughly with clean water. Remove excess oil by wiping with cloths. Clean contact surfaces of forms for reuse.

3.13 REINFORCING STEEL

A. General: Provide reinforcement bars, stirrups, hanger bars, wire fabric, and other reinforcing materials as indicated on the Drawings or required by the specifications together with necessary wire ties, chairs, spacers, supports, and other devices to properly install and secure the reinforcing. Reinforcement shall be free from foreign substances. Reinforcement which has bands not shown on the project drawings or on approved shop drawings or which is reduced in section by rusting shall not be used.

B. Fabricate bar mats from bars conforming to specifications for reinforcement bars and intersections shall be fastened securely by approved mechanical ties.

C. Placing: Place reinforcement accurately and thoroughly secure. Support with concrete or metal chairs, spacers, or metal hangers. Metal chairs, clips, or supports, the ends of which will be exposed on the concrete surface, will be permitted only

where the surface will not be exposed to weathering and where discoloration will not be objectionable; elsewhere concrete or other approved non-corrodible material or other approved means shall be used for support.

D. Splicing: Where splices in addition to those shown on the project Drawings are necessary, lap bars as scheduled below.

BAR SIZE	LAP, INCHES	BAR SIZE	LAP, INCHES
#3	16 (18)	#7	33 (42)
#4	19 (24)	#8	39 (51)
#5	23 (30)	#9	69 (90)
#6	28 (36)	#10	88 (114)

Figures in parentheses are for top bars (horizontal reinforcement placed such that more than twelve inches of fresh concrete is cast in the member below the reinforcement). Other figures are for all other bars.

Stagger splices in alternate bars. Splices shall be in accordance with ACI 318 and ACI 301.

E. Protection of Reinforcement: Reinforcement of footings and other principal structural members in which the concrete is deposited on the ground shall have not less than 3 inches of concrete between the reinforcement and the ground contact surface. If concrete surfaces after removal of the forms are to be exposed to the weather or water or be in contact with the ground, the reinforcement shall be protected with not less than 2 inches of concrete for bars greater than 5/8-inch in diameter and 1-1/2 inches for bars 5/8-inch or less in diameter. Measure protective cover from the outside edge of the steel.

F. Concrete protective covering for reinforcement of surfaces not exposed directly to the ground, water, or weather shall be not less than 3/4 inch for slabs and walls and not less than 1-1/2 inch for beams, girders, and columns.

G. Do not use heat to field bend bars.

H. When required and approved in writing by the Engineer, welding of reinforcing shall conform to "Recommended Practice for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction (ANS D12.1)". No tack welding will be permitted.

3.14 SETTING MISCELLANEOUS MATERIALS

A. Pipe sleeves, wall castings, anchors and bolts, including those for machine and equipment bases, angle frames or edgings, hangers and inserts, pipe supports, conduits and other materials in connection with concrete construction, shall, where practicable, be placed and secure in position when the concrete is placed. Anchor bolts for machines and equipment shall be set according to templates, shall be carefully plumbed, checked for location and elevation with an instrument, and be held in position rigidly to prevent displacement while concrete is being placed.

3.15 TESTING

A. Field Poured Specimens:

1. Provide one set of specimens for compressive strength tests for each 100 cubic yards, or fraction thereof, of each class of concrete, placed each day. Not less than four specimens shall be made for each test. Specimens shall be made and cured in accordance with ASTM C31. When in the opinion of the Engineer there is a possibility of the air temperature falling below 40 degrees F, additional specimens shall be taken and cured in the field under conditions similar to those of the concrete in the structure. Test specimens in accordance with ASTM C39.
   a. The standard age of specimens at test shall be 28 days. Of the four specimens made for each test, two shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. The fourth specimen shall be a reserve.
   b. The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results (average of two cylinders tested at 28 days) equals or exceeds the specified strength f'c and no individual strength test result falls below the specified strength f'c by more than 500 psi. When the test results do not conform to these requirements, the Engineer shall have the right to require changes in the mix design and conditions of temperature and moisture necessary to secure the required strength.
   c. Tests shall be performed by an independent laboratory as specified in Section 01450, Quality Control.
   d. Test reports shall be submitted in accordance with Section 01450, Quality Control.

B. Drilled Cores:

1. Where there is a question as to the quality of the concrete in the structure, the Engineer may require additional testing in accordance with ASTM C42 for that portion of the structure where the questionable concrete has been found. If the results of these additional tests meet the requirements of the specifications, the Owner shall pay for the costs of the tests. If the results of the additional tests fail to meet the requirements of the specifications, the Contractor shall pay for the tests. Concrete failing to meet the specifications shall be removed and replaced at no additional cost to the Owner.

C. Air Entrainment shall be as specified. Test air content in accordance with AASHTO T152, T121, or T156. Test shall be at the frequency required by the Engineer.

D. Test slump plus or minus 1 inch as determined by AASHTO T119. Make test from each delivery before placing concrete. Slump tests shall be made in the presence of the Engineer's representative. Concrete not meeting the slump standards specified shall be modified, if possible, to meet the standards or shall be rejected by the Engineer's representative and removed from the project.

E. Water-bearing structures shall be watertight against water pressure which may come upon them prior to backfill. Repair imperfections. On completion of water-bearing

structures, fill with water to the high water line and allow to remain filled for forty-eight (48) hours before testing for water-tightness. Repair leaks to make structures water-tight.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work under this section shall include the painting of all surfaces specified herein and indicated on the Drawings.

1.02 DESCRIPTION

A. Provide the painting required to paint the newly constructed areas under this contract.

B. Where new pumps are to be installed, paint the entire piping and pumping system at continuous connection. Where new work is installed within existing, paintings should continue as follows:
   1. Continuous Surface: To the nearest intersection.
   2. Assembly: Entire Assembly

1.03 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. National Sanitation Foundation (NSF)
      a. Std. 61 Drinking Water System Components - Health Effects.

1.04 QUALITY ASSURANCE

A. Paint supplier shall verify the compatibility of the specified paint systems to the surface to be painted both new and existing. Submit certification that the paint systems to be used are suitable for the surface to be painted. Notify Engineer of suggested changes in the paint system with the paint submittal.

B. Ensure compatibility of shop applied primers with the paints specified herein. If shop applied primers are incompatible contractor shall remove incompatible primer with SSPC SP-6 commercial blast.

C. Painting of surface indicates acceptance of surface for paint system being used.

D. Paints and varnishes shall be the standard products of the Valspar Corporation, Tnemec Company, Sherwin Williams Company, Glidden, PPG Company, Carboline or equal.

1.05 SUBMITTALS

A. Submit the following in accordance with Section, Submittals:
   1. Affidavit of Compliance: Affidavit shall attest that supplied products conform to the referenced standard and this specification and that all tests set forth in each applicable referenced publication have been performed and that all test requirements have been met. Submit for each of the following materials:
      a. Each type of paint.
   2. Certification: Provide a letter at the end of the Project certifying the following actual work dates, that the cure time for each coat complied with the

manufacturer's requirements, and the manner of application pertaining to the surface preparation, number and type of coats and mil thickness is as specified.
   a. Start and completion dates for each paint coat for each major work area.
3. 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. Paint Schedule: Submit five (5) copies of the manufacturer's data sheet for each type of paint proposed to be used on the Project. Use paint schedule as indicated in these specifications as a format guide. The data sheet shall include, but not be limited to, the following:
      1) Paint system.
      2) Requirements for the following:
         i) Handling and storage.
         ii) Health and safety.
         iii) Surface preparation.
         iv) Application.
         v) Curing time between coats and for immersion as appropriate.
      3) Certification by NSF, International in accordance with NSF Std. 61 for interior paint systems.
      4) Recommended Dry Film Thickness (DFT).
4. Samples: Submit five (5) color cards with paint schedule submittal.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Product shall be handled in accordance with Section, Material and Equipment.

B. Mixing of paints shall be restricted to locations directed.

C. Take necessary precautions to prevent fire.

PART 2 PRODUCTS

2.01 PAINTING MATERIALS

A. Cleaners, thinners, driers, and other additives and surface treatment materials shall be those approved for use by the manufacturer of the paints.

B. Products used in areas to be in contact with potable water shall be certified in accordance with NSF Std. 61.

2.02 PAINTING SCHEDULE

A. For convenience only, the paints specified herein, unless listed otherwise, are as manufactured by Tnemec, Carboline, Sherwin-Williams or equal. Similar paints as manufactured by other manufacturers will be acceptable.

B. Paint on this project shall be of one manufacturer.

C. Concrete Floors, except ceramic resilient tile and below grade concrete floors:
   1. Prepare surface per ICRI CSP 1-2.
   2. 2 coats Tnemec 66 Series Hi-Build Epoxoline, or equal (2 mils dry per coat), or 1 Coat Valspar 84-V-2 Epoxy Sealer, 1 Coat Valspar 84 Series Epoxy Enamel (4 mils dry) or Carboline Carboguard 890 (1 coat @ 4.0-6.0 mils DFT), or 1 Coat Sherwin-Williams Macropoxy 646 Fast Cure Epoxy @ 6 mils DFT, 1 Coat Sherwin-Williams ArmorSeal Rexthane I @ 2.0-3.0 mils DFT.

D. Exposed piping, ductwork, electrical conduits and other utility items shall be painted to match the adjacent surface colors. Each item shall be treated and primed in accordance with paint manufacturer's recommendations.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Surfaces to be painted shall be thoroughly clean and shall be dry when paint is applied. Painting materials shall be thoroughly worked into all joints, crevices, and open spaces.

B. Colors and shades of colors shall be as directed unless specified otherwise.

C. Finished surfaces shall be smooth, even and free of defects prior to painting.

D. Surfaces which are inaccessible for painting after erection shall be treated, primed and painted prior to erection.

E. Equipment nameplates, tags, signs, and equipment lubrication points shall be masked or otherwise protected from covering with paint.

F. Properly mask and protect portion of finished work not to be painted.

G. Damaged painting shall be retouched before applying the succeeding coat.

H. Existing bare surfaces and surfaces made bare by cleaning methods shall be primed prior to painting.

I. The number of paint coats specified shall be in addition to spot priming and shop prime coats except as indicated otherwise.

J. Copper and aluminum, except for pipe identification, shall not be painted.

K. Paints shall be applied strictly in accordance with the manufacturer's direction and thinners shall be of the type required by the individual paint specifications. No thinners will be stored on site or used unless specifically authorized by the Engineer.

L. Painting of exterior surfaces shall extend one vertical foot below finished grade.

3.02 SURFACE PREPARATION

A. General: Dirt, rust, loose scale and particles, disintegrated paint, grease, and foreign matter shall be removed by scraping, sand blasting, wire brushing, or other approved methods, from all surfaces which are to receive paint or other finish. Surfaces shall be free from dust and in proper condition to receive paint or other finish, Where necessary, putty shall be applied with a knife. Sand-papering, where necessary, shall be done after the undercoats are dry.

B. Ferrous Metal
   1. New Metal: New metal work shall be cleaned in accordance with the Steel Structure Painting Council Specifications indicated in the painting schedule for the respective service indicated.
   2. Existing Metal: Existing metal surfaces to be painted shall be closely examined to determine the exact condition of the existing paint coating. The existing surface shall then be prepared for painting as required by the Engineer and as recommended by the paint manufacturer. As a minimum loose, spoiled and brittle paint shall be removed. Exposed metal shall be hand cleaned. The

following table shall be used as a guide for determining the degree of surface preparation.

Surface Condition	Degree of Preservation
75% intact	Hand clean and spot primer base areas
Less than 75% intact	Total sandblast
Brittle, corroded	Total sandblast

C. Piping, Fittings and Mechanical and Electrical Equipment:
   1. Piping to be insulated, except zinc-coated pipe, prior to the application of the insulation, shall be coated with one coat of approved pretreatment coating to a dry film thickness of 0.3 to 0.5 mil, and then given two coats of zinc-chromate primer, each coat applied to a minimum dry film thickness of one mil. Zinc-coated piping under insulation shall not be painted.
   2. Pipe hangers, structural supports, pipe and fittings, conduit and conduit fittings, pipe covering, insulation and miscellaneous steel and iron work shall be painted to match the adjacent interior surfaces and exterior work shall be as directed, utilizing the painting schedule as hereinbefore specified.
   3. Factory finished surfaces shall be painted as indicated.

3.03 APPLICATION

A. Workmanship shall be first-class in every respect. Paint shall be applied to dry, except as otherwise specified, on thoroughly clean surfaces only and shall be worked into all joints, crevices, and open spaces thoroughly. Paint shall be applied carefully with good clean brushes. Sufficient time shall be allowed between coats to permit thorough drying, and each coat shall be in proper condition to receive the next coat before its application. Finish coats shall be smooth and free from runs, sags, blisters, or other defects. Each coat of paint shall be sufficiently heavy to cover completely the previous coat or surface. Exterior paint shall not be applied during foggy or inclement weather.

3.04 PIPE COLOR CODING AND LEGEND

A. Color Coding: Interior exposed piping shall be painted in their entirety in accordance with the color code approved by the Engineer. PVC piping to be painted with 15" long color bands at intervals less than 15' OC and at all junction points and valves.

B. Legend: Exposed pipes, both interior and exterior, shall be marked with the service of the pipe stenciled on the pipe at intervals not exceeding 15' on center spacing and at each valve, tie or other junction of two or more pipes. Indicate the direction of flow adjacent to the legend. The legend shall be stenciled with contrasting colors of either black or white. Use the following chart for determining the size of the lettering.

Outside Diameter of the Pipe (inches)	Size of Letters (inches)
3/4 to 1-1/4	1/2
1-1/2 to 2	3/4
2-1/2 to 6	1-1/4
8 to 10	2-1/2
Over 10	3-1/2

3.05 COATING THICKNESS

A. General: Thickness of coatings shall be checked by a dry film thickness gauge of the magnetic type operated electrically or by permanent magnet. Gauges shall be calibrated with a standard which is approximately the same thickness as the coating

to be measured and, if possible, on metal identical both in composition and surface texture to that underlying coating. The Contractor shall be responsible for providing a gauge for checking the film thickness.

B. The total dry mil thickness of the coating for masonry surfaces shall not be less than 6.0 mils.

C. The total dry mil thickness of the coating for exposed metal surfaces subject to submergence in wastewater shall be not less than 10 mils.

3.06 CLEAN-UP

A. On completion of the painting work, clean all paint spots and other paint material from surfaces not intended for painting. Clean all rubbish and accumulated material from the work site. Leave the work in a clean and orderly condition, acceptable to the Engineer. No payment for painting work will be approved until the contractor has requested anticipated and firm thickness has been verified.

END OF SECTION

SECTION 11080

ELECTRIC GRINDER WITH ROTATING SCREEN

PART 1 GENERAL

1.01 DESCRIPTION

A. This section of the specification describes the screen(s), grinder(s), and the associated motor controller(s). The equipment shall be installed as shown on the plans, as recommended by the supplier, and in compliance with all OSHA, local, state, and federal codes and regulations.

B. The number of Channel Monster(s) (horizontal screening system with grinder) shall be **1**. Each screening/grinder system shall include a screen/drum, grinder, motor, and motor controller.

1.02 QUALITY ASSURANCE

A. Screen drum assembly(s), grinder(s), and motor controller(s) shall, as applicable, meet the requirements of the following industry standards:
   1. American Society for Testing and Materials (ASTM) A 36: Standard Specification for Carbon Steel Plate
   2. American Society for Testing and Materials (ASTM) A 536-84: Standard Specification for Ferritic Ductile Iron Castings
   3. American Iron and Steel Institute (AISI) 304 Stainless Steel
   4. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel
   5. American Iron and Steel Institute (AISI) 4140 Heat Treated Hexagon Steel
   6. Cutter Material Hardness: 45-50 Rockwell C
   7. National Electrical Manufacturer's Association (NEMA) Standards
   8. National Electrical Code (NEC)
   9. Underwriters Laboratory (UL and cUL)

B. Qualified suppliers shall have a minimum 5 years experience at manufacturing two-shafted grinding and controlling equipment and a minimum 20 installations at equivalent applications. Supplier shall provide a list of names and dates of installations for verification by the Engineer or Owner's Representative.

1.03 ACCEPTABLE SUPPLIERS

A. Screen drum assembly(s), grinder(s), and motor controller(s) shall be supplied by JWC Environmental. Screening/grinder system shall be Model No. 30005-18-CD or approved equal.

B. The manufacturer shall certify that the unit can be returned for maintenance to the factory or a local repair facility. The certification shall include a statement that there will be no charge for repair labor.

1.04 IDENTIFICATION

A. Each unit of equipment shall be identified with a corrosion resistant nameplate, securely affixed in a conspicuous place. Nameplate information shall include equipment model number, serial number, supplier's name and location.

PART 2 PRODUCTS

2.01 SCREEN DRUM ASSEMBLY

A. GENERAL

1. The rotating screen drum shall consist of a helical coil mounted to vertical supports and stub shafts.
2. The horizontally rotating drum shall direct all solids captured on the drum toward and into the dual counter-rotating shaft grinder. The drum shall be self-cleaning and driven by the grinder drive mechanism.

B. COMPONENTS

1. Screen
   a. The screen shall be made of a stainless-steel spiral coil drum.

Drum Support Skeleton

   b. The drum support skeleton shall be constructed of Grade 304 stainless steel. The support skeleton shall include hubs for mounting of drum stub shafts. Vertical members shall provide support for the coil.
2. Drum Stub Shafts
   a. Drum shafts shall be made of Grade 304 stainless steel with a tensile strength of not less than 95,000 PSI (654,550 kPa). The shaft diameter shall be a minimum of 1 1/2-inch (38 mm).
3. Drum Shaft Bearings and Seals
   a. The radial and axial loads of the drum shaft shall be borne by two sealed oversized deep-groove ball bearings. The bearings shall be protected by a combination of a replaceable and independent tortuous path device and end face mechanical seals. Face materials shall be a minimum of tungsten carbide to tungsten carbide, not requiring an external flush or any type of lubrication.
   b. Products requiring continuous or occasional lubrication or flushing shall not be accepted.
   c. The mechanical seal shall be rated at 90-psi (620-kPa) continuous duty by the seal supplier.
   d. The bearings and seals shall be housed in a replaceable cartridge that supports and aligns the bearings and seals, as well as protects the shafts and end housings.
   e. O-rings shall be made of Buna-N elastomers. Viton and other materials for o-rings can be provided depending on application.
   f. Each seal face shall be locked to provide positive drive on the rotating face and a positive lock on the static face. This positive lock on the seal faces is critical to long seal life in applications where grit or other abrasive materials are present.

2.02 GRINDER(S)

A. GENERAL

1. Each Channel Monster grinder shall include frame, end housings, covers, shafts, side rails, reducer, motor, cutters, spacers, bearings, and seals.
2. The grinder shall be two-shaft design and be capable of continuous operation, processing wet or dry. Bar screens or single shaft devices utilizing a single rotating cutter bar with stationary cutters shall not be acceptable. Grinders designed with cutter and spacer cartridges rather than individual cutters and spacers, shall not be acceptable.

3. Two-shaft design shall consist of two parallel shafts alternately stacked with individual intermeshing cutters and spacers positioned on the shaft to form a helical pattern. The two shafts shall counter-rotate with the driven shaft operating at approximately two-thirds (2/3) the speed of the drive shaft.

