

































































































































- h. Excess or Umbrella Liability
  - 1) General Aggregate \$2,000,000
  - 2) Each Occurrence \$2,000,000
- 3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:
  - a. Include coverage for all owned, hired and non-owned automobiles.
  - b. Combined Single Limit of \$1,000,000
- 4. The Contractual Liability coverage required by Paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
  - a. Bodily Injury:
    - Each Accident \$2,000,000
    - Annual Aggregate \$2,000,000
  - b. Property Damage:
    - Each Accident \$2,000,000
    - Annual Aggregate \$2,000,000
- 5. Flood Insurance: The Contractor is required to carry flood insurance for projects located in designated flood hazard areas in which Federal Flood Insurance is available.

#### **5.05 Owner's Liability Insurance**

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

#### **5.06 Property Insurance**

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof.
  - 1. This insurance shall:
    - a. include the interests of Owner, Contractor, Subcontractors, Engineer and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
    - b. in addition to the individuals and entities specified, include as additional insureds, the following:
    - c. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required;

- d. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
  - e. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
  - f. allow for partial utilization of the Work by Owner;
  - g. include testing and startup; and
  - h. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.
2. Contractor shall be responsible for any deductible or self-insured retention.
3. The policies of insurance required to be purchased and maintained by Contractor in accordance with this Paragraph SC-5.06.A shall comply with the requirements of paragraph 5.06.C of the General Conditions.
- B. Owner shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty (30) days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

## **5.07 Waiver of Rights**

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:
  - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

## **5.08 Receipt and Application of Insurance Proceeds**

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

#### **5.09 Acceptance of Bonds and Insurance; Option to Replace**

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Part 5 on the basis of nonconformance with the Contract Documents, the objecting party shall so notify the other party in writing within ten (10) days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

#### **5.10 Partial Utilization, Acknowledgment of Property Insurer**

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

### **PART 6 - CONTRACTOR'S RESPONSIBILITIES**

#### **6.01 Supervision and Superintendence**

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

## **6.02 Labor; Working Hours**

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

## **6.03 Services, Materials, and Equipment**

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, startup, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

## **6.04 Progress Schedule**

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
  - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Part 12. Adjustments in Contract Times may only be made by a Change Order.

## **6.05 Substitutes and "Or-Equals"**

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
  - a. in the exercise of reasonable judgment Engineer determines that:
    - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
    - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,
    - 3) it has a proven record of performance and availability of responsive service; and
  - b. Contractor certifies that, if approved and incorporated into the Work:
    - 1) there will be no increase in cost to the Owner or increase in Contract Times, and
    - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
2. Substitute Items
  - a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
  - b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
  - c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.
  - d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
    - 1) shall certify that the proposed substitute item will:
      - a) perform adequately the functions and achieve the results called for by the general design,
      - b) be similar in substance to that specified, and
      - c) be suited to the same use as that specified;

- 2) will state:
    - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;
    - b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
    - c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
  - 3) will identify:
    - a) all variations of the proposed substitute item from that specified, and
    - b) available engineering, sales, maintenance, repair, and replacement services;
  - 4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,
- B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or-equal." Engineer will advise Contractor in writing of any negative determination.
- D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

## **6.06 Concerning Subcontractors, Suppliers, and Others**

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. The identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
  - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor
  - 2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer,, and all other individuals or entities to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.
- H. Owner or Engineer may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by a particular Subcontractor or Supplier.

#### **6.07 Patent Fees and Royalties**

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### **6.08 Permits**

- A. Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

#### **6.09 Laws and Regulations**

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

#### **6.10 Taxes**

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### **6.11 Use of Site and Other Areas**

- A. Limitation on Use of Site and Other Areas
  - 1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
  - 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
  - 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

#### **6.12 Record Documents**

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

#### **6.13 Safety and Protection**

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. all persons on the Site or who may be affected by the Work;
  2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### **6.14 Safety Representative**

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### **6.15 Hazard Communication Programs**

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### **6.16 Emergencies**

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### **6.17 Shop Drawings and Samples**

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.
  - 1. Shop Drawings
    - a. Submit number of copies specified in the General Requirements.
    - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
  - 2. Samples: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.
    - a. Submit number of Samples specified in the Specifications.
    - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

### C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:
  - a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;
  - c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and
  - d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

### D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
- F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three (3) submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.
- G. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time unless the need for such substitution is beyond the control of Contractor.

**6.18 Continuing the Work**

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

**6.19 Contractor's General Warranty and Guarantee**

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
  1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;
  3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. use or occupancy of the Work or any part thereof by Owner;
  5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or
  7. any correction of defective Work by Owner.
- D. The Contractor's General Warranty and Guarantee shall be for a period of one (1) year after work has been accepted and final payment made to the Contractor. In the case of Water and Wastewater lines, the warranty period will start after acceptance of these lines into the utility provider's system for ownership, operation, and maintenance. The Contractor accepts the transference of all warranties and guarantees to the utility provider owning and operating the new lines.

## **6.20 Indemnification**

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

## **6.21 Delegation of Professional Design Services**

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents,

Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

## **PART 7 - OTHER WORK AT THE SITE**

### **7.01 Related Work at Site**

- A. Owner may perform other work related to the Project at the Site with Owner's employees or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
  - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
  - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Part 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that

render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

## **7.02 Coordination**

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth:
  - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
  - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
  - 3. the extent of such authority and responsibilities will be provided.
- B. Owner shall have sole authority and responsibility for such coordination.

## **7.03 Legal Relationships**

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

## **7.04 Claims Between Contractors**

- A. Should Contractor cause damage to the work or property of any other contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any other contractor against Contractor, Owner, Engineer, or the construction coordinator, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law.

- B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, the construction coordinator and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any other contractor against Owner, Engineer, Engineer's Consultants, or the construction coordinator to the extent said claim is based on or arises out of Contractor's performance of the Work. Should another contractor cause damage to the Work or property of Contractor or should the performance of work by any other contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the construction coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, or the construction coordinator on account of any such damage or Claim.
- C. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of another contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim for an extension of times in accordance with Part 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and construction coordinator for any delay, disruption, interference, or hindrance caused by any other contractor. This paragraph does not prevent recovery from Owner, Engineer, or construction coordinator for activities that are their respective responsibilities.

## **PART 8 - OWNER'S RESPONSIBILITIES**

### **8.01 Communications to Contractor**

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### **8.02 Replacement of Engineer**

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

### **8.03 Furnish Data**

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### **8.04 Pay When Due**

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

### **8.05 Lands and Easements; Reports and Tests**

- A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

#### **8.06 Insurance**

- A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Part 5.

#### **8.07 Change Orders**

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

#### **8.08 Inspections, Tests, and Approvals**

- A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

#### **8.09 Limitations on Owner's Responsibilities**

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

#### **8.10 Undisclosed Hazardous Environmental Condition**

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

#### **8.11 Evidence of Financial Arrangements**

- A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth.
- B. On request of Contractor prior to the execution of any Change Order involving a significant increase in the Contract Price, Owner shall furnish to Contractor reasonable evidence that adequate financial arrangements have been made by Owner to enable Owner to fulfill the increased financial obligations to be undertaken by Owner as a result of such Change Order.

### **PART 9 - ENGINEER'S STATUS DURING CONSTRUCTION**

#### **9.01 Owner's Representative**

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

## **9.02 Visits to Site**

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

## **9.03 Project Representative**

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in Paragraph 9.09.

## **9.04 Authorized Variations in Work**

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

## **9.05 Rejecting Defective Work**

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

#### **9.06 Shop Drawings, Change Orders and Payments**

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Parts 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Part 14.

#### **9.07 Determinations for Unit Price Work**

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

#### **9.08 Decisions on Requirements of Contract Documents and Acceptability of Work**

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

#### **9.09 Limitations on Engineer's Authority and Responsibilities**

- A. Neither Engineer's authority or responsibility under this Part 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

## **PART 10 - CHANGES IN THE WORK; CLAIMS**

### **10.01 Authorized Changes in the Work**

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

### **10.02 Unauthorized Changes in the Work**

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

### **10.03 Execution of Change Orders**

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
  - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
  - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

#### **10.04 Notification to Surety**

- A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

#### **10.05 Claims**

- A. Engineer's Decision Required: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. Notice: Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. Engineer's Action: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
  1. deny the Claim in whole or in part,
  2. approve the Claim, or
  3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Part 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

## **PART 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **11.01 Cost of the Work**

- A. Costs Included: The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.
  - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
  - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
  - 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
  - 4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

- a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
- b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
- c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. Costs Excluded: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
  2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
  5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.
- C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

## **11.02 Allowances**

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. Cash Allowances
1. Contractor agrees that:
    - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
    - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

**11.03 Unit Price Work**

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
  1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
  2. there is no corresponding adjustment with respect any other item of Work; and
  3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

**PART 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES**

**12.01 Change of Contract Price**

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05. Final approval of all change orders rests with the owner.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
  1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
  2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
    - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
    - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

## **12.02 Change of Contract Times**

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05. Final approval of all change orders rests with the owner.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Part 12.

### **12.03 Delays**

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Part 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Part 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times , or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
- F. All claims for delays shall be submitted within thirty (30) days of the event causing the delay.

## **PART 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

### **13.01 Notice of Defects**

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Part 13.

### **13.02 Access to Work**

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

### **13.03 Tests and Inspections**

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
  - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
  - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and
  - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

### **13.04 Uncovering Work**

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

- D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### **13.05 Owner May Stop the Work**

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### **13.06 Correction or Removal of Defective Work**

- A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

#### **13.07 Correction Period**

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. repair such defective land or areas; or
  - 2. correct such defective Work; or
  - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

#### **13.08 Acceptance of Defective Work**

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

#### **13.09 Owner May Correct Defective Work**

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven (7) days written notice to Contractor, correct or remedy any such deficiency.

- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

## **PART 14 - PAYMENTS TO CONTRACTOR AND COMPLETION**

### **14.01 Schedule of Values**

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

### **14.02 Progress Payments**

- A. Applications for Payments
  - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. The date of the pay application must be the last day of the month. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

#### B. Review of Applications

1. Engineer will, within fifteen (15) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
  - a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
  - b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
  - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

1. Fifteen (15) days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
- a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
  - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - c. there are other items entitling Owner to a set-off against the amount recommended; or
  - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.
3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

#### **14.03 Contractor's Warranty of Title**

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

#### **14.04 Substantial Completion**

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven (7) days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

#### **14.05 Partial Utilization**

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.
1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
  4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

#### **14.06 Final Inspection**

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### **14.07 Final Payment**

- A. Application for Payment
1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
  2. The final Application for Payment shall be accompanied (except as previously delivered) by:
    - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

- b. consent of the surety, if any, to final payment;
  - c. a list of all Claims against Owner that Contractor believes are unsettled; and
  - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

**B. Engineer's Review of Application and Acceptance**

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten (10) days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

**C. Payment Becomes Due**

1. Thirty (30) days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

**14.08 Final Completion Delayed**

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

## **14.09 Waiver of Claims**

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

## **PART 15 - SUSPENSION OF WORK AND TERMINATION**

### **15.01 Owner May Suspend Work**

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

### **15.02 Owner May Terminate for Cause**

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's disregard of the authority of Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven (7) days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),
2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and
3. complete the Work as Owner may deem expedient.

- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven (7) days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

### **15.03 Owner May Terminate For Convenience**

- A. Upon seven (7) days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
  - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
  - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### **15.04 Contractor May Stop Work or Terminate**

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven (7) days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven (7) days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

### **PART 16 - DISPUTE RESOLUTION**

#### **16.01 Methods and Procedures**

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
  - 1. elects in writing to invoke any dispute resolution process, or
  - 2. agrees with the other party to submit the Claim to another dispute resolution process, or
  - 3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

## **PART 17 - MISCELLANEOUS**

### **17.01 Giving Notice**

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  - 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or
  - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### **17.02 Computation of Times**

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### **17.03 Cumulative Remedies**

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

### **17.04 Survival of Obligations**

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

### **17.05 Controlling Law**

- A. This Contract is to be governed by the law of the state in which the Project is located.

### **17.06 Headings**

- A. Part and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

END OF SECTION

**SECTION 01 26 20**  
**WEATHER DELAYS**

**ARTICLE 1 - GENERAL**

**1.01 Extension of Contract Time**

If a Claim is made for an extension of time based upon weather delays in accordance with the General Conditions, an extension may be granted only for the number of Weather Delay Days in excess of the number of days listed for the applicable month on the Standard Baseline.

**2.01 Standard Baseline for Adverse Weather**

- A. The Standard Baseline is defined as the number of calendar days for each month during which construction activity exposed to weather conditions is expected to be prevented and suspended by cause of Adverse Weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.
- B. The Owner has established a Standard Baseline from the National Climatic Data Center (NCDC) from summary period of 1981 to 2010 and climate record period of 1887 to 2017 for the State of South Carolina.

**3.01 Adverse Weather and Weather Delay Days**

- A. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site:
  - 1. Precipitation (rain, snow, or ice) in excess of one-tenth (0.10") liquid measure.
  - 2. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
  - 3. Sustained wind in excess of twenty-five (25) miles per hour.
  - 4. Dry Out (or Mud) Days under the following conditions:
    - a more precipitation days occur than listed in the Standard Baseline;
    - b there is a hindrance to site access or sitework and Contractor has taken all reasonable accommodations to avoid such hindrance; and,
    - c no more than one (1) Dry Out Day is allocated for each additional day of precipitation more than the Standard Baseline that total 1.0 inch or more, liquid measure, unless specifically recommended by the Designer.
- B. A Weather Delay Day may be counted if Adverse Weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day and critical path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activities that day.

- C. Days of normal weather conditions which the contractor elects not to perform construction activities will be deducted from the eligible weather delays requested.

#### **4.01 Documentation and Submittals**

- A. An extension of the Contract Time for Adverse Weather must be requested in writing to the Designer at the end of each month and submitted with the pay application of applicable Adverse Weather occurrence along with all required support information. Such requests made after this limitation will not be considered.
- B. Submit daily jobsite work logs showing which and to what extent critical path construction activities have been affected by weather on a monthly basis.
- C. Submit actual weather data to support claim for time extension obtained from nearest NOAA weather station or other independently verified source approved by Designer at beginning of project.
- D. Organize Claim documentation to facilitate evaluation on a basis of calendar month periods and the Standard Baseline.
- E. Submit in accordance with the requirements of the Contract Documents.

**END OF SECTION**

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 225 ft. Lat: 33.9419° N Lon: -81.1181° W  
Station: COLUMBIA METROPOLITAN AIRPORT, SC US USW00013883

Summary of Monthly Normals  
1981-2010  
Generated on 11/04/2020

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

| Temperature (°F) |           |           |      |                       |                       |                       |                     |      |      |      |       |       |                     |       |       |       |                     |           |           |           |           |          |
|------------------|-----------|-----------|------|-----------------------|-----------------------|-----------------------|---------------------|------|------|------|-------|-------|---------------------|-------|-------|-------|---------------------|-----------|-----------|-----------|-----------|----------|
| Mean             |           |           |      |                       |                       |                       | Cooling Degree Days |      |      |      |       |       | Heating Degree Days |       |       |       | Mean Number of Days |           |           |           |           |          |
|                  |           |           |      |                       |                       |                       | Base (above)        |      |      |      |       |       | Base (above)        |       |       |       |                     |           |           |           |           |          |
| Month            | Daily Max | Daily Min | Mean | Long Term Max Std Dev | Long Term Min Std Dev | Long Term Avg Std Dev | 55                  | 57   | 60   | 65   | 70    | 72    | 55                  | 57    | 60    | 65    | Max >= 100          | Max >= 90 | Max >= 50 | Max <= 32 | Min <= 32 | Min <= 0 |
| 01               | 56.0      | 33.7      | 44.8 | 3.8                   | 3.5                   | 3.5                   | 22                  | 14   | 6    | 1    | -7777 | -7777 | 336                 | 390   | 476   | 626   | 0.0                 | 0.0       | 21.7      | 0.4       | 14.5      | 0.0      |
| 02               | 60.3      | 36.8      | 48.5 | 3.6                   | 2.6                   | 2.9                   | 37                  | 24   | 12   | 3    | -7777 | -7777 | 217                 | 261   | 332   | 463   | 0.0                 | 0.0       | 22.9      | -7777     | 9.5       | 0.0      |
| 03               | 68.2      | 43.0      | 55.6 | 3.2                   | 2.7                   | 2.7                   | 121                 | 90   | 55   | 18   | 4     | 1     | 103                 | 134   | 191   | 310   | 0.0                 | -7777     | 29.7      | 0.0       | 4.4       | 0.0      |
| 04               | 76.3      | 50.4      | 63.4 | 3.2                   | 2.9                   | 2.7                   | 269                 | 220  | 155  | 73   | 23    | 13    | 18                  | 30    | 55    | 122   | 0.0                 | 1.1       | 29.9      | 0.0       | 0.5       | 0.0      |
| 05               | 83.8      | 59.5      | 71.7 | 2.4                   | 3.1                   | 2.5                   | 517                 | 455  | 365  | 226  | 112   | 76    | 1                   | 1     | 4     | 20    | 0.0                 | 5.9       | 31.0      | 0.0       | 0.0       | 0.0      |
| 06               | 90.0      | 68.2      | 79.1 | 2.7                   | 2.2                   | 2.1                   | 723                 | 663  | 573  | 424  | 277   | 221   | 0                   | -7777 | -7777 | 1     | 0.8                 | 15.6      | 30.0      | 0.0       | 0.0       | 0.0      |
| 07               | 92.7      | 71.6      | 82.2 | 2.8                   | 1.2                   | 1.8                   | 842                 | 780  | 687  | 532  | 377   | 315   | 0                   | 0     | 0     | 0     | 2.3                 | 23.0      | 31.0      | 0.0       | 0.0       | 0.0      |
| 08               | 90.7      | 71.0      | 80.8 | 2.7                   | 1.8                   | 2.1                   | 801                 | 739  | 646  | 491  | 337   | 276   | 0                   | 0     | 0     | -7777 | 1.4                 | 18.4      | 31.0      | 0.0       | 0.0       | 0.0      |
| 09               | 85.2      | 64.2      | 74.7 | 2.4                   | 2.5                   | 1.9                   | 591                 | 531  | 442  | 299  | 171   | 127   | -7777               | -7777 | 1     | 8     | 0.0                 | 7.1       | 30.0      | 0.0       | 0.0       | 0.0      |
| 10               | 76.1      | 52.1      | 64.1 | 2.8                   | 4.1                   | 3.0                   | 297                 | 244  | 175  | 85   | 30    | 18    | 15                  | 24    | 47    | 112   | 0.0                 | 0.5       | 31.0      | 0.0       | 0.5       | 0.0      |
| 11               | 67.3      | 42.3      | 54.8 | 3.1                   | 3.8                   | 3.1                   | 102                 | 76   | 44   | 15   | 3     | 2     | 108                 | 142   | 200   | 321   | 0.0                 | 0.0       | 29.1      | 0.0       | 5.1       | 0.0      |
| 12               | 58.2      | 35.3      | 46.7 | 4.5                   | 4.1                   | 4.1                   | 36                  | 25   | 13   | 3    | -7777 | -7777 | 292                 | 343   | 424   | 569   | 0.0                 | 0.0       | 23.9      | 0.1       | 12.8      | 0.0      |
| Summary          | 75.4      | 52.3      | 63.9 | 3.1                   | 2.9                   | 2.7                   | 4358                | 3861 | 3173 | 2170 | 1334  | 1049  | 1090                | 1325  | 1730  | 2552  | 4.5                 | 71.6      | 341.2     | 0.5       | 47.3      | 0.0      |

-7777: a non-zero value that would round to zero  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 225 ft. Lat: 33.9419° N Lon: -81.1181° W  
Station: COLUMBIA METROPOLITAN AIRPORT, SC US USW00013883

Summary of Monthly Normals  
1981-2010  
Generated on 11/04/2020

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

| Precipitation (in.) |        |                     |         |         |         |                                                                                                                        |       |       |
|---------------------|--------|---------------------|---------|---------|---------|------------------------------------------------------------------------------------------------------------------------|-------|-------|
|                     | Totals | Mean Number of Days |         |         |         | Precipitation Probabilities<br>Probability that precipitation will be<br>equal to or less than<br>the indicated amount |       |       |
|                     | Means  | Daily Precipitation |         |         |         | Monthly Precipitation<br>vs. Probability Levels                                                                        |       |       |
| Month               | Mean   | >= 0.01             | >= 0.10 | >= 0.50 | >= 1.00 | 0.25                                                                                                                   | 0.50  | 0.75  |
| 01                  | 3.58   | 9.9                 | 6.5     | 2.6     | 0.9     | 1.94                                                                                                                   | 3.19  | 4.16  |
| 02                  | 3.61   | 9.1                 | 5.9     | 2.6     | 1.0     | 2.35                                                                                                                   | 3.44  | 4.78  |
| 03                  | 3.73   | 8.6                 | 5.9     | 2.6     | 1.1     | 2.26                                                                                                                   | 3.44  | 5.33  |
| 04                  | 2.62   | 8.0                 | 5.3     | 1.9     | 0.5     | 1.08                                                                                                                   | 2.02  | 3.96  |
| 05                  | 2.97   | 7.7                 | 4.9     | 2.0     | 0.8     | 1.61                                                                                                                   | 2.45  | 4.30  |
| 06                  | 4.69   | 10.5                | 7.1     | 3.1     | 1.3     | 2.72                                                                                                                   | 4.22  | 6.47  |
| 07                  | 5.46   | 11.8                | 7.7     | 3.6     | 1.7     | 3.11                                                                                                                   | 3.83  | 7.86  |
| 08                  | 5.26   | 10.5                | 7.0     | 3.3     | 1.8     | 3.36                                                                                                                   | 4.64  | 6.70  |
| 09                  | 3.54   | 7.3                 | 5.0     | 2.3     | 1.2     | 1.94                                                                                                                   | 3.29  | 5.27  |
| 10                  | 3.17   | 7.0                 | 4.2     | 2.1     | 1.1     | 1.47                                                                                                                   | 2.43  | 4.30  |
| 11                  | 2.74   | 7.3                 | 4.6     | 1.9     | 0.9     | 1.46                                                                                                                   | 2.47  | 4.02  |
| 12                  | 3.22   | 9.0                 | 5.5     | 1.8     | 0.9     | 1.51                                                                                                                   | 2.45  | 4.16  |
| Summary             | 44.59  | 106.7               | 69.6    | 29.8    | 13.2    | 24.81                                                                                                                  | 37.87 | 61.31 |

-7777: a non-zero value that would round to zero  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 225 ft. Lat: 33.9419° N Lon: -81.1181° W  
Station: COLUMBIA METROPOLITAN AIRPORT, SC US USW00013883

Summary of Monthly Normals  
1981-2010  
Generated on 11/04/2020

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

| Snow (in.) |                  |                        |       |     |       |       |                          |     |       |     |                                                                                                   |     |     |
|------------|------------------|------------------------|-------|-----|-------|-------|--------------------------|-----|-------|-----|---------------------------------------------------------------------------------------------------|-----|-----|
|            | Totals           | Mean Number of Days    |       |     |       |       |                          |     |       |     | Snow Probabilities<br>Probability that snow will be equal to<br>or less than the indicated amount |     |     |
|            | Means            | Snowfall >= Thresholds |       |     |       |       | Snow Depth >= Thresholds |     |       |     | Monthly Snow vs. Probability Levels<br>Values derived from the<br>incomplete gamma distribution.  |     |     |
| Month      | Snowfall<br>Mean | 0.01                   | 1.0   | 3.0 | 5.00  | 10.00 | 1                        | 3   | 5     | 10  | .25                                                                                               | .50 | .75 |
| 01         | 0.8              | 0.5                    | 0.2   | 0.2 | 0.0   | 0.0   | 0.5                      | 0.2 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.4 |
| 02         | 0.5              | 0.3                    | 0.1   | 0.1 | -7777 | 0.0   | 0.1                      | 0.1 | -7777 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 03         | 0.1              | 0.1                    | -7777 | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 04         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 05         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 06         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 07         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 08         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 09         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 10         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 11         | 0.0              | 0.0                    | 0.0   | 0.0 | 0.0   | 0.0   | 0.0                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 12         | 0.1              | 0.1                    | 0.1   | 0.0 | 0.0   | 0.0   | 0.1                      | 0.0 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| Summary    | 1.5              | 1.0                    | 0.4   | 0.3 | 0.0   | 0.0   | 0.7                      | 0.3 | 0.0   | 0.0 | 0.0                                                                                               | 0.0 | 0.4 |

-7777: a non-zero value that would round to zero  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 225 ft. Lat: 33.9419° N Lon: -81.1181° W  
Station: **COLUMBIA METROPOLITAN AIRPORT, SC US USW00013883**

**Summary of Monthly Normals**  
**1981-2010**  
Generated on 11/04/2020

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

| Growing Degree Units (Monthly)          |     |     |     |     |     |      |      |      |      |     |     |     |
|-----------------------------------------|-----|-----|-----|-----|-----|------|------|------|------|-----|-----|-----|
| Base                                    | Jan | Feb | Mar | Apr | May | Jun  | Jul  | Aug  | Sep  | Oct | Nov | Dec |
| 40                                      | 203 | 257 | 487 | 700 | 981 | 1173 | 1307 | 1266 | 1041 | 747 | 446 | 244 |
| 45                                      | 112 | 155 | 343 | 551 | 826 | 1023 | 1152 | 1111 | 891  | 592 | 307 | 144 |
| 50                                      | 55  | 82  | 219 | 405 | 671 | 873  | 997  | 956  | 741  | 440 | 190 | 77  |
| 55                                      | 22  | 37  | 121 | 269 | 517 | 723  | 842  | 801  | 591  | 297 | 102 | 36  |
| 60                                      | 6   | 12  | 55  | 155 | 365 | 573  | 687  | 646  | 442  | 175 | 44  | 13  |
| Growing Degree Units for Corn (Monthly) |     |     |     |     |     |      |      |      |      |     |     |     |
| 50/86                                   | 127 | 163 | 306 | 447 | 653 | 800  | 889  | 873  | 711  | 482 | 284 | 153 |

| Growing Degree Units (Accumulated Monthly)          |     |     |     |      |      |      |      |      |      |      |      |      |
|-----------------------------------------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| Base                                                | Jan | Feb | Mar | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| 40                                                  | 203 | 460 | 947 | 1647 | 2628 | 3801 | 5108 | 6374 | 7415 | 8162 | 8608 | 8852 |
| 45                                                  | 112 | 267 | 610 | 1161 | 1987 | 3010 | 4162 | 5273 | 6164 | 6756 | 7063 | 7207 |
| 50                                                  | 55  | 137 | 356 | 761  | 1432 | 2305 | 3302 | 4258 | 4999 | 5439 | 5629 | 5706 |
| 55                                                  | 22  | 59  | 180 | 449  | 966  | 1689 | 2531 | 3332 | 3923 | 4220 | 4322 | 4358 |
| 60                                                  | 6   | 18  | 73  | 228  | 593  | 1166 | 1853 | 2499 | 2941 | 3116 | 3160 | 3173 |
| Growing Degree Units for Corn (Monthly Accumulated) |     |     |     |      |      |      |      |      |      |      |      |      |
| 50/86                                               | 127 | 290 | 596 | 1043 | 1696 | 2496 | 3385 | 4258 | 4969 | 5451 | 5735 | 5888 |

Note: For corn, temperatures below 50 are set to 50, and temperatures above 86 are set to 86.  
-7777: a non-zero value that would round to zero.  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value.