B. COMPONENTS
   1. Frame
      a. Channel Monster frame shall be made of ASTM A 36 merchant quality steel. Frame shall be designed for channel installation and shall house the drum and grinder assembly.
   2. Grinder End Housings, Covers, and Shafts
      a. Grinder end housings shall be cast of ASTM A 536-84 ductile iron with a cast-in-place flow deflector, designed to protect the bushings while guiding particles directly into the cutting chamber. The open area of the cutting chamber shall be a nominal height of 18-inches (457-mm).
      b. Top covers shall be ASTM A 536-84 ductile iron and bottom covers shall be ASTM A 36 hot rolled plates.
      c. Grinder drive and driven shafts shall be made of AISI 4140 Heat Treated Hexagon Steel with a tensile strength rating of not less than 149,000-psi (1,027-MPa). Each shaft diameter shall be a minimum of 2-inches (51-mm).
   3. Hi-Flow Cutter Side Rail
      a. The inside profile of the side rail shall be concave to follow the radial arc of the cutters. The side rail shall be affixed to the grinder and maintain a clearance not to exceed 5/16-inch (8-mm) between the major diameter of the cutter and the concave arc of the side rail. Keeping this clearance directs larger particles toward the cutters to assure fineness of grind.
      b. Hi-Flow cutter side rail shall have evenly spaced slots that increase flow and decrease head loss.
      c. Side rail shall be cast of ASTM A 536-84 ductile iron.
   4. Drum Side Rail
      a. The inside profile of the side rail shall be concave with its center offset from the radial arc of the drum to allow only two-point particle contact.
      b. Drum side rail shall be equipped with an adjustable extension strip that creates a tight interface between the rotating drum and the drum side rail to inhibit the passage of particles.
      c. Side rail shall be cast of ASTM A536-84 ductile iron.
   5. Cutter Stack Tightening
      a. Cutter stack compression for maximum cutting efficiency shall be maintained by torquing a quick maintenance stack screw accessed through an opening in the grinder top cover.
      b. Removal of the grinder from the channel for cutter stack tightening shall not be required.
   6. Reducer
      a. The speed reducer shall be a grease-filled planetary-type reducer with "Heavy Shock" load classification. The reduction ratio shall be 29:1. The high-speed shaft of the grinder shall be directly coupled with the reducer using a two-piece coupling.
   7. Motor
      a. The motor shall be intermittent submerged design, 5-HP (3.7-kW), 1770-rpm, 460-volt, 3-phase, 60 Hz. Motor service factor shall be a

minimum 1, the efficiency factor not less than 82.5% at full load and the power factor not less than 75% at full load.

b. Motor shall be U.L. rated NEMA 6P, Class I, Div. I Groups C&D, Class II Div. II, Groups F&G, Class III Div. I

8. Required Running Torque per Horsepower (kW):
   a. Continuously: 1000 in-lbs. (152-Nm) minimum
   b. At momentary load peaks: 300 in-lbs. (500-Nm)
9. Individual Cutters and Spacers
   a. The inside configuration of both the individual cutters and the individual spacers shall be hexagonal so as to fit the shafts with a total clearance not to exceed 0.015-inch (0.38-mm) across the flats to assure positive drive, minimize wear on the cutters, and increase the compressive strength of the spacers.
   b. Individual cutters and spacers shall be AISI 4130 Heat Treated Alloy Steel, surface ground for uniformity and through-hardened to a minimum 45-50 Rockwell C.
   c. Cutter configuration shall consist of both shafts with individual 11-tooth cam cutters. To maintain particle size, the height of the tooth shall not exceed 1/2-inch (13-mm) above the root diameter. Cutter to cutter root diameter overlap shall not be less than 1/16-inch (1.6-mm) or greater than 1/4-inch (6-mm) to maintain the best possible cutting efficiency while incurring the least amount of frictional losses.
   d. The cutter shall exert a minimum force of 450-lbs./HP (2680-N/kW) continuously and 1430-lbs./HP (8530-N/kW) at momentary load peaks at the tooth tip.
10. Cutter Shaft Bearings and Seals
   a. The cutter shaft's radial and axial loads shall be borne by a sealed oversize deep-groove (Conrad type) ball bearing at each end. The bearings shall be protected by a combination of a replaceable and independent tortuous path device and end face mechanical seals.
   b. Face materials shall be a minimum of tungsten carbide to tungsten carbide, not requiring an external flush or any type of lubrication.
   c. Products requiring continuous or occasional lubrication or flushing shall not be accepted.
   d. The mechanical seal shall be rated at 90-psi (620-kPa) continuous duty by the seal supplier.
   e. The bearings shall be housed in a replaceable cartridge that supports and aligns the bearings and seals, as well as protects the shafts and end housings. The cartridge shall be independent of the stack height; therefore cutter stack tightness shall not affect seal performance. The seal faces shall maintain their factory set preload independent of the cutter stack tightness.
   f. Seals shall meet required pressure rating regardless of cutter stack fit. Independent seal design shall provide protection against axial loading on shafts and bearings during shaft deflection.
   g. O-rings shall be made of Buna-N elastomers.
   h. Each seal face shall be locked to provide positive drive on the rotating face and a positive lock on the static face. This positive lock on the seal faces is critical to long seal life in applications where grit or other abrasive materials are present.

2.03 MOTOR CONTROLLER(S)

A. GENERAL
1. Controller shall be the supplier's UL/cUL listed standard Model PC2200.
2. The controller shall be equipped with a HAND-OFF/RESET-AUTO three-position selector switch. In OFF/RESET the grinder shall not run. In HAND the grinder shall run. In AUTO the grinder start and stop shall be controlled by a remotely located dry contact.
3. When a grinder jam condition occurs, while running in either the HAND or AUTO mode, the motor controller shall stop the grinder and reverse its rotation to clear the obstruction. If the jam is cleared, the controller shall return the grinder to normal operation. If the jam condition still exists, the controller shall go through two additional reversing cycles within 30-seconds (3-times total) before signaling a grinder overload condition. When a grinder overload condition occurs, the controller shall shut the grinder off and activate a fail indication.
4. If the grinder is stopped due to a fail condition and a power failure occurs, the fail indicator shall reactivate when power is restored.
5. Controller reset shall be from local panel controls only.
6. The controller shall have indicator lights for POWER ON, RUN, and FAIL conditions.
7. The controller shall provide overcurrent protection through an overload relay mounted directly on the contactor.
8. The controller shall be rated 5-HP, **460 volts, 3 phase, 60 Hz.**
9. Short circuit protection requires that a properly sized circuit breaker or fuses be installed by others.

B. COMPONENTS
1. Enclosure
   a. Enclosures shall be NEMA 4X, fabricated of fiberglass reinforced polyester resins and shall be suitable for wall mounting. Doors shall have hinges and corrosion resistant latches.
   b. Enclosure shall house the control devices, relays, terminal blocks, and reversing motor starter.
2. Control Devices
   a. Pilot devices shall be mounted on the enclosure front panel.
   b. Indicators shall be integral transformer type with low voltage long life 6-volt lamps. Lamps and selector switches shall be heavy duty NEMA 4X type.
   c. Two normally open status contacts shall be provided. One for a RUN signal and one for a FAIL signal. The contacts shall be rated at 2-Amp, 120-VAC, resistive load.
3. Motor Starter
   a. Starter shall be a full voltage reversing type with 120-volt operating coils.
   b. Forward and reverse contactors on the starter shall have both mechanical and electrical interlocks.
   c. The overload (OL) relay shall be adjustable so that the range selected includes the FLA (full load amperes) rating and service factor.

2.04 SPARE PARTS

A. Supplier shall provide the following spare parts for each unit:
1. Three (3) fuses
2. Three (3) 6-volt, long life lamps

3. One (1) complete gasket set
4. Three (3) cutters
5. Three (3) spacers

B. Controller spare parts shall be stored inside the controller.

C. Grinder spare parts shall be packaged in containers suitable for long term storage and shall bear labels clearly designating the contents and the equipment for which they are intended.

PART 3 EXECUTION

3.01 FACTORY TEST

A. Each grinder and controller shall be factory tested to ensure satisfactory operation.

3.02 INSTALLATION

A. Channel Monster grinder and controller shall be installed in accordance with the supplier's installation instructions and in compliance with all OSHA, local, state, and federal codes and regulations.

3.03 FIELD QUALITY CONTROL

A. Supplier shall provide the services of a factory trained representative to check installation and to start-up each Channel Monster. Factory representative shall have complete knowledge of proper installation, operation, and maintenance of equipment supplied. Representative shall inspect the final installation and supervise a start-up test of the equipment.

3.04 OPERATION AND MAINTENANCE MANUALS

A. Supplier shall provide Operation and Maintenance Manuals. The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended maintenance schedule, and the recommended lubricants.

END OF SECTION

SECTION 11307

SUBMERSIBLE NON-CLOG PUMP STATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide complete submersible non-clog pump(s) for the following location(s):
   1. City of Georgetown Maryville Lift Station

B. Work shall include, but not be limited to, the following major items and necessary accessories for a complete and operational pump system:
   1. Submersible non-clog centrifugal sewage pumps and motors with mounting plates and guide rails.
   2. Control panel.
   3. Precast concrete wet well and valve vault.
   4. Removable trash basket.
   5. Lifting hoist.
   6. One (1) spare pump and motor.

1.02 RELATED SECTIONS

A. The following Sections have work that is directly related to this Section. This does not relieve Contractor of his responsibility of proper coordination of all the work:
   1. Section 02530 Sanitary Sewer System
   2. Section 13440 Telemetry Equipment
   3. Division 16 Electrical

1.03 SYSTEM DESCRIPTION

A. City of Georgetown Maryville Lift Station
   1. Function: Pump Wastewater
   2. Number of Pumps: Two (2) in duplex operation.
   3. Performance Requirements
      a. Capacity: 780 gpm
      b. Total Dynamic Head: 126 ft
   4. Pump Characteristics
      a. Impeller Type: Nonclog, 1 or 2 vane
      b. Discharge Flange Outlet: 4 inch, 125 lb flanges
      c. Pass Sphere Size: 3.0 inch
      d. Minimum Efficiency: 50%
   5. One (1) trimming of impeller for each pump to meet field conditions after startup, as necessary as determined by Engineer.
   6. Motor Characteristics
      a. Maximum Horsepower: 55 hp
      b. Maximum Speed: 1780 rpm
      c. Voltage: 480 V, 3 phase, 60 Hz
      d. Motor shall be non-overloading over the entire pump curve.
   7. Controls
      a. Automatic duplex pump operation.
      b. Audible and visual alarms.
      c. Primary level control shall be via an ultrasonic level controller with transducer. Two floats shall be used for backup control

8. Wet Well and Valve Vault
    a. Precast concrete manhole as indicated on the Drawings.
    b. Existing wet well is an 8.5’ diameter precast concrete manhole as indicated on the Drawings. Existing wet well shall be converted to usable manhole, trash basket/ grinder vault.

1.04 SUBMITTALS

A. Submit the following in accordance with Section, Submittals:
    1. Certification: Submit certified pump curves after approval of Manufacturer's Data and Shop Drawings and prior to purchase.
    2. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following:
        a. Pumps.
        b. Precast concrete wet wells.
        c. Access hatch.
        d. Lifting hoist.
        e. Removable trash basket.
        f. Float switches.
        g. Level transmitter.
        h. Pressure Gauges.
    3. Shop Drawings: Submit Project specific shop drawings for the following:
        a. Dimensional mounting detail for pumps and trash basket within wet well indicating position of equipment with respect to access hatches in wet well top.
        b. Electrical diagram(s) for complete operating system.
        c. Layout of control panel face.
    4. Manufacturer's Installation Procedures.
    5. Test Reports: Upon testing of the installed system, field test reports shall be submitted in booklet form showing field tests performed to adjust each component and field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of controls.
    6. Operation and Maintenance Instructions: Submit complete operation and maintenance manual for the total system as indicated below.
    7. Parts: Provide a parts list for each piece of equipment.
    8. Spare pump and motor: Provide one spare pump and motor as provided for pump station ready for storage at the Owner’s facility.
    9. Equipment and Performance Data: Pump characteristic curves showing capacity in gpm, minimum submergence, head, efficiency, and pumping horsepower from 0 to 110 percent of design capacity.

B. Submit Operation and Maintenance Instructions in accordance with Section, Submittals and the following:
    1. Pump station equipment shall be submitted in one or binders as appropriate and shall include equipment in this section and the generator and associated electrical components.
    2. Front page(s) in binder shall include the following as a minimum:
        a. Name, address and phone number for manufacturer and manufacturer’s local representative capable of providing service for each piece of equipment.
        b. Pump and motor plate data.
    3. After the front page provide the pump curve and field test report.

1.05 QUALITY ASSURANCE

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.
   2. Equipment shall be as manufactured by ABS, Inc. model XFP 105J-CB2 or engineer's approved equal.

B. Pumps and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

C. Submit the name, address, and phone number of the firm that will provide required repair or replacement during the warranty period.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pumps and controls to the job site in as large of units as practical to require the minimum amount of field connection and assembly.

1.07 WARRANTY

A. Provide standard manufacturer's warranty but shall not be less than one year. Warranty shall start from date of substantial completion of pump station.

PART 2 PRODUCTS

2.01 PUMP

A. General: Provide submersible, nonclog, centrifugal pumps specifically designed for the specified use. Openings and passages of pump shall permit passage of the specified sphere diameter and typical trash and stringy material associated with sanitary sewage. Pump with appurtenances shall be capable of continuous operation at specified submergence depth. Pump shall be designed for remote connection to a base elbow using one or two guide bars.

B. Casing: Pump casing shall be constructed of cast iron ASTM A-48, Class 30. The casing shall be of uniform quality, surface, and free from defects. The casing shall be capable of withstanding operating pressures 50 percent greater than the maximum operating pressure. Volute shall have smooth passages, which provide unobstructed flow through the pump.
   1. Mating Surfaces: Mating surfaces where watertight seal is required shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between mating surfaces, resulting in proper compression of the O-rings without the requirement of specific torque limits.
   2. Exterior Surfaces: A factory applied sewage resistant coating shall protect exterior surfaces of the casing in contact with sewage. Exposed nuts and bolts shall be stainless steel.

C. Impeller: Impeller shall be of cast iron and shall be of the single or double shrouded nonclogging design. Impeller shall be statically, dynamically, and hydraulically balanced. Impeller shall be securely keyed to the shaft with a locking arrangement whereby the impeller cannot be loosened by torque from either forward or reverse direction.

D. Wearing Rings: Renewable wearing rings shall be provided on the impeller and casing and shall have wearing surfaces normal to the axis of rotation. Wear rings shall be constructed of bronze or stainless steel. Wearing rings shall be designed for ease of maintenance and shall be adequately secured to prevent rotation.

E. Shaft: Provide one piece 416 Stainless steel shaft of adequate strength to transmit full motor horsepower to the impeller.

F. Seals: A tandem mechanical shaft seal system running in an oil bath shall be provided. Seals shall be of tungsten carbide alloy with each interface held in contact by its own spring washer.

G. Bearings: Pump shall rotate on a minimum of two (2) permanently lubricated bearings with a L-10 bearing life of 40,000 hours.

2.02 MOTOR

A. Provide sealed squirrel cage induction motor for submersible operation in conformance with NEMA standards for type motor specified and shall meet the following requirements:
   1. UL listed for Class I, Division 1, Group C and D explosion proof hazardous locations.
   2. Service factor of 1.15.
   3. Horsepower, RPM, voltage and phase shall be as specified in the paragraph, System Description. Nameplate horsepower rating shall not be exceeded by the brake horsepower requirements of the specified head and capacity conditions.
   4. Continuous duty submerged and 15 minutes in air at nameplate horsepower and a minimum of 15 evenly spaced starts per hour.
   5. Exterior hardware shall be stainless steel.
   6. Class F insulation.
   7. Lifting lugs of adequate strength to lift the pump and motor assembly shall be cast into the motor housing.
   8. Two moisture detector probes to detect seal failure shall be wired internally to control cable.
   9. Two normally closed automatic reset thermostats shall be imbedded in the motor windings to open on excessive heat stopping the motor.
   10. Provide waterproof power and control cable sized to conform to NEC and ICEA standards and adequate length to connect to the control panel. Seal cables at motor entry point to prevent moisture from entering motor housing and cable wicking.
   11. Motor shall not overload throughout the pump-operating curve.

2.03 PAINTING

A. Exterior surface of pump and motor shall receive as a minimum the following paint system at the factory:
   1. SSPC-SP6, Commercial Blast Cleaning
   2. One coat of Modified Alkyd Enamel to a minimum 2 mils dry film thickness.

2.04 INSTALLATION SYSTEM

A. Provide a rail mounted installation system consisting of stainless steel guide rails, upper rail guide bracket, sliding bracket, intermediate rail guide bracket(s) (for rails over 20 ft), and a discharge connection elbow. System shall be of the size and type standard with the pump manufacturer for pump type to be supplied and shall not be used to support the weight of the pump. Stainless steel sliding guide bracket shall

be an integral part of the pump unit. Discharge connection elbow and piping shall be permanently installed in the wet well. Pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection and service without entering the wet well.

B. Lifting cable: Provide a stainless steel cable capable of supporting the pump and to raise and lower the pump through one continuous motion with the hoist.

2.05 CONTROL SYSTEM

A. Provide a duplex pump control panel with a PLC-based control system, operator interface and the required contacts and relays for the following pump operation and controls. All setpoints shall be adjustable via the operator interface.
   1. "Lead" pump shall start at 80% when liquid level rises to "lead pump" elevation (-3.5').
   2. The "lead" pump speed shall ramp up to 100% as the level continues to rise to elevation (-2'). At elevation (-1') the "lag" pump shall start at 100% speed.
   3. The "lag" pump shall operate with "lead" pump until liquid level drops to "pump off" elevation. (-5.5')
   4. As the liquid level drops, both pumps will ramp down from 100% speed to 80% speed at the "pump off" elevation.
   5. If liquid level continues to rise to "high water" elevation, the high-water alarm shall be activated.
   6. Pumps shall alternate between starting cycles. In the event either pump fails to function, the other shall automatically start.
   7. Motors shall automatically shut down upon loss of phase, under voltage, or phase reversal.
   8. Provide adjustable time delay start (15 sec) for lag pump motor to prevent both motors from attempting to start simultaneously while on standby generator power.
   9. Ultrasonic level controller shall monitor liquid level elevation and transmit a 4-20mA signal to the PLC. Terminal strip wired for control via float switches shall also be included.
   10. High and low level float switches shall be provided as backup control with an adjustable time delay for starting the second pump.

B. Control panel shall be a NEMA 4X stainless steel enclosure with a dead front with a hinged inner door. Panel shall be UL labeled, as a complete unit, following assembly. Panel shall include, but not be limited to, the following items:
   1. Enclosure door shall be provided with stainless steel clamps and provisions for padlocking or shall be equipped with a three-point latching mechanism operated by an oil-tight key-locking handle.
   2. Main circuit breaker.
   3. Surge arrester.
   4. Surge capacitor.
   5. Phase monitor relay.
   6. Entry alarm to detect unauthorized attempt to gain entry into control panel. Provide override for use of authorized personnel.
   7. A thermal / magnetic circuit breaker for each pump with operator located on the inner swing panel.