Current Location: Elev: 476 ft. Lat: 34.2977° N Lon: 81.6236° W  
Station: **NEWBERRY, SC US USC00386209**

Summary of Monthly Normals  
1981-2010  
Generated on 07/21/2025

| Temperature (°F) |           |           |      |                       |                       |                       |                     |      |      |       |       |       |                     |       |       |       |                     |           |           |           |           |          |
|------------------|-----------|-----------|------|-----------------------|-----------------------|-----------------------|---------------------|------|------|-------|-------|-------|---------------------|-------|-------|-------|---------------------|-----------|-----------|-----------|-----------|----------|
| Mean             |           |           |      |                       |                       |                       | Cooling Degree Days |      |      |       |       |       | Heating Degree Days |       |       |       | Mean Number of Days |           |           |           |           |          |
|                  |           |           |      |                       |                       |                       | Base (above)        |      |      |       |       |       | Base (above)        |       |       |       |                     |           |           |           |           |          |
| Month            | Daily Max | Daily Min | Mean | Long Term Max Std Dev | Long Term Min Std Dev | Long Term Avg Std Dev | 55                  | 57   | 60   | 65    | 70    | 72    | 55                  | 57    | 60    | 65    | Max >= 100          | Max >= 90 | Max >= 50 | Max <= 32 | Min <= 32 | Min <= 0 |
| 01               | 53.6      | 31.4      | 42.5 | 3.8                   | 3.8                   | 3.6                   | 10                  | 6    | 3    | -7777 | 0     | 0     | 398                 | 455   | 545   | 698   | 0.0                 | 0.0       | 20.1      | 0.5       | 16.7      | 0.0      |
| 02               | 58.1      | 33.5      | 45.8 | 3.4                   | 2.5                   | 2.7                   | 20                  | 12   | 4    | -7777 | -7777 | 0     | 277                 | 325   | 402   | 538   | 0.0                 | 0.0       | 21.2      | 0.1       | 13.0      | 0.0      |
| 03               | 66.2      | 39.2      | 52.7 | 3.4                   | 2.8                   | 2.8                   | 76                  | 52   | 27   | 6     | 1     | -7777 | 147                 | 186   | 254   | 388   | 0.0                 | 0.0       | 29.2      | 0.0       | 7.9       | 0.0      |
| 04               | 74.0      | 48.0      | 61.0 | 3.1                   | 2.7                   | 2.6                   | 212                 | 168  | 112  | 44    | 10    | 3     | 32                  | 48    | 82    | 164   | 0.0                 | 0.1       | 29.8      | 0.0       | 1.3       | 0.0      |
| 05               | 82.1      | 58.0      | 70.1 | 2.4                   | 3.2                   | 2.5                   | 468                 | 408  | 320  | 185   | 79    | 49    | 2                   | 3     | 8     | 29    | 0.0                 | 2.8       | 30.9      | 0.0       | 0.0       | 0.0      |
| 06               | 88.8      | 66.9      | 77.8 | 2.7                   | 1.8                   | 1.9                   | 685                 | 625  | 536  | 387   | 243   | 188   | 0                   | 0     | -7777 | 1     | 0.1                 | 12.9      | 30.0      | 0.0       | 0.0       | 0.0      |
| 07               | 91.9      | 70.6      | 81.3 | 2.5                   | 1.3                   | 1.6                   | 814                 | 752  | 659  | 504   | 349   | 288   | 0                   | 0     | 0     | -7777 | 1.0                 | 21.1      | 31.0      | 0.0       | 0.0       | 0.0      |
| 08               | 90.1      | 69.5      | 79.8 | 3.0                   | 1.8                   | 2.1                   | 769                 | 707  | 614  | 459   | 305   | 244   | 0                   | 0     | 0     | -7777 | 0.8                 | 16.1      | 31.0      | 0.0       | 0.0       | 0.0      |
| 09               | 84.1      | 62.4      | 73.2 | 2.4                   | 2.1                   | 1.7                   | 548                 | 488  | 399  | 259   | 138   | 98    | -7777               | -7777 | 2     | 12    | 0.0                 | 5.3       | 30.0      | 0.0       | 0.0       | 0.0      |
| 10               | 74.2      | 50.5      | 62.4 | 2.2                   | 3.4                   | 2.5                   | 249                 | 200  | 138  | 60    | 17    | 9     | 21                  | 34    | 65    | 142   | 0.0                 | 0.3       | 31.0      | 0.0       | 0.3       | 0.0      |
| 11               | 65.1      | 40.8      | 53.0 | 3.2                   | 3.7                   | 3.1                   | 74                  | 52   | 28   | 7     | 1     | 1     | 135                 | 174   | 240   | 368   | 0.0                 | 0.0       | 28.8      | 0.0       | 6.3       | 0.0      |
| 12               | 56.1      | 33.2      | 44.6 | 4.7                   | 4.2                   | 4.3                   | 23                  | 15   | 7    | 1     | -7777 | 0     | 343                 | 398   | 482   | 632   | 0.0                 | 0.0       | 21.8      | 0.2       | 15.0      | 0.0      |
| Summary          | 73.7      | 50.3      | 62.0 | 3.1                   | 2.8                   | 2.6                   | 3948                | 3485 | 2847 | 1912  | 1143  | 880   | 1355                | 1623  | 2080  | 2972  | 1.9                 | 58.6      | 334.8     | 0.8       | 60.5      | 0.0      |

-7777: a non-zero value that would round to zero  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value

Current Location: Elev: 476 ft. Lat: 34.2977° N Lon: 81.6236° W  
Station: **NEWBERRY, SC US USC00386209**

Summary of Monthly Normals  
1981-2010  
Generated on 07/21/2025

| Precipitation (in.) |        |                     |         |         |         |                                                                                                                        |       |       |
|---------------------|--------|---------------------|---------|---------|---------|------------------------------------------------------------------------------------------------------------------------|-------|-------|
|                     | Totals | Mean Number of Days |         |         |         | Precipitation Probabilities<br>Probability that precipitation will be<br>equal to or less than<br>the indicated amount |       |       |
|                     | Means  | Daily Precipitation |         |         |         | Monthly Precipitation<br>vs. Probability Levels                                                                        |       |       |
| Month               | Mean   | >= 0.01             | >= 0.10 | >= 0.50 | >= 1.00 | 0.25                                                                                                                   | 0.50  | 0.75  |
| 01                  | 4.23   | 10.7                | 7.1     | 3.3     | 1.4     | 2.75                                                                                                                   | 4.54  | 5.19  |
| 02                  | 4.15   | 9.3                 | 6.5     | 3.0     | 1.6     | 2.86                                                                                                                   | 3.99  | 4.99  |
| 03                  | 4.39   | 9.5                 | 6.3     | 3.0     | 1.2     | 2.83                                                                                                                   | 4.10  | 6.01  |
| 04                  | 3.00   | 8.4                 | 6.0     | 2.2     | 0.7     | 1.46                                                                                                                   | 2.85  | 3.96  |
| 05                  | 3.26   | 7.9                 | 5.5     | 2.1     | 0.7     | 1.87                                                                                                                   | 3.05  | 3.72  |
| 06                  | 4.68   | 8.9                 | 6.4     | 2.5     | 1.4     | 2.47                                                                                                                   | 4.87  | 6.19  |
| 07                  | 3.53   | 9.6                 | 5.6     | 2.4     | 0.8     | 2.03                                                                                                                   | 3.26  | 4.48  |
| 08                  | 5.33   | 9.9                 | 6.5     | 3.2     | 1.4     | 4.17                                                                                                                   | 4.97  | 6.50  |
| 09                  | 4.33   | 7.7                 | 4.8     | 2.8     | 1.6     | 2.46                                                                                                                   | 3.99  | 6.07  |
| 10                  | 3.87   | 7.3                 | 4.7     | 2.9     | 1.4     | 2.02                                                                                                                   | 3.50  | 5.10  |
| 11                  | 3.42   | 8.5                 | 5.6     | 2.7     | 1.0     | 1.84                                                                                                                   | 2.98  | 4.30  |
| 12                  | 3.78   | 9.9                 | 6.2     | 2.4     | 0.9     | 2.13                                                                                                                   | 3.30  | 5.39  |
| Summary             | 47.97  | 107.6               | 71.2    | 32.5    | 14.1    | 28.89                                                                                                                  | 45.40 | 61.90 |

-7777: a non-zero value that would round to zero  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value

Current Location: Elev: 476 ft. Lat: 34.2977° N Lon: 81.6236° W  
Station: **NEWBERRY, SC US USC00386209**

Summary of Monthly Normals  
1981-2010  
Generated on 07/21/2025

| Snow (in.) |                  |                        |       |       |      |       |                          |     |     |     |                                                                                                   |     |     |
|------------|------------------|------------------------|-------|-------|------|-------|--------------------------|-----|-----|-----|---------------------------------------------------------------------------------------------------|-----|-----|
|            | Totals           | Mean Number of Days    |       |       |      |       |                          |     |     |     | Snow Probabilities<br>Probability that snow will be equal to<br>or less than the indicated amount |     |     |
|            | Means            | Snowfall >= Thresholds |       |       |      |       | Snow Depth >= Thresholds |     |     |     | Monthly Snow vs. Probability Levels<br>Values derived from the<br>incomplete gamma distribution.  |     |     |
| Month      | Snowfall<br>Mean | 0.01                   | 1.0   | 3.0   | 5.00 | 10.00 | 1                        | 3   | 5   | 10  | .25                                                                                               | .50 | .75 |
| 01         | 0.3              | 0.2                    | 0.2   | -7777 | 0.0  | 0.0   | 0.1                      | 0.1 | 0.1 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 02         | 0.4              | 0.2                    | 0.1   | -7777 | 0.0  | 0.0   | 0.2                      | 0.1 | 0.1 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 03         | 0.2              | 0.1                    | 0.1   | 0.1   | 0.0  | 0.0   | 0.1                      | 0.1 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 04         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 05         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 06         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 07         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 08         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 09         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 10         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 11         | 0.0              | 0.0                    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| 12         | 0.1              | -7777                  | -7777 | 0.0   | 0.0  | 0.0   | 0.0                      | 0.0 | 0.0 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |
| Summary    | 1.0              | 0.5                    | 0.4   | 0.1   | 0.0  | 0.0   | 0.4                      | 0.3 | 0.2 | 0.0 | 0.0                                                                                               | 0.0 | 0.0 |

-7777: a non-zero value that would round to zero  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value

Current Location: Elev: 476 ft. Lat: 34.2977° N Lon: 81.6236° W  
Station: **NEWBERRY, SC US USC00386209**

Summary of Monthly Normals  
1981-2010  
Generated on 07/21/2025

| Growing Degree Units (Monthly)                      |     |     |     |      |      |      |      |      |      |      |      |      |
|-----------------------------------------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| Base                                                | Jan | Feb | Mar | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Growing Degree Units (Monthly)                      |     |     |     |      |      |      |      |      |      |      |      |      |
| Base                                                | Jan | Feb | Mar | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| 40                                                  | 151 | 203 | 402 | 630  | 931  | 1135 | 1279 | 1234 | 997  | 693  | 393  | 199  |
| 45                                                  | 74  | 113 | 267 | 482  | 777  | 985  | 1124 | 1079 | 847  | 539  | 261  | 110  |
| 50                                                  | 31  | 53  | 157 | 340  | 622  | 835  | 969  | 924  | 697  | 388  | 152  | 54   |
| 55                                                  | 10  | 20  | 76  | 212  | 468  | 685  | 814  | 769  | 548  | 249  | 74   | 23   |
| 60                                                  | 3   | 4   | 27  | 112  | 320  | 536  | 659  | 614  | 399  | 138  | 28   | 7    |
| Growing Degree Units for Corn (Monthly)             |     |     |     |      |      |      |      |      |      |      |      |      |
| 50/86                                               | 95  | 137 | 266 | 399  | 619  | 777  | 872  | 850  | 677  | 438  | 245  | 126  |
| Growing Degree Units (Accumulated Monthly)          |     |     |     |      |      |      |      |      |      |      |      |      |
| 40                                                  | 151 | 354 | 756 | 1386 | 2317 | 3452 | 4731 | 5965 | 6962 | 7655 | 8048 | 8247 |
| 45                                                  | 74  | 187 | 454 | 936  | 1713 | 2698 | 3822 | 4901 | 5748 | 6287 | 6548 | 6658 |
| 50                                                  | 31  | 84  | 241 | 581  | 1203 | 2038 | 3007 | 3931 | 4628 | 5016 | 5168 | 5222 |
| 55                                                  | 10  | 30  | 106 | 318  | 786  | 1471 | 2285 | 3054 | 3602 | 3851 | 3925 | 3948 |
| 60                                                  | 3   | 7   | 34  | 146  | 466  | 1002 | 1661 | 2275 | 2674 | 2812 | 2840 | 2847 |
| Growing Degree Units for Corn (Monthly Accumulated) |     |     |     |      |      |      |      |      |      |      |      |      |
| 50/86                                               | 95  | 232 | 498 | 897  | 1516 | 2293 | 3165 | 4015 | 4692 | 5130 | 5375 | 5501 |

Note: For corn, temperatures below 50 are set to 50, and temperatures above 86 are set to 86.  
-7777: a non-zero value that would round to zero.  
Empty or blank cells indicate data is missing or insufficient occurrences to compute value.

**SECTION 01 30 00**  
**ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Progress photographs.
- G. Coordination drawings.
- H. Submittals for review, information, and project closeout.
- I. Number of copies of submittals.
- J. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 70 00 - General Conditions and Lexington County Supplement General Conditions
- B. Section 01 70 00 - Execution Requirements
- C. Section 01 78 00 - Closeout Submittals
- D. Sections throughout these specifications may include other submittals that may be required for construction.

**1.03 PROJECT COORDINATION**

- A. Project Coordinator: Construction Manager.
- B. During construction, coordinate use of site and facilities through the Project Coordinator.
- C. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- D. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- F. Make the following types of submittals to Engineer through the Project Coordinator:
  - 1. Requests for interpretation.
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Design data.
  - 6. Manufacturer's instructions and field reports.
  - 7. Applications for payment and change order requests.
  - 8. Progress schedules.
  - 9. Coordination drawings.
  - 10. Closeout submittals.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRECONSTRUCTION MEETING**

- A. Engineer will schedule a meeting within thirty (30) days after the Owner has determined the low bidder and may be held prior to issuance of the Notice to Proceed when required by regulatory

agencies having jurisdiction. In any event, the Conference will be held prior to actual start of construction.

- B. For the individuals designated by the Contractor, his subcontractors and suppliers attending the Preconstruction Conference, provide required authority to commit the entities they represent to solutions agreed upon in the meeting.
- C. Advise the Engineer at least twenty-hours (24) in advance of the meeting to add items to the agenda.
- D. Attendance Required:
  - 1. Owner.
  - 2. Engineer.
  - 3. South Carolina Department of Health and Environmental Control
  - 4. Contractor
- E. Agenda:
  - 1. Execution of **Newberry** County - Contract Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Arrangement of Contractor's forces and personnel and those of subcontractors, materials suppliers and the Engineer.
  - 5. Channels and procedures for communication.
  - 6. Submission of schedule of values, and progress schedule.
  - 7. Designation of personnel representing the parties to Contract, Contractor, Owner and Engineer.
  - 8. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 9. Scheduling.
  - 10. Scheduling activities of a Geotechnical Engineer.
  - 11. Rules and regulations governing performance of the Work.
  - 12. Security, quality control, housekeeping and related matters.
- F. Preconstruction Meeting minutes will be recorded and distributed within ten (10) days after meeting to participants, with three (3) copies to the Contractor and the required number of copies to the Owner, and those affected by decisions being made.

### **3.02 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the Work at maximum 2-week intervals.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings. Contractor must advise the Engineer within forty-eight (48) hours of advance notice of the meeting to add items to the agenda.
- C. The Contractor's relations with his subcontractors and material suppliers, and discussions with regards to these items, are the Contractor's responsibility and normally not part of the project meeting agenda.
- D. For the individuals designated by the Contractor to attend and participate in the project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.
- E. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.
- F. Meeting Schedule:
  - 1. Project Meetings will be held Bi-weekly or, at a minimum, monthly.
  - 2. Coordinate as necessary to establish mutually acceptable schedule for meetings.
- G. Meeting Location: The Engineer will establish the meeting location, and where possible the meetings will be held at the project site or a location near the project site.

- H. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede, or will impede, planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of off-site fabrication and delivery schedules.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Other business relating to Work.
- I. Project Meeting minutes will be recorded and distributed within ten (10) days after meeting to participants, with three (3) copies to the Contractor and the required number of copies to the Owner, and those affected by decisions made.
- J. Revisions to Meeting Minutes:
  - 1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, the minutes will be accepted as properly stating the activities and decisions of the meeting.
  - 2. Individuals challenging published minutes shall reproduce and distribute copies of the challenge for review by all parties affected.
  - 3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

### **3.03 CONSTRUCTION PROGRESS SCHEDULE**

- A. Comply with Section 01 30 00.
- B. Within fourteen (14) days after date of the Agreement, submit preliminary schedule defining planned operations for the first sixty (60) days of Work, with a general outline for remainder of Work.
- C. If preliminary schedule requires revision after review, submit revised schedule within ten (10) days.
- D. Within thirty (30) days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- E. Include written certification that major contractors have reviewed and accepted proposed schedule.
- F. Within ten (10) days after joint review, submit complete schedule.
- G. Submit updated schedule with each Application for Payment.

### **3.04 PROGRESS PHOTOGRAPHS**

- A. Submit photographs with each application for payment, taken not more than three (3) days prior to submission of application for payment.
- B. Submit new photographs at least once a month, within three (3) days after exposure.
- C. Maintain one (1) set of all photographs at project site for reference; same copies as submitted, identified as such.
- D. Photography Type: Digital; electronic files.
  - 1. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Engineer.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
  - 1. Completion of site clearing.

- a. Excavations in progress.
  - b. Installation of swales in progress and upon completion.
  - c. Final completion/grassing of site, minimum of ten (10) photos.
- 2. Views:
  - a. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
  - b. Consult with Engineer for instructions on views required.
  - c. Provide factual presentation.
  - d. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
  - 1. Delivery Medium: Via email.
  - 2. File Naming: Include project identification, date and time of view, and view identification.
  - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
  - 4. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
  - 5. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

### **3.05 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product data.
  - 2. Shop drawings.
  - 3. Samples for selection.
  - 4. Samples for verification.
- B. Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
- C. Samples
  - 1. Provide sample or samples identical to the precise article proposed to be provided. Identify as described under "Identification of submittals" below.
  - 2. Number of samples required:
    - a. Unless otherwise specified, submit samples in the quantity which is required to be returned, plus one which will be retained by the Engineer.
    - b. By pre-arrangement in specific cases, a single sample may be submitted for review and, when approved, be installed in the work at a location agreed upon by the Engineer.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

### **3.06 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions and literature.
  - 6. Manufacturer's field reports.
  - 7. Other types indicated.
- B. Submit for Engineer's knowledge as contract administrator or for Owner.

### **3.07 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. When the following are specified in individual sections, submit them at project closeout:
  - 1. Project record documents.

2. Operation and maintenance data.
3. Warranties and Bonds.
4. Evidence of payment and release to liens per the General Conditions.
5. Section 00 65 19.13 - Contractor's Affidavit.
6. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

### **3.08 NUMBER OF COPIES OF SUBMITTALS**

- A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Documents for Review:
  1. Shop Drawings
    - a. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.
    - b. Large prints (11-inches x 17-inches or larger):
      - 1) Submit shop drawings in the form of white copies.
      - 2) Blueprints will not be acceptable.
    - c. Manufacturer's literature:
      - 1) Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.
      - 2) Submit the number of copies which are required to be returned, plus three (3) copies which will be retained by the Engineer.
    - d. Do not begin fabrication of equipment or materials prior to Engineer's approval of shop drawings.
  2. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit one copy; the Contractor shall make his own copies from original returned by the Engineer after making his own file copy.
  3. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus 3 that will be retained by Engineer.
- C. Documents for Information: Submit three (3) copies.
- D. Extra Copies at Project Closeout: See Section 01 78 00.
- E. Documents for Project Closeout: Make one (1) reproduction of submittal originally reviewed. Submit one (1) extra of submittals for information.
- F. Samples: Submit the number specified in individual specification sections; two (2) of which will be retained by Engineer.
  1. After review, produce duplicates.
  2. Retained samples will not be returned to Contractor unless specifically so stated.

### **3.09 SUBMITTAL PROCEDURES**

- A. Transmit each submittal with a copy of approved submittal form.
- B. Transmit each submittal with a approved form, that stipulates that the items submitted complies or does not comply with the full extent of the specifications. The Cover Letter must also include an explanation of why the items submitted are considered equal to the items specified. Failure to submit a Cover Letter will result in a rejection of the submittal.
- C. Timing of Submittals:
  1. Within fifteen (15) calendar days after the Contractor has received the Owner's notice to proceed, submit:
    - a. Schedule for submittals including specification section, type of submittal and submittal date.
    - b. Construction schedule.
    - c. Schedule of partial payment requests.

2. Make submittals of shop drawings, samples, substitution requests and other items in accordance with the provisions of this Section.
- D. Quality Assurance:
1. Coordination of submittals:
    - a. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
    - b. Verify that each item and the submittal for it conform in all respects with the specified requirements.
    - c. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.
  2. The following products do not require further approval except for interface within the Work and where otherwise indicated.
    - a. Products specified by reference to standard specifications such as ASTM, AWWA, and similar standards.
    - b. Products specified by manufacturer's name and catalog model number.
  3. "Or equal":
    - a. Where the phrase "or equal" occurs in the Contract Documents, do not assume that the materials, equipment or methods will be considered as equal unless the item has been specifically so approved for this Work by the Engineer.
    - b. The decision of the Engineer shall be final.
  4. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise in writing.
- E. Sequentially number submittal in the Cover Letter. Revise submittals with original number and a sequential alphabetic suffix.
- F. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- G. Before submitting a shop drawing or any related material, Contractor shall:
1. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor.
  2. Approve each such submission before submitting it.
  3. Stamp each such submission before submitting it.
- H. Shop drawings and related materials shall be returned with comments provided that each submission has been specified and is stamped by the Contractor.
- I. Shop drawings or material not specified or which have not been approved by the Contractor shall be returned without comment.
- J. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. The following is an illustration of the stamp to be used on all shop drawings:

"This Shop Drawing has been reviewed by [Name of Contractor] and approved in accordance with the ways, means, methods, techniques, sequences and procedures associated with the project construction. [Name of Contractor] has approved these Shop Drawings in accordance with safety precautions and programs incidental thereto, and warrants that these Shop Drawings comply with the Contract Documents and includes no variations from the specifications."

Signature\_\_\_\_\_

Name and Title (Please Print)\_\_\_\_\_

Date\_\_\_\_\_

- K. Identification of Submittals
  - 1. Consecutively number all submittals.
    - a. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
    - b. On resubmittals, cite the original submittal number for reference.
  - 2. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.
  - 3. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
  - 4. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to the Engineer for his review upon request.
- L. Consecutively number all submittals.
  - 1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
  - 2. On resubmittals, cite the original submittal number for reference.
- M. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.
- N. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
- O. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to the Engineer for his review upon request.
- P. Unrequired submittals will not be reviewed by the Engineer.
- Q. Submittals required by the Contractor of his subcontractors, such as drawings, setting diagrams or similar information needed to coordinate the construction, shall remain between the Contractor and his subcontractors and these submittals will not be reviewed by the Engineer.
- R. Grouping of Submittals
  - 1. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
    - a. Partial submittals may be rejected as not complying with the provisions of the Contract.
    - b. The Contractor may be held liable for delays so occasioned.
- S. Timing of Submittals
  - 1. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.
- T. Resubmittal Schedule
  - 1. For submittals marked "Furnish as Corrected" by the Engineer, resubmittal shall be within fifteen (15) days of the review date shown on the Engineer's shop drawing review stamp.
  - 2. For submittals marked "Revise and Resubmit", "Submit Specified Item", or "Rejected", resubmittal shall be within fifteen (15) days of the review date shown on the Engineer's shop drawing review stamp.
- U. Engineer's Review
  - 1. Review by the Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.
  - 2. Revisions:
    - a. Make revisions required by the Engineer.
      - 1) If the Contractor considers any required revision to be a change, he shall so notify the Engineer as provided for in the General Conditions.
      - 2) Make only those revisions directed or approved by the Engineer.

- 3) Submittals which have been reviewed and returned to the Contractor marked "Revise and Resubmit" or "Rejected" and which are resubmitted and not in an approved state, will not be reviewed a third time unless payment for the third and any subsequent review is by the Contractor. The engineering costs for review shall be equal to the Engineer's charges to the Owner under the terms of the Engineering Agreement with the Owner.
- V. Deliver submittals to Engineer at PO Box 8147 Columbia, SC 29202-8147.
- W. Schedule submittals to expedite the Project, and coordinate submission of related items.
- X. For each submittal for review, allow twenty-five (25) working days excluding delivery time to and from the Contractor.
- Y. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- Z. Provide space for Contractor and Engineer review stamps.
- AA. When revised for resubmission, identify all changes made since previous submission.
- AB. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- AC. Submittals not requested will not be recognized or processed.

**END OF SECTION**

**SECTION 01 40 00**  
**QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. References and standards.
- B. Mock-ups.
- C. Control of installation.
- D. Tolerances.
- E. Testing and inspection services.
- F. Manufacturers' field services.
- G. Cooperate with the Owner's selected testing agency and all others responsible for testing and inspecting the work.
- H. Provide such other testing and inspecting as are specified to be furnished by the Contractor in this Section and/or elsewhere in the Contract Documents.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 70 00 - General Conditions and Lexington County Supplement General Conditions
- B. Section 01 30 00 - Administrative Requirements
- C. Section 01 60 00 - Product Requirements
- D. Requirements for testing may be described in various Sections of these specifications.
- E. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.

**1.03 WORK NOT INCLUDED**

- A. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.
- B. Payment for initial testing: The Owner will pay for all initial services of the testing laboratory as further described in Article 2.1 of this Section.
- C. Tests at point of manufacture as specified in other Sections of these documents are to be made with all costs borne by the Contractor.

**1.04 REFERENCE STANDARDS**

- A. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2013a.
- B. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2012.
- C. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- D. ASTM E329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2011.
- E. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2009.

**1.05 SUBMITTALS**

- A. Testing Agency Qualifications:
  - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full-time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- B. Design Data: Submit for Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit three (3) copies of report to Engineer and to Contractor.
  1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Conformance with Contract Documents.
    - k. When requested by Engineer, provide interpretation of results.
  2. Test report submittals are for Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
  1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
  1. Submit report in duplicate within 30 days of observation to Engineer for information.
  2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

#### **1.06 REFERENCES AND STANDARDS - SEE SECTION 01 42 19**

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### **1.07 QUALITY ASSURANCE**

- A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329.
- B. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

#### **1.08 PRODUCT HANDLING**

- A. Comply with pertinent provisions of Section 01 30 00.
- B. Promptly process and distribute required copies of test reports and related instructions to assure necessary retesting and replacement of materials with the least possible delay in progress of the work.

#### **1.09 TESTING AND INSPECTION AGENCIES**

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

### **PART 2 PRODUCTS**

#### **2.01 PAYMENT FOR TESTING**

- A. Initial services:
  - 1. The Owner will pay for initial testing services requested by the Owner.
  - 2. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.
  - 3. Retesting: When initial tests indicate non-compliance with the Contract Documents, subsequent re-testing occasioned by the non-compliance shall be performed by the same testing agency and all costs there from will be deducted by the Owner from the contract sum.

#### **2.02 CODE COMPLIANCE TESTING**

- A. Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

#### **2.03 CONTRACTOR'S CONVENIENCE TESTING**

- A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

### **PART 3 EXECUTION**

#### **3.01 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step-in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.

- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### **3.02 CONTRACTOR TESTING COORDINATION**

- A. Cooperation with Testing Laboratory:
  - 1. Representatives of the testing laboratory shall have access to the work at all times and at all locations where the work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.
- B. Taking Specimens:
  - 1. All specimens and samples for testing, and deliveries to laboratory, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

### **3.03 SCHEDULES FOR TESTING**

- A. Establishing schedule:
  - 1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
  - 2. Provide all required time within the construction schedule
- B. Revising schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.
- C. Adherence to schedule: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra charges for testing attributable to the delay may be back charged to the Contractor and shall not be borne by the Owner.

### **3.04 MOCK-UPS**

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

### **3.05 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.06 TESTING AND INSPECTION**

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
  6. Perform additional tests and inspections required by Engineer.
  7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the Work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

### **3.07 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations.
  1. Observer subject to approval of Engineer.
  2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### **3.08 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct an appropriate remedy or adjust payment.

**END OF SECTION**

**SECTION 01 42 19**  
**REFERENCE STANDARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements relating to referenced standards.
- B. Reference standards full title and edition date.

**1.02 QUALITY ASSURANCE**

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards when required by the Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

**PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS**

**2.01 AASHTO -- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS**

**2.02 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL**

**2.03 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.**

**2.04 ALSC -- AMERICAN LUMBER STANDARDS COMMITTEE**

**2.05 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE**

**2.06 ASCE -- AMERICAN SOCIETY OF CIVIL ENGINEERS**

**2.07 ASTM A SERIES -- ASTM INTERNATIONAL**

**2.08 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION**

**2.09 AWS -- AMERICAN WELDING SOCIETY**

**2.10 AWWA -- AMERICAN WATER WORKS ASSOCIATION**

**2.11 SPIB -- SOUTHERN PINE INSPECTION BUREAU, INC.**

**2.12 SSPC -- THE SOCIETY FOR PROTECTIVE COATINGS**

**END OF SECTION**

**SECTION 01 60 00**  
**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.
- G. Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 40 00 - Quality Requirements.
- B. Section 01 74 19 - Waste Management
- C. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these specifications.
- D. Additional procedures also may be prescribed in other Sections of these specifications.

**1.03 REFERENCE STANDARDS**

- A. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; current edition.
- B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc.; 2008.

**1.04 SUBMITTALS**

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within fifteen (15) days after date of Agreement.
  - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

**1.05 QUALITY ASSURANCE**

- A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

**1.06 MANUFACTURER'S RECOMMENDATIONS**

- A. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage and protection.

## **PART 2 PRODUCTS**

### **2.01 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

### **2.02 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
  - 1. Made outside the United States, its territories, Canada, or Mexico.
  - 2. Made using or containing CFC's or HCFC's.
  - 3. Made of wood from newly cut old growth timber.
- C. Where all other criteria are met, Contractor shall give preference to products that:
  - 1. Are extracted, harvested, and/or manufactured closer to the location of the project.
  - 2. Have longer documented life span under normal use.
  - 3. Result in less construction waste.
- D. Provide interchangeable components of the same manufacture for components being replaced.

### **2.03 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

### **2.04 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

## **PART 3 EXECUTION**

### **3.01 SUBSTITUTION PROCEDURES**

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Engineer will consider requests for substitutions only within 15 days after date of Agreement.
- C. Substitutions will not be considered when a product becomes unavailable through no fault of the Contractor.
- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- E. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work that 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. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.
- F. 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.
- G. 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 the proposed product equivalence. Burden of proof is on proposer.
  3. The Engineer will notify Contractor in writing of decision to accept or reject request.

### **3.02 PACKAGING**

- A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
1. Maintain packaged materials with seals unbroken and labels intact until time of use.
  2. Promptly remove damaged material and unsuitable items from the job site and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- B. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality and other pertinent information.

### **3.03 TRANSPORTATION AND HANDLING**

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### **3.04 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- L. Partial payments under the Contract will not relieve the Contractor from responsibility.
  - 1. When materials and work at the site that have been partially paid for are not adequately protected by the Contractor, such materials will be protected by the Owner at the expense of the Contractor and no further partial payment thereon will be made.
- M. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.
- N. Electrical and control equipment:
  - 1. Store in a dry area protected from dust and humidity.
  - 2. Equipment can be protected by a weatherproof cover if shipped to the site no more than two (2) weeks prior to installation and energization.

### **3.05 REPAIRS AND REPLACEMENTS**

- A. In the event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the contract time of completion.

**END OF SECTION**

**SECTION 01 70 00**  
**EXECUTION REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Project Record Documents.
- J. Closeout procedures, except payment procedures.
- K. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.
- B. Other requirements for technical services are stated in other sections of these Specifications.
- C. Section 00 65 19.13 - Contractor's Affidavit.
- D. Section 01 30 00 - Administrative Requirements
- E. Section 01 40 00 - Quality Requirements
- F. Section 01 74 19 - Waste Management
- G. Section 01 78 00 - Closeout Submittals.
- H. Individual Product Specification Sections:
  - 1. Advance notification to other sections of openings required in work of those sections.
  - 2. Limitations on cutting structural members.

**1.03 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
  - 3. Submit surveys and survey logs for the project record.

- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.
  - 6. Include in request:
    - a. Identification of Project.
    - b. Location and description of affected work.
    - c. Necessity for cutting or alteration.
    - d. Description of proposed work and products to be used.
    - e. Alternatives to cutting and patching.
    - f. Effect on work of Owner or separate Contractor.
    - g. Written permission of affected separate Contractor.
    - h. Date and time work will be executed.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

#### **1.05 QUALIFICATIONS**

- A. For survey work, employ a land surveyor registered in South Carolina and acceptable to Engineer. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in South Carolina.
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in South Carolina.

#### **1.06 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
  - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
  - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
  - 1. Minimize amount of bare soil exposed at one time.
  - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
  - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
  - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
  - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.

- 2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

### **1.07 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate completion and clean-up of work of separate sections.
- E. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Examine and verify specific conditions described in individual specification sections.
- C. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- E. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.

- C. Notify Engineer four (4) days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two (2) days after meeting to participants, with two (2) copies to Engineer, Owner, participants, and those affected by decisions made.

#### **3.04 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer of any discrepancies discovered.
- C. Control datum for survey is that indicated on Drawings.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- G. Utilize recognized engineering survey practices.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.
- J. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

#### **3.05 GENERAL INSTALLATION REQUIREMENTS**

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

#### **3.06 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- E. Prohibit traffic from landscaped areas.
- F. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

### 3.07 PROJECT RECORD DOCUMENTS

- A. Work includes:
  - 1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below.
  - 2. Upon completion of Work, deliver the recorded changes to the Engineer.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these specifications.
  - 2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these specifications.
- C. Quality assurance:
  - 1. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.
  - 2. Accuracy of records shall be such that future search for items shown on the Project Record Documents may rely reasonably on the information provided under this Section of the Work.
- D. Submittals:
  - 1. The Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.
  - 2. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.
  - 3. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer and secure his approval.
- E. Product handling:
  - 1. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer to the Engineer.
  - 2. In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.
    - a. Such means shall include, if necessary, in the opinion of the Engineer, removal and replacement of concealing materials.
    - b. In such case, provide replacements to the standards originally required by the Contract Documents.
- F. Maintenance of Job Set:
  - 1. Immediately upon receipt of the job set described in above paragraph titled "JOB SET DOCUMENTS", identify each of the Documents with the title, "RECORD DOCUMENTS-JOB SET".
  - 2. Preservation:
    - a. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Engineer.
    - b. Do not use the job set for any purpose except entry of new data and for review by the Engineer.
    - c. Maintain the job set at the site of Work as that site is designated by the Engineer.
  - 3. Making entries on Job Set Drawings:
    - a. Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.
    - b. Show by station number location of all fittings, manholes, valves, wye locations, etc.
    - c. Reference all fittings and valves to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.
    - d. Show location of electrical conduit, pull boxes, etc.

4. Submittal:
  - a. Submit "marked-up" set of drawings to the Engineer.
    - 1) Make any necessary additions as required by the Engineer.

### **3.08 CLOSEOUT PROCEDURES**

- A. Work included shall be providing compliance with the requirements of the General Conditions of these Specifications for administrative procedures in closing out the project work.
- B. Make submittals that are required by governing or other authorities.
  1. Provide copies to Engineer.
  2. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.
  3. When the Engineer finds the Contractor's work acceptable, the Contractor shall be given such notice and should proceed with closeout submittals.
  4. Closeout submittals shall contain at least the following:
    - a. Project record documents.
    - b. Warranties and bonds.
    - c. Spare parts and manuals.
    - d. Evidence of payment and release to liens per General Conditions.
    - e. Section 00 65 19.13 - Contractor's Affidavit
- C. Notify Engineer when work is considered ready for Substantial Completion.
  1. The Contractor shall notify the Engineer that, in his opinion, the project is substantially complete. A written statement listing items complete shall be submitted.
  2. Upon receipt of the Contractor's notice, the Engineer shall make an observation to determine if substantial completion is provided.
  3. If, in the Engineer's opinion, the project is not substantially complete, a written notice to the Contractor shall follow outlining reasons and deficiencies in work that comprised the Engineer's decision. The Engineer's decision shall be final.
- D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's review.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Accompany Engineer & Owner on preliminary final observation.
  1. The Engineer will make a final observation for the Contractor after all items noted in the substantial completion observation have been corrected. The Contractor shall notify the Engineer in writing when a final observation is needed. Incomplete and/or defective work shall be given to the Contractor by written notice.
- G. Complete items of work determined by Engineer's final inspection.
- H. Reobservation:
  1. Re-observation required due to failure by the Contractor to make previously noted corrections will be performed by the Engineer.
  2. Cost for such observations will be due to and payable by the Contractor at a rate equal to charges to the Owner for similar work.
  3. Re-observations will continue until the work is acceptable to the Engineer.
- I. Final Payment:
  1. Final payment to the Contractor will be made upon completion of the previous items and others required by these specifications. A final statement shall be forwarded to the Engineer. The statement shall address:
    - a. Previous change orders.
    - b. Unit prices.
    - c. Deductions for uncorrected work.
    - d. Deductions for liquidated damages.

- e. Deductions for re-testing work.
  - f. Deductions for reobservation.
  - g. Deductions for shop drawing review.
  - h. Adjusted contract sum.
  - i. Previous payments.
  - j. Amount due.
2. When required, the Engineer will prepare a contract change order for adjustments not previously made.

### **3.09 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 01 74 19**  
**WASTE MANAGEMENT**

**PART 1 GENERAL**

**1.01 WASTE MANAGEMENT REQUIREMENTS**

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
  - 5. Incineration, either on- or off-site.
- E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements
- B. Section 01 60 00 - Product Requirements
- C. Section 01 70 00 - Execution Requirements
- D. Section 31 11 00 - Clearing and Grubbing.

**1.03 DEFINITIONS**

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

## **PART 2 PRODUCTS**

### **2.01 PRODUCT SUBSTITUTIONS**

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
  - 1. Relative amount of waste produced, compared to specified product.
  - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
  - 3. Proposed disposal method for waste product.
  - 4. Markets for recycled waste product.

## **PART 3 EXECUTION**

### **3.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- C. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

**END OF SECTION**

**SECTION 01 78 00**  
**CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 70 00 - General Conditions
- B. Section 01 30 00 - Administrative Requirements
- C. Section 01 70 00 - Execution Requirements
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

**1.03 SUBMITTALS**

- A. Project Record Documents: Submit documents to Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents fifteen (15) days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within ten (10) days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.
  - 2. Make other submittals within ten (10) days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish first floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - 5. Details not on original Contract drawings.

### **3.02 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

### **3.04 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.
- F. Manual: Bind in commercial quality 8-1/2 by 11-inch three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

**END OF SECTION**

**SECTION 02 30 00**  
**SUBSURFACE INVESTIGATION**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Soils investigation report:
  - Report of Subsurface Exploration Mid-Carolina Commerce Park Phase IIA & III Roadway  
Prepared for the project by S&ME Consultants dated April 24, 2009 (S&ME Consultants  
Project Number 1611-09-106)
  
  - Report for Geotechnical Exploration Mid-Carolina Commerce Park – Parcel 6  
Prepared for the Project by S&ME Consultants dated July 31, 2023 (S&ME Consultants  
Project Number 206769).
- a. A Copy of the reports are included
- B. Use of data:
  - 1. These reports were obtained only for the Engineer's use in design and is not a part of the Contract Documents.
  - 2. The report is available for bidders' information, but is not a warranty of subsurface conditions.
  - 3. It is the responsibility of the Bidders to visit the site and acquaint themselves with the existing conditions.
  - 4. Prior to bidding, bidders may make their own Subsurface Investigations to satisfy themselves as to site and subsurface soil conditions, but these investigations must be performed under the time schedules and arrangements that have been approved in advance by the Engineer.

**1.02 QUALITY ASSURANCE**

- A. The Owner will retain a soils engineer to observe the performance of work in connection with excavating, trenching, filling, backfilling and grading, and to perform compaction tests as required.
- B. All work that is performed under this contract that does not meet technical or design requirements must be adjusted and no deviation from the Contract Documents can be made without specific and written approval from the Engineer.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

**REPORT OF  
SUBSURFACE EXPLORATION**

**MID-CAROLINA COMMERCE PARK  
PHASE IIA & III ROADWAY  
NEWBERRY COUNTY, SOUTH CAROLINA  
S&ME PROJECT NO. 1611-09-106**

**Prepared For:**

**Alliance Consulting Engineers, Inc.  
Post Office Box 8147  
Columbia, South Carolina 29202-8147**

**Prepared By:**



**S&ME, Inc.  
134 Suber Road  
Columbia, South Carolina 29210**

**April 24, 2009**



April 24, 2009

Alliance Consulting Engineers, Inc.  
Post Office Box 8147  
Columbia, South Carolina 29202-8147

Attention: Mr. Christian C. Jones, EIT

**Reference: REPORT OF SUBSURFACE EXPLORATION**  
Mid-Carolina Commerce Park Phase IIA and III Roadway  
Newberry County, South Carolina  
S&ME Project No. 1611-09-106

Dear Mr. Jones:

As requested, S&ME, Inc. (S&ME) has completed field and laboratory testing of the proposed Mid-Carolina Commerce Park Phase IIA and III Roadway in Newberry County, South Carolina. Our work was performed in general accordance with our proposal (No. 1611-6727-09) dated March 26, 2009, our Change of Scope letter dated March 30, 2009 and the under terms and conditions of the indefinite delivery contract between Alliance Consulting Engineers, Inc. and S&ME dated January 15, 2007. This report provides the exploration and testing procedures, our boring logs, the laboratory test results and our recommendations regarding site preparation, fill placement, pavement section thicknesses and design parameters for the pump station.

S&ME appreciates this opportunity to work with Alliance Consulting Engineers as your geotechnical engineering consultant on this project. Please contact us at (803) 561-9024 if you have any questions or need any additional information regarding this report.

Sincerely,  
**S&ME, Inc.**

*Melissa Quinton*  
Melissa Quinton, P.E.  
Geotechnical Engineer  
mqinton@smeinc.com



*James T. Palmer*  
James T. Palmer, P.E.  
Engineering Manager  
jpalmer@smeinc.com

## TABLE OF CONTENTS

|                                                                |    |
|----------------------------------------------------------------|----|
| EXECUTIVE SUMMARY.....                                         | 1  |
| 1. PROJECT INFORMATION.....                                    | 2  |
| 2. EXPLORATION PROCEDURES.....                                 | 2  |
| 3. LABORATORY TESTING .....                                    | 2  |
| 4. SITE CONDITIONS .....                                       | 3  |
| 4.1 Surface Conditions.....                                    | 3  |
| 4.2 Subsurface Conditions .....                                | 4  |
| 4.2.1 Site Geology.....                                        | 4  |
| 4.2.2 Interpreted Subsurface Profile .....                     | 4  |
| 5. RECOMMENDATIONS .....                                       | 6  |
| 5.1 Site Preparation.....                                      | 6  |
| 5.1.1 Stripping and Grubbing.....                              | 6  |
| 5.1.2 Proofrolling/Densification of the Stripped Surface ..... | 6  |
| 5.2 Site Excavation .....                                      | 7  |
| 5.2.1 Groundwater.....                                         | 8  |
| 5.3 Fill Placement and Compaction.....                         | 8  |
| 5.3.1 Wet Weather Grading.....                                 | 8  |
| 6. PAVEMENT DESIGN.....                                        | 9  |
| 6.1 Assumed Traffic.....                                       | 9  |
| 6.2 Pavement Section Thickness Recommendations.....            | 10 |
| 6.3 Construction Considerations.....                           | 11 |
| 6.3.1 Drainage.....                                            | 11 |
| 6.3.2 Construction of Flexible Pavement Sections .....         | 11 |
| 7. QUALIFICATIONS OF REPORT .....                              | 12 |

## **APPENDIX**

Figure 1 – Site Vicinity Map

Figure 2 – Boring Location Plan

Summary of Exploration Procedures

Boring Logs

Laboratory Data

## **EXECUTIVE SUMMARY**

The information provided in this executive summary is intended to be a brief overview of project information and recommendations from the geotechnical report. Information in the executive summary should not be used without first reading the geotechnical report and the recommendations described therein.

Our subsurface exploration was performed at the proposed Mid-Carolina Commerce Park Phase IIA and III Roadway located off of SC Highway 773 in Newberry County, South Carolina. The exploration included twelve soil test borings along the centerline of the proposed roadway. The site is mostly wooded consisting of mature and sapling pines with sparsely spaced hard woods. In addition, the site exhibits considerably rolling terrain with elevation changes of approximately 100 feet based on the provided topographical map. The most notable drainage feature is a stream flowing south to north across the site. At the time of our field exploration the majority of the site was dry with the exception of flowing water noted in lower lying stream feature. Some rock outcropping was observed in areas along the stream bed.

Our borings generally encountered sandy lean clays, clayey sands, sandy silts (ML and MH) and silty sands beneath the topsoil to depths ranging from about 5 feet to 15 feet below the ground surface. Partially Weathered Rock was encountered at approximate depths ranging from the ground surface to 10 feet (Elevation 422 to 450 feet) in borings B-2, B-4, B-5, and B-7 through B-9. Auger refusal was encountered at an approximate depth of 10 feet below the ground surface (Elevation 438 feet) in boring B-5. The potential exists that PWR and/or massive rock will be encountered at shallower depths at locations between our boring locations. Approximately zero to three inches of topsoil was encountered at our boring locations; however, these thicknesses were likely disturbed during clearing for access to the boring locations. Groundwater was not encountered at the time of drilling in any of our borings at the site. Groundwater may be encountered at relatively shallow depths near the existing stream during construction.

The sandy clays, clayey sands, sandy silts (ML), and silty sands encountered near the ground surface of our borings are suitable for use as structural fill, provided they are free of deleterious materials. These soils will have a tendency to retain moisture. If these soils are used as structural fill, extended drying times may be required during wet weather grading. The Sandy Elastic Silts (MH) encountered in the upper 8-1/2 feet of boring B-10 should be avoided for use as fill.

The soil profiles encountered appear generally suitable for the proposed development. Pavement design was based on a California Bearing Ratio of 3 percent for sandy lean clay soils compacted to 98 percent of the standard Proctor maximum dry density. Traffic is assumed to be on the order of 3,190,720 Equivalent Single Axle Loads over a 20 year design life. Two options for asphalt pavement sections are provided.

## **1. PROJECT INFORMATION**

Information about the project was obtained in an e-mail from Christian Jones with Alliance Consulting Engineers to Trapp Harris with S&ME on March 24, 2009. Roadway plan and profile drawings were attached to the e-mail. This project proposes the new construction of approximately 2,500 feet roadway that will comprise phases IIA and III of the Mid-Carolina Commerce Park. S&ME is familiar with the site, and has completed a geotechnical exploration for the Phase I portion of the roadway under S&ME Project No. 1611-07-329, dated August 10, 2007. The proposed site is located on wooded undeveloped land off of SC Highway 773 near its intersection with Interstate 26 in Newberry County, South Carolina. A site location map is attached as Figure 1. Anticipated traffic volumes for the proposed park were not available as of the date of this report. We have assumed traffic volumes and loadings based on our experience with similar industrial park developments.

## **2. EXPLORATION PROCEDURES**

On March 30<sup>th</sup> and 31<sup>st</sup>, 2009, a representative from S&ME visited the site to observe current site conditions, supervise clearing operations, and lay out proposed boring locations. The proposed boring locations and clearing paths were laid out by a hand held GPS unit utilizing state plane coordinates provided by Alliance Consulting Engineers, Inc. Cleared paths and our borings were located as close as practical to the centerline of the proposed roadway. Borings B-4 and B-5 were offset approximately 80 feet left of the centerline due to a drainage ditch approximately 5 feet deep, which would have required extensive clearing and grading to allow access to the drilling rig. Boring B-11 was offset approximately 50 feet right of the proposed centerline due to steep terrain.

The field subsurface exploration was performed on April 8<sup>th</sup> and 9<sup>th</sup>, 2009. The field exploration included 12 soil test borings and Standard Penetration Test (SPT) sampling and testing. In addition, two 30 to 50 pound bulk samples were collected of soils that will likely comprise the subgrade for pavements. These activities were completed at the approximate locations shown on Figure 2.

## **3. LABORATORY TESTING**

After visual observation and manual manipulation of the soil samples, it was determined that the samples obtained directly beneath the topsoil at the site consisted of Sandy Clays (CL), Clayey Sands (SC), Silty Sands (SM) and Sandy Silts (ML and MH). Laboratory tests were performed on two bulk samples. Bulk sample 1 was obtained from the auger cuttings from boring B-4, and bulk sample 2 was obtained from the auger cuttings of boring B-9. We conducted the following quantitative laboratory tests:

- Two Standard Proctor Moisture Density Relationship Tests (ASTM D698)

- Two remolded California Bearing Ratio (CBR) tests (ASTM D1883)
- Two Atterberg Limits tests (ASTM D4318)
- Two Wash 200 sieve analysis tests (ASTM D422)
- Four natural moisture content tests (ASTM D2116)

Standard Proctor and CBR test results are provided in the following table.

**Table 1: Summary of Standard Proctor and CBR Laboratory Test Results**

| Sample No.                              | Soil Type               | Maximum Dry Density | Optimum Moisture Content | CBR |
|-----------------------------------------|-------------------------|---------------------|--------------------------|-----|
| Bulk Sample 1<br>(Boring B-4, 0 – 5 ft) | Clayey Sand<br>(SC)     | 119.0 pcf           | 12.1%                    | 6%  |
| Bulk Sample 2<br>(Boring B-9, 0 – 5 ft) | Sandy Lean Clay<br>(CL) | 107.9 pcf           | 16.5%                    | 3%  |

Standard Proctor and CBR tests were used to help evaluate soil support values for pavement sections. Additional laboratory testing was conducted on split spoon samples obtained at the site, including wash 200 sieve analysis, Atterberg Limits, and natural moisture content tests. This information was used to help classify the soils encountered. Laboratory test results are attached in the Appendix.

## **4. SITE CONDITIONS**

S&ME's assessment of the geotechnical conditions began with a reconnaissance of the topography and physical features of the site. We also consulted available topographic and geologic maps, for relevant information.

### **4.1 Surface Conditions**

The project site is situated at the southwest corner of Hwy 773 and Interstate 26 in Newberry County, South Carolina. The site is accessible by a dirt road from Highway 773 on the north side of the project, and overhead utility corridor on the south side of the project. The site exhibits considerably rolling terrain with elevation changes of approximately 100 feet by observation and based on the provided topographical map. The site is mostly wooded consisting of mature and sapling pines with sparsely space hard woods. Ground cover consists of sandy clay soils on the upper elevations and sandy soils observed near the stream elevation. The most notable drainage feature is a stream flowing northwest across the site. At the time of our field exploration the majority of the site was dry with the exception of flowing water noted in lower lying stream feature. Some rock outcropping was observed in areas along the stream bed.

## 4.2 Subsurface Conditions

Recovered field samples and field boring records were reviewed in the laboratory by the geotechnical professional. Finished soil test boring records and other field data are assembled in the Appendix.

### 4.2.1 Site Geology

The site lies within the Piedmont Physiographic Province of South Carolina, an area underlain by soils weathered in place from the parent crystalline bedrock material. Residual soils of the Carolina Piedmont consist of stiff or very stiff micaceous silts and clays, grading to firm sands with depth. These soils have been completely weathered in place from the parent bedrock material, but below depths of a few feet retain most of the relict rock structure. Soil strength derives largely from relict intermolecular bonding and remolded materials generally less exhibit lower shear strength than do undisturbed samples. Piedmont soils are normally consolidated to slightly overconsolidated.

The term *partially weathered rock (PWR)* is applied to very dense micaceous sands or silty sands of the Carolina Piedmont, which register SPT N-values in excess of 100 blows per foot. PWR generally varies widely within even small areas owing to minute differences in the chemical properties of the parent bedrock, which results in widely varying rates of weathering. Isolated lenses or seams of PWR often are present within Piedmont Residuum well above the overall PWR level within a given area. PWR is considered excellent bearing material for foundations and is relatively incompressible except in highly stressed deep foundations.

PWR was encountered at approximate depths ranging from the ground surface to 10 feet (Elevation 422 to 450 feet) in borings B-2, B-4, B-5, and B-7 through B-9. Auger refusal was encountered at an approximate depth of 10 feet below the ground surface (Elevation 438 feet) in boring B-5. Auger refusal often occurs on coarse gravel, boulders or hard rock. The potential exists that PWR, boulders and/or hard rock will be encountered at shallower depths at locations between our boring locations.

### 4.2.2 Interpreted Subsurface Profile

The generalized subsurface conditions at the site are described below. For detailed descriptions and stratification at a particular boring location, the respective boring record should be reviewed. Subsurface conditions between the borings will likely vary. The nature and extent of variations between the sampling points will not become evident until construction. Soil test boring logs are attached in the Appendix.

Top-of-ground elevations shown on the boring logs are assumed and were derived from the topographic site plan provided by Alliance Consulting Engineers for demonstration purposes only. Boring locations and elevations were not surveyed.

### Topsoil

Approximately zero to three inches of topsoil was encountered at our borings locations at the site. Topsoil thicknesses were likely disturbed during clearing activity to access boring locations. While these measurements are likely representative of the topsoil thicknesses that will be encountered during construction, the potential exists that greater topsoil thickness may be encountered at other locations on the site.

### Piedmont Soils Encountered

Soils encountered in our borings consisted mainly of sandy lean clays, clayey sands, silty sands, and sandy silts.

Sandy lean clay soils were encountered from just below the topsoil, where encountered, to depths of about 3-1/2 feet to 5 feet below the ground surface in borings B-1 through B-3, B-5, B-6, B-11 and B-12. This is about 60 percent of the boring locations. These soils were generally brown, to reddish brown, and gray in color and moist with low to medium plasticity fines and fine to medium sands. Standard Penetration Test (SPT) N-values (blow counts) for sandy clays encountered in our borings ranged from 6 to 38 blows per foot indicating a firm to hard consistency. Consistency was generally firm to stiff in the upper strata and becoming very stiff to hard with depth.

Clayey sands were encountered beneath the topsoil to a depth of about 3-1/2 feet in boring B-4. These soils were generally reddish-brown and tan in color and were wet, with fine to medium sands and low plasticity fines. An SPT N-value of 4 blows per foot was recorded in this layer, indicating a very loose relative density.

Silty sands were encountered beneath the topsoil to depths of approximately 6 feet to 10 feet in borings B-7 and B-8, and beneath the sandy clays and clayey sands to depths of about 5 feet to 15 feet in borings B-1, B-2, and B-10 through B-12. Silty sands were generally brown or tan in color and moist with fine to medium sands and low plasticity fines. SPT N-values recorded in these soils ranged from 20 to 43 blows per foot, indicating a medium dense to dense relative density.

Sandy silts (ML and MH) were encountered from a depth of about 3-1/2 feet to termination of drilling at 10 feet in boring B-6, and beneath the topsoil to a depth of about 8-1/2 feet in boring B-10. Sandy silt (ML) encountered in boring B-6 was generally tan to brown with low plasticity fines and fine to medium sands. Sandy elastic silt (MH) encountered in boring B-10 was generally reddish-brown with a trace of white with medium to high plasticity fines and fine sands. SPT N-values recorded in these layers ranged from 13 to 43 blows per foot, indicating a stiff to hard consistency. Consistency was generally stiff in the upper 2 feet of the strata and becoming very stiff to hard with depth.

### Partially Weathered Rock (PWR)

PWR was encountered at approximate depths ranging from the ground surface to 10 feet (Elevation 422 to 450 feet) in borings B-2, B-4, B-5, and B-7 through B-9. Auger refusal was encountered at an approximate depth of 10 feet below the ground surface (Elevation 438 feet) in boring B-5. Auger refusal at location B-5 was likely on a boulder or massive rock. Recovered PWR material in our borings was sampled as silty sands. This material was generally gray, brown, and white in color and dry with mostly fine sands and little low plasticity fines. Standard Penetration Test N-values for PWR were in excess of 100 blows per foot indicating a very dense relative density.

### Groundwater

Groundwater was not encountered at our boring locations during the time of our site investigation. Due to the nature of soils encountered in our borings, it is possible that perched seams or lenses of water may be encountered during construction. These seams or lenses of perched water generally occur on layers of dense sands or stiff clays and silts during wet periods. Groundwater may also be encountered at relatively shallow depths near the existing stream.

## **5. RECOMMENDATIONS**

The following paragraphs include our conclusions and recommendations for site preparation, excavation at the site and the design and fill placement and compaction. The soil profile encountered at this site appears generally suitable for the proposed development.

In the Piedmont geological province the depth to PWR and/or rock can vary greatly over short distances. Because of this, there is some potential that excavation at the site will encounter very hard digging or will require ripping, the use of pneumatic tools or blasting.

### **5.1 Site Preparation**

Based on the provided roadway profile drawing, cut and fill of up to 15 to 20 feet is anticipated in areas of the site during construction. Below are recommendations for preparation of the site prior to fill placement and compaction.

#### *5.1.1 Stripping and Grubbing*

Strip and grub all vegetation and topsoil in the proposed pavement areas and dispose of this material outside of the footprint of pavement areas. Large stumps and tree root bulbs should be completely removed.

#### *5.1.2 Proofrolling/Densification of the Stripped Surface*

After stripping and cutting to grade, in areas that will receive less than 12 inches of new fill, the upper 12 inches of existing soils should be compacted to at least 98 percent of

standard Proctor maximum dry density. Where encountered dense/hard soils and PWR soils should be disturbed as little as possible and additional compaction is not required. Where dense/hard soils or PWR is encountered, in cut areas and in areas that will receive more than 12 inches of new fill, the exposed surface should be proofrolled using a heavily loaded truck or pan to identify soft areas.

Areas which rut or pump excessively under the proofrolling operation will need to be stabilized prior to placement of new fill soil or base course layers. Soft, wet or unstable soils may make it difficult to achieve the required compaction and will exhibit substantially lower bearing for pavements. Stabilization, if required, may consist of scarifying and/or drying and recompacting any soft or wet surface soils or undercutting and replacing unstable material. Additional stabilization may be required if surface soils are heavily reworked or allowed to become saturated during construction. The geotechnical engineer or a representative of the geotechnical engineer should be present to observe and document surface preparation and proofrolling.

## **5.2 Site Excavation**

The boring data indicates that excavation at the site will extend through loose to medium dense or stiff to hard material to a depth of approximately 5 to 15 feet below the ground surface. These consistency soils can normally be excavated by routine earthmoving equipment. However, there is a strong potential that very hard or very dense soils, PWR or even rock will be encountered at shallow depths. This is evidenced by rock out cropping being observed near the stream locations.

Excavations greater than 5 to 10 feet below the ground surface may extend through very dense partially weathered rock. Heavy excavating equipment with ripping tools will probably be effective in removing the partially weathered rock during site grading. The speed and ease of excavation will depend on the type of grading equipment, operator skill and the geologic structure of the material itself, such as the direction of bedding, planes of weakness, and spacing of discontinuities.

Rock excavation may be required where excavations extend below the boring refusal elevation of 438 feet at the site. The volume of rock excavation can have a major impact on the project cost, particularly when substantial quantities of rock must be excavated. Small diameter exploratory borings at dispersed locations do not provide sufficient information for reliable rock quantity estimates. This is particularly true where rock conditions are extremely variable from point to point. There could be seams or knobs of dense rock at some locations which would necessitate much greater rock removal than expected.

### **5.2.1 Groundwater**

Groundwater is not likely to be encountered during site excavations. In small shallow excavations groundwater, if encountered, can likely be controlled by the construction of sumps and pumping.

## **5.3 Fill Placement and Compaction**

The sandy clays, clayey sands and silty sands encountered near the ground surface are suitable for use as structural fill. The sandy clays and clayey sands will have a tendency to retain moisture and extended drying times may be required during wet weather grading.

Sandy elastic silt (MH) soils similar to those encountered in the upper 8-1/2 feet of boring B-10 should be avoided for use as structural fill.

All fill placed in pavement, and embankment areas should be comprised of soils free of organic matter and other deleterious materials. The fill should be uniformly spread in relatively thin lifts (8 inches, loose) and compacted to at least 98 percent of the soil's maximum dry density as determined by a laboratory standard Proctor compaction test (ASTM D-698). The moisture content should be controlled to within plus to minus 3 percent of optimum. In addition to meeting the compaction requirement, fill material should be stable under movement of the construction equipment and should not exhibit rutting or pumping.

It is very important that all fill is uniformly well compacted. Accordingly, fill placement should be monitored by a qualified Materials Technician working under the direction of the Geotechnical Engineer. In addition to this visual evaluation, the Technician should perform at least one in-place density test for each 2000 square feet per lift in mass grading and one density test per 50 feet in utility line trenches.

### **5.3.1 Wet Weather Grading**

Our experience indicates that the movement of clearing and construction equipment on areas of standing water or saturated soils will result in degradation of the soils to depths of 1 to 2 feet. Repeated passes of equipment will cause rutting and the mixture of surface materials (organics) into what might otherwise be acceptable soils. Movement of construction equipment on saturated soils should be avoided where possible. Where organics and near surface soils become mixed it will be necessary to remove and replace the mixed material.

Based on our experience, sandy clays, clayey sands and silty sands similar to those encountered in our borings may be difficult to work if allowed to become wet. If allowed to become wet these soils will likely impede the movement of construction equipment. These soils may also require extended drying times once wet. To help reduce the

potential for these upper soils becoming wet during rain events, we recommend the surface be “sealed” with a smooth drum roller if rain is pending. Positive drainage from the roadway surface should be maintained.

## **6. PAVEMENT DESIGN**

Soaked laboratory California Bearing Ratio (CBR) tests were performed on representative bulk samples (BS-1 and BS-2) obtained from borings B-4 and B-9. The samples were compacted (remolded) to approximately 98 percent of the standard Proctor maximum dry density near the optimum moisture content. A CBR value of 6 percent was obtained at approximately 98 percent compaction from bulk sample BS-1, and a CBR value of 3 percent was obtained at approximately 98 percent compaction from bulk sample BS-2. Based on the soil profile that will likely be affected by the loads applied, a CBR value of 3 percent is recommended for use in design of the pavement section. This is assuming that the upper 12 inches of subgrade material is compacted to at least 98 percent of the standard Proctor maximum dry density. This also assumes that any fill material placed within the proposed pavement area is placed and compacted according to the recommendations given in this report. Imported fill should be tested to determine that it exhibits a soaked CBR of at least 3 percent.

Design procedures are based on the AASHTO Guide for Design of Pavement Structures and associated literature. Based on the subsurface conditions and assuming our grading recommendations will be implemented as specified, the following presents our recommendations regarding typical pavement sections and materials.

### **6.1 Assumed Traffic**

Traffic volumes were not made available as of the writing of this report, therefore assumed traffic volumes have been used in analysis and are not guaranteed to represent the actual traffic volumes. If actual traffic volumes differ from those assumed, the pavement section should be reevaluated. For a normal duty section the following assumptions were used:

- A design life of 20 years with **3,190,720** Equivalent Single Axle Loads (ESAL) over the design life.
- Average Daily Traffic of 500 passenger cars per day with 0.006 ESAL per vehicle (six days per week).
- Average Daily Traffic of 200 multiple axle trucks per day with 2.5 ESAL per vehicle (six days per week).
- Five delivery trucks per day with 1.5 ESAL per truck (six days per week).
- Two garbage trucks per week with 2.5 ESAL per truck.