C. Variable Frequency Drives (2 required):

1. Power Supply
    a. 480 volt, 3 phase, 3 wire, 60 hertz.
    b. 5% line reactor
    c. Variable Frequency Drives Specifications
        1) The input power section shall utilize a full wave bridge design incorporating diode rectifiers. The diode rectifiers shall convert fixed voltage and frequency, AC line power to fixed DC voltage.
        2) The output power section shall change fixed DC voltage to adjustable frequency AC voltage.
        3) The adjustable frequency drive package shall include input EMI/RFI filtering.
        4) The AC drive shall have a user interface (keypad) that presents information in plain English / Spanish / French text. The keypad shall have Run and Stop keys and a manual speed potentiometer function.
        5) The AC Drive power converter shall be UL Plenum rated.
        6) All heat sink fans shall be accessible from the front and shall not require the removal of the AC drive power converter for fan replacement.
        7) All heat sink fans shall be cycled on only when required to cool the drive to maximize the life of the fan
        8) The AC Drive shall have an enclosure rating of IP 41 on top, IP30 sides & front IP00 on bottom, Type 1 w/ optional conduit kit
        9) When a Type 1 conduit entrance kit is required. The kit shall attach and be ground to the bottom of the AC drive and provide conduit landing for incoming line power cables, motor lead cable, control wiring, and network cabling.
        10) The AC Drive shall be sized to operate a variable torque load.
        11) The speed range shall be from a minimum speed of 1.0 Hz to a maximum speed of 72 Hz.
        12) The AC Drive shall meet IEC 60664-1 Annex A and NEMA ICS 1, UL, and CSA standards.
        13) Environmental Rating:
            a) The AC Drive shall be designed to operate in an ambient temperature from -10 to 50 ˚C (14 to 122 ˚F).
            b) AC Drives in Type 1 enclosures shall be designed to operate in an ambient temperature from -10 to 40 ˚C (14 to 104 ˚F).
            c) The storage temperature range shall be -25 to 65 ˚C (-13 to 149 ˚F).
            d) The maximum relative humidity shall be 95%, non-condensing.
            e) The AC Drive shall be rated to operate at altitudes less than or equal to 3300 ft (1000 m). For altitudes above 3300 ft (1000 m), the AC Drive should be de-rated per drive specifications.

f) The AC Drive shall meet the IEC 60721-3-3-3M3 operational vibration specification.

14) Ratings:
   a) The AC Drive shall be designed to operate at the input line voltage.
   b) The AC Drive shall operate from an input frequency range of 60 Hz (±) 5%.
   c) The displacement power factor shall not be less than .98 lagging under any speed or load condition.
   d) The efficiency of the AC Drive at 100% speed and load shall not be less than 97%.
   e) The variable torque rated AC Drive over current capacity shall be not less than 110% for 1 minute.
   f) The output carrier frequency shall be randomly modulated about the selected frequency. The output carrier frequency of the AC Drive shall be selectable from 1 to 16 kHz, 12kHz nominal rating for 1-60 hp @ 200/240 V, 1-100 hp @ 380/480 V. Selectable: 2.5 to 8 kHz, 2.5kHz nominal rating for 75-125 hp @ 200/240 V, 125-900 hp @ 380/480 V.

15) Protection:
   a) Upon power-up, the AC Drive shall automatically test for valid operation of memory, loss of analog reference input, loss of communication, DC-to-DC power supply, control power and pre-charge circuit.
   b) The AC drive shall be rated for UL minimum short circuit currents per given horsepower rating.
   c) The AC Drive shall be protected against short circuits, between output phases and to ground.
   d) The AC Drive shall have under-voltage power-loss ride through performance per the SEMI F-47 voltage ride through standard and certified by a third party.
   e) The AC drive shall have a programmable ride-through function, which will allow the logic to maintain control for a minimum of one-second (60 cycles) without faulting.
   f) An auto restart function will provide selectable time for restart attempts after the fault has disappeared and other operating conditions permit the restart. The restart shall be performed by a series of automatic attempts separated by increasingly longer periods of time. This period of time shall be selectable.
   g) Upon loss of the analog process follower reference signal, the AC Drive shall be programmable to display a fault.
   h) The AC Drive shall have a solid-state UL 508C listed overload protective device and meet IEC 60947.
   i) The output frequency shall be software enabled to fold back when the motor is overloaded.

j) There shall be three skip frequency ranges that can be programmed to a bandwidth of 2.5 Hz.

16) Adjustments and Configurations
   a) The AC Drive shall be capable of storing the configuration in the keypad.
   b) The acceleration and deceleration ramp times shall be adjustable from 0.05 to 999.9 seconds.
   c) The memory shall retain and record run status and fault type of the past eight faults.
   d) The software shall have an energy economy function that, when selected, will reduce the voltage to the motor when selected for variable torque loads. A constant volts/Hz ratio will be maintained during acceleration. The output voltage will then automatically adjust to meet the torque requirement of the load. Selectable volts/Hz ratio patterns does not meet specification, the function must be automatically optimized.
   e) The AC Drive shall have macro configurations for HVAC and pump applications, PID regulator set-up and network set-up.
17) Keypad Display Interface
   a) A keypad display interface shall offer the modification of AC Drive adjustments through a touch keypad. All electrical values, configuration parameters, I/O assignments, application and activity function access, faults, local control, and adjustment storage, and diagnostics shall be accessible.
   b) The AC Drive model number, torque type, software revision number, horsepower, output current, motor frequency and motor voltage shall be listed on the drive identification portion of the LCD display.
   c) The keypad display shall have password protection that allows the keypad to be locked out from unauthorized personnel.
   d) The keypad shall be capable of displaying I/O assignment and status.
18) Manufacturer: Altivar 61 manufactured by Square D Company or equal of Danfoss or ABB.
19) Each VFD shall be furnished with a reduced voltage soft starter. The soft starters shall automatically bypass the VFD on VFD failure. The soft starters shall be furnished with a shorting contactor and a digital keypad to enter operating parameters.
20) Provide a VFD-Soft Starter selector switch for each pump to manually bypass the VFD.
21) Soft starter current limit settings shall be minimized to allow starting on generator.

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8. Transformer sized for control circuit loads and additional 120 V circuits as specified. Transformer size shall be adequate to provide 150 percent of the control circuit requirements, a minimum of 3.5 amperes for the receptacle and 100 percent of other auxiliary 120-volt loads. Provide fused primary and secondary and bond unfused leg of secondary to enclosure.
9. Separate circuit breaker with handle to project through inner door for the following:
    a. Each pump motor
    b. Control circuit.
    c. Cabinet heater.
    d. Door mounted duplex receptacle.
    e. Battery charger receptacle.
    f. One 15 amp, 2pole, 480v breaker for external mini-power zone.
    g. One 20 amp, 3 pole, 480v breaker for alternate grinder
10. Cabinet condensate heater with thermostat.
11. Alternator relay to alternate pumps between successive starts.
12. Mount the following devices on inner door:
    a. Hand-off-automatic (H-O-A) control switch for each pump.
    b. Non-resettable elapsed time meter for each pump. Meter shall read in tenth of hours through 99,999 hours total time.
    c. GFCI type duplex receptacle.
13. Mount operating and warning lights on inner door for the following. Color indicates required lens color.
    a. Power on (white).
    b. High water level (red).
    c. For each pump.
        1) Running (green).
        2) Seal failure (red).
        3) Thermal overload (red).
    d. Phase monitor (red).
14. Alarm horn and light (red) mounted on top of protective shield. Horn sound level shall be a minimum of 100 decibels at 10 feet. Provide horn silence switch on inside panel.
    a. In the event of a power loss at the pump station or a failure of the automatically activated stand-by generator, the alarm system shall be operated from a battery back-up power source. Battery back-up power source shall be provided with continuous charge. No alarm relays or indicator lights (except the alarm silence relay and alarm light) shall be part of the battery charging circuit.
    b. At a minimum, the following conditions shall be monitored by the system, and each shall cause activation of the audible and visual alarms:
        1) Loss of power supply.
        2) Pump failure for each pump for seal failure or thermal overload.
        3) High water level.
        4) Loss of telemetry transmission line. Provide contacts for signal from telemetry system.
        5) Standby generator failure.
15. Auxiliary contacts for remote signal for the following:
    a. Pump run status for each pump.
    b. High water alarm.
    c. Pump failure alarm for both pumps on thermal overload or seal failure.
    d. Loss of power.

e. Loss of phase to indicate over / under voltage, phase loss, or phase reversal.
f. Standby generator failure
g. VFD/Soft starter fault.

16. Provide laminated plastic labels to identify all control components.
17. Provide a plastic laminated electric diagram with wire / terminal numbers and color codes permanently fastened to inside of enclosure door.

C. Switches, push buttons, and indicator lights shall be oil tight / watertight units. Lights shall be push-to-test type.

D. 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

E. Provide UL listed float switches encapsulated in buoyant waterproof housing with sufficient cable to extend to control panel. Float and cable shall be designed and manufactured for use in a sewage wet well environment. Sensor levels shall be field adjustable. Provide intrinsically safe relays for floats.

F. Conduits running into wet well shall have a positive seal in accordance with NFPA 70.

G. Provide Air Conditioner Unit of 304 stainless steel construction. The air conditioner shall be sized to for heat gain from all equipment mounted inside cabinet.

2.06 ULTRASONIC LEVEL CONTROLLER

A. General:

1. Ultrasonic level controller with transducer shall provide differential control via ultrasonic echo ranging technology.
2. Capable of digital communications with built-in Modbus RTU via RS-485.
3. Range 1 to 50 feet.
4. Achievable 0.1% resolution with accuracy to 0.25% of range.
5. Anti-grease ring / tide mark buildup.
6. Auto False-Echo Suppression for fixed obstruction avoidance.
7. Differential amplifier transceiver for common node noise rejections and improved signal to noise ratio.
8. Programmable via handheld programmer or PC with compatible software.
9. AC power; 100-230 Volt A.C. +\ - 15%, 50/60 Hz, 36 VA (17W)
10. 1 MB static RAM with battery backup
11. UL Listed for FM Class 1, Div 1.

B. Construction:

1. Panel mountable with control panel
2. Backlit LCD display

C. Output:

1. Six programmable relay outputs

2. Two 4 to 20 mA outputs (isolated)

D. General:
   1. Wetwell level signal to be generated via controller
   2. Provide Hydroranger controller or approved equal.

2.07 TELEMETRY SYSTEM

A. Scope of Work:
   1. Utilize existing RTU on equipment rack.
   2. Provide interlock wiring and required conduit from pump package controller, transfer switch, and standby generator. The output “point” wiring from each location shall be connected to the appropriate terminals. The wiring shall be run to the logic panel enclosure. The wires shall be clearly labeled as to their respective “point” identification. There shall be adequate length of wire within the RTU enclosure to allow the Owner to make connections in the RTU panel. The wire in the RTU shall be terminated by the Owner.
   3. The power to the logic panel shall be 24 volts a.c.

B. Sequence of Operation
   1. The status of the following shall be monitored by the system:
      a. Pump run status for each pump
      b. Wetwell level
      c. High water alarm
      d. Common pump failure alarm for each pump.
      e. Loss of power.
      f. Loss of phase to indicate over/under voltage, phase loss, or phase reversal.

C. Installation
   1. Electrical work specified herein shall be the responsibility of the Contractor and licensed electrician.
   2. All electrical wiring and terminations within the RTU panel shall be provided by the Owner.
   3. All wiring shall be in conduit unless specified otherwise and all wires shall be number coded. Conduit will be used for all exposed work.

2.08 PORTABLE HOIST

A. Provide one galvanized or stainless steel portable hoist at each pump station with reach as required for the safe removal of each pump and trash basket.

B. Hoist shall have a capacity of 150 percent of equipment weight and capable of 360-degree rotation.

C. Hoist shall have winch with quick disconnect cable anchor for receiving stainless cable with swagged ball end.

D. Provide lifting cable for each pump and trash basket. Lifting cable shall be stainless steel with snap hook on pump / trash basket end and swagged ball on winch end. Cable shall have sufficient length to reach from installed equipment to lifting winch.

E. Provide number of floor mounted stainless steel sockets at each pump station as required for the removal of the equipment.

F. Portable hoist shall be as manufactured by Halliday Products, Thern Inc., or Wallace B E Products.

2.09 PRESSURE GAUGES

A. Pressure gauges shall meet the following requirements:
   1. Use: Pressure reading for sanitary sewer force main.
   2. Liquid fill: Glycern
   3. Dial: White aluminum with black markings.
   4. Dial size: 4 inch minimum.
   5. Case & Ring: Aluminum
   6. Accuracy: 1/2 % of full scale (Grade 2A).
   7. Stem connection: Back.
   8. Gauge reading: Combination reading in psi and feet of water (ft) with range as follows:
      a. Discharge Piping: 0-100 psi (0-230 ft)
   9. Equipped with a stopcock and a diaphragm isolator for use with sewage.
   10. Mounted on station piping where indicated on drawings. Provide accessories as necessary so gauge shall face up with numbers reading towards access hatch.

2.10 REMOVABLE TRASH BASKET

A. Provide one aluminum trash basket with guide rails with the following requirements:
   1. Basket shall have bar screen on the front and bottom with a minimum 1-1/4 inch to maximum 2 inch clear opening between 1/4-inch thick bars. The sides of the basket may be solid.
   2. Basket shall have a minimum of four solid aluminum wheels with stainless steel axles for easy removal from wetwell on aluminum guide rail system. Guide rail system shall not be provided with ladder rungs. Provide basket stop bar for installation in field to insure proper location of basket.
   3. Minimum dimensions: 2 inches wider than OD of influent pipe, 18 inches deep, and 18 inches high. Influent pipe must be able to pass through guide rails to influent face of basket.

2.11 PRECAST CONCRETE WET WELL AND VALVE VAULT

A. Provide precast concrete wet well and valve vault to the size and depth indicated on the Drawings and in conformance with the paragraph, Manholes, Section, Sanitary Sewer System, with the deletion of the manhole steps and manhole ring and covers.

2.12 ACCESS HATCH

A. Provide access hatches in conformance to the following requirements:
   1. Size as indicated on the Drawings. The size on the Drawings is for the required minimum clear opening. Unless specifically indicated on the Drawings the doors can be single or double door as required for opening size.
   2. Frame shall be aluminum extrusion and aluminum checkered tread plate for the door(s). Frame shall be equipped with necessary anchors for setting in concrete. Hinges, nuts, bolts, and washers shall be stainless steel and tamper proof from outside.
   3. Design and construct hatches for a minimum 300 lb. live load unless an H20 load is indicated on the Drawings.
   4. Provide the following:
      a. Bituminous coating at locations, which will have contact with concrete.
      b. Waterproof hatch where indicated on the Drawings.
      c. Positive open door latch.
      d. Retractable lifting handle.

e. Double doors shall be interlocked.
f. Padlocking provision. Provide lock for each hatch and keyed alike for multiple hatches.
g. Provide a stainless steel interior automatic slam lock with an interior operating handle. The lock shall be operated from the outside by a removable handle key.
h. Provide doors requiring greater then a 50 lb lift with a stainless steel spring assist.

5. Hatches shall be of one manufacturer.

2.13 SIGN

A. Provide a metal sign mounted on the fence at the gate to the pump station. Sign shall be a minimum of 18 inches square and white with blue lettering. Sign shall read “City of Georgetown, Maryville Elementary School Pump Station #16, Emergency Contact 843-545-4500.”

PART 3 EXECUTION

3.01 WET WELL AND VALVE VAULT

A. Install precast concrete wet well and valve vault in accordance with paragraph, Manholes, Section, Sanitary Sewer System.

B. Wet Well Testing

1. Test wet well for water-tightness. Perform water-tightness test in the presence of the Engineer.
2. Water-tightness test shall be in accordance with ACI 350. IR "Testing Reinforced Concrete Structures for water-tightness." Plug influent line and fill wet well with water to 6-inches below the force main pipe. Allow water to sit for 24 hours to allow for absorption by the concrete. There shall be no loss of water over a 24 hour period. If the water level has dropped the test may be run again at the Contractor’s option. If the test fails a second time, the interior of the wet well shall be coated with water proofing compound and the wet well retested.
3. Vacuum test may be used upon approval of the Engineer. Test shall meet the requirement for manhole testing as indicated in Section, Sanitary Sewer Systems.
4. Submit record of test signed by the Contractor.

3.02 FACTORY TEST

A. Certified Performance Test shall be performed on each pump at the factory.

3.03 INSTALLATION

A. Install pumps in accordance with manufacturer's installation instructions.

B. Level base.

C. Provide electrical work in accordance with Division 16. Coordinate electrical service to site with local power company.

D. Mount pressure gauges as described above.

3.04 START UP SERVICES

A. Provide the services of manufacturer's representative to check the pump station installation, supervise initial start up, and instruct Owner's personnel in proper

operation and maintenance of the pumps and appurtenances. A minimum of two separate trips to the site will be required, each consisting of a minimum of one 8 hour working day. Regardless of the time spent at the site, services will not be considered complete until the pump station operates as intended for a minimum of one (1) week of operation.

B. Operate pump station under actual field service to demonstrate that all equipment performs to the specified criteria flow capacity and head conditions. During the field test, make adjustments as necessary for proper operation. Adjust impeller size as necessary to meet field conditions.

C. Manufacturer's recommended start up tests shall be performed according to the installation schedule. Start up tests shall include the following as a minimum:
   1. Data for each pump under operating conditions:
      a. Amperage reading.
      b. Pressure head reading.
      c. Drawdown flow test.
   2. Pull out each pump and reinstall using guide rails and hoist.
   3. Test alarm condition for high flow.
   4. Test auxiliary contacts.
   5. Test primary level control system on normal and emergency power.
   6. Test backup float control system on normal and emergency power.

D. Submit copy of tests and checks performed in the field, complete with recordings, where applicable, to the Engineer.

E. Provide 2 hours of training on operation of VFDs and control system.

3.05 PAINTING

A. Provide touch up of exterior paint system as appropriate.

END OF SECTION

SECTION 16260

STANDBY ELECTRIC POWER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide an engine driven standby electric generator system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:

1. Diesel engine.
2. Engine instruments and controls.
3. Alternator.
4. Control panel.
5. Exhaust silencer.
6. Weather-protective, sound attenuated, non- walk-in enclosure.
7. Associated accessories and other items and services required to complete the system whether particularly mentioned or not.
8. Fuel tank (filled on site).
9. Automatic transfer switch (specified in 16400)

B. Applicable Standards

1. NFPA 70: National Electrical Code
2. NFPA 110: Standard for Emergency and Standby Power Systems
3. UL508: Standard for Industrial Control Equipment
4. UL2200: Standard for Stationary Engine Generator Assemblies
5. UL142: Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids
6. CSA C22.2 No. 14: Industrial Control Equipment
7. CSA C282: Emergency Electrical Power Supply for Buildings
8. CSA C22.2 No. 100: Motors and Generators
9. EN61000-6: Electromagnetic Compatibility
10. EN55011: Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-frequency Equipment
11. FCC Part 15 - Radio Frequency Devices - Subpart B-Unintentional Radiators
12. ISO 8528: Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets
13. IEC 61000: Electromagnetic Compatibility

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Referenced manufacturers are Caterpillar and Cummins/Onan, and are named to establish standards of quality. Equal products of other manufacturers conforming to these specifications may be provided as outlined in the bid form and as approved by the Engineer.

C. The system shall be factory assembled and tested by the manufacturer of the generating system or be assembled and tested by an authorized representative of the manufacturer using an engine or generator made by the system manufacturer so

that the system will have one source of supply and responsibility. The performance of the generating set series shall be certified by an independent testing laboratory as to the set's full power rating, stability and voltage and frequency regulation.

D. The manufacturer of the generating system shall maintain a thoroughly stocked authorized parts and service facility within 150 miles of the installation.

E. Technical services:

1. Provide a service engineer, complying with requirements of Section 01660 to complete the initial start-up, make proper and complete adjustments of all adjustable devices, load switches, etc., and to also verify and approve all connections prior to any test operation of said equipment.
   a. One 2-day trip.
2. Confirmation in writing by the manufacturer's authorized representative of said services shall be submitted to Engineer.