The assumed traffic volumes presented above are the same volumes and loads used during design of the Phase I portion of the roadway during our previous geotechnical exploration (S&ME Project No. 1611-07-329, dated August 10, 2007).

## 6.2 Pavement Section Thickness Recommendations

Our pavement analysis was performed using DARWin Pavement Design and Analysis System software. DARWin uses the AASHTO '93 Flexible Pavement Design Method for analysis of the unreinforced pavement section. Structural design DARWin input data included an initial serviceability of 4.2, a terminal serviceability of 2.2, a reliability level of 70 percent, and an overall standard deviation of 0.45 for flexible pavements.

It is our opinion that the flexible pavement should consist of a wearing course of hot mix asphaltic (HMA) concrete and a base course of graded aggregate material. Graded aggregate material is necessary for structural support and to help transport any rainwater that seeps below the pavement. The results of our design are summarized in the following table.

**Table 2: Recommended Flexible Pavement Section Thicknesses**

| <b>Pavement Type</b>                      | <b>Graded<br/>Aggregate Base</b> | <b>Asphalt<br/>Binder Course</b> | <b>Asphalt<br/>Surface Course</b> |
|-------------------------------------------|----------------------------------|----------------------------------|-----------------------------------|
| Normal Duty (Option #1)<br>3,190,720 ESAL | 8 in.                            | 4 in.                            | 2 in.                             |
| Normal Duty (Option #2)<br>3,190,720 ESAL | 12 in.                           | 3 in.                            | 2 in.                             |

Pavement materials should conform with and be placed in accordance with the South Carolina DOT Standard Specifications for Highway Construction for Type 1 or Type C asphalt. The aggregate base course should consist of Macadam Base Course (Refer to SCDOT Standard Specifications, Section 305 page 209). This base course should be compacted to at least 100 percent of the maximum dry density, as determined by the modified Proctor compaction test (ASTM D 1557-90 or AASHTO T 180-90). To confirm that the base course has been uniformly compacted, in-place field density tests should be performed by a qualified Materials Technician, and the area should be methodically proofrolled under his evaluation.

Although our analysis was based on a 20 year design life, our experience indicates that an overlay may be needed in approximately 7 to 10 years due to normal weathering of the asphaltic concrete. Also, some areas could require repair in a shorter time period.

### **6.3 Construction Considerations**

Recommendations for construction of asphalt pavements are given in the paragraphs below.

#### **6.3.1 Drainage**

Pavement performance is very dependent on subgrade condition. Drainage will have a major impact on subgrade condition. Drainage should be designed to result in subsurface water levels being at least 2 feet below the top of the pavement subgrade. Design should not result in water standing on the pavement surface or behind curbing. Design should result in positive drainage being available from the stone base material.

Where possible, ditches should be excavated adjacent to the pavement shoulders. Shoulder maintenance also plays an important role in continued performance of the pavement section. Shoulders should be maintained such that water does not stand adjacent to the pavement.

The performance of the pavement will be influenced by a number of factors including the actual condition of subgrade soils at the time of pavement installation, installed thicknesses and compaction, and drainage. The subgrade soils should be reevaluated by proofrolling immediately prior to placement of base course stone and any unstable areas repaired. This recommendation is very important to the long-term performance of the pavements. Areas adjacent to pavements (embankments, landscaped island, ditching, etc.) which can drain water (rainwater or sprinklers) should be designed so that water does not seep below the pavements. This may require the use of French drains or swales. Sufficient tests and inspections should be performed during pavement installation to confirm that the required thickness, density, and quality requirements of the specifications are followed.

#### **6.3.2 Construction of Flexible Pavement Sections**

Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed. This is very important for the long-term performance of the pavement, and can be performed by S&ME, Inc. as part of our construction materials testing services. In addition, the following guidelines should be considered during construction:

1. Prior to pavement installation, all exposed pavement subgrades should be methodically proofrolled at final subgrade elevation under the observation of the S&ME, Inc. geotechnical engineer, and any identified unstable areas should be repaired as directed.

2. Depending upon conditions at the time of construction, pavement under drainage, French drains, and/or ditches may be required in some areas to control perched groundwater and stabilize subgrades.
3. We recommend the placement of a non-woven filter fabric between the subgrade soils and the underlying sandy clays and sandy silts. The filter fabric may be omitted where the pavement section will be underlain by clayey or silty sands. Placement of the filter fabric will help reduce the potential for contamination of the base course rock by the underlying fine grained soils.
4. All material and construction should be in accordance with the applicable sections of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.
5. As stated in the SCDOT Section 305 specification, new base course should be compacted to at least **100 percent** of the modified Proctor maximum dry density (ASTM D 1557), and should not exhibit pumping or rutting under equipment traffic. Heavy compaction equipment is likely to be required in order to achieve the required base course compaction, and the moisture content of the material will likely need to be maintained very near the optimum moisture content in order to facilitate proper compaction. S&ME, Inc. should be contacted to perform field density and thickness testing of the base course prior to paving.
6. Experience indicates that, for asphalt surfaced roads designed for a 20 year design life, a surface overlay of asphalt pavement may be required in about 10 years due to normal wear and weathering of the surface. Such wear is typically visible in several forms of pavement distress, such as aggregate exposure and polishing, aggregate stripping, asphalt bleeding, and various types of cracking. There are means to methodically estimate the remaining pavement life based on a systematic statistical evaluation of pavement distress density and mode of failure. We recommend the pavement be evaluated in about 7 years to assess the pavement condition and remaining life.

## **7. QUALIFICATIONS 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 contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, express 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 between the borings will not become evident until construction. If variations appear evident, then we will

re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the proposed structure are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing.

We recommend that S&ME, Inc. be provided the opportunity to review the final design plans and specifications in order to ensure that earthwork and foundation recommendations are properly interpreted and implemented.

# APPENDIX



SOURCE: Google Earth

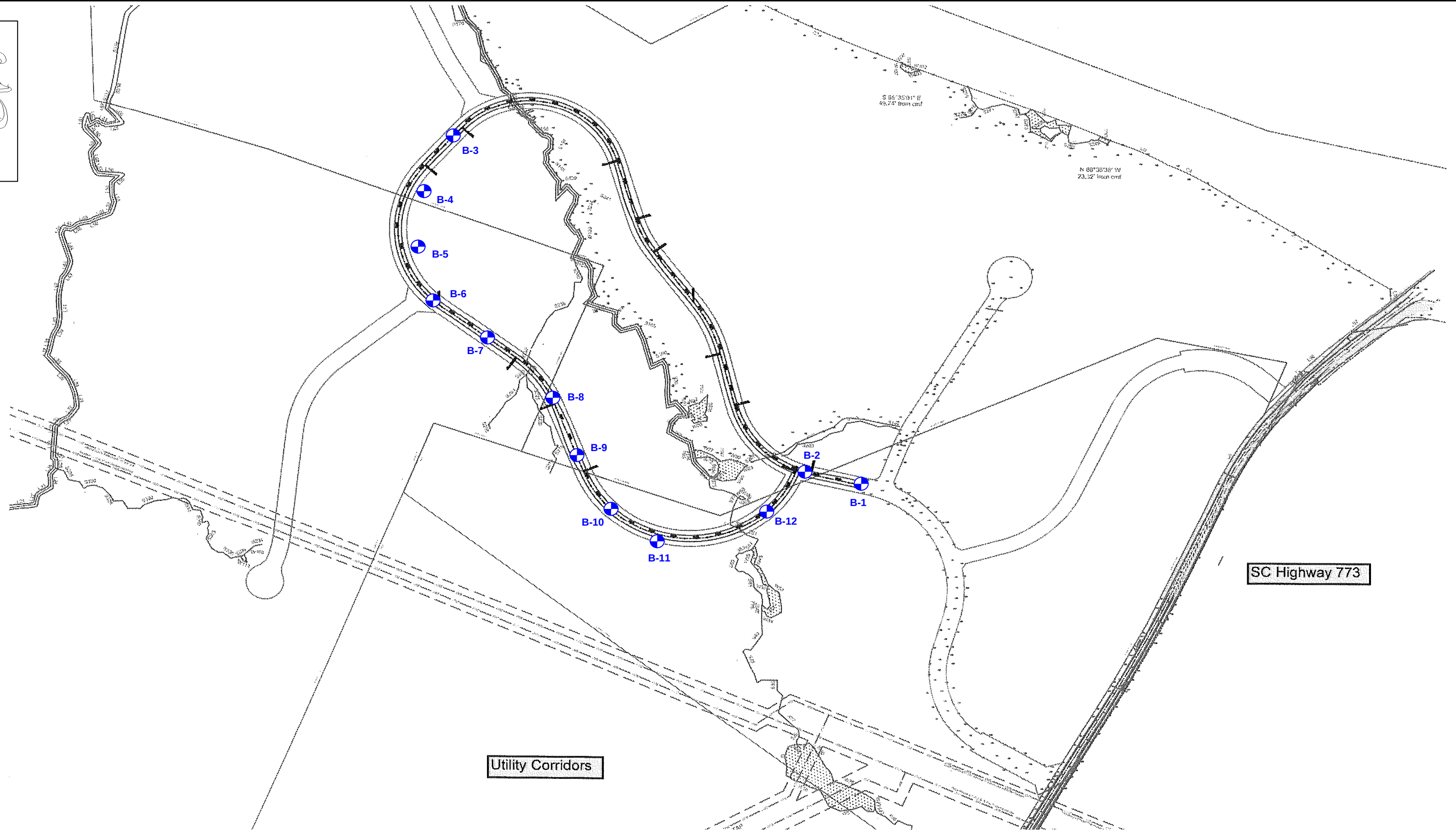
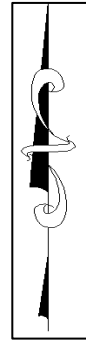
SCALE: NTS  
 CHECKED BY: JTP  
 DRAWN BY: MQ  
 DATE: 3/27/09



**SITE VICINITY MAP**  
 Mid-Carolina Commerce Park  
 Newberry County, South Carolina  
 JOB NO. 1611-09-106

FIGURE NO:

1



**APPROXIMATE BORING LOCATION**

**SOURCE:** Alliance Consulting Engineers, Inc.

**DRAWING:** Phase IIA and III Roadway 3.24.09.dwg

|             |           |
|-------------|-----------|
| SCALE:      | NTS       |
| CHECKED BY: | JTP       |
| DRAWN BY:   | MQ        |
| DATE:       | 4/24/2009 |



**BORING LOCATION PLAN**

Mid-Carolina Commerce Park Phase IIA & III Roadway

Newberry County, South Carolina

JOB NO. 1611-09-106

FIGURE NO.

2

## **SUMMARY OF EXPLORATION PROCEDURES**

### **Layout and Access to Boring Locations**

Layout Plan – S&ME was provided with a scaled sketch of the site in state-plane coordinates indicating the location of the proposed roadway alignment prior to mobilization to the site.

Staking of Borings - S&ME laid out the borings with a hand-held Global Positioning System (GPS) device prior to commencement of field work. The device used is considered accurate within 1 meter of the true coordinate. Boring locations were marked in the field with small colored flags with the boring numbers inscribed. Boring locations indicated on the attached “Boring Location Plan” must be considered as approximate.

Clearing – A track mounted bulldozer was utilized to provide access to staked boring locations in heavily vegetated terrain. Clearing to the staked borings was done by a locally subcontracted machine and operator, who followed direction of the Engineer. The operator attempted to clear small brush and saplings to the minimum extent possible consistent with passage of the equipment. He did not attempt to topple or fell large trees or snags, nor did he attempt to strip or grub the surface. Felled vegetation was pushed to the side of the path to allow equipment to pass but the vegetation was not stacked or burned.

Boring Access – Borings were accessed using an all-terrain tractor mounted drill rig.

### **Boring and Sampling**

Soil Test Boring with Hollow-Stem Auger – 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*”. At regular intervals, 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, and then driven an additional 12 inches with blows of a 140-pound hammer falling approximately 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.

Borehole Closure – Following collection of relevant geotechnical data, boreholes were filled by slowly pouring auger cuttings into the open hole such that minimal “bridging” of the material occurred in the hole. Backfilling of the upper two feet of each hole was tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface.

### **Laboratory Testing**

Recovered disturbed and undisturbed samples and the drillers’ field logs were transported to the laboratory where they were examined by the geotechnical engineer. Selected samples representative of certain groups of soils were subjected to simple classification tests by hand

or other simple means. Other samples were tested in the laboratory to determine their strength or classification.

Examination of Recovered Soil Samples – Soil samples and field boring records were reviewed in the laboratory by the geotechnical engineer. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, “*Standard Practice for Description and Identification of Soils (Visual-Manual Method)*”. The geotechnical engineer also prepared the final boring records enclosed with this report.

Moisture Content Testing of Soil Samples by Oven Drying – Moisture content was determined in general conformance with the methods outlined in ASTM D 2216, “*Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass.*”

Liquid and Plastic Limits Testing – Atterberg limits of the soils was determined generally following the methods described by ASTM D 4318, “*Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.*” In current engineering usage, the *liquid limit* of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The *plastic limit* defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The *plasticity index* (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Percent Fines Determination of Samples – A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D 1140, “*Standard Test Method for Amount of Material Finer Than the No. 200 Sieve.*”

Compaction Tests of Soils Using Standard Effort – Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D 698, “*Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft<sup>3</sup>).*”

Laboratory California Bearing Ratio Tests of Compacted Samples – This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in roadway pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D 1883, “*Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.*”

# 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  
 = Hole Cave

## CONSISTENCY OF COHESIVE SOILS

### CONSISTENCY

Very Soft  
 Soft  
 Firm  
 Stiff  
 Very Stiff  
 Hard  
 Very Hard

### STD. PENETRATION RESISTANCE BLOWS/FOOT

0 to 2  
 3 to 4  
 5 to 8  
 9 to 15  
 16 to 30  
 31 to 50  
 Over 50

## RELATIVE DENSITY OF COHESIONLESS SOILS

### RELATIVE DENSITY

Very Loose  
 Loose  
 Medium Dense  
 Dense  
 Very Dense

### STD. PENETRATION RESISTANCE BLOWS/FOOT

0 to 4  
 5 to 10  
 11 to 30  
 31 to 50  
 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%.



|                                                                                                           |  |                                                        |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  | <b>BORING LOG      B-1</b>                             |  |
| DATE DRILLED: <b>4/9/2009</b>                                                                             |  | ELEVATION: <b>462</b>                                  |  |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                     |  | BORING DEPTH: <b>15</b>                                |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                          | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |    |    |
|-----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|----|----|
|                 |                |                                                                                                                                                                                               |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |    |    |
|                 |                | Approximately 2 inches of topsoil.                                                                                                                                                            |             |                         |                           |                                              |    |    |    |    |         |    |    |
|                 |                | <b>SANDY LEAN CLAY (CL)</b> - mostly low to medium plasticity fines, little fine sands, trace of fine roots, moist, reddish-brown, stiff.<br><br>- reddish-brown, trace of black, very stiff. |             |                         | 1                         |                                              |    |    |    |    |         | 9  |    |
|                 |                |                                                                                                                                                                                               |             | 2                       |                           |                                              |    |    |    |    |         | 17 |    |
| 5               |                |                                                                                                                                                                                               |             |                         | 3                         |                                              |    |    |    |    |         |    | 20 |
|                 |                |                                                                                                                                                                                               |             | 4                       |                           |                                              |    |    |    |    |         |    | 22 |
| 10              |                |                                                                                                                                                                                               |             |                         |                           |                                              |    |    |    |    |         |    |    |
|                 |                | <b>SILTY SAND (SM)</b> - mostly fine to medium sands, some low plasticity fines, moist, tan, brown, medium dense.<br><br>- brown.<br><br>- tan, gray.                                         |             |                         | 5                         |                                              |    |    |    |    |         | 22 |    |
| 15              |                |                                                                                                                                                                                               |             |                         |                           |                                              |    |    |    |    |         |    |    |
|                 |                |                                                                                                                                                                                               |             |                         |                           |                                              |    |    |    |    |         |    |    |
|                 |                | BORING TERMINATED AT 15 FEET.                                                                                                                                                                 |             |                         |                           |                                              |    |    |    |    |         |    |    |

**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.

|                                                                                                                       |  |                                                        |  |                                                            |
|-----------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|------------------------------------------------------------|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road</b><br><b>Newberry County, SC</b><br><b>1611-09-106</b> |  | <b>BORING LOG      B-2</b>                             |  |                                                            |
| DATE DRILLED: <b>4/9/2009</b>                                                                                         |  | ELEVATION: <b>446</b>                                  |  | NOTES:<br><b>Safety hammer.</b><br><b>CL station 21+50</b> |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                                 |  | BORING DEPTH: <b>10.5</b>                              |  |                                                            |
| LOGGED BY: <b>MQ</b>                                                                                                  |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |                                                            |
| DRILLER: <b>S&amp;ME</b>                                                                                              |  | DRILL RIG:                                             |  |                                                            |

| DEPTH<br>(feet) | GRAPHIC LOG                 | MATERIAL DESCRIPTION                                                                                                                        | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |           |
|-----------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|-----------|
|                 |                             |                                                                                                                                             |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |           |
|                 | [Green Hatched Box]         | Approximately 2 inches of topsoil.                                                                                                          |             |                         |                           |                                              |    |    |    |    |         |           |
|                 | [Blue Diagonal Hatched Box] | <b>SANDY LEAN CLAY (CL)</b> - mostly low plasticity fines, some fine to medium sands, dry, brown, very stiff.                               |             |                         | 1 [Red Box]               |                                              |    |    |    |    |         | 9         |
| 5               | [Orange Dotted Box]         | <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, micaceous, moist, brown, medium dense.                             |             | 441.0                   | 2 [Red Box]               |                                              |    |    |    |    |         | 26        |
|                 | [Wavy Line Box]             | No Recovery                                                                                                                                 |             |                         | 3 [Red Box]               |                                              |    |    |    |    |         | 50/<br>0" |
|                 | [Wavy Line Box]             | <b>PARTIALLY WEATHERED ROCK</b> sampled as <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, dry, brown, very dense. |             |                         | 4 [Red Box]               |                                              |    |    |    |    |         | 50/<br>4" |
| 10              |                             | BORING TERMINATED AT 10 FEET.                                                                                                               |             | 436.0                   |                           |                                              |    |    |    |    |         |           |

**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.

|                                                                                                                       |  |                                                        |  |                                                            |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|------------------------------------------------------------|--|--|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road</b><br><b>Newberry County, SC</b><br><b>1611-09-106</b> |  |                                                        |  | <b>BORING LOG      B-3</b>                                 |  |  |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                                         |  | ELEVATION: <b>403</b>                                  |  | NOTES:<br><b>Safety hammer.</b><br><b>CL station 48+00</b> |  |  |  |
| DRILLING METHOD: <b>3/4" H.S.A.</b>                                                                                   |  | BORING DEPTH: <b>5</b>                                 |  |                                                            |  |  |  |
| LOGGED BY: <b>MQ</b>                                                                                                  |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |                                                            |  |  |  |
| DRILLER: <b>S&amp;ME</b>                                                                                              |  | DRILL RIG:                                             |  |                                                            |  |  |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG                                                                    | MATERIAL DESCRIPTION                                                                                                                                                         | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE                                                             | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    |  | N VALUE |
|-----------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|----|----|----|----|--|---------|
|                 |                                                                                   |                                                                                                                                                                              |             |                         |                                                                                       | 10                                           | 20 | 30 | 60 | 80 |  |         |
|                 |  | Approximately 2 inches of topsoil.                                                                                                                                           |             |                         |                                                                                       |                                              |    |    |    |    |  |         |
|                 |  | <b>SANDY CLAY (CL)</b> - mostly low to medium plasticity fines, some fine to medium sands, trace of fine roots, moist, reddish-brown, firm.<br><br>- tan, brown, very stiff. |             |                         | 1  |                                              |    |    |    |    |  | 8       |
| 5               |                                                                                   |                                                                                                                                                                              |             | 398.0                   | 2  |                                              |    |    |    |    |  | 29      |
|                 |                                                                                   | BORING TERMINATED AT 5 FEET.                                                                                                                                                 |             |                         |                                                                                       |                                              |    |    |    |    |  |         |

**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.

|                                                                                                           |  |                                                        |                            |                                                                          |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|----------------------------|--------------------------------------------------------------------------|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  |                                                        | <b>BORING LOG      B-4</b> |                                                                          |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                             |  | ELEVATION: <b>426</b>                                  |                            | NOTES:<br><b>Safety hammer.<br/>Offset 80 feet left at station 51+00</b> |  |
| DRILLING METHOD: <b>3¼" H.S.A.</b>                                                                        |  | BORING DEPTH: <b>10</b>                                |                            |                                                                          |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |                            |                                                                          |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |                            |                                                                          |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                              | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE   |
|-----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|-----------|
|                 |                |                                                                                                                                                                                                   |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |           |
|                 |                | Approximately 2 inches of topsoil.                                                                                                                                                                |             |                         |                           |                                              |    |    |    |    |           |
|                 |                | <b>CLAYEY SAND (SC)</b> - mostly fine to medium sands, some low plasticity fines, wet, tan, reddish-brown, very loose.                                                                            |             |                         | 1                         |                                              |    |    |    |    | 4         |
| 5               |                | <b>PARTIALLY WEATHERED ROCK</b> sampled as <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, dry, tan, gray, very dense.<br><br>- few fine to medium quartz gravel, white. |             | 421.0                   | 2                         |                                              |    |    |    |    | 50/<br>4" |
|                 |                | - few fine to medium quartz gravel, white.                                                                                                                                                        |             |                         | 3                         |                                              |    |    |    |    | 50/<br>4" |
|                 |                | No Recovery                                                                                                                                                                                       |             |                         | 4                         |                                              |    |    |    |    | 50/<br>0" |
| 10              |                | BORING TERMINATED AT 10 FEET.                                                                                                                                                                     |             | 416.0                   |                           |                                              |    |    |    |    |           |

**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.

|                                                                                                           |  |                                                        |  |                                                                          |  |  |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|--------------------------------------------------------------------------|--|--|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  |                                                        |  | <b>BORING LOG      B-5</b>                                               |  |  |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                             |  | ELEVATION: <b>448</b>                                  |  | NOTES:<br><b>Safety hammer.<br/>Offset 80 feet left at station 54+00</b> |  |  |  |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                     |  | BORING DEPTH: <b>10.5</b>                              |  |                                                                          |  |  |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |                                                                          |  |  |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |                                                                          |  |  |  |

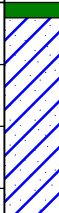
| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                        | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |           |
|-----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|-----------|
|                 |                |                                                                                                                                                                                             |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |           |
|                 |                | Approximately 2 inches of topsoil.                                                                                                                                                          |             |                         |                           |                                              |    |    |    |    |         |           |
|                 |                | <b>SANDY LEAN CLAY (CL)</b> - mostly low plasticity fines, some fine to medium sands, trace of fine roots, wet, brown, gray, trace of reddish-brown, firm.<br><br>- dry, brown, gray, hard. |             |                         | 1                         |                                              |    |    |    |    |         | 6         |
| 5               |                |                                                                                                                                                                                             |             | 443.0                   | 2                         |                                              |    |    |    |    |         | 34        |
|                 |                |                                                                                                                                                                                             |             |                         |                           |                                              |    |    |    |    |         |           |
|                 |                | <b>PARTIALLY WEATHERED ROCK</b> sampled as <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, dry, gray, white, brown, very dense.<br><br>- tan, brown.               |             |                         | 3                         |                                              |    |    |    |    |         | 50/<br>2" |
|                 |                |                                                                                                                                                                                             |             |                         |                           |                                              |    |    |    |    |         |           |
| 10              |                |                                                                                                                                                                                             |             | 438.0                   | 4                         |                                              |    |    |    |    |         |           |
|                 |                | AUGER REFUSAL AT 10.5 FEET.                                                                                                                                                                 |             |                         |                           |                                              |    |    |    |    |         |           |

**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.

|                                                                                                                       |  |                                                        |  |
|-----------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road</b><br><b>Newberry County, SC</b><br><b>1611-09-106</b> |  | <b>BORING LOG      B-6</b>                             |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                                         |  | ELEVATION: <b>444</b>                                  |  |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                                 |  | BORING DEPTH: <b>10</b>                                |  |
| LOGGED BY: <b>MQ</b>                                                                                                  |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |
| DRILLER: <b>S&amp;ME</b>                                                                                              |  | DRILL RIG:                                             |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG                                                                    | MATERIAL DESCRIPTION                                                                                                 | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |    |
|-----------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|----|
|                 |                                                                                   |                                                                                                                      |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |    |
|                 |  | Approximately 3 inches of topsoil.                                                                                   |             |                         |                           |                                              |    |    |    |    |         |    |
|                 |                                                                                   | <b>SANDY LEAN CLAY (CL)</b> - mostly low plasticity fines, little fine to medium sands, moist, reddish-brown, stiff. |             |                         | 1                         |                                              |    |    |    |    |         | 10 |
| 5               |                                                                                   | <b>SANDY SILT (ML)</b> - mostly low plasticity fines, some fine to medium sands, moist, tan, brown, very stiff.      |             | 439.0                   | 2                         |                                              |    |    |    |    |         | 23 |
|                 |                                                                                   | - brown, trace of black.                                                                                             |             |                         | 3                         |                                              |    |    |    |    |         | 22 |
|                 |                                                                                   | - brown, tan, trace of black, hard.                                                                                  |             |                         | 4                         |                                              |    |    |    |    |         | 43 |
| 10              |                                                                                   | BORING TERMINATED AT 10 FEET.                                                                                        |             | 434.0                   |                           |                                              |    |    |    |    |         |    |

**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.

|                                                                                                           |  |                                                        |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  | <b>BORING LOG      B-7</b>                             |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                             |  | ELEVATION: <b>444</b>                                  |  |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                     |  | BORING DEPTH: <b>10</b>                                |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                              | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |           |
|-----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|-----------|
|                 |                |                                                                                                                                                   |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |           |
|                 |                | Approximately 2 inches of topsoil.                                                                                                                |             |                         |                           |                                              |    |    |    |    |         |           |
|                 |                | <b>SILTY SAND (SM)</b> - mostly fine to medium sands, little low plasticity fines, dry, tan, brown, dense.                                        |             |                         | 1                         |                                              |    |    |    |    |         | 36        |
|                 |                | - gray, very dense.                                                                                                                               |             |                         | 2                         |                                              |    |    |    |    |         | 68        |
| 5               |                |                                                                                                                                                   |             | 439.0                   |                           |                                              |    |    |    |    |         |           |
|                 |                | <b>PARTIALLY WEATHERED ROCK</b> sampled as <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, dry, brown, gray, very dense. |             |                         | 3                         |                                              |    |    |    |    |         | 50/<br>5" |
|                 |                | <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, dry, tan, very dense.                                                    |             |                         | 4                         |                                              |    |    |    |    |         | 83        |
| 10              |                |                                                                                                                                                   |             | 434.0                   |                           |                                              |    |    |    |    |         |           |
|                 |                | BORING TERMINATED AT 10 FEET.                                                                                                                     |             |                         |                           |                                              |    |    |    |    |         |           |

BORING LOG MID CAROLINA LOG.GPJ WITH CPT.GDT 4/24/09

**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.

|                                                                                                           |  |                                                        |  |                                                      |  |  |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|------------------------------------------------------|--|--|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  |                                                        |  | <b>BORING LOG      B-8</b>                           |  |  |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                             |  | ELEVATION: <b>439</b>                                  |  | NOTES:<br><b>Safety hammer.<br/>CL station 64+00</b> |  |  |  |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                     |  | BORING DEPTH: <b>5</b>                                 |  |                                                      |  |  |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |                                                      |  |  |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |                                                      |  |  |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG                                                                    | MATERIAL DESCRIPTION                                                                                                                                                                                                              | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |       |
|-----------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|-------|
|                 |                                                                                   |                                                                                                                                                                                                                                   |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |       |
|                 |  | <p>Approximately 2 inches of topsoil.</p> <p><b>PARTIALLY WEATHERED ROCK</b> sampled as <b>SILTY SAND (SM)</b> - mostly fine to medium sands, little low plasticity fines, dry, orange, tan, very dense.</p> <p>- No Recovery</p> |             |                         | 1                         |                                              |    |    |    |    |         | 50/4" |
| 5               |                                                                                   | <p>BORING TERMINATED AT 5 FEET.</p>                                                                                                                                                                                               |             | 434.0                   | 2                         |                                              |    |    |    |    |         | 50/0" |

**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.

|                              |  |                                                                                         |  |                                              |            |  |     |  |
|------------------------------|--|-----------------------------------------------------------------------------------------|--|----------------------------------------------|------------|--|-----|--|
| PROJECT:                     |  | Mid-Carolina Commerce Park Phase IIA and III Road<br>Newberry County, SC<br>1611-09-106 |  |                                              | BORING LOG |  | B-9 |  |
| DATE DRILLED: 4/8/2009       |  | ELEVATION: 456                                                                          |  | NOTES:<br>Safety hammer.<br>CL station 67+00 |            |  |     |  |
| DRILLING METHOD: 3/4" H.S.A. |  | BORING DEPTH: 10                                                                        |  |                                              |            |  |     |  |
| LOGGED BY: MQ                |  | WATER LEVEL: Not encountered at time of boring.                                         |  |                                              |            |  |     |  |
| DRILLER: S&ME                |  | DRILL RIG:                                                                              |  |                                              |            |  |     |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                               | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |           |
|-----------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|-----------|
|                 |                |                                                                                                                                                                                    |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |           |
|                 |                | Approximately 3 inches of topsoil.                                                                                                                                                 |             |                         |                           |                                              |    |    |    |    |         |           |
|                 |                | <b>SILTY SAND (SM)</b> - mostly fine to medium sands, some low plasticity fines, few fine to medium quartz gravel, moist, white, gray, medium dense.                               |             |                         | 1                         |                                              |    |    |    |    |         | 18        |
| 5               |                | - some organics, brown, gray, dense.                                                                                                                                               |             | 451.0                   | 2                         |                                              |    |    |    |    |         | 30        |
|                 |                | <b>PARTIALLY WEATHERED ROCK</b> sampled as <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, few fine to medium quartz gravel, dry, tan, white, very dense. |             |                         | 3                         |                                              |    |    |    |    |         | 50/<br>4" |
| 10              |                | BORING TERMINATED AT 10 FEET.                                                                                                                                                      |             | 446.0                   | 4                         |                                              |    |    |    |    |         | 50/<br>5" |

**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.

|                                                                                                           |  |                                                        |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  | <b>BORING LOG      B-10</b>                            |  |
| DATE DRILLED: <b>4/8/2009</b>                                                                             |  | ELEVATION: <b>469</b>                                  |  |
| DRILLING METHOD: <b>3/4" H.S.A.</b>                                                                       |  | BORING DEPTH: <b>15</b>                                |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                     | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |    |
|-----------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|----|
|                 |                |                                                                                                                                          |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |    |
|                 |                | Approximately 2 inches of topsoil.                                                                                                       |             |                         |                           |                                              |    |    |    |    |         |    |
|                 |                | <b>SANDY ELASTIC SILT (MH)</b> - mostly medium to high plasticity fines, little fine sands, moist, reddish-brown, trace of white, stiff. |             |                         | 1                         |                                              |    |    |    |    |         | 13 |
| 5               |                | - very stiff.                                                                                                                            |             | 464.0                   | 2                         |                                              |    |    |    |    |         | 18 |
|                 |                | - reddish-brown, white.                                                                                                                  |             |                         | 3                         |                                              |    |    |    |    |         | 27 |
| 10              |                | <b>SILTY SAND (SM)</b> - mostly fine sands, little low plasticity fines, moist, tan, trace of reddish-brown, dense.                      |             | 459.0                   | 4                         |                                              |    |    |    |    |         | 31 |
|                 |                | - brown, trace of black, medium dense.                                                                                                   |             |                         | 5                         |                                              |    |    |    |    |         | 21 |
| 15              |                | BORING TERMINATED AT 15 FEET.                                                                                                            |             | 454.0                   |                           |                                              |    |    |    |    |         |    |

BORING LOG MID CAROLINA LOG.GPJ WITH CPT.GDT 4/24/09

**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.

|                                                                                                           |  |                                                        |  |                                                                                 |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|---------------------------------------------------------------------------------|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  | <b>BORING LOG      B-11</b>                            |  |                                                                                 |
| DATE DRILLED: <b>4/8/2009</b>                                                                             |  | ELEVATION: <b>463</b>                                  |  | NOTES:<br><b>Safety hammer.</b><br><b>Offset 50 feet right at station 72+50</b> |
| DRILLING METHOD: <b>3/4" H.S.A.</b>                                                                       |  | BORING DEPTH: <b>15</b>                                |  |                                                                                 |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |                                                                                 |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |                                                                                 |

| DEPTH<br>(feet) | GRAPHIC LOG | MATERIAL DESCRIPTION                                                                                                                                                               | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |    |    |    | N VALUE |    |
|-----------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|---------------------------|----------------------------------------------|----|----|----|----|---------|----|
|                 |             |                                                                                                                                                                                    |             |                         |                           | 10                                           | 20 | 30 | 60 | 80 |         |    |
|                 |             | Approximately 2 inches of topsoil.                                                                                                                                                 |             |                         |                           |                                              |    |    |    |    |         |    |
|                 |             | <b>SANDY LEAN CLAY (CL)</b> - mostly low plasticity fines, little fine sands, moist, reddish-brown, stiff.<br><br>- very stiff.                                                    |             |                         | 1                         |                                              |    |    |    |    |         | 15 |
|                 |             |                                                                                                                                                                                    |             | 2                       |                           |                                              |    |    |    |    |         | 38 |
| 5               |             |                                                                                                                                                                                    |             |                         | 3                         |                                              |    |    |    |    |         | 22 |
|                 |             |                                                                                                                                                                                    |             | 4                       |                           |                                              |    |    |    |    |         | 23 |
| 10              |             |                                                                                                                                                                                    |             |                         | 5                         |                                              |    |    |    |    |         | 25 |
|                 |             | <b>SILTY SAND (SM)</b> - mostly fine sands, some low plasticity fines, micaceous, moist, brown, medium dense.<br><br>- tan, brown, trace of white.<br><br>- brown, trace of black. |             |                         |                           |                                              |    |    |    |    |         |    |
| 15              |             | BORING TERMINATED AT 15 FEET.                                                                                                                                                      |             | 448.0                   |                           |                                              |    |    |    |    |         |    |

BORING LOG MID CAROLINA LOG.GPJ WITH CPT.GDT 4/24/09

**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.

|                                                                                                           |  |                                                        |  |                                                      |  |  |  |
|-----------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--|------------------------------------------------------|--|--|--|
| PROJECT: <b>Mid-Carolina Commerce Park Phase IIA and III Road<br/>Newberry County, SC<br/>1611-09-106</b> |  |                                                        |  | <b>BORING LOG      B-12</b>                          |  |  |  |
| DATE DRILLED: <b>4/9/2009</b>                                                                             |  | ELEVATION: <b>427</b>                                  |  | NOTES:<br><b>Safety hammer.<br/>CL station 77+50</b> |  |  |  |
| DRILLING METHOD: <b>3 1/4" H.S.A.</b>                                                                     |  | BORING DEPTH: <b>5</b>                                 |  |                                                      |  |  |  |
| LOGGED BY: <b>MQ</b>                                                                                      |  | WATER LEVEL: <b>Not encountered at time of boring.</b> |  |                                                      |  |  |  |
| DRILLER: <b>S&amp;ME</b>                                                                                  |  | DRILL RIG:                                             |  |                                                      |  |  |  |

| DEPTH<br>(feet) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                      | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.<br>SAMPLE TYPE                                      | STANDARD PENETRATION TEST DATA<br>(blows/ft) | N VALUE |
|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|----------------------------------------------------------------|----------------------------------------------|---------|
|                 |                |                                                                                                                                           |             |                         |                                                                | 10    20    30    60    80                   |         |
|                 |                | <b>SANDY LEAN CLAY (CL)</b> - mostly low to medium plasticity fines, little fine to medium sands, moist, gray, reddish-brown, tan, stiff. |             |                         | 1 <span style="border: 1px solid red; padding: 2px;">CL</span> |                                              | 15      |
|                 |                | <b>SILTY SAND (SM)</b> - mostly fine to medium sands, some low plasticity fines, moist, orangish-brown, gray, dense.                      |             |                         | 2 <span style="border: 1px solid red; padding: 2px;">SM</span> |                                              | 43      |
| 5               |                | BORING TERMINATED AT 5 FEET.                                                                                                              |             | 422.0                   |                                                                |                                              |         |

**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.

# Moisture - Density Report



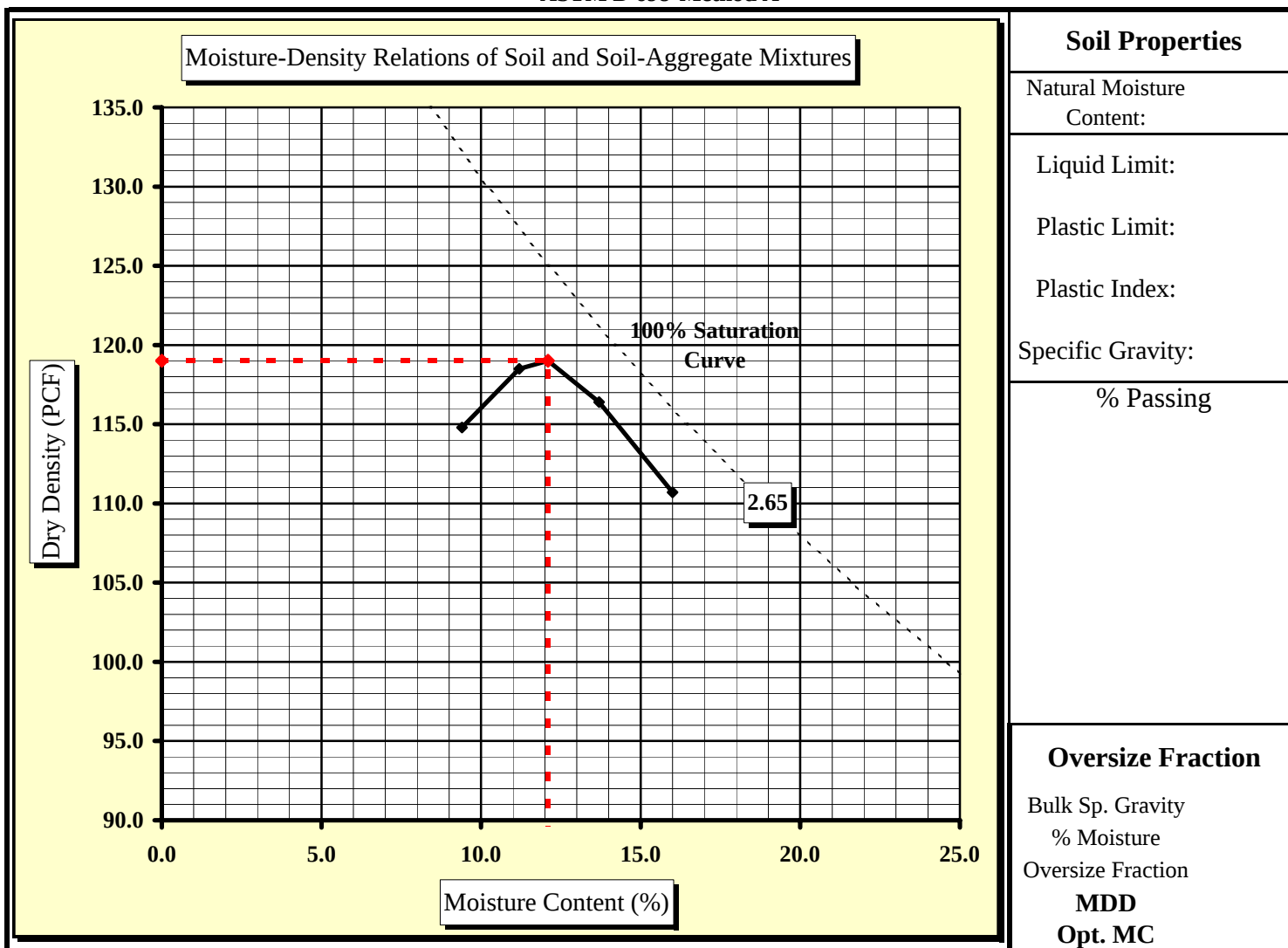
**S&ME Project #:** 1611-09-106  
**Project Name:** Mid-Carolina Commerce Park Phase IIA & III Rd.  
**Client Name:** Alliance Consulting Engineers, Inc.  
**Client Address:** P.O. Box 8147, Columbia, South Carolina 29202

**Report Date:** April 13, 2009  
**Test Date(s):** April 10, 2009

**Boring #:** B-4 **Sample #:** Bulk 1 **Sample Date:** April 9, 2009  
**Location:** B-4 **Depth:** 0-10.0'  
**Sample Description:** Clayey Sand (SC) low plasticity, fine to medium sand, light brown

**Maximum Dry Density** 119.0 PCF. **Optimum Moisture Content** 12.1 %

ASTM D 698 Method A



Moisture-Density Curve Displayed: Fine Fraction ☐ Corrected for Oversize Fraction (ASTM D 4718) ☐  
 Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐  
 Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

**References:** ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort  
 ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 2488: Description and Identification of Soils (Visual-Manual Procedure)

Soil Discription is based on a visual classification.

Technical Responsibility:

Melissa Quinton

Signature

Staff Professional

Position

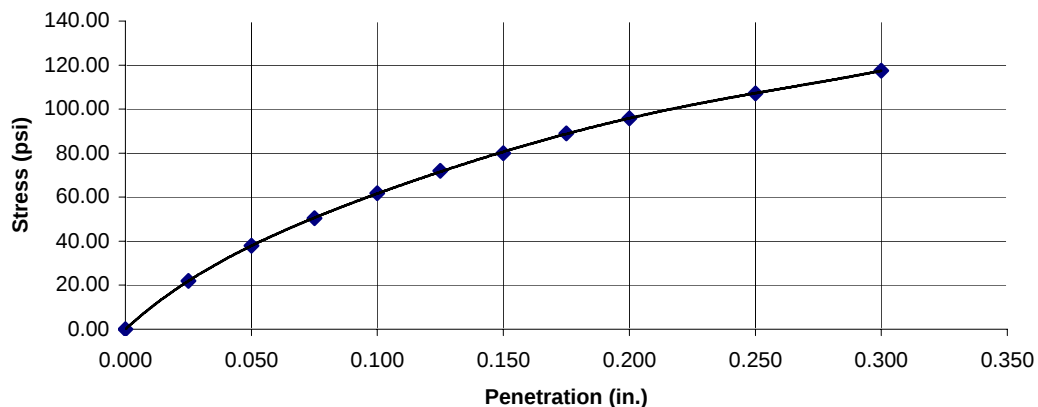


### CBR TEST DATA SHEET ASTM NO. D 1883-94

|                      |                                           |         |             |                       |            |
|----------------------|-------------------------------------------|---------|-------------|-----------------------|------------|
| JOB NAME             | Mid-Carolina Roadway Phase IIA & III Road |         | Description | Clayey Sand (SC)      |            |
| JOB NO.              | 1611-09-106                               | Sample  | B-4         | WEIGHT OF SOIL + MOLD | 44.505 lb. |
| TEST                 | 1                                         | Blows   | 36          | WEIGHT OF MOLD        | 34.712 lb. |
| MAX DRY DENSITY      | 119                                       | PCF     |             | WEIGHT OF WET SOIL    | 9.793 lb.  |
| OPT MOISTURE CONTENT | 12.0%                                     |         |             | WET UNIT WEIGHT       | 130.7 pcf  |
| % H2O after soak     | 15.8%                                     |         |             | % H2O pre soak        | 12.2%      |
| CBR PUNCH AREA       | 3.1416                                    | Sq. in. |             | DRY UNIT WEIGHT       | 116.5 pcf  |
| CBR SERIAL NO        | 459                                       |         |             | % COMPACTION          | 97.9%      |
| LOAD RING RATIO      | 1.7851                                    |         |             |                       |            |
| LOAD RING CONSTANT   | 2.342                                     |         |             | % WATER ABSORBED      | 3.6%       |
| PERFORMED BY         | BU                                        |         |             | PERCENT SWELL         | 0.7 %      |

| Actual Deformation (in) | Load Dial Reading | Stress (psi) | CBR | Corrected Stress | Corrected CBR |
|-------------------------|-------------------|--------------|-----|------------------|---------------|
| 0                       | 0                 | 0.00         |     |                  |               |
| 0.025                   | 40                | 21.98        |     |                  |               |
| 0.05                    | 68                | 37.89        |     |                  |               |
| 0.075                   | 90                | 50.39        |     |                  |               |
| 0.1                     | 110               | 61.76        | 6.2 | 0                | 6             |
| 0.125                   | 128               | 71.99        |     |                  |               |
| 0.15                    | 142               | 79.94        |     |                  |               |
| 0.175                   | 158               | 89.03        |     |                  |               |
| 0.2                     | 170               | 95.85        | 6.4 | 0                | 6             |
| 0.25                    | 190               | 107.22       |     |                  |               |
| 0.3                     | 208               | 117.44       |     |                  |               |

CBR TEST DATA B-4 BS-1 0-10.0' @ 97.9% Compaction



# Particle Size Analysis of Soils

ASTM D 422

**Project #:** 1611-09-106**Project Name:** Mid- Carolina Commerce Park Phase IIA & III Road

Client Name: Alliance Consulting Engineers, Inc.

Client Address: P.O. Box 8147, Columbia, South Carolina 29202

Test Date(s): 4/16/09-4/17/09

Report Date: 4/17/09

Boring #: 4

Sample #: BS-1

Sample Date:

Location: B-4

Elevation:

0-10.0'

Sample Description: Clayey Sand (SC) low plasticity, fine to medium sand, light brown

| Particle Size Analysis / Without Hydrometer Analysis |                                  |  | Moisture Content                 |                       | Natural |
|------------------------------------------------------|----------------------------------|--|----------------------------------|-----------------------|---------|
|                                                      |                                  |  |                                  | Tare #                | 116     |
|                                                      | Tare Number                      |  | A                                | Tare Weight           | 0.00    |
| A                                                    | Tare Weight                      |  | B                                | Wet Weight + Tare Wt. | 137.33  |
| B                                                    | Total Sample Dry Wt. + Tare Wt.  |  | C                                | Dry Weight + Tare Wt. | 124.02  |
| C                                                    | Total Sample Dry Weight (B-A)    |  | D                                | Water Wt. (B-C)       | 13.31   |
| D                                                    | Total Sample Wt. After #200 Wash |  | E                                | Dry Wt.(C-A)          | 124.02  |
| E                                                    | Percent Passing #200 (1-D/C)x100 |  | Moisture Content (100 x D/E) (%) |                       | 10.7%   |

|                                     |                                      |                                                                                  |                                                                                         |
|-------------------------------------|--------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Notes:</b> Maximum Particle Size |                                      | Gravel < 75 mm and > 4.75 mm (#4)                                                |                                                                                         |
| Apparent Relative Density           |                                      | Coarse Sand < 4.75 mm and > 2.00 mm (#10)                                        |                                                                                         |
| Liquid Limit                        | Fineness Modulus                     | Medium Sand < 2.00 mm and > 0.425 mm (#40)                                       |                                                                                         |
| Plastic Limit                       | Cu = D60/D10:                        | Fine Sand < 0.425 mm and > 0.075 mm (#200)                                       |                                                                                         |
| Plastic Index                       | Cc = (D30) <sup>2</sup> / (D10xD60): | % Silt and Clay < 0.075 mm                                                       |                                                                                         |
|                                     |                                      | Description of Sand & Gravel                                                     | Rounded <input checked="" type="checkbox"/> Angular <input checked="" type="checkbox"/> |
|                                     |                                      | Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/> | Weathered & Friable <input type="checkbox"/>                                            |

Organic Content

D10 =

D30 =

D60 =

D50 =

D90 =

ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, &amp; Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Brian Urban

Certification #

Technical Responsibility: Melissa Quinton

Signature

Staff Professional

Position

## Moisture - Density Report



Quality Assurance

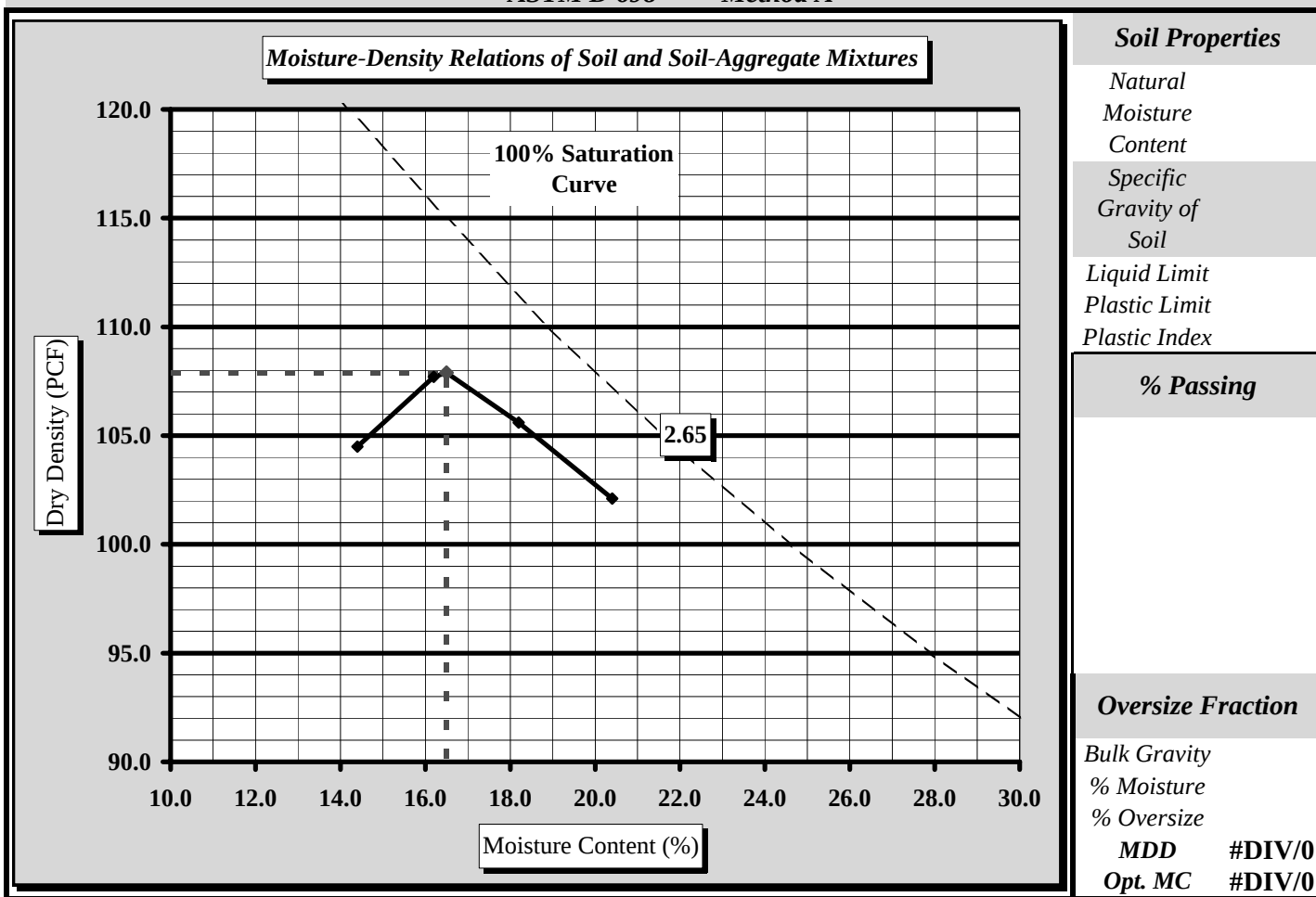
S&amp;ME, Inc. 134 Suber Road, Columbia, SC 29210

|                     |                                                                 |               |           |
|---------------------|-----------------------------------------------------------------|---------------|-----------|
| S&ME Project #:     | 1611-09-106                                                     | Report Date:  | 4/15/09   |
| Project Name:       | Mid-Carolina Commerce Park Phase IIA & III Road                 | Test Date(s): | 4/14/09   |
| Client Name:        | Alliance Consulting Engineers, Inc.                             |               |           |
| Client Address:     | P.O. Box 8147, Columbia, South Carolina 29202                   |               |           |
| Boring #:           | 9                                                               | Sample #:     | Bulk 2    |
|                     |                                                                 | Sample Date:  | 4/10/2009 |
| Location:           | B-9                                                             | Depth:        | 0-10.0    |
| Sample Description: | Sandy Lean Clay (CL) low plasticity, fine to medium sand, brown |               |           |

Maximum Dry Density 107.9 PCF.

Optimum Moisture Content 16.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

## References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Technical Responsibility

Signature

Position

Date

This report shall not be reproduced, except in full, without the written approval of S&amp;ME, Inc.

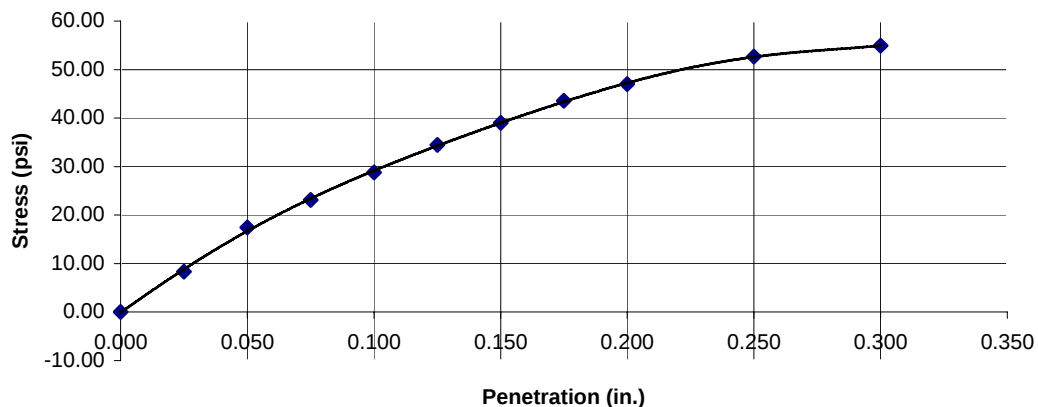


### CBR TEST DATA SHEET ASTM NO. D 1883-94

|                             |                                           |                              |                      |
|-----------------------------|-------------------------------------------|------------------------------|----------------------|
| <b>JOB NAME</b>             | Mid-Carolina Roadway Phase IIA & III Road | <b>Description</b>           | Sandy Lean Clay (CL) |
| <b>JOB NO.</b>              | 1611-09-106                               | <b>Sample</b>                | B-9                  |
| <b>TEST</b>                 | 1                                         | <b>Blows</b>                 | 38                   |
| <b>MAX DRY DENSITY</b>      | 107.9                                     | <b>PCF</b>                   |                      |
| <b>OPT MOISTURE CONTENT</b> | 16.5%                                     | <b>WEIGHT OF SOIL + MOLD</b> | 44.117 lb.           |
| <b>% H2O after soak</b>     | 20.8%                                     | <b>WEIGHT OF MOLD</b>        | 34.89 lb.            |
| <b>CBR PUNCH AREA</b>       | 3.1416                                    | <b>WEIGHT OF WET SOIL</b>    | 9.227 lb.            |
| <b>CBR SERIAL NO</b>        | 459                                       | <b>WET UNIT WEIGHT</b>       | 123.2 pcf            |
| <b>LOAD RING RATIO</b>      | 1.7851                                    | <b>% H2O pre soak</b>        | 16.6%                |
| <b>LOAD RING CONSTANT</b>   | 2.342                                     | <b>DRY UNIT WEIGHT</b>       | 105.7 pcf            |
| <b>PERFORMED BY</b>         | BU                                        | <b>% COMPACTION</b>          | 97.9%                |
|                             |                                           | <b>% WATER ABSORBED</b>      | 4.2%                 |
|                             |                                           | <b>PERCENT SWELL</b>         | 1.6 %                |

| Actual Deformation (in) | Load Dial Reading | Stress (psi) | CBR | Corrected Stress | Corrected CBR |
|-------------------------|-------------------|--------------|-----|------------------|---------------|
| 0                       | 0                 | 0.00         |     |                  |               |
| 0.025                   | 16                | 8.35         |     |                  |               |
| 0.05                    | 32                | 17.44        |     |                  |               |
| 0.075                   | 42                | 23.12        |     |                  |               |
| 0.1                     | 52                | 28.80        | 2.9 | 0                | 3             |
| 0.125                   | 62                | 34.48        |     |                  |               |
| 0.15                    | 70                | 39.03        |     |                  |               |
| 0.175                   | 78                | 43.58        |     |                  |               |
| 0.2                     | 84                | 46.98        | 3.1 | 0                | 3             |
| 0.25                    | 94                | 52.67        |     |                  |               |
| 0.3                     | 98                | 54.94        |     |                  |               |

CBR TEST DATA B-9 BS-2 0-10.0' @ 97.9% Compaction





# Particle Size Analysis of Soils

ASTM D 422

**Project #:** 1611-09-106**Test Date(s):**

4/16/09-4/17/09

**Project Name:** Mid- Carolina Commerce Park Phase IIA & III Rd.**Report Date:**

4/17/09

**Client Name:** Alliance Consulting Engineers, Inc.**Client Address:** P.O. Box 8147, Columbia, South Carolina 29202**Boring #:** 9**Sample #:** BS-2**Sample Date:****Location:** B-9**Elevation:**

0-10.0'

**Sample Description:** Sandy Lean Clay (CL) low plasticity, fine to medium sand, brown

| Particle Size Analysis / Without Hydrometer Analysis |                                  |  | Moisture Content                 |                       | Natural |
|------------------------------------------------------|----------------------------------|--|----------------------------------|-----------------------|---------|
|                                                      |                                  |  |                                  | Tare #                | 117     |
|                                                      | Tare Number                      |  | A                                | Tare Weight           | 0.00    |
| A                                                    | Tare Weight                      |  | B                                | Wet Weight + Tare Wt. | 127.78  |
| B                                                    | Total Sample Dry Wt. + Tare Wt.  |  | C                                | Dry Weight + Tare Wt. | 108.20  |
| C                                                    | Total Sample Dry Weight (B-A)    |  | D                                | Water Wt. (B-C)       | 19.58   |
| D                                                    | Total Sample Wt. After #200 Wash |  | E                                | Dry Wt.(C-A)          | 108.20  |
| E                                                    | Percent Passing #200 (1-D/C)x100 |  | Moisture Content (100 x D/E) (%) |                       | 18.1%   |

|                                     |                                      |                                                                                  |                                                                                         |
|-------------------------------------|--------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Notes:</b> Maximum Particle Size |                                      | Gravel < 75 mm and > 4.75 mm (#4)                                                |                                                                                         |
| Apparent Relative Density           |                                      | Coarse Sand < 4.75 mm and > 2.00 mm (#10)                                        |                                                                                         |
| Liquid Limit                        | Fineness Modulus                     | Medium Sand < 2.00 mm and > 0.425 mm (#40)                                       |                                                                                         |
| Plastic Limit                       | Cu = D60/D10:                        | Fine Sand < 0.425 mm and > 0.075 mm (#200)                                       |                                                                                         |
| Plastic Index                       | Cc = (D30) <sup>2</sup> / (D10xD60): | % Silt and Clay < 0.075 mm                                                       |                                                                                         |
|                                     |                                      | Description of Sand & Gravel                                                     | Rounded <input checked="" type="checkbox"/> Angular <input checked="" type="checkbox"/> |
|                                     |                                      | Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/> | Weathered & Friable <input type="checkbox"/>                                            |

Organic Content

D10 =

D30 =

D60 =

D50 =

D90 =

ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, &amp; Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

**Technician Name:**Brian Urban

Certification #

**Technical Responsibility:**Melissa Quinton

Signature

Staff Professional

Position

# Particle Size Analysis of Soils

ASTM D 422

**Project #:** 1611-09-106**Project Name:** Mid- Carolina Commerce Park Phase IIA & III Road

Client Name: Alliance Consulting Engineers, Inc.