1.3 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

B. Upon completion of the work of this Section, and as a condition of its acceptance, deliver to the Engineer five copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01650 of these Specifications.

1.4 WARRANTY

A. Provide a standard two-year warranty on all labor, materials, and equipment of the generating system (including the ATS).

1. Upon placing the generator in service provide a 30-day initial operating period.
2. The warranty will begin upon successful completion of the initial operating period.

1.4 RULES AND PERMITS

A. The entire installation shall be in accordance South Carolina Department of Health and Environmental Control (SCDHEC) Regulations, NFPA, and all local codes.

B. The Engineer will obtain all permits and inspections required by local or state laws.

C. Furnish the Owner with certificate of inspection and final approval from all authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide new and current system equipment consisting of:

1. Engine driven electric generating set to provide standby power.
2. Engine start-stop control system mounted on the generating set.
3. Mounted accessories as specified.

2.2 SYSTEM

A. Provide generator rated for continuous standby service at 125 KW (minimum), 156.25_KVA at 0.8-power factor, 277/480 volt, 3-phase, 4-wire wye. Continuous standby service constitutes full load operation without interruption for a minimum period of 14 days.

2.3 ENGINE

A. Provide fuel filter and fuel transfer pump at engine.

B. Provide water-cooled with mounted radiator, fan and water pump.

C. Provide intake and exhaust valves made of heat resisting alloy steel with exhaust valve seat inserts.

D. Supply full pressure lubrication by lube oil pumps.

E. Provide air cleaner, fuel and oil filters with replaceable elements, and lube oil cooler.

F. Govern engine speed by electronic governor to maintain the alternator frequency within one (1) hertz from no load to full load alternator output.

G. Provide remote, 2-wire starting by a solenoid shift, electric starter.

H. Directly connect the starter to the engine flywheel housing.

2.4 ALTERNATOR

A. Provide brushless, 4-pole, revolving field design with temperature compensated solid-state voltage regulator and rotating rectifier exciter system.

1. Provide rotor driven through a semi-flexible driving flange to ensure permanent alignment.
2. Provide alternator with frequency regulation not exceeding 3 Hz from no load to rated load.
3. Provide alternator with voltage regulation within +/-2% of rated voltage, from no load to full rated load.
4. Provide alternator with recovery to stable operation occurring within 2 seconds.
   a. Stable operation is defined as operation with terminal voltage remaining constant +/-1% of rated voltage.
5. Provide alternator with a rheostat providing a minimum of +/-5% voltage adjustment from rated value.
6. Provide alternator with temperature rise within NEMA MG1-22 definition.
7. Provide alternator utilizing 3-phase filtered sensing voltage regulation and having an independent power supply for the excitation system (i.e. permanent magnet generator, Auxiliary Winding, Regulator Exciter Principle (AREP) and series boost type excitation system).
8. Provide alternator with a sub-transient reactance of 0.12 per unit, or lower, based on steady-state rating.
9. Provide alternator with Class H insulation.

10. Provide alternator producing a voltage waveform for proper operation of variable frequency PWM drives that produce line to neutral total harmonic distortion to 5% maximum with a maximum 3% distortion in any single harmonic order.
11. Equip alternator with a 120 volt, single-phase space heater.

2.5 CONTROLS

A. Provide a fully solid-state, microprocessor based, generator control panel wired, tested and shock mounted on the generating set by the manufacturer of the generating plant.

B. Provide the following functionality integral to the control panel:

1. A minimum 64 x 240 pixel (28mm x 100mm) white backlight graphical display with text based alarm/event descriptions.
2. A minimum of 3-line data display.
3. Audible horn for alarm and shutdown with horn silence switch.
4. Standard ISO labeling
5. Multiple language capability
6. Remote start/stop control
7. Local run/off/auto control integral to system microprocessor
8. Cooldown timer
9. Speed adjust
10. Lamp test
11. Push button emergency stop button
12. Voltage adjust
13. Voltage regulator V/Hz slope – adjustable
14. Power Factor Control for paralleling units
15. Password protected system programming

C. Provide the panel with the following Digital indications:

1. AC voltage, 3-phase (L-L and L-N)
2. AC amps (3-phase and total)
3. KW (total and per phase)
4. KVA (total)
5. KVAR (total)
6 KWHR (total)
7. KVARHR (total)
8. PF (average total and 3-phase)
9. % of rated (total)
10. Frequency
11. DC voltage
12. System diagnostic
13. Excitation voltage
14. Excitation current
15 Engine oil pressure
16. Engine oil temperature
17. Engine coolant temperature
18. Engine RPM
19. Battery volts
20. Engine hours
21. Engine crank attempt counter
22. Engine successful start counter
23. Service maintenance interval
24. Real time clock
25. Oil filter differential pressure
26. Fuel temperature

27. Fuel pressure
28. Fuel filter differential pressure
29. Fuel consumption rate
30. Total fuel consumed
31. Engine intake manifold temperature
32. Engine intake manifold pressure
33. Engine crankcase pressure
34. Air filter differential pressure
35. Boost pressure
36. Oil filter differential pressure

D. Provide alarm indication and subsequent shutdown for the following conditions (Store in the control panel the first and last occurrences of all alarms and shutdowns with a time, date, and engine hour stamp):

1. Low oil pressure alarm/shutdown
2. High coolant temperature alarm/shutdown
3. Loss of coolant shutdown
4. Overspeed shutdown
5. Overcrank shutdown
6. High intake manifold temperature alarm/shutdown
7. High exhaust manifold temperature alarm/shutdown
8. High crankcase pressure alarm/shutdown
9. High air inlet temperature alarm/shutdown
10. Emergency stop depressed shutdown
11. Low coolant temperature alarm
12. Low battery voltage alarm
13. High battery voltage alarm
14. Control switch not in auto position alarm
15. Battery charger failure alarm
16. Generator over voltage
17. Generator under voltage
18. Generator over frequency
19. Generator under frequency
20. Generator reverse power
21. Generator overcurrent
22. Loss of excitation alarm/shutdown
23. Instantaneous over excitation alarm/shutdown
24. Time over excitation alarm/shutdown
25. Rotating diode failure
26. Loss of sensing
27. Loss of PMG

E. Provide the ability to accept six (6) programmable digital input signals.

F. Provide accessible through a single electronic service tool all engine, voltage regulator, control panel and accessory units. Provide the following maintenance functionality:

1. Engine running hours display
2. Service maintenance interval (running hours or calendar days)
3. Engine crank attempt counter
4. Engine successful starts counter
5. 20 events are stored in control panel memory
6. Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 14 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points:
   a. Day of week

b. Time of day to start
c. Duration of cycle

G. Provide Modbus RTU remote communications as standard via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.

H. Provide an annunciator to meet the requirements of NFPA 110, Level 1.

1. Network directly to the generator set control
2. Include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton
3. Provide the following individual light indications for protection and diagnostics:
   a. Overcrank
   b. Low coolant temperature
   c. High coolant temperature warning
   d. High coolant temperature shutdown
   e. Low oil pressure warning
   f. Low oil pressure shutdown
   g. Overspeed
   h. Low coolant level
   i. EPS supplying load
   j. Control switch not in auto
   k. High battery voltage
   l. Low battery voltage
   m. Battery charger AC failure
   n. Emergency stop
   o. Spare
   p. Spare

I. Equip unit with factory mounted terminal blocks and strips for all power, signal and control wiring connections.

2.6 GENERATING SET MOUNTING

A. Equip generator set with vibration isolators and mount on a welded steel base that will provide suitable mounting to any level surface.

B. Equip unit with a reinforced sheet steel, minimum 16 gauge, sound attenuating, non-walk-in weather-protective housing.

1. Reinforce to be vibration-free in the operating mode.
2. Provide housing with lockable removable panels on each side of the housing to access generator with a hinged door to access instrument panel.
3. Provide housing complete with accessories listed below, be rust treated and painted standard color of manufacturer.
4. Provide peaked roof for drainage.
5. Provide corrosion resistant fasteners.
6. Extend coolant and oil drain line connections outside of enclosure.
7. Insulate enclosure to limit unit noise to 85 db at 3'.
8. Mount enclosure over an integral welded steel base fuel tank complete with all fuel fittings, level indicator, vent, exterior lockable fill port and drains, etc., and necessary galvanized steel support framing so that the weight of the generator is not supported by the tank. Size tank to run the generator at full load for a minimum of 2 days.
   a. Enclose tank in a welded steel secondary containment vessel having an audible spill alarm system powered from the generator battery system and alarmed on the generator control panel.

b. All welds, cuts, openings, etc., in the steel material, shall be cold galvanized as a minimum after fabrication.

9. Provide tank underwriter's labeled (UL).

2.7 ACCESSORIES

A. Provide the plant with all accessories needed for proper operation to include, but not be limited to:

1. A critical type silencer of schedule 40 steel mounted inside enclosure.
2. Stainless steel flexible exhaust connection.
3. Sufficient exhaust piping of 316 schedule 40 stainless steel pipe and fittings, including end rain cap.
4. Lace-up type insulation blankets to completely insulate muffler and interior exhaust piping.
5. Provide a 10-amp, automatic "float" type battery charger to maintain the batteries at normal capacity.
   a. Provide 120V input with 12 VDC output to battery(s)
   b. Provide cables, battery rack, AC compensation, current limit, DC ammeter to show battery voltage, equalizing switch, fused AC input and DC output, complete isolation of AC input and DC output.
   c. Design as not to discharge the battery in event of failure.
6. Provide engine mounted, thermostatically controlled, immersion type heater to ensure a minimum coolant temperature of 120° F in a minimum ambient temperature of –15° F.
   a. Operate on a 120 volt, single-phase AC power.
7. Engine Block Heaters sized per manufacturer's requirements. Any required increase of feeder circuits, different from that as shown on drawings, is the responsibility of the Contractor to provide and install at no additional cost to the Owner.
8. The generator shall accept a single 30 amp, 1P, 120 branch circuit to feed block heater, battery charger and alternator heater.

B. Radiator coolant shall be all weather, all season, environment friendly 50% solution antifreeze.

C. Provide adequate fuel to fill tank

D. Overcurrent Protection:

1. Furnish the engine/generator set with overcurrent output protection per the latest edition of NEC 445-4 at the engine/generator set.

2.8 IDENTIFYING SIGNS

A. Provide identifying signs as shown on drawings and as specified herein for proper installation and in accordance with latest edition of National Electrical Code.

1. Sign design is based on use of standard products manufactured by Seton Name Plate Company of New Haven, CT and is named to establish standards of quality.
2. Provide the products upon which design is based or provide equal products of another manufacturer approved in advance by the Engineer.
3. Provide sign material as 60 mils. thick press polished high performance vinyl plastic.
4. Provide sunlight fade resistance.
5. Overcoat with Tedlar.
6. Provide rounded corners.
7. Provide 14" x 10" sign.

8. Main heading to read: "CAUTION", white letters on red background with black border. Subtitle to have black letters on white background.
9. Mount with stainless steel screws at location as directed in field.
10. Sign schedule:

AREA	SIGN SUBTITLE	NO. SIGNS PER AREA
Service Entrance	Standby Emergency Generator Onsite	1
System Ground Connection Point	Normal Service and Standby Emergency Generator Connected to Grounding Electrode	1

11. Install sign in strict accordance with the manufacturer's recommendations as approved by the Engineer, using only the approved mounting materials, and locating all components firmly into position, level and plumb.
12. Locate where directed by the Engineer.
13. Mounting hardware to be Type 316 stainless steel.
14. Where adequate sign supports are not available, fabricate sign stand using Type 316 stainless steel channel and fittings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Engineer.

C. Put all components through at least five complete cycles of operation, adjust as required, and verify that the complete system functions at optimum operating level.

3.3 TESTING AND INSPECTION

A. Provide personnel and equipment, make required tests, and secure required approvals from the Engineer and governmental agencies having jurisdiction.

B. Make written notice to the Engineer adequately in advance of each of the following stages of construction:

1. In the underground condition prior to placing concrete floor slab, when all associated electrical work is in place.
2. When all rough-in is complete, but not covered.
3. At completion of the work of this Section.

C. An operational test of the standby power system shall be conducted by a representative of the manufacturer of this equipment in the presence of the Engineer and the operating personnel. It shall be demonstrated during these tests that the voltage sensitive and time delay devices perform at their specified settings.

D. When material and/or workmanship are found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the Owner.

3.4 PROJECT COMPLETION

A. Upon completion of the work of this Section, thoroughly clean all exposed portions of the system installation, removing all traces of soil, labels, grease, oil and other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned.

B. Thoroughly indoctrinate the Owner's operation and maintenance personnel in the contents of the operations and maintenance manual required to be submitted under Part 1.3 of this Section of these Specifications.

3.5 COMPUTATIONS

A. The pump station will include the following:

Step Number	Motor Load	Motor Control	Residual Load
1	1 @ 58 HP	VFD	5 kW
2	1 @ 58 HP	VFD	

B. The manufacturer shall submit computations indicating that the unit furnished will satisfactorily operate with equipment to be connected as stated above.

C. Maximum voltage drop of 20%.

3.6 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for this work and all costs for same shall be included in the price bid for the work to which it pertains.

END OF SECTION

SECTION 16400

ELECTRICAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work included: Provide a complete electrical system as indicated on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:

1. Main service and main breaker
2. Automatic transfer switch (furnished with generator)
3. Mini-power zone.
4. Feeder system, in conduit.
5. Branch circuit wiring, in conduit.
6. Lighting fixtures.
7. Wiring system, in conduit, for equipment and controls provided under other Sections of these Specifications including, but not necessarily limited to, Equipment and Mechanical Sections.
8. Transient voltage surge suppressor.
9. Other items and services required to complete the systems whether particularly mentioned or not.

B. Related work:

1. Section 16260 – Standby Electric Power System.

1.2 ABBREVIATIONS

A	Ampere (Amps)	MCA	Minimum Circuit Amps
AFF	Above Finished Floor	MCC	Motor Control Center
AFG	Above Finished Grade	MCM	1000 Circular Mils (KCMIL)
AHJ	Local Authority Having Jurisdiction	MOCP	Maximum Over-current Protection
AIC	Amps Interrupting Current	N	Neutral
AFCI	Arc-Fault Circuit Interrupter	NEC	2002 National Electrical Code
ANSI	The American National Standards Institute	NEMA	National Electrical Manufacturers Association
BF	Ballast Factor	NFPA	National Fire Protection Association
Bkr.	Breaker	NIC	Not in Contract
C	Conduit	OSHA	Occupational Safety and Health Act
Ckt.	Circuit	PF	Power Factor
CRI	Color Rendering Index	PLC	Programmable Logic Controller
CU	Copper Conductor	PVC	Polyvinyl Chloride Conduit
DETD	Dual Element Time Delay Fuse	RGSC	Rigid Galvanized Steel Conduit
Disc.	Disconnect	RMS	Root Mean Square
Dn	Down	RTU	Remote Terminal Unit
EMT	Electrical Metallic Tubing	SCADA	Supervisory Control and Data Acquisition
FLA	Full Load Amps	SCCR	Short-Circuit Current Rating
FPM	Fuse per Manufacturer Requirements	SPD	Surge Suppression Device
FS	Federal Specifications	Sym	Symmetrical
G or Gnd.	Ground	THD	Total Harmonic Distortion
GFCI	Ground-Fault Circuit Interrupter	TSP	Twisted Shielded Pair
GFP	Ground-Fault Protection	TST	Twisted Shielded Triplet

HD	Heavy Duty	TVSS	Transient Voltage Surge Suppressor
HP	Horsepower	UL	Underwriters Laboratories Inc.
IBC	International Building Code	UON	Unless Otherwise Noted
IEEE	The Institute of Electrical and Electronics Engineers	V	Volts
IMC	Intermediate Metallic Conduit	W	Watts
KVA	Kilovolt-Amps	WFC	Watertight Flexible Conduit
KW	Kilo Watt	WG	Wire Guard
KA	Kilo Amps	XFMR	Transformer
LCCF	Lamp Current Crest Factor		

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section. These shall include, but not be limited to, an electrical supervisor who is a licensed master electrician, a field foreman with a minimum journeyman electrician's license and adequate electricians and helpers.

B. Without additional cost to the Owner, provide such other labor and materials required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

C. Electrical subcontractor shall furnish a 100 percent performance bond and a 100 percent payment bond to the Contractor as security for the faithful performance of this Section, as security for the payment of all persons performing labor on the project under this Section and furnishing materials in connection with this Section The performance bond and payment bond shall be in separate instruments.

1.4 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications, other data and shop drawings needed to prove compliance with the specified requirements. Provide the following approval drawings:
   a. Main breaker.
   b. Automatic Transfer Switch.
   c. Mini-power zone.
   d. Wiring devices and cover plates.
   e. Conduit and fittings.
   f. Conductors.
   g. Transient Voltage Surge Suppressor.
3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

B. Samples:

1. When so requested by the Engineer.
2. When specifically, so requested by the Contractor and approved by the Engineer, approved samples will be returned to the Contractor for installation on the Work.

D. Manual: Upon completion of this portion of the Work and as a condition of its acceptance, provide operation and maintenance manuals in accordance with other Sections of these Specifications. Include within each manual:

1. Copy of the approved Record Documents for this portion of the Work.
2. Copies of all circuit directories.
3. Copies of all warranties and guaranties.

1.5 PRODUCT HANDLING

A. Comply with other Sections of Specifications.

1.6 WARRANTY

A. Provide standard one (1) year warranty on all labor and materials.

B. Provide minimum five (5) year warranty on Surge Protection Devices, incorporating unlimited replacements of suppressor parts if destroyed by transients during the warranty period.

C. Provide standard five (5) year parts and labor warranty on automatic transfer switch.

1.7 RULES AND PERMITS

A. The entire installation shall be in accordance with the latest edition of the NEC, OSHA, and all local codes.

B. Apply and pay for all permits and inspections required by local or state laws.

C. Furnish the Owner with certificate of inspection and final approval from all authorities having jurisdiction.

1.8 DRAWINGS

A. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. The drawings are diagrammatic and are to be followed as closely as the construction will permit.

B. The drawings show the general location of outlets, conduits and circuit arrangement. Because of the small scale of the drawings, it is not possible to indicate all of the detail involved. The Contractor shall carefully investigate the structural and finish conditions affecting all his Work and shall arrange such work accordingly, furnishing such fittings, junction boxes and accessories as may be required to meet such conditions.

1.9 ELECTRICAL SERVICE

A. From the utility company, establish requirements for transformer pad(s), metering, connections, etc., and make provisions for them; providing and installing all lugs, connectors, grounding, etc., required for a complete installation.

1. Coordinate work with both the electric utility company and the Owner, and schedule the installation of the service in accordance with the construction schedule such that there will be no delays in equipment startup and placing the facilities in operation.

B. Local Utility Company is Dominion Energy. Contact Harry Johnson with the City of Georgetown Electric. (843-545-4600, hjohnson@georgetownsc.gov.

1.10 ELECTRICAL OUTAGE

A. Coordinate all outages with the Owner, 72 hours prior. Schedule all outages such that they will not interfere with normal plant operation and that there will be no delays in equipment startup and placing the facilities in operation.

1.11 SPARE PARTS

A. Provide the following spare parts to Owner in neatly packaged box marked with contents:

1. Fuses: One (1) box of fuses for each type and size installed on the project.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide only materials that are new, of the type and quality specified. Where Underwriters' Laboratories, Inc. have established standards for such materials, provide only materials bearing the UL label. Materials called for are to be considered as standard that, however, implies no right on the part of the Contractor to substitute other materials and methods without written authority from the Engineer.