Client Address: P.O. Box 8147, Columbia, South Carolina 29202

Test Date(s): 4/16/09-4/17/09

Report Date: 4/17/09

Boring #: 3

Sample #: 1

Sample Date:

Location: B-3

Elevation:

1.0'

Sample Description: Sandy Lean Clay (CL) low to medium plasticity, fine to medium sand, reddish-brown

| Particle Size Analysis / Without Hydrometer Analysis |                                  |        | Moisture Content                 |                       | Natural |
|------------------------------------------------------|----------------------------------|--------|----------------------------------|-----------------------|---------|
|                                                      |                                  |        |                                  | Tare #                | 6       |
|                                                      | Tare Number                      | 6.0    | A                                | Tare Weight           | 0.00    |
| A                                                    | Tare Weight                      | 0.0    | B                                | Wet Weight + Tare Wt. | 233.21  |
| B                                                    | Total Sample Dry Wt. + Tare Wt.  | 0.0    | C                                | Dry Weight + Tare Wt. | 192.34  |
| C                                                    | Total Sample Dry Weight (B-A)    | 192.34 | D                                | Water Wt. (B-C)       | 40.87   |
| D                                                    | Total Sample Wt. After #200 Wash | 93.62  | E                                | Dry Wt.(C-A)          | 192.34  |
| E                                                    | Percent Passing #200 (1-D/C)x100 | 51.3%  | Moisture Content (100 x D/E) (%) |                       | 21.2%   |

|                                     |                                     |                                                                                  |                                                                                         |
|-------------------------------------|-------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Notes:</b> Maximum Particle Size |                                     | Gravel < 75 mm and > 4.75 mm (#4)                                                |                                                                                         |
| Apparent Relative Density           |                                     | Coarse Sand < 4.75 mm and >2.00 mm (#10)                                         |                                                                                         |
| Liquid Limit                        | Fineness Modulus                    | Medium Sand < 2.00 mm and > 0.425 mm (#40)                                       |                                                                                         |
| Plastic Limit                       | Cu = D60/D10:                       | Fine Sand < 0.425 mm and > 0.075 mm (#200)                                       |                                                                                         |
| Plastic Index                       | Cc =(D30) <sup>2</sup> / (D10xD60): | % Silt and Clay < 0.075 mm                                                       |                                                                                         |
|                                     |                                     | Description of Sand & Gravel                                                     | Rounded <input checked="" type="checkbox"/> Angular <input checked="" type="checkbox"/> |
|                                     |                                     | Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/> | Weathered & Friable <input type="checkbox"/>                                            |

Organic Content

D10 =

D30 =

D60 =

D50 =

D90 =

ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, &amp; Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name:

Brian Urban

Certification #

Technical Responsibility:

Melissa Quinton

Signature

Staff Professional

Position

# Particle Size Analysis of Soils

ASTM D 422

**Project #:** 1611-09-106**Project Name:** Mid- Carolina Commerce Park Phase IIA & III Road

Client Name: Alliance Consulting Engineers, Inc.

Client Address: P.O. Box 8147, Columbia, South Carolina 29202

Test Date(s): 4/16/09-4/17/09

Report Date: 4/17/09

Boring #: 6

Sample #: 4

Sample Date:

Location: B-6

Elevation:

8.5'

Sample Description: Sandy Silt (ML) low to medium plasticity, fine to medium sand, brown and yellow

| Particle Size Analysis / Without Hydrometer Analysis |                                  |        | Moisture Content                 |                       | Natural |
|------------------------------------------------------|----------------------------------|--------|----------------------------------|-----------------------|---------|
|                                                      |                                  |        |                                  | Tare #                | 5       |
|                                                      | Tare Number                      | 5.0    | A                                | Tare Weight           | 0.00    |
| A                                                    | Tare Weight                      | 0.0    | B                                | Wet Weight + Tare Wt. | 239.34  |
| B                                                    | Total Sample Dry Wt. + Tare Wt.  | 0.0    | C                                | Dry Weight + Tare Wt. | 193.72  |
| C                                                    | Total Sample Dry Weight (B-A)    | 193.72 | D                                | Water Wt. (B-C)       | 45.62   |
| D                                                    | Total Sample Wt. After #200 Wash | 93.93  | E                                | Dry Wt.(C-A)          | 193.72  |
| E                                                    | Percent Passing #200 (1-D/C)x100 | 51.5%  | Moisture Content (100 x D/E) (%) |                       | 23.5%   |

|                                     |                                      |                                                                                  |                                                                                         |
|-------------------------------------|--------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Notes:</b> Maximum Particle Size |                                      | Gravel < 75 mm and > 4.75 mm (#4)                                                |                                                                                         |
| Apparent Relative Density           |                                      | Coarse Sand < 4.75 mm and > 2.00 mm (#10)                                        |                                                                                         |
| Liquid Limit                        | Fineness Modulus                     | Medium Sand < 2.00 mm and > 0.425 mm (#40)                                       |                                                                                         |
| Plastic Limit                       | Cu = D60/D10:                        | Fine Sand < 0.425 mm and > 0.075 mm (#200)                                       |                                                                                         |
| Plastic Index                       | Cc = (D30) <sup>2</sup> / (D10xD60): | % Silt and Clay < 0.075 mm                                                       |                                                                                         |
|                                     |                                      | Description of Sand & Gravel                                                     | Rounded <input checked="" type="checkbox"/> Angular <input checked="" type="checkbox"/> |
|                                     |                                      | Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/> | Weathered & Friable <input type="checkbox"/>                                            |

Organic Content

D10 =

D30 =

D60 =

D50 =

D90 =

ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, &amp; Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name:

Brian Urban

Certification #

Technical Responsibility:

Melissa Quinton

Signature

Staff Professional

Position



## Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1611-09-106**  
 Project Name: Mid-Carolina Commerce Park Phase IIA & III Road  
 Client Name: Alliance Consulting Engineers, Inc.  
 Client Address: P.O. Box 8147, Columbia, South Carolina 29202

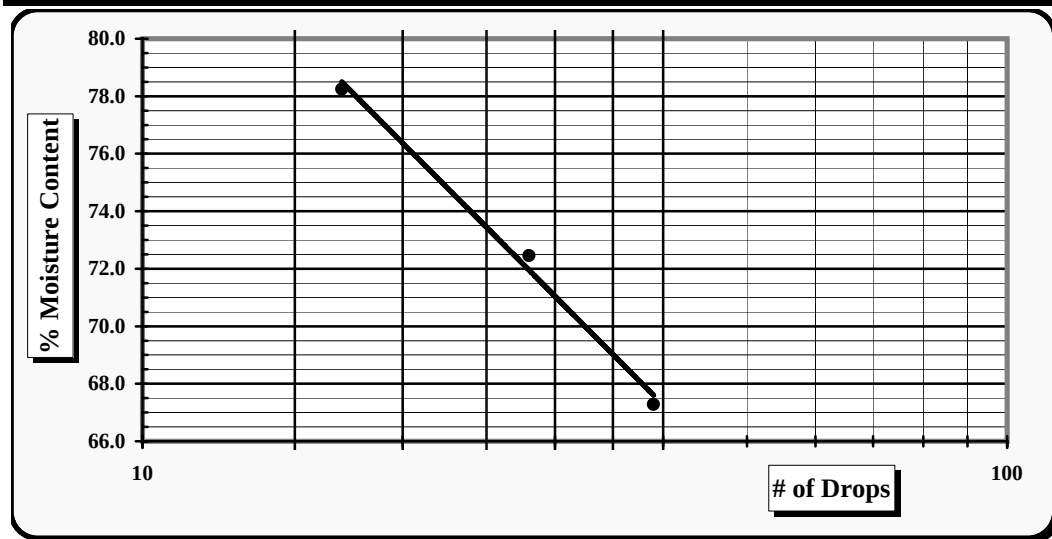
Report Date: 4/17/09  
 Test Date(s): 4/17/09

Boring #: 10 Sample #: 1 Sample Date:

Location: B-10 Elevation: 1.0'

Sample Description: Sandy Elastic Silt (MH) medium to high plasticity, fine to medium sand, brownish-red

| Pan # |                              | Liquid Limit |       |       |   |   |   | Plastic Limit                                  |       |   |
|-------|------------------------------|--------------|-------|-------|---|---|---|------------------------------------------------|-------|---|
|       | Test #                       | 1            | 2     | 3     | 4 | 5 | 6 | 1                                              | 2     | 3 |
|       | Tare #                       | 124          | 126   | 101   |   |   |   | 131                                            | 244   |   |
| A     | Tare Weight                  | 13.99        | 13.84 | 13.70 |   |   |   | <b>13.56</b>                                   | 13.74 |   |
| B     | Wet Soil Weight + A          | 25.95        | 25.55 | 25.56 |   |   |   | 17.65                                          | 18.18 |   |
| C     | Dry Soil Weight + A          | 20.70        | 20.63 | 20.79 |   |   |   | 16.48                                          | 16.92 |   |
| D     | Water Weight (B-C)           | 5.25         | 4.92  | 4.77  |   |   |   | 1.17                                           | 1.26  |   |
| E     | Dry Soil Weight (C-A)        | 6.71         | 6.79  | 7.09  |   |   |   | 2.92                                           | 3.18  |   |
| F     | % Moisture Content (D/E)*100 | 78.2%        | 72.5% | 67.3% |   |   |   | 40.1%                                          | 39.6% |   |
| N     | # OF DROPS                   | 17           | 28    | 39    |   |   |   | Moisture Contents determined<br>by ASTM D 2216 |       |   |
| LL    | LL = F * FACTOR              |              |       |       |   |   |   |                                                |       |   |
| Ave.  | Average                      |              |       |       |   |   |   | 39.8%                                          |       |   |



| One Point Liquid Limit |        |    |        |
|------------------------|--------|----|--------|
| N                      | Factor | N  | Factor |
| 20                     | 0.974  | 26 | 1.005  |
| 21                     | 0.979  | 27 | 1.009  |
| 22                     | 0.985  | 28 | 1.014  |
| 23                     | 0.990  | 29 | 1.018  |
| 24                     | 0.995  | 30 | 1.022  |
| 25                     | 1.000  |    |        |

Notes:

### Special Sampling Methods:

|                     |                                                       |                                                     |                                               |                                          |
|---------------------|-------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|------------------------------------------|
| Sample Preparation: | Wet Preparation <input type="checkbox"/>              | Dry Preparation <input checked="" type="checkbox"/> | Air Dried <input checked="" type="checkbox"/> | NP, Non-Plastic <input type="checkbox"/> |
| Liquid limit Test:  | Multipoint Method <input checked="" type="checkbox"/> | One-point Method <input type="checkbox"/>           |                                               | Liquid Limit <u>73</u>                   |
| Classification:     | ASTM D 2487 <input checked="" type="checkbox"/>       | AASHTO M 145 <input type="checkbox"/>               |                                               | Plastic Limit <u>40</u>                  |
| Liquid limit Test:  | ASTM D 4318 <input checked="" type="checkbox"/>       | AASHTO T 89 <input type="checkbox"/>                |                                               | Plastic Index <u>33</u>                  |
| Plastic limit Test: | ASTM D 4318 <input checked="" type="checkbox"/>       | AASHTO T 90 <input type="checkbox"/>                |                                               | Group Symbol <u>MH</u>                   |

Technician Name: Brian Urban

Certification #

Technical Responsibility: Melissa Quinton

Signature

Staff Professional

Position

# Particle Size Analysis of Soils

ASTM D 422

**Project #:** 1611-09-106**Project Name:** Mid- Carolina Commerce Park Phase IIA & III Road

Client Name: Alliance Consulting Engineers, Inc.

Client Address: P.O. Box 8147, Columbia, South Carolina 29202

Test Date(s): 4/16/09-4/17/09

Report Date: 4/17/09

Boring #: 10

Sample #: 1

Sample Date:

Location: B-10

Elevation:

1.0'

Sample Description: Sandy Elastic Silt (MH) med. to high plasticity, fine to medium sand, brownish-red

| Particle Size Analysis / Without Hydrometer Analysis |                                  |  | Moisture Content                 |                       | Natural |
|------------------------------------------------------|----------------------------------|--|----------------------------------|-----------------------|---------|
|                                                      |                                  |  |                                  | Tare #                | 105     |
|                                                      | Tare Number                      |  | A                                | Tare Weight           | 0.00    |
| A                                                    | Tare Weight                      |  | B                                | Wet Weight + Tare Wt. | 66.22   |
| B                                                    | Total Sample Dry Wt. + Tare Wt.  |  | C                                | Dry Weight + Tare Wt. | 47.93   |
| C                                                    | Total Sample Dry Weight (B-A)    |  | D                                | Water Wt. (B-C)       | 18.29   |
| D                                                    | Total Sample Wt. After #200 Wash |  | E                                | Dry Wt.(C-A)          | 47.93   |
| E                                                    | Percent Passing #200 (1-D/C)x100 |  | Moisture Content (100 x D/E) (%) |                       | 38.2%   |

|                                     |    |                                      |                                                                                                                               |  |  |
|-------------------------------------|----|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|--|
| <b>Notes:</b> Maximum Particle Size |    |                                      | Gravel < 75 mm and > 4.75 mm (#4)                                                                                             |  |  |
| Apparent Relative Density           |    |                                      | Coarse Sand < 4.75 mm and > 2.00 mm (#10)                                                                                     |  |  |
| Liquid Limit                        | 73 | Fineness Modulus                     | Medium Sand < 2.00 mm and > 0.425 mm (#40)                                                                                    |  |  |
| Plastic Limit                       | 40 | Cu = D60/D10:                        | Fine Sand < 0.425 mm and > 0.075 mm (#200)                                                                                    |  |  |
| Plastic Index                       | 33 | Cc = (D30) <sup>2</sup> / (D10xD60): | % Silt and Clay < 0.075 mm                                                                                                    |  |  |
|                                     |    |                                      | Description of Sand & Gravel Rounded <input checked="" type="checkbox"/> Angular <input checked="" type="checkbox"/>          |  |  |
|                                     |    |                                      | Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/> |  |  |

Organic Content

D10 =

D30 =

D60 =

D50 =

D90 =

ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, &amp; Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name:

Brian Urban

Certification #

Technical Responsibility:

Melissa Quinton

Signature

Staff Professional

Position



## Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1611-09-106**  
 Project Name: Mid-Carolina Commerce Park Phase IIA & III Road  
 Client Name: Alliance Consulting Engineers, Inc.  
 Client Address: P.O. Box 8147, Columbia, South Carolina 29202

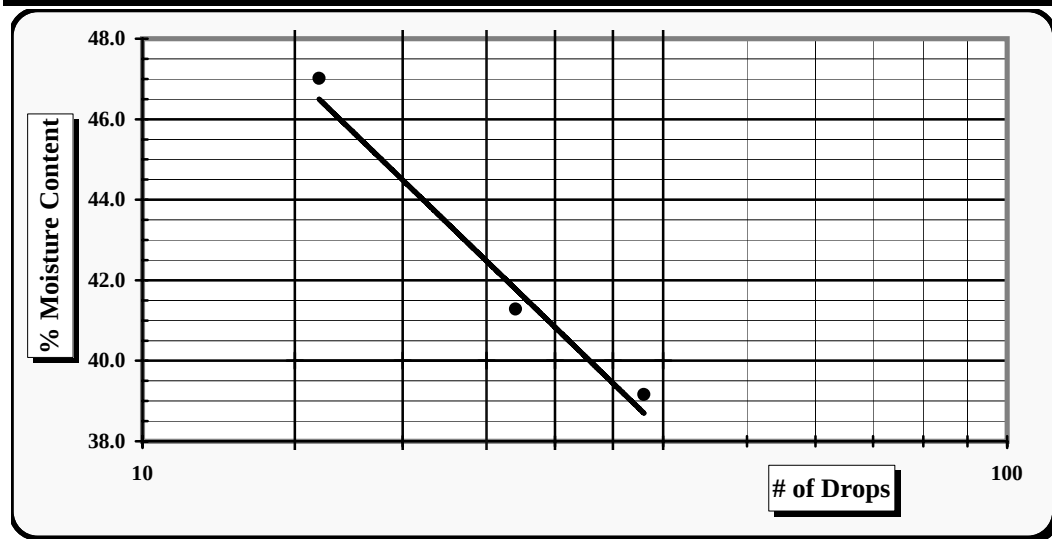
Report Date: 4/17/09  
 Test Date(s): 4/17/09

Boring #: 12 Sample #: 1 Sample Date:

Location: B-12 Elevation: 1.0'

Sample Description: Sandy Lean Clay (CL) low to med. plasticity, fine to medium sand, brownish-yellow

| Pan # |                              | Liquid Limit |       |       |   |   |   | Plastic Limit                                  |       |   |
|-------|------------------------------|--------------|-------|-------|---|---|---|------------------------------------------------|-------|---|
|       | Test #                       | 1            | 2     | 3     | 4 | 5 | 6 | 1                                              | 2     | 3 |
|       | Tare #                       | 140          | 230   | 142   |   |   |   | 109                                            | 144   |   |
| A     | Tare Weight                  | 13.71        | 13.79 | 13.78 |   |   |   | <b>13.82</b>                                   | 13.79 |   |
| B     | Wet Soil Weight + A          | 26.28        | 25.46 | 25.33 |   |   |   | 18.63                                          | 18.70 |   |
| C     | Dry Soil Weight + A          | 22.26        | 22.05 | 22.08 |   |   |   | 17.78                                          | 17.84 |   |
| D     | Water Weight (B-C)           | 4.02         | 3.41  | 3.25  |   |   |   | 0.85                                           | 0.86  |   |
| E     | Dry Soil Weight (C-A)        | 8.55         | 8.26  | 8.30  |   |   |   | 3.96                                           | 4.05  |   |
| F     | % Moisture Content (D/E)*100 | 47.0%        | 41.3% | 39.2% |   |   |   | 21.5%                                          | 21.2% |   |
| N     | # OF DROPS                   | 16           | 27    | 38    |   |   |   | Moisture Contents determined<br>by ASTM D 2216 |       |   |
| LL    | LL = F * FACTOR              |              |       |       |   |   |   |                                                |       |   |
| Ave.  | Average                      |              |       |       |   |   |   | 21.3%                                          |       |   |



| One Point Liquid Limit |        |    |        |
|------------------------|--------|----|--------|
| N                      | Factor | N  | Factor |
| 20                     | 0.974  | 26 | 1.005  |
| 21                     | 0.979  | 27 | 1.009  |
| 22                     | 0.985  | 28 | 1.014  |
| 23                     | 0.990  | 29 | 1.018  |
| 24                     | 0.995  | 30 | 1.022  |
| 25                     | 1.000  |    |        |

Notes:

### Special Sampling Methods:

|                     |                                                       |                                                     |                                               |                                          |
|---------------------|-------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|------------------------------------------|
| Sample Preparation: | Wet Preparation <input type="checkbox"/>              | Dry Preparation <input checked="" type="checkbox"/> | Air Dried <input checked="" type="checkbox"/> | NP, Non-Plastic <input type="checkbox"/> |
| Liquid limit Test:  | Multipoint Method <input checked="" type="checkbox"/> | One-point Method <input type="checkbox"/>           |                                               | Liquid Limit <u>42</u>                   |
| Classification:     | ASTM D 2487 <input checked="" type="checkbox"/>       | AASHTO M 145 <input type="checkbox"/>               |                                               | Plastic Limit <u>21</u>                  |
| Liquid limit Test:  | ASTM D 4318 <input checked="" type="checkbox"/>       | AASHTO T 89 <input type="checkbox"/>                |                                               | Plastic Index <u>21</u>                  |
| Plastic limit Test: | ASTM D 4318 <input checked="" type="checkbox"/>       | AASHTO T 90 <input type="checkbox"/>                |                                               | Group Symbol <u>CL</u>                   |

Technician Name: Brian Urban

Certification #

Technical Responsibility: Melissa Quinton

Signature

Staff Professional

Position

# Particle Size Analysis of Soils

ASTM D 422

**Project #:** 1611-09-106**Project Name:** Mid-Carolina Commerce Park Phase IIA & III Road

Client Name: Alliance Consulting Engineers, Inc.

Client Address: P.O. Box 8147, Columbia, South Carolina 29202

Test Date(s): 4/16/09-4/17/09

Report Date: 4/17/09

Boring #: 12

Sample #: 1

Sample Date:

Location: B-12

Elevation:

1.0'

Sample Description: Sandy Lean Clay (CL) low to med. plast., fine to medium sand, brownish-yellow

| Particle Size Analysis / Without Hydrometer Analysis |                                  |  | Moisture Content                 |                       | Natural |
|------------------------------------------------------|----------------------------------|--|----------------------------------|-----------------------|---------|
|                                                      |                                  |  |                                  | Tare #                | 101     |
|                                                      | Tare Number                      |  | A                                | Tare Weight           | 0.00    |
| A                                                    | Tare Weight                      |  | B                                | Wet Weight + Tare Wt. | 81.84   |
| B                                                    | Total Sample Dry Wt. + Tare Wt.  |  | C                                | Dry Weight + Tare Wt. | 68.62   |
| C                                                    | Total Sample Dry Weight (B-A)    |  | D                                | Water Wt. (B-C)       | 13.22   |
| D                                                    | Total Sample Wt. After #200 Wash |  | E                                | Dry Wt.(C-A)          | 68.62   |
| E                                                    | Percent Passing #200 (1-D/C)x100 |  | Moisture Content (100 x D/E) (%) |                       | 19.3%   |

|                                     |    |                                      |                                                                                                                               |  |  |
|-------------------------------------|----|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|--|
| <b>Notes:</b> Maximum Particle Size |    |                                      | Gravel < 75 mm and > 4.75 mm (#4)                                                                                             |  |  |
| Apparent Relative Density           |    |                                      | Coarse Sand < 4.75 mm and > 2.00 mm (#10)                                                                                     |  |  |
| Liquid Limit                        | 42 | Fineness Modulus                     | Medium Sand < 2.00 mm and > 0.425 mm (#40)                                                                                    |  |  |
| Plastic Limit                       | 21 | Cu = D60/D10:                        | Fine Sand < 0.425 mm and > 0.075 mm (#200)                                                                                    |  |  |
| Plastic Index                       | 21 | Cc = (D30) <sup>2</sup> / (D10xD60): | % Silt and Clay < 0.075 mm                                                                                                    |  |  |
|                                     |    |                                      | Description of Sand & Gravel Rounded <input checked="" type="checkbox"/> Angular <input checked="" type="checkbox"/>          |  |  |
|                                     |    |                                      | Hard & Durable <input checked="" type="checkbox"/> Soft <input type="checkbox"/> Weathered & Friable <input type="checkbox"/> |  |  |

Organic Content

D10 =

D30 =

D60 =

D50 =

D90 =

ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, &amp; Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name:

Brian Urban

Certification #

Technical Responsibility:

Melissa Quinton

Signature

Staff Professional

Position



Report of Geotechnical Exploration  
Mid-Carolina Commerce Park – Parcel 6  
Prosperity, South Carolina  
S&ME Project No. 206769

**PREPARED FOR:**

**Alliance Consulting Engineers, Inc.  
124 Verdae Boulevard, Suite 505  
Greenville, South Carolina, 29607**

**PREPARED BY:**

**S&ME, Inc.  
134 Suber Road  
Columbia, South Carolina 29210**

**March 31, 2021**



March 31, 2021

Alliance Consulting Engineers, Inc.  
124 Verdae Boulevard, Suite 505  
Greenville, South Carolina 29607

Attention: Ms. Emily Palamara

Reference: **Report of Geotechnical Exploration**  
**Mid-Carolina Commerce Park – Parcel 6**  
Commerce Park Avenue  
Prosperity, Newberry County, South Carolina  
S&ME Project No. 206769

Dear Ms. Palamara:

As requested, S&ME, Inc. has completed field and laboratory testing for the Mid-Carolina Commerce Park – Parcel 6 site, in Prosperity, Newberry County, South Carolina. Our work was performed in general accordance with email correspondence and Task Order 21114-0036, dated February 17, 2021.

This report provides information on the exploration and testing procedures used, our boring records, our laboratory testing results and our conclusions and recommendations regarding site conditions, IBC 2018 Seismic Site Class, site preparation, excavation considerations, slope considerations, suitability of on-site soils for use as structural fill, fill placement and compaction and preliminary considerations on foundation and slab support.

S&ME appreciates this opportunity to work with you as your geotechnical engineering consultant on this project. Please contact us at (803) 561-9024 if you have any questions or need any additional information regarding this report.

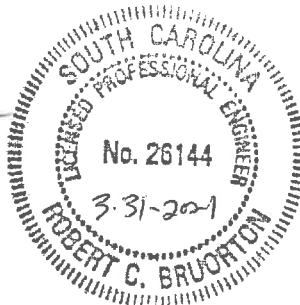
Sincerely,

**S&ME, Inc.**

  
John P. Lewis, P.E.  
Project Engineer



  
Robert C. Bruorton, P.E.  
Senior Engineer





## Table of Contents

|            |                                               |          |
|------------|-----------------------------------------------|----------|
| <b>1.0</b> | <b>Project Information.....</b>               | <b>1</b> |
| <b>2.0</b> | <b>Previous Exploration by S&amp;ME .....</b> | <b>1</b> |
| <b>3.0</b> | <b>Exploration Procedures .....</b>           | <b>1</b> |
| 3.1        | Reconnaissance of Project Area .....          | 2        |
| 3.2        | Field Testing and Sampling .....              | 2        |
| 3.2.1      | Site Clearing.....                            | 2        |
| 3.2.2      | Soil Test (SPT) Borings .....                 | 2        |
| 3.2.3      | Ground Water Measurements.....                | 2        |
| 3.2.4      | Bulk Samples .....                            | 2        |
| 3.3        | Laboratory Testing .....                      | 3        |
| <b>4.0</b> | <b>Site Conditions .....</b>                  | <b>3</b> |
| 4.1        | Surface Conditions .....                      | 3        |
| 4.2        | Subsurface Conditions.....                    | 3        |
| 4.2.1      | Site Geology.....                             | 3        |
| 4.2.2      | USDA Soil Survey Information.....             | 4        |
| 4.2.3      | Interpreted Subsurface Profile.....           | 5        |
| 4.3        | Laboratory Physical Tests .....               | 8        |
| 4.3.1      | Compaction Behavior .....                     | 8        |
| <b>5.0</b> | <b>Building Code Seismic Provisions .....</b> | <b>8</b> |
| 5.1        | IBC Site Class .....                          | 8        |
| 5.2        | Design Spectral Values .....                  | 9        |
| <b>6.0</b> | <b>Conclusions and Recommendations .....</b>  | <b>9</b> |
| 6.1        | Site Preparation.....                         | 10       |
| 6.1.1      | Clearing, Grubbing and Stripping.....         | 10       |
| 6.1.2      | Surface Preparation/Proofrolling .....        | 10       |
| 6.1.3      | Wet Weather Grading .....                     | 11       |
| 6.2        | Excavation Considerations.....                | 11       |



|            |                                                                   |           |
|------------|-------------------------------------------------------------------|-----------|
| 6.2.1      | <i>Difficult Excavation – PWR</i> .....                           | 11        |
| 6.2.2      | <i>Ripping versus Blasting</i> .....                              | 12        |
| 6.2.3      | <i>Confined Areas</i> .....                                       | 12        |
| 6.2.4      | <i>Classified Excavations</i> .....                               | 12        |
| 6.3        | <b>General Comments on Slope Stability and Construction</b> ..... | 13        |
| 6.3.1      | <i>Temporary Excavation Stability</i> .....                       | 13        |
| 6.3.2      | <i>Excavation Slopes</i> .....                                    | 13        |
| 6.3.3      | <i>Fill Slopes</i> .....                                          | 13        |
| 6.3.4      | <i>General Slope Recommendations</i> .....                        | 14        |
| 6.4        | <b>Use of On-site Soils as Structural Fill</b> .....              | 15        |
| 6.4.1      | <i>Sandy Proposed Fill Soils</i> .....                            | 15        |
| 6.4.2      | <i>Fine Grained Proposed Fill Soils</i> .....                     | 15        |
| 6.4.3      | <i>Use of Rock Fill</i> .....                                     | 15        |
| 6.5        | <b>Fill Placement and Compaction</b> .....                        | 16        |
| 6.5.1      | <i>Density and Moisture Requirements</i> .....                    | 16        |
| 6.5.2      | <i>Compaction of Granular Soils</i> .....                         | 17        |
| 6.5.3      | <i>Compaction of Cohesive Soils</i> .....                         | 17        |
| 6.5.4      | <i>Deep Fill Considerations</i> .....                             | 17        |
| 6.5.5      | <i>Monitoring and Testing</i> .....                               | 18        |
| 6.6        | <b>Foundations</b> .....                                          | 18        |
| 6.7        | <b>Grade Slab Support</b> .....                                   | 18        |
| <b>7.0</b> | <b>Qualifications of Report</b> .....                             | <b>18</b> |

## List of Tables

|                                                                     |    |
|---------------------------------------------------------------------|----|
| Table 3-1 – Laboratory Testing Summary .....                        | 3  |
| Table 4-1 – USDA Soil Series Survey .....                           | 5  |
| Table 4-2 – Summary of Encountered PWR .....                        | 6  |
| Table 4-3 – Summary of Auger Refusal Depth/Elevation .....          | 7  |
| Table 4-4 – Bulk Sample Moisture-Density Relationship Summary ..... | 8  |
| Table 5-1 – Spectral Design Values .....                            | 9  |
| Table 6-1 – Bulk Sample/Proposed Fill Laboratory Summary .....      | 15 |



## **Appendices**

Appendix I – Figures

Appendix II-A – Current Field Data

Appendix II-B – Previous Field Data

Appendix III – Laboratory Data



## 1.0 Project Information

Initial information regarding the project was received in email correspondence between Ms. Emily Palamara of Alliance Consulting Engineers, and Mr. Chad Bruorton, P.E. of S&ME, on November 25, 2020. Provided in the email correspondence was the *Overall Site Plan*, produced by Alliance Consulting Engineers, dated March 2009.

From our review of the provided information and online aerial imagery, we understand that the site of the proposed Parcel 6 development is located within the existing Mid-Carolina Commerce Park, roughly 2,200 feet northwest of the existing Commerce Park Avenue termination, in Prosperity, Newberry County, South Carolina, as shown in the *Site Location Plan*, Figure 1 in Appendix I. The site is legally defined as a portion of Newberry County Tax Map Number 573-15, is approximately 36 acres in size, and is currently an undeveloped tract of land. The site is currently wooded with mature pine and hardwood trees.

We further understand that the planned development at the site will consist of the construction of a roughly 300,000 square foot building pad. Based on our review of available USGS topographic maps, existing grades across the site appear to range from about elevation 470 feet to about elevation 380 feet. Planned grading information is not available at this time. From our review of the Phase III Roadway Profile depicted on the *Phases IIA and III Roadway, Water and Wastewater Improvements* plans, produced by Alliance, dated March 2009, received in email correspondence from Ms. Palamara for our use on another project, it appears that the roadway planned along the eastern side of Parcel 6 will be graded to roughly elevation 433 feet to 441 feet between Stations 52+00 and 54+00, which appears to be the main roadway frontage of Parcel 6. Assuming Parcel 6 will be graded to access from this roadway, we have assumed that cuts and fills to grade the site may be on the order of up to 30 feet.

## 2.0 Previous Exploration by S&ME

S&ME is familiar with the general geologic conditions within and around the project site having previously conducted a preliminary geotechnical exploration for the Mid-Carolina Commerce Park and other geotechnical explorations for access roads and lots within the park.

From our review of the provided information, one shear wave velocity array (SW-2) from our previous exploration entitled *Report of Reconnaissance Level Geotechnical Exploration – Mid-Carolina Commerce Park* (S&ME Project 1611-12-378), dated October 29, 2011, is located within the project site. The shear wave velocity profile from this previous exploration is provided in Appendix II-B and will be incorporated into our current exploration.

## 3.0 Exploration Procedures

The subsurface exploration of this project included ten (10) Standard Penetration Test (SPT) soil test borings. The approximate boring locations are shown in the *Testing Location Plan*, attached as Figure 2 in Appendix I.



### **3.1 Reconnaissance of Project Area**

On March 1, 2021, a representative from S&ME visited the site to observe current site conditions and lay out the proposed soil test boring locations. Soil test boring locations were marked in the field with orange pin flags. Soil test boring locations were laid out using our sub-meter GPS equipment. The boring locations indicated on the attached *Testing Location Plan* must be considered as approximate. No formal survey of boring locations or elevations was conducted by S&ME.

### **3.2 Field Testing and Sampling**

The following sections detail our field and sampling activities at the site. A summary of our exploration procedures is included in Appendix II-A.

#### *3.2.1 Site Clearing*

Clearing to create drill rig access pathways to the boring locations was performed by Palmetto Property and Wildlife Services, under subcontract to S&ME, using a skid steer-mounted forestry grinder and operator on March 1, 2021. Trails approximately 12 to 15 feet wide were cleared with trees chipped in-place. No attempt was made to stack or remove downed trees from the site.

#### *3.2.2 Soil Test (SPT) Borings*

Ten (10) soil test borings (B-1 through B-10) with SPT sampling and testing were performed on March 15, 2021. The SPT borings were performed by Southern Drill, Inc., under subcontract to S&ME, using an ATV-mounted CME 550 drill rig. The borings were advanced using 2¼-inch inside diameter hollow-stem augers to refusal or termination depths of roughly 5½ to 46 feet below the existing ground surface.

Split-spoon samples and Standard Penetration Test Resistance N-values were obtained at selected intervals in general accordance with ASTM D1586. Representative samples of the soils obtained by the split-spoon sampler were collected and placed in suitably identified, sealed glass jars and transported to our laboratory.

#### *3.2.3 Ground Water Measurements*

Measurement of ground water was attempted in the borings shortly after drilling was completed. Once drilling was completed, boreholes that exceeded 5 feet in depth were left open for 24-hour ground water measurements. After ground water measurements, the boreholes were backfilled with auger cuttings and a plastic hole plug was placed within the boreholes that exceeded 5 feet in depth.

#### *3.2.4 Bulk Samples*

One (1) bulk sample was obtained from the site in a companion off-set auger probe boring adjacent to Boring B-9. The representative bulk sample of near-surface soils was obtained by randomly taking shovel loads of auger cutting spoils from boring until a sample of 50 to 75 pounds was obtained. The sample was placed in plastic bags and marked with appropriate descriptive information. The bulk sample was obtained to represent possible on-site borrow materials to be reused as structural fill.



### 3.3 Laboratory Testing

Recovered split spoon samples, the bulk sample and field logs were transported to our laboratory. Soils were subsequently classified by a geotechnical professional in general accordance with the visual-manual method described in ASTM D2488 *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. The following laboratory testing was conducted on the bulk sample representative of possible structural fill soils during this exploration:

**Table 3-1 – Laboratory Testing Summary**

| Laboratory Test               | Specification | Quantity |
|-------------------------------|---------------|----------|
| Natural Moisture Content      | ASTM D2216    | 1        |
| Percent Finer than #200 Sieve | ASTM D1140    | 1        |
| Atterberg Limits              | ASTM D4318    | 1        |
| Standard Proctor              | ASTM D698     | 1        |

A summary of our laboratory testing procedures and the laboratory test results are included in Appendix III.

## 4.0 Site Conditions

S&ME's assessment of the geotechnical conditions began with a reconnaissance of the topography and physical features of the site. We also consulted various available topographic and geologic maps for relevant information. Where previous S&ME testing data pertinent to the project is known to exist and can be readily retrieved, such data is incorporated into our evaluation process.

### 4.1 Surface Conditions

As previously mentioned, the site is located roughly 2,200 feet west of the Commerce Park Avenue existing termination, in Prosperity, Newberry County, South Carolina. The site is bounded by undeveloped, wooded property to the north, south and east, and by an unnamed tributary of Cannon Creek and wooded property to the west. The site is currently undeveloped and wooded with mature pine and hardwood trees.

From our review of the USGS Little Mountain quadrangle topographic map, the site appears to generally slope down in elevation to the west toward the unnamed tributary creek. Existing site grades appear to range from roughly 470 to 380 feet.

### 4.2 Subsurface Conditions

Recovered field samples and field boring logs were reviewed in the laboratory by a member of our geotechnical staff. Soil test boring records and other field data are assembled in Appendices II-A and II-B.

#### 4.2.1 Site Geology

The site lies within the Piedmont Physiographic Province of South Carolina, an area underlain by soils weathered in place from the parent crystalline bedrock material. Residual soils of the Carolina Piedmont consist of stiff or



very stiff micaceous silts and clays, grading to firm sands with depth. These soils have been completely weathered in place from the parent bedrock material, but below depths of a few feet retain most of the relict rock structure. Soil strength derives largely from relict intermolecular bonding and remolded materials generally less exhibit lower shear strength than do undisturbed samples. Piedmont soils are normally consolidated to slightly over-consolidated.

The term *partially weathered rock (PWR)* is applied to very dense micaceous sands or silty sands of the Carolina Piedmont, which register SPT N-values in excess of 100 blows per foot. PWR generally varies widely within even small areas owing to minute differences in the chemical properties of the parent bedrock, which results in widely varying rates of weathering. Isolated lenses or seams of PWR often are present within Piedmont Residuum well above the overall PWR level within a given area. PWR is considered excellent bearing material for foundations and is relatively incompressible except in highly stressed deep foundations.

#### *4.2.2 USDA Soil Survey Information*

From a qualitative standpoint, the USDA Natural Resources Conservation Service's Soil Surveys can often provide helpful information. The surveys map the near surface soils (i.e., depths  $\leq 6$  ft.) and provide general descriptions. The data is not intended to replace geotechnical evaluations and testing but it can help identify trends. Soil maps are often a useful indication of the geologic environment governing soil behavior as well as the seasonal depth to ground water and depth to rock.

The USDA-NCSS web-based SoilWeb and USDA Natural Resource Conservation Service soils map of Newberry County, South Carolina, issued in 2008 were reviewed. Five (5) series were indicated within the project area:

- Cecil sandy clay loam, 2 to 6 percent slopes (CfB2) – gently sloping, very deep, well-drained soils found on broad to narrow ridges and side slopes adjacent to drainageways. Residuum weathered from felsic igneous and high-grade metamorphic rock.
- Hard Labor sandy loam, 2 to 6 percent slopes (HaB) – gently sloping, very deep, moderately well-drained soils found on broad to narrow ridges and side slopes adjacent to drainageways. Residuum weathered from felsic igneous and metamorphic rock, primarily granite and granite gneiss.
- Hard Labor sandy loam, 6 to 10 percent slopes (HaC) – sloping, very deep, moderately well-drained soils found on narrow ridges and side slopes adjacent to drainageways. Residuum weathered from felsic igneous and metamorphic rock, primarily granite and granite gneiss.
- Rion sandy loam, 15 to 25 percent slopes, moderately eroded (RnE2) – moderately steep, very deep, well-drained soils found on side slopes adjacent to drainageways. Residuum weathered from acid crystalline rock.
- Toccoa sandy loam, 0 to 3 percent slopes, frequently flooded (ToA) – nearly level or gently sloping, very deep, moderately well-drained or well-drained alluvial soils found on first bottoms along small to large streams.

**Table 4-1 – USDA Soil Series Survey**

| Soil Series | Soil Type             | Depth to Seasonal High GW Table | Permeability                   | Shrink / Swell Potential | Soil Reaction                    |
|-------------|-----------------------|---------------------------------|--------------------------------|--------------------------|----------------------------------|
| CfB2        | SC-SM, SC, CL, CH     | >6 feet                         | Moderately Rapid to Rapid      | Low                      | Very Strongly to Moderately acid |
| HaB         | SM, SC-SM, SC, CL, CH | 2.5-5 feet                      | Moderately slow to Very Rapid  | Low                      | Very Strongly to Moderately acid |
| HaC         | SM, SC-SM, SC, CL, CH | 2.5-5 feet                      | Moderately slow to Very Rapid  | Low                      | Very Strongly to Moderately acid |
| RnE2        | SM, SC-SM, SC, CL     | >6 feet                         | Moderately Rapid to Very Rapid | Low                      | Very Strongly to Slightly acid   |
| ToA         | SC-SM, SM             | 2.5-5 feet                      | Rapid to Very Rapid            | Low                      | Strongly to Slightly acid        |

The USDA information provided for this site points to a few items that could influence geotechnical recommendations for the planned development.

- Soil series CfC2, HaB and HaC are noted to have high plasticity (CH) soils.
- Soil series HaB, HaC and ToA are noted to have shallow seasonal high groundwater tables.

The USDA Soil Survey for the site is shown on the *USDA Soil Survey Map*, attached as Figure 3 in Appendix I.

#### **4.2.3**      *Interpreted Subsurface Profile*

The generalized subsurface conditions at the site are described below. The discussed subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring records included in Appendix II-A should be reviewed for specific information at each boring location. The depth and thickness of the subsurface strata indicated on the boring records was estimated based on the drill cuttings and the samples recovered. The transition between materials may be more gradual than indicated on the boring records. Information on actual subsurface conditions exists only at the specific boring locations and is relevant to the time the exploration was performed. Variations may occur and should be expected at locations remote from the boring. The stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as the basis for design or construction cost estimates. Soil test boring records are attached in Appendix II-A.



### Surface Materials

Surface materials in the form of topsoil were encountered in the borings performed across site, measuring from roughly 2 to 4 inches in thickness. We caution that varying depths of surface materials may be encountered in areas that were not explored by our borings.

### Piedmont Residuum

Beneath the surface materials Piedmont residual soils were encountered that extended to depths of 3½ to 13½ feet below the existing ground surface. The Piedmont residual soils consisted of fine to medium sands with some low to medium plasticity fines and trace to some fine to coarse rock fragments (SM and SC) and medium plasticity clayey fines with some fine sands (CL). Some samples contained fine to coarse rock fragments, roots, and mica.

Recovered samples of the Piedmont residuum were typically dry to moist to the touch and were typically brown, gray, white, yellow, red and blue in color. SPT N-values ranged from 3 to 67 blows per foot (bpf) in the sandy soils, indicating very loose to very dense relative densities. SPT N-values ranged from 7 to 11 bpf in the clayey soils, indicating firm to stiff consistencies.

### Partially Weathered Rock (PWR)

Each of the borings encountered partially weathered rock (PWR) beneath or intermittent within the Piedmont residuum. PWR is defined as a very dense or very hard material exhibiting SPT N-values in excess of 100 bpf. PWR was encountered as summarized in the table below:

**Table 4-2 – Summary of Encountered PWR**

| Boring No. | Approximate PWR Depth | Approximate PWR Elevation |
|------------|-----------------------|---------------------------|
| B-1        | 3½ ft                 | ~401.5 ft                 |
| B-2        | 13½ ft                | ~409.5 ft                 |
| B-3        | 13½ ft                | ~434.5 ft                 |
| B-4        | 8½ ft                 | ~402.5 ft                 |
| B-5        | 3½ ft                 | ~424.5 ft                 |
| B-6        | 13½ ft                | ~451.5 ft                 |
| B-7        | 13½ ft                | ~398.5 ft                 |
| B-8        | 3½ ft                 | ~424.5 ft                 |
| B-9        | 3½ ft                 | ~464.5 ft                 |
| B-10       | 3½ and 13½ ft         | ~447.5 and ~437.5 ft      |

Recovered samples of PWR consisted of fine to coarse sands with some low to medium plasticity fines and trace to few fine to coarse rock fragments (SM and SC), similar to the overlying Piedmont residual soils. An isolated layer of fine to coarse gravels with few fine to coarse sands and trace low plasticity fines (GP) was encountered in

Boring B-9 from roughly 8 to 15 feet below the existing ground surface. Split spoon samples were typically dry to moist to the touch and were brown, yellow, gray, white and blue in color.

#### Refusal to Drilling

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project. Auger refusal was encountered as summarized in the table below:

**Table 4-3 – Summary of Auger Refusal Depth/Elevation**

| Boring No. | Approximate Auger Refusal Depth | Approximate Auger Refusal Elevation |
|------------|---------------------------------|-------------------------------------|
| B-1        | 7 ft                            | ~398 ft                             |
| B-2        | 21 ft                           | ~402 ft                             |
| B-3        | 46 ft                           | ~402 ft                             |
| B-4        | 12½ ft                          | ~398.5 ft                           |
| B-5        | 5½ ft                           | ~422.5 ft                           |
| B-6        | 28 ft                           | ~437 ft                             |
| B-8        | 12 ft                           | ~416 ft                             |
| B-9        | 15½ ft                          | ~452.5 ft                           |
| B-10       | 21½ ft                          | ~429.5 ft                           |

Refusal may have consisted of large boulders, rock ledges, lenses, seams or the top of parent bedrock. Core drilling techniques would be necessary to evaluate the character and continuity of the refusal material.

#### Ground Water

Ground water was measured at the time of drilling and repeated after a roughly 24-hour period. Ground water was not encountered in our borings at time of drilling or after a roughly 24-hour period.

Borehole cave-in was measured in our borings, at depths ranging from roughly 5 to 9 feet below the existing ground surface. In moist or dry soils, cave-in depths typically represent soils which fell into the boreholes as the drilling tools were removed.

Although planned grades across the site were not available at the time of this report, it appears that ground water will not impact construction on this site. However, it is possible that perched water conditions may be encountered during excavation and grading activities across the site. Perched ground water is surface water that infiltrates through the upper, less dense or more permeable soils (such as the sandy soils encountered across the site) but becomes perched or trapped at the interface with the underlying, more dense or less permeable soils (such as the PWR encountered across the site).

We note that ground-water levels are influenced by precipitation, long term climatic variations, and nearby construction. Measurements of ground water made at different times than our exploration may indicate ground-water levels substantially different than indicated on the boring records in Appendix II-A.



## 4.3 Laboratory Physical Tests

### 4.3.1 Compaction Behavior

The bulk sample was compacted in standard molds using ASTM D698 Method A. A summary of the results is provided in the table below, with laboratory data sheets presented in Appendix III:

**Table 4-4 – Bulk Sample Moisture-Density Relationship Summary**

| Boring No. | Sample No. | Sample Depth (ft) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | USCS Soil Type |
|------------|------------|-------------------|---------------------------|------------------------------|----------------|
| B-9        | BS-1       | 0 - 10            | 129.3                     | 11.0                         | SM             |

Bulk sample BS-1 was obtained from soils assumed to represent on-site cut/borrow to be reused as structural fill. The soils had a maximum dry density of 129.3 pcf at an optimum moisture content of 11.0 percent. The optimum moisture content obtained in the test was roughly 7.3 percent above the in-situ moisture content of the soils. The silty fines tested as non-plastic in nature.

## 5.0 Building Code Seismic Provisions

Seismic induced ground shaking at the foundation is the effect taken into account by building code seismic-resistant design provisions. Other effects, such as soil liquefaction, are not addressed in building codes but must also be considered.

### 5.1 IBC Site Class

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 1613.3.2.2, using the procedures described in Chapter 20 of ASCE 7-16.

The initial step in site class definition is a 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 under item 1) including quick and highly sensitive clays or collapsible weakly cemented soils were not observed in the borings. Three other conditions, 2) peats and highly organic clays; 3) very high plasticity clays ( $H > 25$  feet); and 4) very thick soft/medium stiff clays were also not evident in the borings performed. The remaining vulnerability, liquefaction, appears unlikely at this site due to the age, density and fines content of the soils encountered.

As previously mentioned, one MASW-MAM survey (SW-2) was performed during a previous exploration (S&ME Project 1611-12-378). The calculated average shear wave velocity using the shear wave velocity profile was 1,572 feet per second. The 1-D shear wave velocity profile from this previous exploration is provided in Appendix II-B. Based on this data and our knowledge of the general geologic profile of the area, we recommend Site Class C be used.



## 5.2 Design Spectral Values

S&ME determined the spectral response parameters for the site using the general procedures outlined under the &ME determined the spectral response parameters for the site using the general procedures outlined under the 2018 International Building Code Section 1613.2.3. 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 Chapter 20 of ASCE 7-16 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  $F_V$  in IBC Section 1613.2.3, tables 1613.2.3(1) and 1613.2.3(2). 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 1613.2.4. 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.

ASCE 7-16 was referenced for determination of peak ground acceleration values for computation of seismic hazard. Peak ground acceleration is separately mapped in ASCE 7-16 and corresponds to the geometric mean maximum credible earthquake (MCEG). The mapped PGA value is adjusted for site class effects to arrive at a design peak ground acceleration value, designated as  $PGA_M$ .

**Table 5-1 – Spectral Design Values**

| Spectral Design Value | 2018 IBC – Site Class C  |
|-----------------------|--------------------------|
| $S_{DS}$              | 0.289 g                  |
| $S_{D1}$              | 0.104 g                  |
| Spectral Design Value | ASCE 7-16 – Site Class C |
| $PGA_M$               | 0.231 g                  |

Under the 2018 IBC, for a structure having a Seismic Use Group classification of I, II or III, spectral response acceleration factors given above correspond to Seismic Design Category B as defined in section 1613.2.5 and Tables 1613.2.5(1) and 1613.2.5(2) of the 2018 IBC.

## 6.0 Conclusions and Recommendations

The following paragraphs include our conclusions and recommendations for site preparation, excavation considerations, slope considerations, dewatering considerations, suitability of on-site soils for use as structural fill, fill placement and compaction and preliminary considerations on foundation and slab support.



The soil profile encountered at this site appears suitable for the proposed development. Conditions at this site do not appear to pose issues for site preparation, grading or foundation construction that differ substantially from the surrounding region.

Medium plasticity clayey soils in possible cut portions of the site appear marginally suitable for re-use as structural fill. The term marginally refers to the fact that these soils may be moisture sensitive to some degree and can be difficult to work if allowed to become wet. These difficulties can include softening of exposed subgrade soils, excessive rutting or deflection under construction traffic, and the difficulty associated with adequately drying and compacting wet soil. Moisture-related earthwork difficulties can be reduced by performing the earthwork during the typically drier months of the year (May through October).

Mass excavation using conventional grading equipment, including trackhoes and pan scrapers, appears feasible, across the majority of the site. However, PWR and auger refusal were encountered in our borings, as previously discussed. As planned grades across the site were not available at the time of this report, if PWR is encountered during excavation processes, special procedures including ripping and/or blasting will be necessary during site grading.

From our knowledge of the assumed planned grades across the site, it appears that ground water will not likely impact construction within the majority of the site.

## **6.1 Site Preparation**

Site preparation will need to include removal of unsuitable surface materials within the proposed structural footprint. This should include surface vegetation, organic laden topsoil, stumps, root bulbs, surface debris and unstable/unsuitable surface or subsurface soils.

Removal of stumps and roots will result in disturbance of the upper soils. In filled areas, the upper soils will need to be stabilized prior to placing fill. Stabilization, if required, may consist of removing and replacing unstable material or, where unstable soils are thin, wetting/drying and compacting in-place.

### *6.1.1 Clearing, Grubbing and Stripping*

The site is comprised mostly of heavily wooded areas. Topsoil thickness encountered in our borings measured between 2 and 4 inches. The organic soil stripping process may expose deeper organic soils in portions of the site than suggested by the boring data. These soils often have a similar color to topsoil but contain only minor amounts of organics. The organic content of the topsoil materials encountered at the existing ground surface was not tested, therefore, the depth of initial stripping is not known at this time, and could vary, depending on the actual organic content of the soils and the project specifications. If these soils are to remain in-place or are to be re-used as structural fill, the organic content should be tested, in general accordance with ASTM D2974.

### *6.1.2 Surface Preparation/Proofrolling*

In most areas, surface preparation can likely be limited to proofrolling of the surface. Areas that rut, pump, or move excessively under movement of the equipment need to be stabilized prior to placement of fill soil. If the near-surface medium plasticity clays (CL) are proofrolled during wet conditions, additional and wide-spread areas of stabilization may be required, as these materials are moisture sensitive. It is likely that unstable proofroll results



will occur within the vicinity of Borings B-2 and B-5, due to the very loose relative density sandy soil conditions within the upper roughly 5 feet of residual soils.

After removal of topsoil and unsuitable soils/materials and cutting to grade, but prior to fill placement, the exposed ground surface should be observed by the geotechnical engineer or a representative of the geotechnical engineer to confirm that poor soils have been removed and that the exposed subgrade is suitable for support of the structures.

To aid in evaluation of the exposed soils, the area should be proofrolled using a loaded dump truck or similarly loaded piece of equipment. Areas that rut, pump, or move excessively under movement of the equipment should be stabilized prior to placement of fill soil. If left in place, soft or wet soils will exhibit substantially lower bearing for foundations and slabs. Stabilization, if required, may consist of removing and replacing unstable material with properly compacted structural fill, or where unstable soils are thin, wetting/drying and compacting in-place. If large unstable areas are encountered that are cost prohibitive to undercut and replace, drying and stabilizing by chemical means could be an option.

Care should be taken during construction so that the subgrade soils are not disturbed any more than necessary. If heavily reworked or disturbed, stabilization may be required for what could otherwise be considered an acceptable subgrade.

### *6.1.3 Wet Weather Grading*

Based on our experience, medium plasticity clayey soils (CL), similar to those encountered at the site, can be difficult to work if allowed to become wet and may also require extended drying times. Reasonable measures by the grading contractor to grade the surface to drain and seal the surface with a smooth drum roller prior to rainfall will likely be effective to limit risk of periodic rain significantly affecting grading.

Our experience indicates that allowing heavy equipment to run on the existing ground surface will result in heavy rutting. Running heavy equipment on previously placed fill during rain events or where water is ponded will result in degradation of the fill. If these conditions are evident or persist and routinely cause issues, then during construction, gravity-drained surface ditches should be installed around the site to promote surface runoff. Ditches should have at least 6 inches of relief per 100 feet of length to facilitate flow.

## **6.2 Excavation Considerations**

Based on review of the soil test boring data, it appears that the Piedmont residual soils consisting of very loose to very dense sandy soils and firm to stiff cohesive soils will mostly be encountered during general excavation. In most cases these residual soils can be typically excavated using pans, scrapers, backhoes and front end loaders in mass grading. The degree of difficulty that mobile equipment will encounter rises dramatically in materials exceeding about 70 to 80 blows per foot. These conditions were generally not encountered in our soil borings other than the areas previously detailed where PWR was encountered.

### *6.2.1 Difficult Excavation – PWR*

Based on the subsurface conditions encountered, as detailed in Table 4-2 above, PWR may be encountered, depending on planned finished grades. It is important to note that PWR elevations shown in the borings reflect



the widely spaced boring locations. No generalization of the trend between boring locations is made. Such generalization would entail substantial risk since the composition and density of the soil and rock may vary between testing locations. We emphasize that there may be substantial areas on the site where PWR or rock may occur above the level indicated by the testing.

PWR can normally be excavated by hard to very hard ripping. We recommend ripping be performed with a single-tooth hydraulically articulated ripper mounted to the frame of a D-9 or larger dozer. Our experience indicates that as the consistency of PWR increases ("N" values greater than 50/4" to 50/2" as represented on the Boring Records in Appendix II-A) the probability that blasting will be required increases for both mass and local excavation. Based on the subsurface conditions encountered by the borings, it is our professional opinion that the majority of the PWR can be excavated by appropriately sized heavy construction equipment. Occasional blasting or hoe ram use to excavate local areas of more resistant PWR or refusal material may be expected in both mass and confined excavations. The speed and ease of excavation will depend on the type of grading equipment, operator skill and the geologic structure of the material itself, such as the direction of bedding, planes of weakness, and spacing of discontinuities.

It has been our experience in this geological area that materials having SPT N-values of less than 50 blows/3 inches (i.e. 50/3" as represented on the Boring Records in Appendix II-A) can generally be excavated using pans and scrapers by first loosening with a single-tooth ripper attached to a suitable sized dozer, such as a Caterpillar D-8 or D-9.

#### *6.2.2 Ripping versus Blasting*

On earthwork projects requiring ripping, a controversy sometimes develops as to whether the materials can be removed by ripping or whether blasting is required. It should be noted that ripping is dependent on the equipment and techniques used as well as the operator's skill and experience. The success of the ripping operation is dependent on finding the proper combinations for the conditions encountered. Excavation of the PWR is typically much more difficult in confined excavations. Jackhammering or blasting is anticipated to be required for materials having SPT N-values in excess of 50 blows/2 inches (i.e. 50/2"), or at or near the level that auger refusal was encountered.

#### *6.2.3 Confined Areas*

Excavation of hard to very hard residual soils in confined areas will likely require pneumatic hammers or spades. Light blasting may be necessary to efficiently remove more resistant PWR or bedrock that could be present in confined excavations. We emphasize that the character of the soil and rock strata may vary widely between testing locations, and no trend between testing locations is implied.

#### *6.2.4 Classified Excavations*

For classified excavations, we suggest that massive rock excavation be defined as material that cannot be excavated with a single tooth, hydraulically articulated ripper drawn by a crawler tractor (Caterpillar D-9 or equivalent), occupying an original volume of at least one cubic yard.



For confined excavations, we suggest that any material occupying an original volume of at least one-half of a cubic yard or more which cannot be excavated with a Caterpillar 325 or equivalent using a 24-inch wide bucket equipped with rock teeth.

### **6.3 General Comments on Slope Stability and Construction**

Due to the existing and planned finished grades assumed to be necessary to level the planned development, it is assumed that cuts and fills to grade the site may be on the order of up to 30 feet.

#### *6.3.1 Temporary Excavation Stability*

Excavations shall be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service, and under no circumstances shall S&ME be assumed to be responsible for construction site safety.

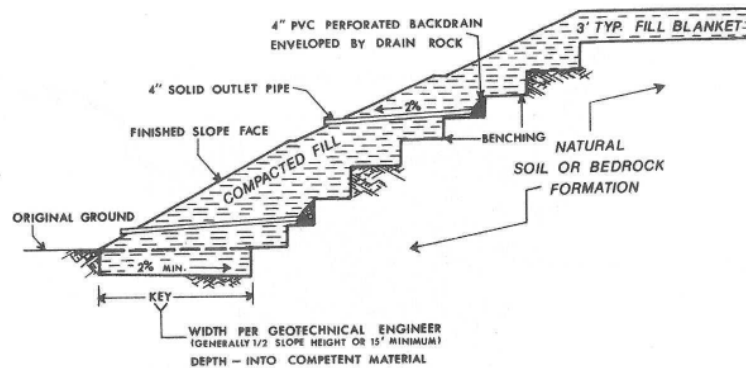
#### *6.3.2 Excavation Slopes*

The assumed excavations at the site will be advanced through mostly Piedmont residual soils and PWR. Slope stability analysis is outside of our current scope of work; however, based upon our experience and information obtained by borings at the site, we recommend the excavated cut slopes not exceed a maximum inclination of 2H:1V (horizontal:vertical). These values are for planning purposes and will need to be confirmed during construction by direct observation of the excavated slopes, and inclinations modified, if necessary, based on the observed conditions. If these slopes are to be exceeded, then temporary/permanent retainage may be necessary.

#### *6.3.3 Fill Slopes*

The assumed fill slopes at the site may possibly be required to exceed 30 feet in height. Slope stability analysis is outside of our current scope of work; however, based upon our experience, permanent compacted fill slopes of these heights with inclinations of 2H:1V (horizontal:vertical) are generally considered stable if properly constructed.

To ensure stability, loose material should be removed (undercut) from the toe of the proposed fill slope or compacted as indicated in this report prior to placing new fill. The fill slopes should be benched into existing sloping terrain and adequately compacted. The tops and bases of all slopes should be located a minimum of 3 times the height of the slope from structural limits. Furthermore, we recommend that fill slopes constructed along existing slopes or embankments steeper than 4H:1V have a keyway constructed along the slope base to help counteract sliding failure, as shown in the example detail below. The keyway width should be at least  $\frac{1}{2}$  of the planned slope height, and the keyway should be embedded a minimum of 2 feet into stiff to medium dense Piedmont residual soils.



#### *Benching and Keyway for Fill Slopes constructed along Existing Slopes*

We recommend that compacted fill slopes be benched and slightly over-built, (in order to minimize the presence of a loose zone of poorly compacted soils near the slope face), and then cut back to firm, well compacted soils prior to the placement of structure or vegetative cover. Upon construction of a competent slope face, the slope face should be protected from erosion.

#### *6.3.4 General Slope Recommendations*

Recommended slopes are preliminary and assume that groundwater is controlled at the lowest level of the excavation continuously while the excavation is open. Groundwater is assumed not to flow or emerge from soil excavation slopes. Surface water is assumed to be captured by appropriate drainage measures above the slope crest and not allowed to drain down the slope. If perched groundwater is observed emerging from the face of the slope or if surface water is adversely affecting the slope, S&ME should be contacted immediately.

It is also assumed that excavated slopes are relatively uniform such that local slopes do not significantly exceed the recommended slopes. Finally, the recommended slope inclination assumes that slopes are monitored for indications of instability and that slopes are flattened, or other measures taken if appropriate. Monitoring of the slopes during construction is presently not part of our contracted scope of services for this project.

Stability can be reduced by a number of additional factors including excessive erosion, non-uniform sloping resulting in areas of steeper grades, loose seams in the cut face, and/or ground water emerging from the cut slopes. As a result, proper channeling of surface water is critical. Surface runoff shall be directed away from the slopes via the use of berms, swales, or slope drains. For erosion protection, a protective cover of grass should be established on permanent soil slopes as soon as possible after slope construction. If loose seams are encountered within cut faces during excavation or ground water is encountered, an in-depth analysis of slope stability should be performed.