B. Temporary power:

1. In addition to providing temporary power as described in Section 01500 of these Specifications, provide and pay the costs for installing permanent electrical meter or meters.
2. When all equipment is in place and connected, and the Engineer determines the project is ready for final checkout, arrange to have the permanent metering installed in the Owner's name. At this point, the Owner will be responsible for all charges.

C. Where any material or operation is specified by reference to published specifications or standards or the specifications or standards of any other organization; the referenced specification or standard shall be as much a part of this Section as if quoted in full herein.

2.2 RACEWAYS

A. Applicable Standards:

1. ANSI C80.1: Rigid Steel Conduits, Zinc-Coated.
2. ANSI C80.3: Electrical Metallic Tubing, Zinc Coated.
3. ANSI C80.5: Rigid Aluminum Conduits.
4. ANSI C80.6: Intermediate Metallic Conduits.
5. ANSI/NEMA FB1: Fittings and Supports for Conduit and Cable Assemblies.
6. UL 6: Rigid Steel Conduit – Zinc Coated.
7. UL 651-2002: Schedule 40 PVC and schedule 80 Rigid PVC Conduit.
8. UL 514B: Flexible conduit fittings.
9. NEMA RN 1: Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
10. NEMA FB 1: Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
11. ASTM F512: Polyvinyl Chloride (PVC) Conduit.
12. ASTM D870: Standard Practice for Testing Water Resistance of Coatings Using Water Immersion.

13. ASTM D1151: Standard Practice for Effect of Moisture and Temperature on Adhesive Bonds.
14. FS WW-C 581E: Federal Specification for Rigid Galvanized Steel Conduit.
15. FS-WW-C-563A: Federal Specification for Electrical Metallic Tubing.
16. FS-WW-C-540C: Federal Specification for Rigid Aluminum Conduit.
17. FS WW-C 566: Federal Specification for Flexible Metal Conduit.

B. Acceptable Manufacturers:

1. Wheatland.
2. Allied Tube.
3. Perma-Cote; Division of Robroy.
4. Ocal.
5. Carlon.

C. Provide conduit and fittings conforming to the above standards.

D. Rigid galvanized steel conduit and fittings – types:

1. Provide threaded type fittings and form 8 conduit bodies with material to match conduit. Provide PVC coated fittings for PVC coated rigid galvanized steel conduit installations.
2. Provide rigid galvanized steel conduit with external 40-mil PVC coating and internal, 2-mil urethane surface.
3. Provide seal fittings for rigid galvanized steel conduit where indicated on the plans equal to Crouse-Hinds series EYSX. Provide PVC coated seal fittings for PVC coated rigid galvanized steel conduit installations.
4. Provide sealing compound and fiber by Crouse-Hinds or approved equal:
   a. Sealing Compound: Chico A.
   b. Sealing Fiber: Chico X.
5. Provide USA manufactured base materials for PVC coated fittings, hangers, straps, etc.

E. Provide compression type fittings and conduit bodies with matching material for electrical metallic tubing conduit.

F. Rigid aluminum conduit:

1. Provide thread type fittings and conduit bodies with matching material.
2. Provide standard electric conduit couplings
   a. Do not use pipe couplings or sleeves.
3. Provide full weight galvanized fittings.
4. Do not imbed aluminum conduit concrete containing chlorides, unwashed beach sand, sea water, or coral bearing aggregates.
5. Isolate from other metals with heat shrink tubing (Raychem or equal) or plastic-coated hangars.
6. Use strap wrenches for tightening aluminum conduit.
   a. Do not use Pipe wrenches, channel locks, chain wrenches, pliers, etc.
7. Clean and coat all threads on aluminum conduit and fittings with “No-Oxide” compound before using.
8. Completely cover Aluminum conduit installed in concrete or below grade s with two(2) coats of bitumastic paint.
9. Terminate aluminum conduit entering manholes and below grade pullboxes with grounding type bushings and connected to a ¾” x 10” copperclad rod with a #6 bare copper wire.
10. All risers from underground, concrete pads, floors, etc.
    a. Provide heat shrink tubing (Raychem or equal) from a point 1 foot-0-inch below bottom of slab or grade to a point not less than 6 inches above grade or surface of slab.

G. Provide hot-dipped, galvanized, watertight type fittings for liquid tight flexible conduit as manufactured by O-Z/Gedney or approved equal. Provide PVC coated fittings for PVC coated rigid galvanized steel conduit installations.

H. Conduit/Cable supports – properties:

1. Provide 316 stainless steel supports for all exposed metallic conduit as manufactured by Unistrut or approved equal.
2. Provide fiberglass supports for all exposed non-metallic conduit/cable as manufactured by Aickinstrut or approved equal.
3. Provide one-hole, PVC coated, malleable iron conduit straps with back spacer for all PVC coated rigid galvanized steel conduit.
4. Provide PVC coated beam clamps with uncoated 316 stainless steel nuts and bolts for all PVC coated rigid galvanized steel conduit.

I. All conduits to conform to the following specifications:

1. Exposed outdoor locations: Rigid aluminum conduit.
2. All conduit between control panel and wetwell and conduit to meter shall be 2" minimum
3. Installations underground: Schedule 40 PVC encased in 2" of concrete.
4. The conduit sleeves that extend into the wetwell from the area below the junction box shall be rigid aluminum conduit with PVC coating, heat shrink tubing or other approved coating such that the conduit is not in direct contact with the earth or concrete.

2.3 CONDUCTORS

A. Applicable standards:

1. NEMA WC 3: Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
2. NEMA WC 5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
3. UL 44 – 2002: Rubber-Insulated Wires and Cables.
4. UL 83 – 1999: Thermoplastic-Insulated Wires and Cables.
5. UL 854 – 2002: Service Entrance Cables.

B. Acceptable Manufacturers:

1. Okonite.
2. Pirelli.
3. Southwire.
4. Superior Essex.
5. Belden.

C. Conductor types:

1. Low voltage conductors (0 to 600V):
   a. Provide copper, 600V, 75ºC, Type XHHW.
   b. Provide stranded conductors for sizes #12 and larger.
   c. Provide same type of equipment grounding conductors as specified above.
2. Splices, Connections and Terminations (0 to 600V):
   a. For #8 AWG, use solderless pressure connectors with insulating covers for copper wire splices and taps. Use insulated spring wire connectors with plastic caps for #10 AWG and smaller.

b. Use insulated, mechanical connectors for copper wire splices and taps, #6AWG and larger, ILSCO or approved equal. Tape connectors with electrical tape to prevent moisture infiltration.

2.4 GROUNDING AND BONDING

A. Applicable standards:

1. UL 467-1998: Grounding and Bonding Equipment.
2. NFPA 70: National Electrical Code.
3. ANSI/IEEE 32: Requirements, Terms and Test Procedures for Neutral Grounding Devices.
4. IEEE 80: Guide for Safety in Substation Grounding.
5. IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
6. NETA ATS: Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Associates).

B. Grounding electrodes (Rod type):

1. Acceptable Manufacturers:
   a. LTV Copperweld.
   b. Line Material.
2. Material: Copper-clad steel.
3. Diameter: ¾".
4. Length: 10'-0"
5. Type: Sectional.

C. Mechanical connectors:

1. Acceptable Manufacturers:
   a. Burndy.
   b. Robbins.
   c. Harger.
2. Material: Bronze.

D. Exothermically-welded connections:

1. Acceptable Manufacturers:
   a. Cadweld.

E. Grounding Electrode Conductor:

1. Material: Bare, soft-drawn, stranded, copper.
2. Minimum size: Meet NEC 70 requirements.

F. Bonding Material:

1. Material: Bare, soft-drawn, stranded, copper.
2. Minimum size: Meet NEC 70 requirements.

G. Regulatory requirements:

1. Products: Listed and classified by UL as suitable for the purpose specified and indicated.

2.5 TRANSIENT VOLTAGE SURGE PROTECTION

A. Applicable standards:

1. UL 1449 3rd Edition - transient Voltage Surge Suppressor.
2. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits.
3. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
4. UL 67 - Panelboards (when mounted in panelboards).
5. UL 891 - Dead-Front Switchboards (when mounted in switchboards).
6. NEMA LS1 - National Electrical Manufacturer's Association – 1992, R2000.
7. MIL STD. 220A - Test Methods of Insertion Loss.

B. Acceptable Manufacturers:

1. Advanced Protection Technologies, Inc. (APT).
2. American Power Conversion Corporation (APC).
3. EFI Electronics.
4. Cutler Hammer.
5. Current Technology.
6. Leviton.

C. Surge Suppression Device (SPD):

1. Manufacturer's published UL 1449 Third Edition test results shall reflect SPD connected lead length of 6" or greater.
2. Provide SPD devices with a minimum EMI/RFI filtering of -50dB at 100 kHz using MIL-STD-220A methodology.
3. Provide a SPD unit with a short circuit current rating clearly marked and install at a point on the system where the available fault current is in excess of that rating.
4. Provide dedicated circuit breaker/disconnect for the SPD.
5. Provide SPD with one set of NO/NC dry contacts.
6. Provide SPD with protection-indicating LED's that are visible without opening enclosure.
7. Provide NEMA 4X SS Enclosure.
8. Provide SPD that meets or exceeds the following criteria:
   a. Maximum UL Suppression Voltage Rating (SVR) and Maximum Operating Voltage (MCOV):

System Voltage	**L-N**	**L-G**	**N-G**	**L-L**	**MCOV**
480/277V 3Ø	700	700	600	1200	320

   b. Minimum Surge Capacity and modes of protection:

SPD Location	**Modular Parallel Protection**	**Modes of Protection**	**RFI Filtering**	**Surge Capacity Per Mode**
Service Entrance ≤ 200A	No	L-N, N-G	No	120kA

.

2.6 ENCLOSED CIRCUIT BREAKERS

A. Applicable standards:

1. FS W-C-375: Circuit Breakers, Molded Case, Branch Circuit and Service.
2. NEMA AB 1-93: Molded Case Circuit Breakers and Molded Case Switches.
3. UL-489: Molded Case Circuit Breakers and Circuit Breaker Enclosures.
4. UL-50: Cabinets and Boxes.
5. NEMA-250: Enclosures for Electrical Equipment.

B. Acceptable manufacturers:

1. General Electric.
2. Square D.
3. Cutler-Hammer.
4. Siemens Energy & Automation.

C. Enclosed Circuit Breakers:

1. Enclosed Molded-Case Circuit Breaker: NEMA AB 1, lockable handle. Handle lockable in OFF position. Provide NEMA 4X stainless steel enclosure as indicated on Drawings.
2. Provide frame size, trip rating, number of poles, and auxiliary devices as indicated, interrupting capacity rating to meet available fault current, 35,000 RMS symmetrical amperes minimum, with appropriate listing when utilized for switching fluorescent lighting, heating, air-conditioning and refrigeration equipment.
3. Provide shunt-trip where indicated, 120V, 60Hz.
4. Provide interchangeable trip units, on circuit beakers 200 amps and larger, with trip units interchangeable within frame size.

2.12 MINI-POWER ZONES

A. Power centers shall consist of a primary breaker, a 480-120/240 volt or 480-120/208 volt transformer, a secondary breaker, and a distribution panelboard in a NEMA Type 3R stainless steel enclosure. Transformer and circuit breaker configuration and ratings shall be as indicated on the Drawings.

B. Transformers shall be self-air-cooled, dry type. Transformers shall have at least two full capacity voltage taps.

C. Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On", "Off", and "Tripped". Breakers and provisions for future breakers shall be provided in the quantities, poles, and ampere ratings indicated on the Drawings. Breakers shall be single pole, 20 amperes, except as indicated otherwise.

2.13 AUTOMATIC TRANSFER SWITCH (FURNISHED WITH GENERATOR)

A. Applicable standards:

1. UL 1008: Standard for Automatic Transfer Switches.
2. NFPA 70: National Electrical Code.
3. NFPA 99: Essential Electrical Systems for Health Care Facilities.
4. NFPA 110: Emergency and Standby Power Systems.
5. IEEE 446: IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
6. NEMA ICS10-1993: AC Automatic Transfer Switches.

B. Acceptable manufacturers:

1. Cummins/Onan
2. American Switch Company (ASCO).
2. Caterpillar.

C. The following specifications are based on the ACSO 300 series power transfer switch and should be considered as a minimum for features and quality.

D. Provide a stand-alone automatic transfer switch rated for 277/480 volt, 3-phase, 4-wire, wye, 60 Hz. Provide unit enclosures as shown on drawings with NEMA 4X stainless steel enclosure.

E. Provide switch as true double throw, mechanically held, electrically operated, utilizing a reliable field proven, single-solenoid operator with contacts easily accessible for inspection and preventive maintenance.

F. Provide 3 pole switch with solid neutral as shown on drawings.

G. Provide amperage and voltage ratings as shown on drawings.

H. Provide the following features:

1. Microprocessor Controls.
2. Optically isolated RS-485 Serial Communication Interface.
3. Open transition.
4. Selective Load Disconnect.
5. Engine Exerciser.
6. Solid Neutral.
7. Switch Position Lights.
8. Source Availability Lights.
9. Test Switch.
10. Time Delay Bypass Switch.
11. One (1) NO and one (1) NC Contacts Rated 10 amps 250VAC.
12. 60 or 50 Hz Selectable.
13. 3 phase or 1 phase Selectable.
14. Two (2) NO and two (2) NC Auxiliary Contacts.
15. Manual Transfer Option.
16. Strip Heater with Thermostat.
17. Serial Communication Board.
18. Deluxe Exerciser.
19. Time Delay Adjustments:
    a. Override Momentary Normal Outage - 1-3 Seconds.
    b. Transfer to Emergency - 0-5 Minutes.
    c. Override Momentary Emergency Outage - 4 Seconds.
    d. Retransfer to Normal - 1 Second – 30 Minutes.
    e. Unloaded Running Time Cool Down - 5 Minutes.
20. Voltage and Frequency Settings:
    a. Normal Source Voltage:
        1) PU - 90%-95%.
        2) DO - 70%-85%.
    b. Emergency Source Voltage:
        1) PU - 90%.
        2) DO - 75%.
    c. Emergency Source Frequency:
        1) PU - 95%.
        2) DO - 85%.

I. Switch manufacturer shall maintain a full time service center located within 150 miles of job site location for warranty and non-warranty repair.

2.14 CONCRETE SUPPORT FOUNDATIONS

A. Install each freestanding unit of electrical equipment on a 6" thick, 3000 PSI wire mesh reinforced concrete pad or curb with 36" clear on front side and 12" clear on all remaining sides, unless otherwise noted on drawings. Provide ¾" chamfer all sides.

2.24 MISCELLANEOUS MATERIALS

A. Provide support framing, channel and associated accessories of 316 stainless steel.

B. Provide and install equipment racks for panels as shown on the drawings and as described in the specifications, with the following as a minimum:

1. Provide cross members consisting of two (2) horizontal pieces of pre-drilled 1-1/2" x 1-1/2" mounting channel, manufactured by Kindorff or approved equal.
2. Attach all struts with spring-loaded nuts and associated hardware provided by manufacturer of strut, and specifically designed for this purpose.
3. Use 316 stainless steel stud nuts, manufactured by Kindorff or approved equal.
4. Support the mounting channel "cross bars" vertically by C-channels, 3" x 2" x 8'.
5. Mount channels a maximum of 24" apart, center-to-center, quantity as required to accommodate equipment.
6. Provide a foundation buried 36" underground and secured with 3000 PSI concrete pad, sized as shown on plans with a minimum of 36" clear walking space in front of control panels and 12" on sides and rear of panel.
7. Provide ¾" chamfer on all concrete edges.
8. Pump Control panel shall be stainless steel NEMA 4x manufactured by Control Interface or approved equal.

C. Provide 316 stainless steel (bolts, nuts, washers, U-bolts, anchors, threaded rods, etc.) attachment hardware.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Coordination:

1. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
2. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total Work.
3. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, provide required supports and wiring to clear the encroachment.

B. Data indicated on the Drawings and in these Specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the Drawings and Specifications should be used only for guidance in such regard.

C. Where outlets are not specifically located on the Drawings, locate as determined in the field by the Engineer. Where outlets are installed without such specific direction, relocate as directed by the Engineer and at no additional cost to the Owner.

D. Verify all measurements at the building. No extra compensation will be allowed because of differences between work shown on the Drawings and actual measurements at the site of construction.

E. Branch circuit wiring and arrangement of home runs have been designed for maximum economy consistent with adequate sizing for voltage drops and other considerations. Install the wiring with circuits arranged exactly as shown on the Drawings, except as otherwise approved in advance by the Engineer.

3.3 ELECTRICAL SERVICE

A. Electrical service is existing and will be upgraded by the utility. Coordinate any required outages with utility and Owner.

3.4 TRENCHING AND BACKFILLING

A. The Contractor shall perform all earthwork including excavation, backfill, bedding, compaction, shoring and bracing, grading and restoration of surfaces and seeded areas disturbed during the execution of the work as specified in other sections of these Specifications.

3.5 CONDUCTORS

A. Install no conductor smaller than #12 AWG unless otherwise indicated.

B. Provide copper conductors.

C. Provide conductors as shown on the plans or as specified herein.

D. Provide continuous wiring from outlet to outlet, identified by color and marked with size, grade and manufacturer.

E. Provide continuous wiring without joints, through pull boxes.

F. Provide minimum of #10 AWG conductors on branch circuits, which exceed 100’ at 120 volts and 200’ at 277 volts from panel to load center.

G. Terminate #14 AWG stranded conductors where indicated for control, using insulated compression-type spade lugs.

H. Terminate #12 AWG stranded conductors using insulated compression-type spade lugs.

I. Install an equal number of conductors for each phase of a circuit in the same raceway or cable.

J. The conductor lengths for parallel circuits must be made equal.

K. Neatly train and lace all wiring inside boxes, equipment, and panel boards.

L. Connect circuits sharing a common neutral to different phases regardless of the numbering.

M. Provide phase, neutral, and ground conductors as required to accommodate metering installed. Any additional conductors required for meter to function properly shall be installed at the Contractor's expense.

3.6 COLOR CODE AND MARKERS

A. Provide color-coding for #12 and #10 conductors as follows:

	277/480-Volt	**120/208(240)-Volt**
Phase "A"	Brown	Black
Phase "B"	Orange	Red
Phase "C"	Yellow	Blue
Neutral	White with Tracer	White
Ground	Green	Green

Mark all conductors #8 and larger and all feeders with plastic tape to match the above color-coding.

B. Mark all 480-volt equipment with red laminated plastic nameplates having one-half inch (1/2") engraved lettering, reading "DANGER 480-VOLTS". Attach plate to equipment with stainless steel screws.

C. Mark conductors within panelboards with self-sticking label bearing the number corresponding to the circuit number on the drawings. Connect these conductors to corresponding breaker in panel. Mark circuit numbers in outlet boxes only where color-coding is repeated by having two or more conductors of the same color.

D. Mark equipment, panelboards, cabinets, control devices, starters, switches, etc. by means of black, white core laminated nameplates having ¼" engraved lettering. Provide designations as indicated on the drawings. Attach plates to equipment with stainless steel screws.

3.7 SPLICES, CONNECTIONS, AND TERMINATIONS IN 600V. CONDUCTORS

A. Provide final connections and/or terminations for all wiring indicated on the electrical drawings and in this division of the specifications. Equipment supplied under other divisions of the specifications that require electrical connections under this division shall be provided with Engineer approved wiring and termination diagrams.

B. Splice only in accessible junction boxes.

C. Thoroughly clean wires before installing lugs and connectors.

D. Terminate spare conductors with electrical tape.

3.8 RACEWAYS AND FITTINGS

A. Apply cold galvanizing compound to all field-cut threads prior to installation.

B. In general, follow the raceway installation layout shown on the plans, however, this layout is diagrammatic only, and where changes are necessary due to structural conditions, other apparatus or other causes, make such changes without any additional cost to the Owner.

C. Cut all conduits square using a saw or pipe cutter and de-burr cut ends.

D. Install the conduit to the shoulder of fittings and couplings and fastened securely.

E. Use conduit hubs, or sealing locknuts, for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.

F. No more than the equivalent of three 90-degree bends may be installed between boxes.

G. Use conduit bodies to make sharp changes in direction, as around beams.

H. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2" size.

I. Avoid Moisture traps where possible; where moisture traps are unavoidable, there must be a junction box with drain fitting provided at the conduit low point. Use suitable conduit caps to protect installed conduit against entrance of dirt, concrete, plaster, mortar, and moisture.

J. Size all conduits for conductor type installed with ¾" being the minimum size conduit allowed.

K. Arrange conduit to maintain headroom and present a neat appearance.

L. Route any exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

M. Provide at all times a minimum of 6" clearance between conduit and piping and a 12" clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

N. Arrange all conduit supports to prevent distortion of alignment by conductor pulling operations.

O. Group conduits in parallel runs where practical using a conduit rack.

P. Make all underground conduit joints watertight by applying manufacturer's recommended thread compound. Thread compound must be conductive and be compatible with conduit and conductor-jacket material.

Q. Provide suitable pull string or #12 AWG insulated conductor in empty conduit, except sleeves and nipples.

R. Maintain minimum 12" clearance between all conduits containing signal circuits and conduits containing power circuits.

S. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.

T. Where conduit penetrates fire-rated walls and floors, the opening around the conduit must be sealed with UL listed foamed silicone elastomer compound.

U. Install exposed raceways either parallel or perpendicular to building walls.

V. Install raceways exposed on walls or free standing perpendicular to the floor.

W. Install exposed raceways on channel so as to provide a minimum spacing of ½" between raceway and the surface to which it is mounted.

X. Bends:

1. Where emerging from walls, ceilings, floor or concrete slabs, all conduit bends shall be made entirely within the structure (i.e.: the conduit shall emerge perpendicular to the surface and the bend shall be covered).
2. Make all 90-degree conduit turns with factory-bent, rigid galvanized steel, long radius elbows.
3. Utilize rigid galvanized steel, long radius elbows on all 90 degree conduit bends of 2" and larger.

Y. Install no metal conduit in contact with the earth or concrete slab unless protected with PVC coating or two coats of bitumastic paint.

Z. Provide necessary sleeves and chases where conduits pass through floors and walls, and provide other necessary openings and spaces, arranging for in proper time to prevent unnecessary cutting in connection with the Work.

AA. Perform cutting and patching in accordance with the provisions for the original Work.

BB. Sealing Conduit:

1. Install watertight conduit hubs on all conduits terminating in the top or sides of NEMA 3R, 4 or 4X enclosures.
2. Use a sealing locknut having an integral gasket on conduits terminating in the bottom of NEMA 3R, 4 or 4X enclosures.
3. Seal all conduits terminating in NEMA 3R, 4 or 4X enclosures with duct seal.
4. Seal watertight all conduits terminating in NEMA 6 or watertight rated enclosures.
5. Install sealing compound and fiber, per manufacturer's recommendation, in hazardous location conduit sealing fittings. Tighten plugs per manufacturer's recommended torque.

CC. Make motor lead connections and connections to other electrical equipment subject to vibration, or where indicated with flexible weatherproof type steel core conduit with wrapping and cover, factory assembled.

DD. Conduit installations in hazardous locations as defined by Article 500 of the NEC must conform to the special requirements of Articles 501, 502, and 503 of the NEC.

EE. Chapter 9 of the NEC shall apply unless larger raceways are specified.

FF. Ensure all threads are fully installed into fittings, boxes, enclosures and equipment per NEC and UL listing requirements to provide mechanical integrity, grounding and sealing. Provide fittings and adapters to ensure full length of conduit or conduit fitting threads are installed per code and listing requirements.

GG. Liquidtight flexible metal conduit shall be supported and securely fastened within 12 inches of each box, cabinet, conduit body or other conduit body termination and shall be supported and secured at intervals not to exceed 4-1/2 feet. Flexible metal conduit shall not exceed 6 feet in length except for luminaire connections as allowed per the NEC.

3.9 CONDUIT SUPPORTS

A. Seal all ends of non-metallic conduit support with manufacturer's recommended sealer.

B. Provide UL listed vinyl end caps for all ends of strut-type metallic conduit supports.

C. Provide all miscellaneous materials and supports as required by the NEC and these specifications to provide support for conduits, raceways, boxes, fittings and equipment.

3.10 GROUNDING AND BONDING

A. Ground and bond the electrical system and motors in accordance with Article 250 of the NEC.

B. Install electric bond around panels, cabinets, pull boxes, enclosures, etc., to incoming and outgoing sub-feed raceways by use of grounding type bushings.

C. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

D. Provide grounding electrode conductor(s) and connect as shown on drawings.

E. Bond together metal siding not attached to grounded structure; bond to ground.

F. Provide separate, insulated, green equipment grounding conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

G. Provide grounding type bushings for conduits 1" or larger and bond to ground bar or lug of enclosure.

H. Bond neutral and ground at service entrance only.

I. Provide exothermic-type weld grounding connections that are buried or otherwise normally inaccessible, and excepting specifically those connections for which access is required for periodic testing.

J. Make each grounding connection strictly in accordance with the manufacturer’s written instructions. Failure to follow manufacturer's written instructions shall result in immediate rejection.

K. Welds which have "puffed up" or which show convex surfaces, indicating improper cleaning, are not acceptable. Provide grounding connection devices compatible with the conductor(s) and/or rods being joined.

L. Maximum acceptable resistance to earth ground is 25 Ohms. Provide testing of the service entrance system ground and verify the resistance to earth ground is within the specified requirements. If the existing service entrance ground does not meet the specified requirements, install additional rod electrodes as required to achieve specified resistance to ground.

3.11 TRANSIENT VOLTAGE SURGE PROTECTION

A. Field Installed:

1. Connect SPD ground to service entrance grounding electrode conductor or to equipment grounding conductor if SPD located downstream of service entrance equipment. Confirm SPD installed per manufacturer’s recommendation.
2. Install SPD on the load side of the main circuit breaker.
3. Install SPD in accordance with manufacturer instructions.
4. Maximum lead length 12”.

3.12 POWER EQUIPMENT

A. Provide power and control wiring for motor starters and safety switches as shown on the Drawings.

B. Connections to miscellaneous building equipment:

1. Wire to, and connect to, all items of building equipment not specifically described but to which electrical power is required.
2. Coordinate as necessary with other trades and suppliers to verify types, numbers, and locations of equipment.

3.13 MOUNTING OF PANELS AND ELECTRICAL EQUIPMENT

A. Install all equipment per the manufacturer's recommendations and the contract drawings.

B. Mount floor and wall mounted equipment utilizing Type 316 stainless steel anchors and fasteners of the size and number recommended by the manufacturer.

C. Provide necessary hardware to secure the assembly in place.

D. Provide 316 stainless steel fasteners for all other installation types.

E. Provide filler plates for unused spaces in panelboards and switchboards.

F. Provide typed circuit directory with protective plastic sleeve secured to inside of panel door for each branch circuit panelboard.

G. Measure steady state load currents at each switchboard and panelboard feeder. Should the voltage difference measured at the equipment between any two phases exceed 20 percent, rearrange circuits to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

3.14 TESTING AND INSPECTION

A. Provide personnel and equipment, make required tests, and secure required approvals from the Engineer and governmental agencies having jurisdiction.

B. Provide written notice to the Engineer adequately in advance of each of the following stages of construction:

1. In the underground condition prior to placing concrete floor slab, when all associated electrical work is in place.
2. When all rough-in is complete, but not covered.
3. At completion of the work of this Section.

C. When material and/or workmanship are found to not comply with the specified requirements, replace items within three days after receipt of notice at no additional cost to the Owner.

D. Provide a qualified field serviceman, representing the manufacturer of each piece of major electrical equipment, to make proper and complete adjustments of all adjustable devices, load switches, etc. after final installation and completion of all field wiring. Verify and approve all connections prior to any initial or test operation of equipment. Submit confirmation in writing by the manufacturer's authorized representative of said services to the Engineer.

3.15 HAZARDOUS LOCATIONS

A. Wiring and equipment in hazardous locations, as defined by the NEC, shall conform to the special requirements of the NEC, unless otherwise indicated or specified.

3.16 CLEANING AND PAINTING

A. Collect and remove from the premises all debris, scraps and other waste material after completion of work.

B. Tamp and level all trench work.

C. Remove excess dirt and debris, when and as directed by the Engineer.

D. Thoroughly clean all electrical equipment, lighting fixtures, exposed conduit, enclosures and boxes of all foreign materials and paint in accordance with Section 09900 of these Specifications unless noted or directed otherwise.

E. Clean any exposed threaded area of raceway of cutting oil and paint with a cold galvanizing compound prior to final finish painting.

3.17 ELECTRIC EQUIPMENT BY OTHERS

A. The equipment manufacturer shall furnish all motors for equipment.

B. Verify voltage, dimensions, extent, type, etc. of this and all other such electrical equipment.

C. Furnish and install all electrical supply and control equipment and material required to put all the items in proper operative condition.

D. Refer to other sections of these specifications for verification of other equipment and devices requiring electrical connections, wiring and devices not included in this section.

E. Refer to other drawings for details not indicated on the electrical drawings.

F. Prior to connecting any piece of such equipment, check the nameplate data against the information shown on the drawings and call to the immediate attention of the Engineer any discrepancies discovered.

3.18 PROJECT COMPLETION

A. Test all 600-Volt service entrance and feeder wiring using an instrument, which applies a voltage of approximately 500 volts DC to provide a direct reading of resistance.

B. Perform test on ground system utilizing Fall-Of-Potential method. Meg grounding systems to measure ground resistance, and provide not more than 25 ohms resistance, adding ground rods as necessary to achieve that level.

C. Conduct all tests in presence of Engineer or his representative. Identify and properly record all readings. Submit readings to Engineer for acceptance.

D. Measure voltages as directed by the Engineer and report to him these values.

E. Provide entire system free from all shorts and grounds.

F. Fully comply with local and national codes for equipment bonding and grounding.

G. Test system in the presence of the Engineer and operate to his complete satisfaction in accordance with true intent of plans and specifications. Defray cost of all adjustments necessary to bring system up to standards set forth by Contract Documents at no additional cost.

H. Thoroughly indoctrinate the Owner's operation and maintenance personnel in the contents of the operations and maintenance manual.

I. On the first day the facility is in operation, for at least eight (8) hours at a time directed by the Engineer, provide a qualified foreman and crew to perform such electrical work as may be required by the Engineer.

3.19 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for this work and all costs for same shall be included in the price bid for the work to which it pertains.

END OF SECTION

APPENDIX 1

Report of Geotechnical Exploration
Georgetown Wet Well
Georgetown, South Carolina
S&ME Project No. 213382

PREPARED FOR:
The Wooten Company
1830 Marion Street, Suite A
Columbia, South Carolina 29201

PREPARED BY:
S&ME, Inc.
1330 Highway 501 Business
Conway, SC 29526

May 11, 2021

May 11, 2021

The Wooten Company
1830 Marion Street, Suite A
Columbia, South Carolina 29201

Attention: Aaron Marshall

Reference: **Report of Geotechnical Exploration**
Georgetown Wet Well
Georgetown, South Carolina
S&ME Project No. 213382

Dear Mr. Marshall:

S&ME, Inc. has completed the subsurface exploration for the referenced project after receiving signed authorization to proceed from you on April 15, 2021. Our exploration was conducted in general accordance with our Proposal No. 213382, dated April 5, 2021.

The purpose of this study was to characterize the surface and subsurface soils on the proposed site, and to provide recommendations for site preparation, earthwork, and foundation support for the proposed structures.

This report describes our understanding of the project, presents the results of the field exploration, laboratory testing, and engineering analysis and discusses our conclusions and recommendations based on these considerations. S&ME, Inc. appreciates this opportunity to be of service to you. Please call if you have questions concerning this report or any of our services.

Respectfully submitted,

S&ME, Inc.

Kara Fugate, E.I.T.
Geotechnical Staff Professional

SOUTH CAROLINA
S&ME, INC.
No. C00473
CERTIFICATE OF AUTHORIZATION

Ronald P. Forest, Jr., P.E.
Senior Project Engineer
SC Registration No. 21248

SOUTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
No. 21248
5/11/21
RON FOREST JR.

Introduction

The purpose of this exploration was to obtain subsurface information to allow us to characterize the subsurface conditions at the site and to develop recommendations concerning grading, foundation design, and other related construction issues. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations.

A site plan showing the approximate test locations is included in Appendix I. The boring logs, a discussion of the field exploration procedures, and a legend to soil classification and symbols in included in Appendix II.

Project Information

Project information was provided in a telephone conversation between Mr. Aaron Marshall (The Wooten Company) and Ron Forest, Jr. (S&ME) on April 1, 2021. Additional information was provided by Mr. Marshall in a follow-up email on April 1, 2021. Attached to the email was an undated and untitled sheet drawing by The Wooten Company.

The drawing provided by Mr. Marshall in an email showed the layout, plan and sections of a proposed wet well pump to be installed on a lot located on Asbury Street in Georgetown, South Carolina (33°20'26.3"N 79°17'27.7"W), directly between the existing fenced-in pump station and the bay. A site vicinity map is included as Figure 1 in Appendix I.

Based on the information provided we understand that the new wet well will have a 12-ft diameter foundation with a 6 inch or 1 foot extension footer placed approximately 18 feet below the existing ground surface. We understand that this new well is needed because the existing wet well is not sufficient. The old wet well will remain in place and pass contents to the new well via pipes.

Exploration Program

Field Exploration

On April 27, 2021 and April 30, 2021, representatives of S&ME, Inc. visited the site. Using the information provided, we performed the following tasks.

1. We performed a site walkover, observing general features of topography, existing structures, ground cover, and surface soils at the project site.
2. We established the location of one (1) discrete test (B-1) at which a standard penetration test boring was advanced. The approximate test location is shown on the test location sketch included in Figure 2 of Appendix I. The boring was advanced to approximately 40 feet below the surface.
3. Drilling was conducted using the mud rotary method and at standard spacing samples were collected using the split spoon method.
4. Groundwater levels were measured after a period of 24 hours had passed from drilling the boring. The boring was then backfilled to the original ground surface with soil cuttings.

A brief description of the field exploration procedures performed, as well as a soil classification legend, and the boring logs are attached in Appendix II.

♦ Site and Surface Conditions

The area we explored was grassed, and located just outside of the enclosure for the existing wet well system. There is a pile of gravel toward the site entrance and trees surrounding the site measuring over 30 feet tall. Ponded water was not observed on the site surface at the time of our exploration.

Topography

It was not within the scope of work to conduct surveying on site and we were not provided with a topographic survey of the site. For the purposes of our boring logs and interpreted subsurface soil profile the ground surface elevation has been set to 6.0 feet as interpreted from the schematic provided by the client.

Local Geology

The site is located in the Coastal Plain Physiographic Region of South Carolina. This area is dominated topographically by a series of relic beach terraces, which progressively increase in surface altitude as they proceed inland. These terraces have been extensively mapped and correlated over wide areas. The terraces have been exposed by uplifting of the local area over the last 250,000 years. Since the terraces are relatively young features, they exhibit only minor surface erosion and can be traced large distances on the basis of surface elevation. The soil profile typically consists of a thin veneer of terrace deposited sediments of the Socastee Formation. Beneath this upper, relatively young formation, geologic mapping and soils encountered within borings indicate the Penholoway Formation, which is characterized by sands, silts and clays often with shell fragments and cemented materials, laid down during the Lower Pleistocene Epoch approximately 760,000 years ago.

Below the Penholoway Formation, soils are mapped as sands and silts of the Black Mingo Formation. These are Paleocene-age (early Tertiary) materials that were laid down approximately 55 to 65 million years ago. Our boring did not penetrate the Black Mingo Formation.

♦ Subsurface Conditions

The generalized subsurface conditions at the site are described below. For more detailed descriptions and stratifications at the test location, the respective boring log should be reviewed in Appendix II.

Interpreted Subsurface Profile

An interpreted subsurface cross-sectional profile of the site soils is attached as Figure 3 in Appendix I to illustrate a general representation of the subsurface conditions within the proposed construction adjacent to the proposed wet well.

The strata indicated in the profile are characterized in the following section. Note that the profile is not to scale and was prepared for illustrative purposes only. Subsurface stratifications may be more gradual than indicated, and conditions may vary between test locations.

Soils presented on the profile were grouped into several general strata and substrata based on estimated physical properties derived from the borings and the recovered samples. The strata encountered are labeled I through IV on the soil profile to allow their properties to be systematically described.

Description of Subsurface Soils

This section describes subsurface soil conditions observed at the site.

Topsoil

At the ground surface, our boring encountered approximately 3 inches topsoil. Topsoil thickness may vary across the site.

Stratum I: Upper Clayey Sands

Underlying the existing topsoil, approximately 3 feet of clayey sand (USCS Classification "SC") was encountered. This sand was orange and grey and wet upon recovery. The SPT N-values within the clayey sand was measured to be 4 blows per foot (bpf). This indicates a very loose relative density.

Stratum II: Intermediate Sands

Beneath the upper clayey sands of Stratum I, a zone of loose, saturated, poorly graded sand with silt (SP-SM) was encountered to a depth of approximately 17 feet below the surface. The SPT N-value within these soils ranged from 6 to 8 bpf, indicating a loose relative density. Upon recovery these soils were grey and wet.

Stratum III: Lower Sands

Beneath the poorly graded sands with silt of Stratum II, the boring encountered a poorly graded sand (SP) to a depth of approximately 24 feet below the surface. These soils were observed to be wet and dark grey. An SPT N-value of 4 bpf was measured, indicating a very loose relative density within the stratum.

Stratum IV: Cemented Cohesive Soils

Beneath the poorly graded sands of Stratum III, a stratum of cemented sandy silts (ML) was encountered to the maximum exploration depth of 40 feet below the surface. Strongly cemented zones were first encountered at a depth of approximately 24 feet below the surface. The SPT N-values in this cemented soil zone ranged from 41 bpf to greater than 100 bpf, indicating a hard to very hard consistency within the silts. The soils within this stratum were shades of gray, and were saturated upon recovery. These silts were also strongly reactive to dilute hydrochloric acid when tested in the laboratory. This strength of reactivity indicates significant quantities of calcium-carbonate marine materials resulting in the natural cementation of particles.

Groundwater

At the time of drilling the encountered water level was measured at a depth of 2 feet. After a period of approximately 24-hours the water level was measured to be 3 feet below the surface and the boring caved at a depth of 5 ½ feet below the surface. Groundwater levels can fluctuate seasonally and can be influenced by site

construction activities. Groundwater levels may fluctuate seasonally at the site, being influenced by rainfall variation and other factors. Site construction activities can also influence groundwater elevations.

♦ Seismic Site Class and Design Parameters

As of January 1, 2020, the 2018 edition of the International Building Code (IBC) has been adopted for use in South Carolina. We classified the site as one of the Site Classes listed in IBC Section 1613.3, using the procedures described in Chapter 20 of ASCE 7-16.

Evaluation of the Potential for Site Class F Conditions

Seismic-induced ground shaking at the foundation is the effect taken into account by seismic-resistant design provisions of the International Building Code (IBC). Other effects, including landslides and soil liquefaction, must also be considered.

The initial step in site class definition is to check for the four conditions described for Site Class F, which would require a site specific evaluation to determine site coefficients F_A and F_V. Soils vulnerable to potential failure include the following: 1) quick and highly sensitive clays or collapsible weakly cemented soils, 2) peats and highly organic clays, 3) very high plasticity clays, and 4) very thick soft/medium stiff clays. These soils were not evident in the borings.

One other determining characteristic, liquefaction potential under seismic conditions, was assessed. Soils were assessed qualitatively for liquefaction susceptibility based on their age, stratum, mode of deposition, degree of cementation, and size composition. This assessment considered observed liquefaction behavior in various soils in areas of previous seismic activity.

Our analysis, which is more fully described below, indicates that some liquefaction of subsoils appears likely to occur at this site in the event of the design magnitude earthquake. Testing indicates that some of the sands between depths of about 3 feet to 24 feet lie beneath the water table, appear to contain relatively few fines, and exhibit relatively low density characteristics.

- The wet well is proposed to bear at a depth of 18 feet below the surface, which means that if liquefaction of the soil between depths of 18 feet and 24 feet below the surface occurs during seismic shaking, it could result in the loss of direct bearing support for the well foundation (e.g. an effective soil bearing capacity of zero).

We consider the soil conditions within this site to be liquefaction prone; and therefore, seismic Site Class F conditions apply to this site.

Selection of Seismic Site Class

Based upon the weighted SPT N-values, this site would typically be categorized as Site Class D if the liquefaction potential in the subsoils were not significant. This recommendation is provided based on the recorded N-values, which average greater than 15 bpf when measured to a depth of 40 feet and extrapolated to a depth of 100 feet. However, Site Class D cannot be used for design if Site Class F conditions apply *unless* the structure meets the

requirements of the exception described in ASCE 7-16 Chapter 20.3.1(1), which requires that the fundamental period of vibration of the structure be less than 0.5 seconds. Most subterranean structures typically do have a fundamental period of vibration of less than 0.5 seconds and would therefore qualify under this exception. This can be confirmed by the design structural engineer. Our analysis of the potential for Site Class F conditions is further discussed below. .

Liquefaction of Bearing Soils

Liquefaction of saturated, loose, cohesionless soils occurs when they are subjected to earthquake loading that causes the pore pressures to increase and the effective overburden stresses to decrease, to the point where large soil deformation or even transformation from a solid to a liquid state results. Earthquake-induced ground surface acceleration at the site was assumed from the building code design peak ground acceleration of 0.36g.

Liquefaction Potential Index (LPI)

To evaluate liquefaction potential, we performed analyses using the data obtained in the borings, considering the characteristics of the soil and water levels observed in the boring. The liquefaction analysis was performed based on the design earthquake prescribed by the 2015 edition of the International Building Code, the "simplified procedure" as presented in Youd et al. (2001), and recent research concerning the liquefaction resistance of aged sands (Hayati & Andrus, 2008; Andrus et al. 2009; Hayati & Andrus, 2009).

To help evaluate the consequences of liquefaction, we have computed the Liquefaction Potential Index (LPI), which is an empirical tool used to evaluate the potential for liquefaction to cause damage. The LPI considers the factor of safety against liquefaction, the depth to the liquefiable soils, and the thickness of the liquefiable soils to compute an index that ranges from 0 to 100. An LPI of 0 means there is no risk of liquefaction; an LPI of 100 means the entire profile is expected to liquefy. The level of risk is generally defined below.

- ***LPI < 5*** – surface manifestation and liquefaction-induced damage not expected.
- ***5 ≤ LPI ≤ 15*** – moderate liquefaction with some surface manifestation possible.
- ***LPI > 15*** – severe liquefaction and foundation damage is likely.

The average LPI for this site was calculated to be greater than 15, which indicates a severe risk of damage due to liquefaction, and indicates that foundation damage is likely to occur during the ground shaking associated with the design magnitude earthquake. Therefore, Site Class F applies to this site.

Seismic Design Coefficients for Site Class D

Selection of the base shear values for structural design for earthquake loading is the responsibility of the structural engineer. However, for the purpose of evaluating seismic hazards at this site, S&ME has evaluated the spectral response parameters for the site using the general procedures outlined under the 2018 International Building Code Section 1613.3. This approach utilizes a mapped acceleration response spectrum reflecting a targeted risk of structural collapse equal to 1 percent in 50 years to determine the spectral response acceleration at the top of seismic bedrock for any period. The 2018 IBC seismic provisions of Section 1613 use the Seismic Hazard Maps published by the National Earthquake Hazard Reduction Program (NEHRP) to define the base rock motion spectra.

The Site Class is used in conjunction with mapped spectral accelerations S_S and S_1 to determine Site Amplification Coefficients F_A and F_V from tables 11.4-1 and 11.4-2 in section 11.4.7 of ASCE 7-16. For purposes of computation, the Code includes probabilistic mapped acceleration parameters at periods of 0.2 seconds (S_S) and 1.0 seconds (S_1), which are then used to derive the remainder of the response spectra at all other periods. The mapped S_S and S_1 values represent motion at the top of seismic bedrock, defined as the Site Class B-C boundary. The surface ground motion response spectrum, accounting for inertial effects within the soil column overlying rock, is then determined for the design earthquake using spectral coefficients F_A and F_V for the appropriate Site Class.

The design ground motion at any period is taken as 2/3 of the smoothed spectral acceleration as allowed in section 1613.3.4. The design spectral response acceleration values at short periods, S_{DS}, and at one second periods, S_{D1}, are tabulated below for the unimproved soil profile using the IBC 2018 criteria.

The 2018 IBC specifically references ASCE 7-16 for determination of peak ground acceleration value for computation of seismic hazard. Peak ground acceleration is separately mapped in ASCE 7-16 and corresponds to the geometric mean Maximum Credible Earthquake (MCE_G). The mapped PGA value is adjusted for site class effects to arrive at a design peak ground acceleration value, designated as PGA_M. The seismic design coefficients for this site based on our findings are shown in Table 1 below.

Table 1 – Seismic Design Coefficients

Criteria	Seismic Site Class	S_S	S_1	S_{DS}	S_{D1}	PGA_M	Seismic Design Category
2018 IBC	F*	0.49	0.16	0.46	0.24	0.36	D

* Use Site Class D based on the "exception" listed in ASCE 7-16, Section 20.3.1 (1.)

Seismic Design Category

For a structure having a Risk Category classification of I, II, or III, the S_{DS} and S_{D1} values obtained are consistent with "Seismic Design Category D" as defined in section 1613.3.5 of the IBC.

♦ Conclusions and Recommendations

The conclusions and recommendations included in this section are based on the project information outlined previously and the data obtained during our exploration. If the construction scope is altered, the locations of the structures changed, or if conditions are encountered during construction that differ from those encountered in the borings, then S&ME, Inc. should be retained to review the following recommendations based upon the new information and make any necessary changes.

Based upon the results of our exploration and our past experience with similar soils in the site vicinity, the site appears generally adaptable for the proposed development. Based on the assumed loading and settlement tolerances, it appears that shallow foundation support is feasible for this area at a depth of 18 feet if the wet well is considered a sacrificial structure in the event of an earthquake. Due to the potential total loss of bearing capacity of the soils beneath the well footing and the down drag of the soils that will potentially liquefy above the

bearing zone, the wet well is likely to experience an excessive amount of settlement due to liquefaction in the event of the design magnitude earthquake.

Seismic Considerations

We have estimated that up to about 5 inches of total settlement under the proposed bottom of wet well, and up to 9.5 inches of total settlement from the surface may occur in the event of the design magnitude earthquake. Based on discussions at the time of our proposal we understand that the structure may not fall within the seismic design requirements of the Building Code. This is likely a Risk Category I, II, or III (non-essential facilities) structure, so the 2018 IBC requires that the design account for (or mitigate) the effects of liquefaction in order to prevent structural collapse and the potential for loss of life.

If the new wet well is not considered a sacrificial structure in the event of an earthquake, then densification of the soils using a vibroprobe may be considered as one possible means of compacting the soils beneath the proposed footing at a depth of 18 feet to mitigate the liquefaction risk. However, using a vibroprobe this close to the existing wet well could potentially damage the existing well, so those risks would need to be further considered and evaluated.

Surface Preparation

The following recommendations are provided regarding site preparation and earthwork:

The site should be stripped of organic topsoil. After the stripping operation is complete, densify the bearing surface with the largest available roller that will fit in the space. Following densification, the densified subgrade surface should be proofrolled by the contractor under the observation of the Geotechnical Engineer (S&ME) by making repeated passes with a fully-loaded dump truck or equipment with similar weight and tire pressures. The proofrolling should be conducted only during dry weather. Areas of rutting or pumping soils indicated by the proofroll may require selective undercutting or further stabilization prior to any new fill placement or slab construction, as determined by the Geotechnical Engineer. This should be done prior to construction of the wet well.

Excavation Considerations

1. Subsurface water was observed and estimated to be approximately 3 feet below the existing ground surface at the time of our exploration. Where subsurface water is encountered during excavation, the water level should be maintained at least 2 to 3 feet below excavation bottoms to help maintain bottom stability.

    A. Soils at depths of about 18 feet, at the likely excavation bottom, consist of saturated, low fines content sands. Since these soils are relatively cohesionless, and are located about 15 feet below the estimated subsurface water level, it is likely that these soils would experience hydraulic uplift failure (heave) in the bottom of the excavation unless the water table is temporarily lowered by some means.
    B. If interlocked sheet piles are used to brace the excavation and are socketed into the hard sandy silts encountered between depths of about 24 and 40 feet, and the exterior water sources are completely cut off from the excavation, then it may be feasible to construct the excavation without an exterior

dewatering system. In such an approach, one possible method of temporarily drawing down the water level during construction may be to excavate a temporary sump hole within the sheet pile enclosed area, and use sump pumping to maintain the water level inside the excavation at least 2 to 3 feet below the bottom of the excavation to help reduce hydraulic uplift. This may require the installation of several "whistles", or slotted pipes embedded in gravel below grade.

C. If the water volume is too great for sumps or whistles to control, or if the pile interlocks are not sufficiently water tight, it may become necessary to treat the soil zone around the sheetpiles in an attempt to prevent water from infiltrating the excavation. Injection of polyurethane into the ground is one method that has been used in the past to seal the soil around sheetpiled excavations. Another possibility may be to to install a vacuum-assisted pumping system, also known as vacuum wellpoints. It was beyond the scope of this analysis to analyze the effectiveness of or to perform the design of specific dewatering systems.

D. Managing the effects of dewatering on nearby structures should be evaluated and are the responsibility of the designers and constructors of any dewatering system. There have been past events within Georgetown County where dewatering has jeopardized the integrity of adjacent structures due to generalized water table drawdown resulting in the collapse of subsurface voids in the soil profile.

2. All excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards for Type C soils. The contractor is solely responsible for site safety. This information is provided only as a service, and under no circumstances should S&ME be assumed to be responsible for construction site or excavation safety.
3. All of the sandy soils encountered within our boring below a depth of 3 feet are subject to collapse due to saturated conditions below the water table, exhibit little to no apparent cohesion, and relatively low SPT penetration resistance N-values indicating loose to very loose density materials. Excavations will have to be temporarily stabilized (braced or shored) in order to remain open, because these soils are not expected to hold an open cut face on their own. These upper sandy soils are also estimated not to be competent end-bearing materials for sheet piling. Sheet piles would need to toe into the cemented silty sands of Stratum IV.
4. Based on the provided drawing, we understand that at least 1 foot of washed, clean, crushed gravel, such as SCDOT No. 57 stone may provide a stable working surface upon which to compact backfill. More than 1 foot of gravel may be needed if the excavation bottom is particularly soft or unstable, or if the groundwater is not adequately controlled.
5. Design of the specific excavation bracing systems was beyond the scope of our work. Additional driving depth or internal bracing may be needed to provide global stability of the excavation bracing system, which was not analyzed as part of this work.

Uplift Resistance and Anchorage

Based on previous projects of similar nature we have assumed that the precast wet well will likely have an inside diameter of 10.67 ft with minimum 8 in.-thick walls and a base that is a minimum of approximately 14 ft x 14 ft x 0.5 ft. Considering these preliminary wet well dimensions and an assumed groundwater depth of approximately 3 ft based on the exploration, we conclude that the weight of the wet well structure is sufficient to resist the estimated buoyancy without the need for additional foundation anchors. If the wet well geometry and

dimensions change from these assumptions, or if the design groundwater level is shallower than 3 ft, we should be given the opportunity to confirm that this conclusion is still applicable based on final wet well dimensions.

Excavation Bracing Design Parameters

The following sections provide our geotechnical recommendations for temporary sheet pile design parameters and other earth retaining structures, including soil strength parameters for use during design of earth-retaining systems. Based on the subsurface conditions at the site and the anticipated excavation depth, we assume interlocking steel sheet piles, possibly coupled with horizontal anchors or internal bracing, may be used during the performance of the work. The following sections provide our geotechnical recommendations for use in designing these systems.

Soil Strength Parameters

The recommended soil parameters for use in designing piles are presented in Table 2 below. Due to the sandy, cohesionless characteristics of these soils, the "undrained" or short-term conditions and "drained" or long-term soil strength parameters are similar, although the unit weight of the material inside the excavation may vary as the water table is drawn down. The values presented in Table 2 are based on the SPT borings performed during our geotechnical exploration, and our experience with the soils in this area.

Table 2 – Soil Strength Parameters

Stratum	Depth (feet)	USCS Soil Classification	Effective Soil Internal Friction Angle (deg.)	Effective Cohesion (psf)	Moist Unit Weight (pcf)	Buoyant Unit Weight (pcf)	Soil/Steel Wall Interface Friction Angle (deg.)
I	0 – 3	SC	26	0	115	53	14
II	3 – 17	SP-SM	28	0	115	53	17
III	17 – 24	SP	25	0	115	53	17
IV	24 – 40	ML	28	1,100	120	58	11

Earth Pressure Coefficients

Earth-retaining structures must be capable of resisting any lateral earth pressures that will be imposed on them. If the walls are relatively rigid and structurally braced against rotation, they should be designed for a condition approaching the "at-rest" lateral earth pressure.

In the event that the wall is free to deflect, such as for walls that are not restrained or rigidly braced, the "active" earth pressure conditions would be applicable for design. Cantilevered retaining walls or sheet piles are normally designed to yield (rotate outward) under the influence of this pressure, which is termed the "active" case.

The lateral earth pressure coefficients in Table 3 are recommended for use during the design of earth-retaining systems at this site.

Table 3 – Static and Seismic Lateral Earth Pressure Coefficients

Stratum	Depth (feet)	USCS Soil Classification	Static Lateral Earth Pressure Coefficients			Seismic Lateral Earth Pressure Coefficients (PGA = 0.36g)		
			At-Rest Coefficient (K_o)	Active Coefficient (K_a)	Passive Coefficient (K_p)	At-Rest Coefficient (K_o)	Active Coefficient (K_a)	Passive Coefficient (K_p)
I	0 – 3	SC	0.56	0.39	2.56	0.78	0.52	2.26
II	3 – 17	SP-SM	0.53	0.36	2.77	0.73	0.48	2.46
III	17 – 24	SP	0.58	0.41	2.46	0.81	0.54	2.17
IV	24 – 40	Cemented ML	0.36	0.22	4.60	0.47	0.31	4.21

The given earth pressure coefficients (K_o, K_a, and K_p) in Table 3 assume a level backfill and a frictionless wall. In Table 2, we provided soil/steel wall interface friction values which may be used in conjunction with the earth pressure coefficients presented in Table 3 to evaluate soil-on-steel interface friction. We note that at the time of our boring, the water level was measured approximately 3 feet below the existing ground surface. However, this water level can fluctuate with construction in the area and with the adjacent bay levels and drawdown of the water table that is performed during construction.

Water Effects on Earth Pressures

Assuming a dewatering system is **not** used outside the excavation, the temporary excavation bracing system (sheet pile) walls should be designed to withstand hydrostatic pressure outside the wall. Additionally, the walls should be designed to support any applied surcharge or structural loads. Lateral earth pressures arising from surcharge loading (including construction equipment) and slopes above the walls should be added to the earth pressures given above in Table 3 to determine the total lateral pressure.

Preliminary Sheet Pile Design Considerations

The design engineer will need to check bending moments in the sheet piles against allowable values for the given sheet pile configuration chosen. The actual embedment depth should be determined by the wall designer after all

variables are known. If the wall system is designed with internal bracing or external soil anchors, then wall deflections, moments, and the required penetration depths may vary from these assumptions.

Pile section size should be determined based on driving conditions. Typically, a penetration depth of 1.5 times the exposed wall portion is required to provide suitable resistance for a cantilever type system; however, internal bracing or an external tie-back system may need to be installed to sufficiently brace the excavation.

The designer and builder should also recognize that due to the very hard condition of the Stratum IV soils, the depth of penetration that can be achieved into the very hard silts may be somewhat limited, particularly if lightweight or vibratory driving equipment is used to install the sheet sections.

Again, this information is intended to be preliminary, and is only intended to be used for planning purposes and to provide some initial guidance regarding the geotechnical parameters that may need to be considered by the wall designer during wall design. Design of the excavation bracing system was not in our scope of services.

Construction Considerations

Sandy soils such as those penetrated by our borings may exhibit "moderate" to "high" infiltration rates (in the range of 2 to 7 inches per hour) and the flow of subsurface water into excavations may be relatively quick. Therefore, the excavation may require the use of sumps with pumps inside the perimeter of the excavation and/or other more aggressive methods such as a vacuum well point system at regularly spaced intervals to control water levels. The water level should be maintained at least 2 to 3 feet below the bottom of the excavation to mitigate bottom instability (heave). Water levels should be expected to fluctuate, and the possibility of groundwater fluctuations should be considered when developing the design and construction of the excavation support system.

Caution should be taken to avoid lowering the water level beneath any adjacent structures because this could result in new settlement that could lead to damage of these structures. The effects of dewatering on nearby structures should be addressed by the designer of the dewatering system, if applicable. It was beyond the scope of this exploration to analyze or design specific dewatering systems for this project.

Risk of Early Refusal to Driving

Based upon the dense SPT N-values that we measured in Stratum IV, refusal of the sheetpiles to advance to the desired penetration depth ("early refusal") is a risk. For this reason, we recommend that the piles be driven into place using a high energy impact hammer rather than vibrated into place. Also, installing steel sheeting through or into very hard silts such as those encountered during our subsurface exploration may cause deformation or damage to lighter (lower modulus) pile sections. Where the final design dictates that piles must penetrate into any material with a medium dense or greater relative density, consideration should be given to sizing the piles for drivability. In some cases, the piles may need to be over-designed with respect to support of the lateral earth pressures in order to facilitate driving through dense or very hard materials without compromising the structural integrity of the piles and their interlocks.

We recommend that several test piles be installed to verify that the specified pile section and hammer are sufficient.

Fill Placement and Compaction

Controlled fill material used at the surface should be cohesionless, non-plastic sandy soil containing no more than 15 percent fines (material passing the No. 200 sieve) by weight and having a maximum dry density of at least 100 pounds per cubic foot (pcf) as determined by a laboratory standard Proctor moisture density relationship test (ASTM D698). The soil should contain less than 5 percent organics or other deleterious matter. All fill should be placed in uniform lifts of 10 in. or less (loose measure) and compacted to at least 98 percent of the standard Proctor maximum dry density (ASTM D 698).

Fill placement should be observed by a qualified Materials Technician working under the direction of the Geotechnical Engineer. In addition to this visual evaluation, the Technician should perform a sufficient number of in-place field density tests to confirm that the required degree of compaction is being attained. At least one density test per each 5,000 square feet per lift of fill should be performed for large area fills.

Shallow Foundations

Since the structure will be embedded at a depth of 17 ½ feet below the surface with a concrete footer and a 1 foot thick gravel bed, the shallow foundation is expected to be constructed within a saturated very loose sand with very little fines, and close to the cemented zone of silts that begins at a depth of about 24 feet. The lower soil profile of the site appears generally suitable to support the proposed wet well with shallow foundations considering static loading conditions and the assumed maximum column. The design engineer needs to confirm that the assumed maximum loads are correct; if actual loads are higher, we should be notified and given a reasonable opportunity to reconsider these recommendations, because it could result in changes to the estimated available bearing capacity and static settlement magnitudes. It is important to note that without the compaction of these very loose soils using a vibroprobe the well should be considered a sacrificial structure in the event of an earthquake.

The following recommendations are provided for the design and construction of shallow foundations at this site for the proposed wet well:

1. Provided that the recommendations in this report are implemented, a net available bearing pressure of up to 2,500 psf may be used for design of individual spread footings.
2. The need for overexcavation in the footing excavations should be a field decision made in consultation with the Geotechnical Engineer at the time of construction based upon the conditions observed.

    A. We understand that the drawing calls for 12 inches of gravel base under the proposed footing. Due to the saturated sands encountered at the test location, it may become necessary to over-excavate and replace this saturated loose material where it is encountered beneath individual footings. We recommend that the over-excavations be backfilled with a clean, coarse gravel such as SCDOT No. 57 or No. 67 stone, because it is relatively insensitive to moisture and does not need to be compacted in thin lifts as a soil backfill would. Another option besides coarse gravel would be ready-mixed, flowable cementitious fill.

B. Where overexcavation of footings is required, S&ME should be present at the site to observe conditions, confirm that poor soils have been removed, and observe that the overexcavated footings are properly backfilled.

3. The following discussion is provided regarding the estimated magnitude of settlements under static loading of the wet well footing embedded at a depth of 17 feet below existing grade, or 17 ½ feet below proposed grade.

   A. Based on an assumed maximum column load of 500 kips, and a 2,500 psf shallow foundation bearing pressure, the estimated total static settlement of an individual spread footing measuring roughly 14 feet by 14 feet in plan area will likely be 1 inch or less, with a differential settlement potential under static loading of ½ inch or less.

♦ Limitations of Report

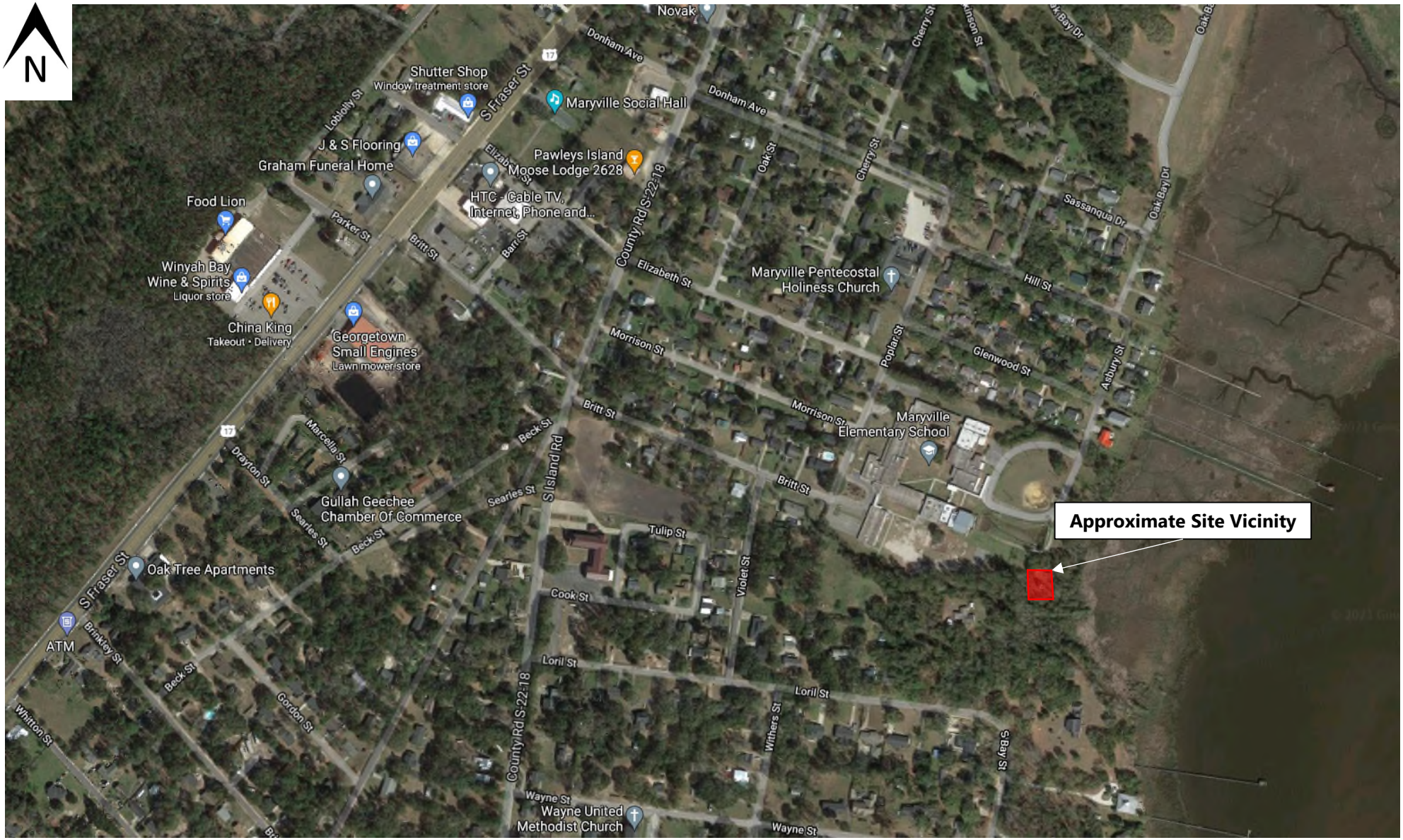
This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations in this report are based on the applicable standards of our practice in this geographic area at the time this report was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

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations across the site may not become evident until construction. If variations appear evident, then we should be given a reasonable 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 shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by the submitting engineers.

Assessment of site environmental conditions; sampling of soils, ground water or other materials for environmental contaminants; identification of jurisdictional wetlands, rare or endangered species, geological hazards or potential air quality and noise impacts were beyond the scope of this geotechnical exploration.

Appendices

Appendix I – Figures



Site Vicinity Map

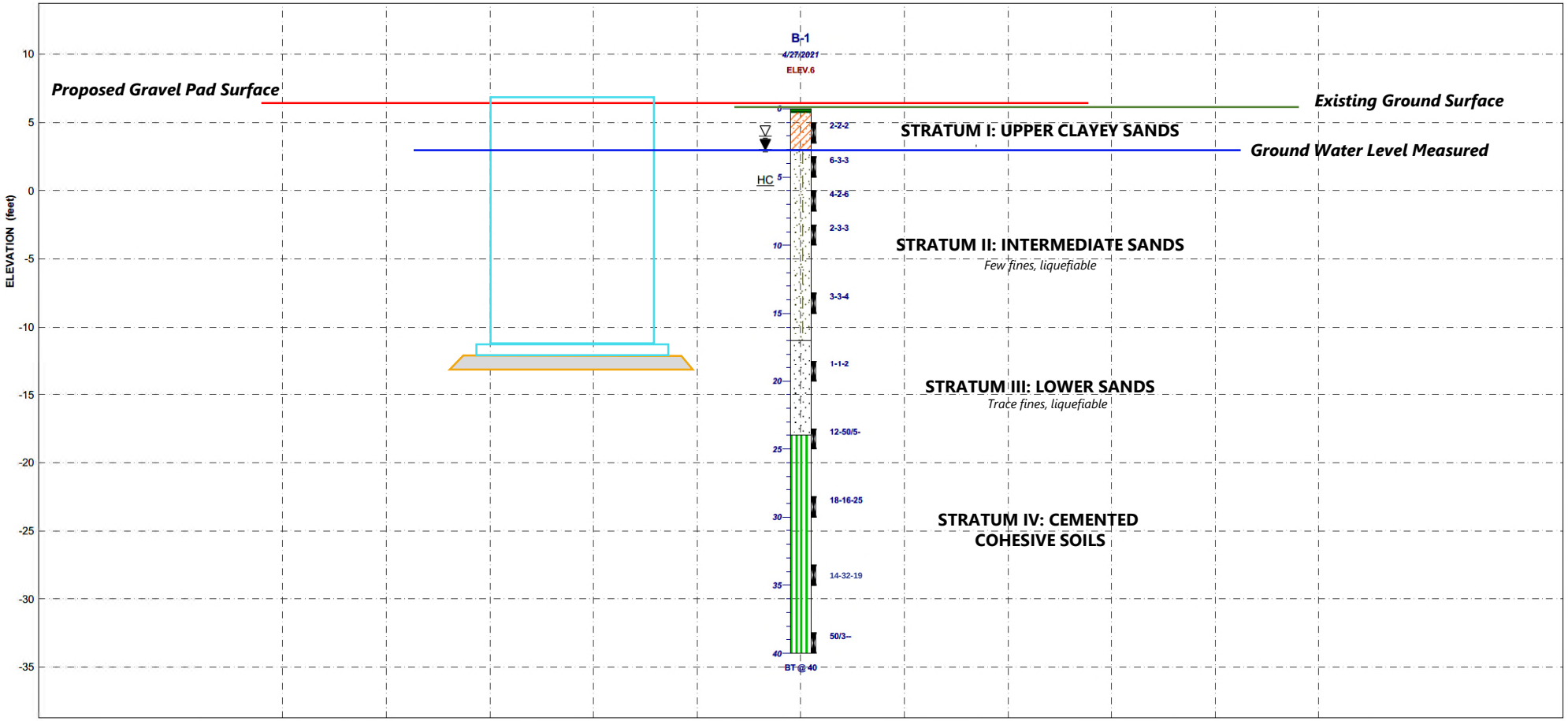
Georgetown Wet Well
Georgetown, South Carolina

SCALE:	AS SHOWN
DATE:	5-3-2021
PROJECT NO.	213382
FIGURE NO.	1

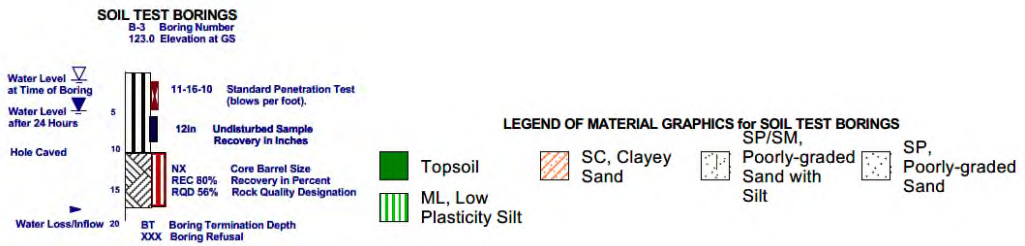
Test Location Sketch

Georgetown Wet Well
Georgetown, South Carolina

SCALE:	AS SHOWN
DATE:	5-3-2021
PROJECT NO.	213382
FIGURE NO.	2



Elevations were interpreted from the provided drawing from The Wooten Company



Subsurface Soil Profile

Georgetown Wet Well
Georgetown, South Carolina

SCALE: AS SHOWN

DATE: 5-3-2021

PROJECT NO. 213382

FIGURE NO. 3

Appendix II – Exploration Data

♦ Summary of Exploration Procedures

The American Society for Testing and Materials (ASTM) publishes standard methods to explore soil, rock and ground water conditions in Practice D-420-18, "*Standard Guide for Site Characterization for Engineering Design and Construction Purposes.*" The boring and sampling plan must consider the geologic or topographic setting. It must consider the proposed construction. It must also allow for the background, training, and experience of the geotechnical engineer. While the scope and extent of the exploration may vary with the objectives of the client, each exploration includes the following key tasks:

- Reconnaissance of the Project Area
- Preparation of Exploration Plan
- Layout and Access to Field Sampling Locations
- Field Sampling and Testing of Earth Materials
- Laboratory Evaluation of Recovered Field Samples
- Evaluation of Subsurface Conditions

The standard methods do not apply to all conditions or to every site. Nor do they replace education and experience, which together make up engineering judgment. Finally, ASTM D 420 does not apply to environmental investigations.

Reconnaissance of the Project Area

We walked over the site to note land use, topography, ground cover, and surface drainage. We observed general access to proposed sampling points and noted any existing structures.

Checks for Hazardous Conditions - State law requires that we notify the South Carolina (SC 811) before we drill or excavate at any site. SC 811 is operated by the major water, sewer, electrical, telephone, CATV, and natural gas suppliers of South Carolina. SC 811 forwarded our location request to the participating utilities. Location crews then marked buried lines with colored flags within 72 hours. They did not mark utility lines beyond junction boxes or meters. We checked proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during the site walkover.

♦ Boring and Sampling

Soil Test Boring with Mud Rotary Drilling

Soil sampling and penetration testing were performed in general accordance with ASTM D1586, "Standard Test Method for Penetration Test and Split Barrel Sampling of Soils. Rotary drilling processes were used to advance the hole and a heavy drilling fluid was circulated in the bore holes to stabilize the sides and flush the cuttings. At regular intervals, drilling tools were removed and soil samples were obtained with a standard 1.4 inch I. D., two-inch O. D., split barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six inch increments was recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Water Level Measurement

Subsurface water levels in the boreholes were measured during the onsite exploration and after a period of 24 hours by measuring depths from the existing grade to the current water level using a tape.

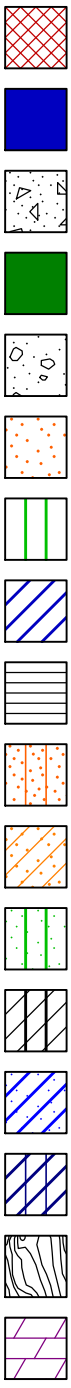
Backfilling of Borings

Once subsurface water levels were obtained, boring spoils were backfilled into the open bore holes. Bore holes were backfilled to the existing ground surface.

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)



- Fill
- Asphalt
- Concrete
- Topsoil
- Gravel
- Sand
- Silt
- Clay
- Organic
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Partially Weathered Rock
- Cored Rock

WATER LEVELS

(Shown in Water Level Column)

▽ = Water Level At Termination of Boring
▼ = Water Level Taken After 24 Hours
◄ = Loss of Drilling Water
HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	STD. 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

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY	STD. 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

SAMPLER TYPES

(Shown in Samples Column)

- Shelby Tube
- Split Spoon
- Rock Core
- No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

Georgetown Wet Well
Georgetown, South Carolina
S&ME Project No. 213382

BORING LOG B-1

DATE DRILLED: **4/27/21**	ELEVATION: **6.0 ft**
DRILL RIG: **CME 55**	BORING DEPTH: **40.0 ft**
DRILLER: **S. Hardee**	WATER LEVEL: **2' ATD, 3' 24 hr**
HAMMER TYPE: **Auto**	LOGGED BY: **K. Fugate**
SAMPLING METHOD: **Split Spoon**	
DRILLING METHOD: **Mud Rotary**	

NOTES: **Elevation approximated from provided The Wooten Company drawing.**

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	TOPSOIL - Approximately 3 inches thick.							
	CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, orange and grey, wet, very loose.		1		2	2	2	4
5	**POORLY GRADED SAND WITH SILT (SP-SM)** - Mostly fine to medium sand, few non plastic fines, grey, wet, loose. HC	1.0	2		6	3	3	6
			3		4	2	6	8
10		-4.0	4		2	3	3	6
			5		3	3	4	7
15		-9.0						
	POORLY GRADED SAND (SP) - Mostly fine to medium sand, trace non plastic fines, dark grey, wet, very loose.		6		1	1	2	3
20		-14.0						
	SANDY SILT (ML) - Mostly low plasticity fines, some fine sand, dark grey, wet, cemented, very hard.		7		12	50/5		50/5
25	- - - - Layer contains very thin cemented zones throughout.	-19.0						
			8		18	16	25	41
30	- - - - Hard.	-24.0						
	- - - - Very hard.		9		14	32	19	51

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS
10 20 30 60 80

S&ME BORING LOG \ LOGS.GPJ \ LIBRARY 2011_06_28.GDT \ 5/11/21

NOTES:

1. *THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.*
2. *BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.*
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

Georgetown Wet Well Georgetown, South Carolina S&ME Project No. 213382	BORING LOG B-1

DATE DRILLED: **4/27/21**	ELEVATION: **6.0 ft**	NOTES: **Elevation approximated from provided The Wooten Company drawing.**
DRILL RIG: **CME 55**	BORING DEPTH: **40.0 ft**	
DRILLER: **S. Hardee**	WATER LEVEL: **2' ATD, 3' 24 hr**	
HAMMER TYPE: **Auto**	LOGGED BY: **K. Fugate**	
SAMPLING METHOD: **Split Spoon**		
DRILLING METHOD: **Mud Rotary**		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
		SANDY SILT (ML) - Mostly low plasticity fines, some fine sand, dark grey, wet, cemented, very hard. *(continued)*								10 20 30 60 80	
40		Boring terminated at 40 ft		-34.0	10		50/3			50/3	

S&ME BORING LOG \ LOGS.GPJ \ LIBRARY 2011_06_28.GDT \ 5/11/21

NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

APPENDIX 2

Wastewater Construction Permit
Bureau of Water

PROJECT NAME: Maryville Lift Station	COUNTY: Georgetown
LOCATION: 2125 Poplar St Georgetown SC 29440	

PERMISSION IS HEREBY GRANTED TO:

City of Georgetown
2377 Maybank Dr
Georgetown, SC 29440

For the construction of a sanitary sewer system in accordance with the construction plans, specifications, design calculations and the Construction Permit Application signed by Aaron Marshall, Wooten Company, Registered Professional Engineer, S.C Registration Number: 38780.

Project Description: The plans call for the existing lift station to be abandoned after construction of the new station is completed with the exception of the existing 8' diameter wet well. Closure of the lift station will consist of removing the existing pumps and removing the unused 8" force main and lift station components. The new lift station will consist of a new 12' diameter wet well, approximately 40 LF of 8" force main piping, and gravity sewer connecting to the existing wet well. The new wet well will pump max out at 780 gpm.

TREATMENT FACILITY: The wastewater will be discharged to the GEORGETOWN CITY OF WWTP - SC0040029 at a design flow rate of 0 GPD.

STANDARD CONDITION:

NOTE: In accepting this permit, the owner agrees to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection. This is a permit for construction only and does not constitute DHEC approval, temporary or otherwise, to place the system in operation. An Approval to Place in Operation is required and can be obtained following the completion of construction by contacting the Pee Dee EA Myrtle Beach at 843-238-4378. Additional permits may be required prior to construction (e.g., Stormwater).

SPECIAL CONDITIONS:

- See attached (to original construction permit) DHEC Office of Ocean and Coastal Resource Management (DHEC-OCRM) certification for additional conditions related to the Coastal Zone Consistency determination.

PERMIT NUMBER:	WW043330
ISSUANCE DATE:	June 11, 2021
EXPIRATION DATES:	Construction must be completed and the Approval to Place in Operation granted prior to June 11, 2024 or this permit will expire.

Douglas B. Kinard, P.E., Director
Drinking Water and Recreational Waters Protection Division

GBA