We caution against the installation of drop inlets or storm sewer lines within an improper embedment zone of the slope face, where possible over stressing and leakage may create maintenance problems or possible isolated slope failure. In general, these structures need to be installed a minimum distance of  $1\frac{1}{2}$  times the height of the embankment, as measured from the crest and/or toe of the slope. Furthermore, proper embedment of buried utilities beneath slope faces should be established prior to construction, with a minimum embedment for

foundation recommended to be 5 feet below the down gradient portion of the slope, while a minimum embedment for buried utilities is recommended to be 3 feet below the down gradient portion of the slope.

## 6.4 Use of On-site Soils as Structural Fill

The on-site soils that may be proposed for use as fill at the site (i.e. within assumed cut portions of the site) consist of soils with USCS soil classification of fine to coarse silty and clayey sands and medium plasticity clays (SM, SC and CL).

As previously mentioned, one bulk sample (BS-1) was obtained from on-site soils in an assumed proposed cut area of the site that are to be reused as structural fill and tested for classification and moisture-density relationship. A summary of the laboratory results is provided below:

**Table 6-1 – Bulk Sample/Proposed Fill Laboratory Summary**

| Bulk Sample No. | Boring No. | Natural Moisture Content | % Fines | Liquid Limit | Plasticity Index | Maximum Dry Density | Optimum Moisture Content |
|-----------------|------------|--------------------------|---------|--------------|------------------|---------------------|--------------------------|
| BS-1            | B-9        | 3.7 %                    | 24.1 %  | NP           | NP               | 129.3 pcf           | 11.0 %                   |

Before beginning to place fill, sample and test each proposed fill material to determine maximum dry density, optimum moisture content, natural moisture content, gradation and plasticity of the soil.

### 6.4.1 *Sandy Proposed Fill Soils*

Coarse grained sandy soils with varying amounts of fines (SM and SC), similar to those encountered across the site of the exploration are typically suitable for use as structural fill and for use as the immediate subgrade for floor slabs.

### 6.4.2 *Fine Grained Proposed Fill Soils*

Fine grained, medium plasticity soils (CL), similar to those encountered at the site are typically suitable to marginally suitable for use as structural fill. Suitability of these soils for use depends a great deal on the moisture content of the material at time of placement.

Marginal suitability refers to the fact that fine grained soils are moisture sensitive to some degree and can be difficult to work if allowed to become wet. These difficulties can include softening of exposed subgrade soils, excessive rutting or deflection under construction traffic, and the difficulty associated with adequately drying and compacting wet soil. Moisture-related earthwork difficulties can be reduced by performing the earthwork during the typically drier months of the year (May through October).

### 6.4.3 *Use of Rock Fill*

Shot rock or partially weathered rock (PWR) excavated in large chunks can be used in deep fill areas, provided you place them well apart to allow compaction of soil between them. Avoid placing heaped large pieces within 2 feet of subgrades in paved areas.



Shot rock used as mass fill often contains so many fines that considerable settling will occur if the fill is not compacted. Rock fill is usually spread in 18-inch to 48-inch lifts, depending on maximum fragment size. Lift thickness must typically be greater than the maximum size. Typically, each lift should be topped by a layer of fine gravel or soil to choke off the voids in the rock fill and limit risk of dropouts forming on the surface.

Heavy compaction forces are needed to relocate large stones to increase the density and stability of the rock mass. Densification of the rock mass typically requires use of very large, high capacity smooth drum vibratory compactors. Since compactors are subject to great stresses, the vibratory drum should be constructed of thick, high-grade steel.

Procedures used to lay and spread each lift prior to compaction are very important in achieving a satisfactory fill. Dozer spreading of the layers is recommended in advance of compaction, because the dozer blade can do some reorienting of the rocks and the tracks perform some compaction. This provides a more or less even surface for the compactor.

Compaction of each lift must be monitored to judge whether the rock fragments tend to break down under the compactive effort. If there is a crushing effect on the surface material, the number of passes may have to be reduced. Or, if the machine is equipped with more than one amplitude, lower amplitude can be used to reduce surface material distortion.

## **6.5 Fill Placement and Compaction**

Structural soil fill material should have less than 5 percent organic matter, a standard Proctor maximum dry density of 90 pcf or greater and a plasticity index (PI) of 30 percent or less. As provided above in Table 6-1, the bulk sample of planned cut material meets these recommended parameters, and it appears that a large portion of the on-site cut materials will be similar in nature to this bulk sample. We recommend that off-site borrow meet the organic content, PI and density requirements of this section. Testing will be required before fill placement begins to determine the optimum moisture-density condition for the fill materials. Material to be used as soil fill should be tested and approved by the geotechnical engineer before being placed.

The existing near-surface sandy and clayey Piedmont residuum (SM, SC and CL) appear suitable to marginally suitable for use as compacted fill based on visual examination; however, classification, moisture content and compaction tests should be performed to confirm this assessment.

### **6.5.1 Density and Moisture Requirements**

Place new fill in maximum 8-inch loose lifts and compact to at least 98 percent of maximum dry density (ASTM D698 Standard Proctor) within the structural footprint. This level of compaction can be practically achieved with area soils and has been found to provide adequate support for foundations. Fill moisture content should be maintained within +/- 3 percent of the optimum moisture content. Contractor should be prepared to wet or dry soils as necessary to achieve compaction. In addition to meeting the compaction requirement, fill material should be stable under movement of the construction equipment and should not exhibit rutting or pumping.



### 6.5.2 *Compaction of Granular Soils*

A vibratory sheeps-foot roller will likely be more effective for compaction of the clayey and silty sandy (SC and SM) soils encountered at the site. Sheeps-foot compactors will likely be preferable because the pads better penetrate the soil and they tend to break down the natural cohesive bonds between the particles.

Sandy soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use.

### 6.5.3 *Compaction of Cohesive Soils*

The compaction characteristics of clayey soils (CL) with plastic properties encountered at this site will be highly dependent on the soil moisture content at the time of construction. Sheeps-foot compactors will likely be preferable because the pads better penetrate the soil and they tend to break down the natural cohesive bonds between the particles.

The water content of these soils is usually very difficult to modify in the field. Above or below the optimum moisture content, the soils become progressively more difficult to manipulate and compact. Soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently with little moisture conditioning required. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use. Drying wet clayey soils usually requires favorable weather conditions and often requires repeated disking and rolling with sheeps-foot rollers to lower the moisture content.

Slope the fill surface to drain and prevent ponding water. If rain is expected while filling is temporarily halted, roll the surface with rubber tire or steel drum equipment to improve surface run-off.

### 6.5.4 *Deep Fill Considerations*

Based on the information provided, fills upwards of 30 feet in depth may be necessary to level the planned development area at the site. Soils when subject to load may deflect, consolidate, or densify. Surcharge loading induced by these heights of fills may induce substantial compression of the underlying soils. The placed fill itself could also undergo significant volume change due to self-weight.

Based on previous experience with high fills in the Piedmont, consolidation of the fill under self-weight will mostly occur while the fill is being placed. Filled soils will lie above the water table and they will be only partially saturated. Primary consolidation will, for that reason, be very rapid and impossible to tell apart from immediate settlement. A small amount of additional settlement or creep will occur shortly after topping out the fill. Secondary compression will be very small and are usually neglected in settlement estimates.

Residual soils in-place consisting of clays (fine grained, cohesive), similar to those encountered in portions of the alignment, exhibit consolidation behavior which is dependent on stress history, mineralogy, age, moisture content, and geologic formation. The time rate of consolidation of clay materials is greatly dependent on particle sizes of the soil and drainage paths. Above the water table consolidation occurs mostly as immediate settlement. Thick deposits of high clay content materials may take years to consolidate, even under high stress. Soils with significant silt content, or free drainage conditions (such as sand seams), may consolidate relatively rapidly.



#### *6.5.5 Monitoring and Testing*

Fill placement should be witnessed by an experienced soils technician working under the guidance of the geotechnical engineer. We recommend full time observation by a qualified soils technician with testing at random intervals to confirm compaction is being achieved. Part-time testing may suffice for the pavement areas and utility trench fills.

### **6.6 Foundations**

Based on our boring data and experience in the area, the soil profile encountered across the site appears generally suitable for development for static loading of up to 200 kips. Under these conditions, we anticipate net allowable bearing pressure ranging from 3,000 to 4,000 pounds per square foot (psf) on well-engineered, compacted fill and undisturbed or stabilized soils, provided that settlements of about 1 inch are able to be tolerated.

If heavier loading (approaching 500 kips) or stricter settlement tolerance are anticipated, a more rigorous evaluation of foundation settlements will need to be carried out to demonstrate acceptable settlements under these loads. Preliminary settlement estimates given above are based on widely-spaced borings and are subject to change once a final geotechnical exploration of specific building areas is carried out.

A design-level geotechnical exploration will be required to explore specific building areas once a specific plan for the development has been prepared. Bearing pressures used in design of specific foundations will need to be individually evaluated for the service loads of the proposed structure(s).

### **6.7 Grade Slab Support**

The sandy soils encountered in the upper strata of our borings across the site and assumed to be planned as structural fill generally appear suitable for soil-supported grade slabs, assuming proper preparation, moisture control, and compaction. Effort to prepare a suitable building pad for support of a slab-on-grade will likely not be greater than typically experienced in similar construction within the surrounding region.

## **7.0 Qualifications 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 contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction.



If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

## **Appendices**

## **Appendix I – Figures**



SOURCE: Newberry County GIS



## SITE LOCATION PLAN

**JOB NAME:** Mid-Carolina Commerce Park - Parcel 6  
**LOCATION:** Commerce Park Avenue  
**CITY, STATE:** Prosperity, South Carolina  
**JOB NO.:** 206769

FIGURE NO.

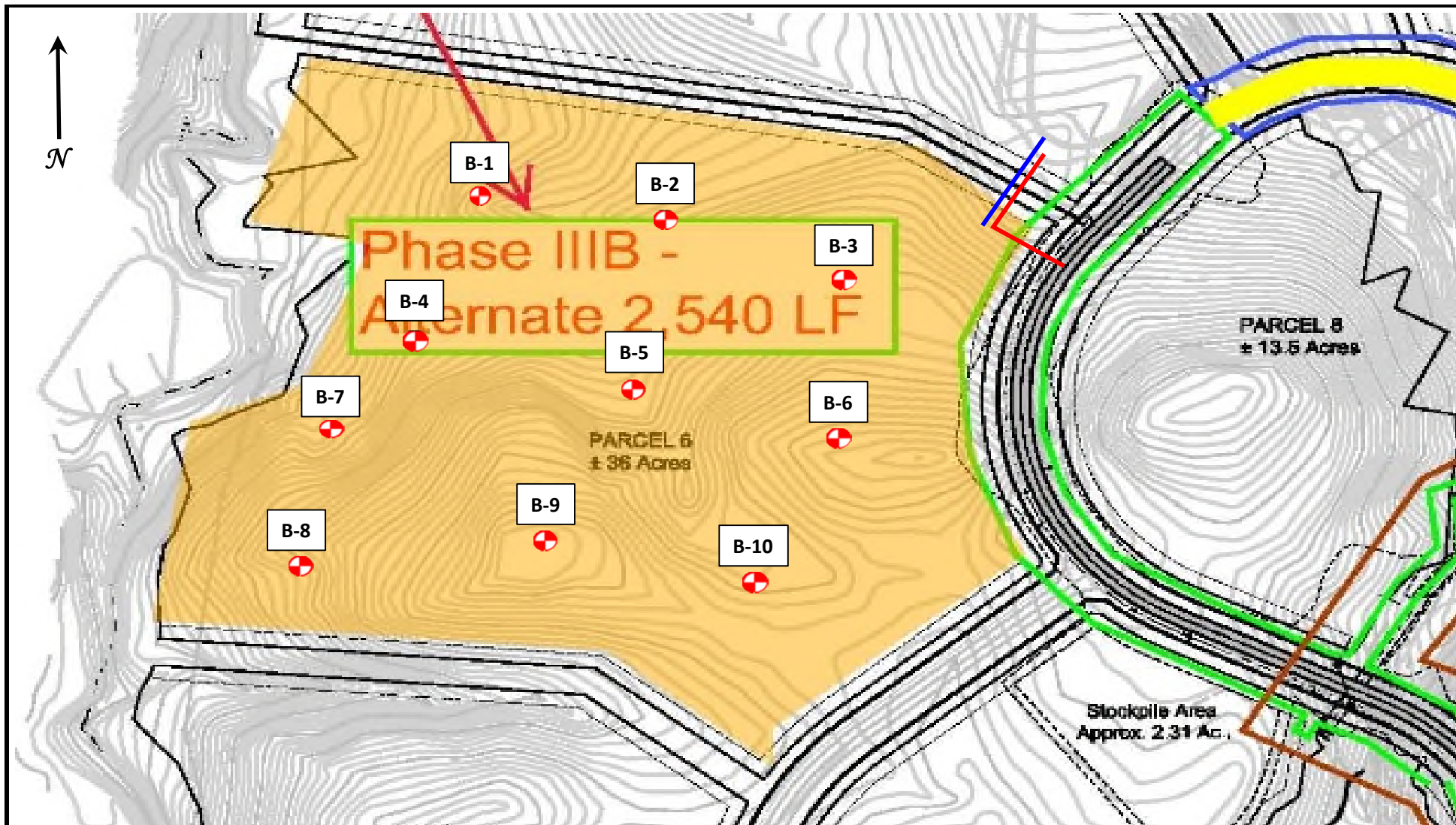
1

SCALE: NTS

CHECKED BY: RCB

DATE: 3/31/2021

DRAWN BY: JPL



SOURCE: Overall Site Plan , produced by Alliance Consulting Engineers, dated March 2009



 Current Boring Location  
 Previous MASW Location

## TESTING LOCATION PLAN

**JOB NAME:** Mid-Carolina Commerce Park - Parcel 6  
**LOCATION:** Commerce Park Avenue  
**CITY, STATE:** Prosperity, South Carolina  
**JOB NO.:** 206769

FIGURE NO.

2

SCALE: NTS

CHECKED BY: RCB

DATE: 3/31/2021

DRAWN BY: JPL



SOURCE: USDA Web Soil Survey



### USDA SOIL SURVEY MAP

**JOB NAME:** Mid-Carolina Commerce Park - Parcel 6  
**LOCATION:** Commerce Park Avenue  
**CITY, STATE:** Prosperity, South Carolina  
**JOB NO.:** 206769

FIGURE NO.

3

SCALE: NTS

CHECKED BY: RCB

DATE: 3/31/2021

DRAWN BY: JPL

## **Appendix II-A – Current Field Data**

# 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

Very Soft

Soft

Firm

Stiff

Very Stiff

Hard

Very Hard

### STD. PENETRATION RESISTANCE BLOWS/FOOT

0 to 2

3 to 4

5 to 8

9 to 15

16 to 30

31 to 50

Over 50

## RELATIVE DENSITY OF COHESIONLESS SOILS

### RELATIVE DENSITY

Very Loose

Loose

Medium Dense

Dense

Very Dense

### STD. PENETRATION RESISTANCE BLOWS/FOOT

0 to 4

5 to 10

11 to 30

31 to 50

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%.



| PROJECT: <b>Mid-Carolina Commerce Park - Parcel 6</b><br><b>Prosperity, South Carolina</b><br>S&ME Project No. 206769 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                | <b>BORING LOG B- 1</b>                                                                                                                                                     |                      |                         |                                                                                           |                                                          |                      |
|-----------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------|
| DATE DRILLED: <b>3/15/21</b>                                                                                          |                | ELEVATION: <b>405.0 ft</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                | <b>NOTES:</b> Northing/Easting correlated from Latitude/Longitude estimated from Google Earth. Elevations estimated from Google Earth. No formal survey performed by S&ME. |                      |                         |                                                                                           |                                                          |                      |
| DRILL RIG: <b>CME 550</b>                                                                                             |                | BORING DEPTH: <b>7.0 ft</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                                                                                                                                                                            |                      |                         |                                                                                           |                                                          |                      |
| DRILLER: <b>H. Wessinger</b>                                                                                          |                | WATER LEVEL: <b>Not Encountered</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                                                                                                                                                                            |                      |                         |                                                                                           |                                                          |                      |
| HAMMER TYPE: <b>Automatic</b>                                                                                         |                | LOGGED BY: <b>JPL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                                                                                                                                                                            |                      |                         |                                                                                           |                                                          |                      |
| SAMPLING METHOD: <b>Split spoon</b>                                                                                   |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                | NORTHING: <b>875944</b>                                                                                                                                                    |                      | EASTING: <b>1855230</b> |                                                                                           |                                                          |                      |
| DRILLING METHOD: <b>2¼" H.S.A.</b>                                                                                    |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                                                                                                                                                                            |                      |                         |                                                                                           |                                                          |                      |
| DEPTH<br>(feet)                                                                                                       | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | WATER<br>LEVEL | ELEVATION<br>(feet-MSL)                                                                                                                                                    | SAMPLE NO.           | SAMPLE TYPE             | BLOW COUNT<br>/ CORE DATA                                                                 | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS | N VALUE              |
|                                                                                                                       |                | <b>SURFACE MATERIAL</b> - 2 inches of Topsoil.<br><br><b>PIEDMONT RESIDUUM - SILTY SAND (SM)</b> - mostly fine to medium sands, some low plasticity fines, dry to moist, trace fine roots, few fine to coarse rock fragments, mottled light brown and white, medium dense.<br><br><b>PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)</b> - mostly fine to medium sands, some low plasticity fines, few fine to coarse rock fragments, dry to moist, mottled pale brown, white and yellow, very dense.<br>--- @ 6 feet - absent rock fragments.<br><br>Boring terminated at 7 ft due to auger refusal | HC             | 400.0                                                                                                                                                                      | SS-1<br>SS-2<br>SS-3 | <br>50/4"<br>50/3"      | 1st 6in / RUN #<br>5<br>7<br>10<br><br>2nd 6in / REC<br><br><br>3rd 6in / RQD<br><br><br> | 10 20 30 60 80<br>                                       | 17<br>60/4"<br>60/3" |

S&amp;ME BORING LOG 206769 BORING LOGS.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 3/30/21

**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.



|                                                                                                         |                |                                                                                                                                                                                                                                    |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
|---------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                                                                                    |             | BORING LOG B- 2                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 423.0 ft                                                                                                                                                                                                                |             | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |            |                  |                                                                                |                                                                                    |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 21.0 ft                                                                                                                                                                                                              |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                                                                                       |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                                                                                     |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                                                                                    |             | NORTHING: 875896                                                                                                                                                       |            | EASTING: 1855534 |                                                                                |                                                                                    |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                                                                                    |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                                                               | WATER LEVEL | ELEVATION<br>(feet-MSL)                                                                                                                                                | SAMPLE NO. | SAMPLE TYPE      | BLOW COUNT<br>/ CORE DATA<br>1st 6in / RUN #<br>2nd 6in / REC<br>3rd 6in / RQD | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br><br>/REMARKS<br><br>10 20 30 60 80 | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL- 2 inches of Topsoil.                                                                                                                                                                                             |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
|                                                                                                         |                | PIEDMONT RESIDUUM - CLAYEY SAND (SC)<br>- mostly fine to medium sands, some medium plasticity fines, moist, mottled light brown and red, very loose.<br><br>--- @ 3.5 feet - mottled brown, pale red and light gray, medium dense. |             |                                                                                                                                                                        | SS-1       |                  | 1 1 2                                                                          |                                                                                    | 3       |
| 5                                                                                                       |                |                                                                                                                                                                                                                                    |             | 418.0                                                                                                                                                                  | SS-2       |                  | 7 7 9                                                                          |                                                                                    | 16      |
|                                                                                                         |                |                                                                                                                                                                                                                                    |             |                                                                                                                                                                        | SS-3       |                  | 8 10 10                                                                        |                                                                                    | 20      |
| 10                                                                                                      |                | --- @ 8.5 feet - mottled pale brown, light gray and white, loose.                                                                                                                                                                  |             | 413.0                                                                                                                                                                  | SS-4       |                  | 3 5 5                                                                          |                                                                                    | 10      |
|                                                                                                         |                |                                                                                                                                                                                                                                    | HC          |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
| 15                                                                                                      |                | PARTIALLY WEATHERED ROCK (PWR)- SILTY SAND (SM) - mostly fine to medium sands, some low plasticity fines, dry, mottled light brown, light gray and white, very dense.                                                              |             | 408.0                                                                                                                                                                  | SS-5       |                  | 17 50/5.5"                                                                     |                                                                                    | 50/5.5" |
|                                                                                                         |                |                                                                                                                                                                                                                                    |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |
|                                                                                                         |                | --- @ 18.5 feet - No recovery                                                                                                                                                                                                      |             |                                                                                                                                                                        | SS-6       |                  | 50/0"                                                                          |                                                                                    | 50/0"   |
| 20                                                                                                      |                |                                                                                                                                                                                                                                    |             | 403.0                                                                                                                                                                  |            |                  |                                                                                |                                                                                    |         |
|                                                                                                         |                | Boring terminated at 21 ft due to auger refusal                                                                                                                                                                                    |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                                    |         |

**NOTES:**

- THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

Page 1 of 1



|                                                                                                         |                |                                                                                                                                                                                      |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
|---------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                                      |             | BORING LOG B- 3         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 448.0 ft                                                                                                                                                                  |             |                         | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |             |                                                                                |                                                                            |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 46.0 ft                                                                                                                                                                |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                                         |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                                       |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                                      |             |                         | NORTHING: 875778                                                                                                                                                       |             | EASTING: 1855828                                                               |                                                                            |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                                      |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                 | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.                                                                                                                                                             | SAMPLE TYPE | BLOW COUNT<br>/ CORE DATA<br>1st 6in / RUN #<br>2nd 6in / REC<br>3rd 6in / RQD | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br>10 20 30 60 80 | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL- 2 inches of Topsoil.                                                                                                                                               |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
|                                                                                                         |                | PIEDMONT RESIDUUM - CLAYEY SAND (SC)<br>- mostly fine to medium sands, some medium plasticity fines, moist, trace fine roots, mottled red, light brown and light gray, loose.        |             |                         | SS-1                                                                                                                                                                   |             | 2 3 6                                                                          |                                                                            | 9       |
| 5                                                                                                       |                | --- @ 3.5 feet - mostly fine sands, dry, absent roots, mottled light brown, yellow, white, very dense.                                                                               |             | 443.0                   | SS-2                                                                                                                                                                   |             | 22 26 31                                                                       |                                                                            | 57      |
|                                                                                                         |                | --- @ 6 feet - dry to moist, dense.                                                                                                                                                  |             |                         | SS-3                                                                                                                                                                   |             | 13 17 19                                                                       |                                                                            | 36      |
| 10                                                                                                      |                | --- @ 8.5 feet - trace mica, medium dense.                                                                                                                                           |             | 438.0                   | SS-4                                                                                                                                                                   |             | 6 10 16                                                                        |                                                                            | 26      |
| 15                                                                                                      |                | PARTIALLY WEATHERED ROCK (PWR)- SILTY SAND (SM) - mostly fine to medium sands, some low plasticity fines, dry, trace fine rock fragments, mottled light brown and white, very dense. |             | 433.0                   | SS-5                                                                                                                                                                   |             | 22 36 50/5"                                                                    |                                                                            | 50/5"   |
| 20                                                                                                      |                |                                                                                                                                                                                      |             | 428.0                   | SS-6                                                                                                                                                                   |             | 50/5.5"                                                                        |                                                                            | 50/5.5" |
| 25                                                                                                      |                |                                                                                                                                                                                      | HC          | 423.0                   | SS-7                                                                                                                                                                   |             | 34 50/4"                                                                       |                                                                            | 50/4"   |

**NOTES:**

- THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|--------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------|------------------------------|-------------------------|--------------------|-------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------|----|------------------|----|----|---------|-------|--|
| PROJECT: <div>Mid-Carolina Commerce Park - Parcel 6<br/>Prosperity, South Carolina<br/>S&amp;ME Project No. 206769</div> |                |                               |                              |                         | BORING LOG    B- 3 |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| DATE DRILLED: 3/15/21                                                                                                    |                |                               | ELEVATION: 448.0 ft          |                         |                    |             |                        | <div>NOTES: Northing/Easting correlated from<br/>Latitude/Longitude estimated from Google Earth.<br/>Elevations estimated from Google Earth. No formal<br/>survey performed by S&amp;ME.</div> |               |                                              |    |                  |    |    |         |       |  |
| DRILL RIG: CME 550                                                                                                       |                |                               | BORING DEPTH: 46.0 ft        |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| DRILLER: H. Wessinger                                                                                                    |                |                               | WATER LEVEL: Not Encountered |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| HAMMER TYPE: Automatic                                                                                                   |                |                               | LOGGED BY: JPL               |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| SAMPLING METHOD: Split spoon                                                                                             |                |                               |                              |                         |                    |             |                        | NORTHING: 875778                                                                                                                                                                               |               |                                              |    | EASTING: 1855828 |    |    |         |       |  |
| DRILLING METHOD: 2¼" H.S.A.                                                                                              |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| DEPTH<br>(feet)                                                                                                          | GRAPHIC<br>LOG | MATERIAL DESCRIPTION          | WATER LEVEL                  | ELEVATION<br>(feet-MSL) | SAMPLE NO.         | SAMPLE TYPE | BLOW COUNT / CORE DATA |                                                                                                                                                                                                |               | STANDARD PENETRATION TEST DATA<br>(blows/ft) |    |                  |    |    | N VALUE |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             | 1st 6in / RUN #        | 2nd 6in / REC                                                                                                                                                                                  | 3rd 6in / RQD | /REMARKS                                     |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               | 10                                           | 20 | 30               | 60 | 80 |         |       |  |
| 30                                                                                                                       |                |                               |                              | 418.0                   | SS-8               | 50/3"       |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    | 50/3"   |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| 35                                                                                                                       |                |                               |                              |                         | 413.0              | SS-9        | 50/2"                  |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         | 50/2" |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
| 40                                                                                                                       |                | --- @ 38.5 feet - No recovery |                              | 408.0                   | SS-10              | 50/1"       |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    | 50/1"   |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |
|                                                                                                                          |                |                               |                              |                         |                    |             |                        |                                                                                                                                                                                                |               |                                              |    |                  |    |    |         |       |  |

**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.



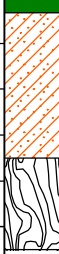
|                                                                                                         |                |                                                                                                                                                                                 |                              |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
|---------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------|---------|-------------------------------------------------------------------------------------|--|--|--|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                                 |                              |                         | BORING LOG B- 4 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
| DATE DRILLED: 3/15/21                                                                                   |                |                                                                                                                                                                                 | ELEVATION: 411.0 ft          |                         |                 | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |                                                                             |                  |         |                                                                                     |  |  |  |         |
| DRILL RIG: CME 550                                                                                      |                |                                                                                                                                                                                 | BORING DEPTH: 12.5 ft        |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
| DRILLER: H. Wessinger                                                                                   |                |                                                                                                                                                                                 | WATER LEVEL: Not Encountered |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
| HAMMER TYPE: Automatic                                                                                  |                |                                                                                                                                                                                 | LOGGED BY: JPL               |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                                 |                              |                         |                 | NORTHING: 875669                                                                                                                                                       |                                                                             | EASTING: 1855132 |         |                                                                                     |  |  |  |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                                 |                              |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                            | WATER LEVEL                  | ELEVATION<br>(feet-MSL) | SAMPLE NO.      | SAMPLE TYPE                                                                                                                                                            | BLOW COUNT / CORE DATA<br>1st 6in / RUN #    2nd 6in / REC    3rd 6in / RQD |                  |         | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br>10    20    30    60/80 |  |  |  | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL- 4 inches of Topsoil.                                                                                                                                          |                              |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |
|                                                                                                         |                | PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL) - mostly medium plasticity fines, some fine sands, moist, trace fine roots, mottled red, light brown and yellow, firm.                 |                              |                         | SS-1            |                                                                                                                                                                        | 2                                                                           | 3                | 4       |                                                                                     |  |  |  | 7       |
| 5                                                                                                       |                | CLAYEY SAND (SC) - mostly fine to medium sands, some medium plasticity fines, mottled yellowish-red and white, moist, trace mica, loose.                                        |                              | 406.0                   | SS-2            |                                                                                                                                                                        | 4                                                                           | 4                | 5       |                                                                                     |  |  |  | 9       |
|                                                                                                         |                | SILTY SAND (SM) - mostly fine sands, some low plasticity fines, trace mica, moist, mottled pale yellow, pale brown and white, medium dense.                                     | HC                           |                         | SS-3            |                                                                                                                                                                        | 9                                                                           | 11               | 13      |                                                                                     |  |  |  | 24      |
| 10                                                                                                      |                | PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM) - mostly fine to medium sands, some low plasticity fines, trace mica, dry to moist, mottled white and light brown, very dense. |                              | 401.0                   | SS-4            |                                                                                                                                                                        | 22                                                                          | 27               | 50/5.5' |                                                                                     |  |  |  | 50/5.5' |
|                                                                                                         |                | Boring terminated at 12.5 ft due to auger refusal                                                                                                                               |                              |                         |                 |                                                                                                                                                                        |                                                                             |                  |         |                                                                                     |  |  |  |         |

**NOTES:**

- THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

Page 1 of 1



| PROJECT: <b>Mid-Carolina Commerce Park - Parcel 6</b><br><b>Prosperity, South Carolina</b><br><b>S&amp;ME Project No. 206769</b> |                                                                                   |                                                                                                                                                                                                                                         |                                     |                         |            | <b>BORING LOG    B- 5</b>                                                                                                                                                  |                           |                         |               |                                                          |    |    |    |         |       |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------|---------------|----------------------------------------------------------|----|----|----|---------|-------|
| DATE DRILLED: <b>3/15/21</b>                                                                                                     |                                                                                   |                                                                                                                                                                                                                                         | ELEVATION: <b>428.0 ft</b>          |                         |            | <b>NOTES:</b> Northing/Easting correlated from Latitude/Longitude estimated from Google Earth. Elevations estimated from Google Earth. No formal survey performed by S&ME. |                           |                         |               |                                                          |    |    |    |         |       |
| DRILL RIG: <b>CME 550</b>                                                                                                        |                                                                                   |                                                                                                                                                                                                                                         | BORING DEPTH: <b>5.5 ft</b>         |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |         |       |
| DRILLER: <b>H. Wessinger</b>                                                                                                     |                                                                                   |                                                                                                                                                                                                                                         | WATER LEVEL: <b>Not Encountered</b> |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |         |       |
| HAMMER TYPE: <b>Automatic</b>                                                                                                    |                                                                                   |                                                                                                                                                                                                                                         | LOGGED BY: <b>JPL</b>               |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |         |       |
| SAMPLING METHOD: <b>Split spoon</b>                                                                                              |                                                                                   |                                                                                                                                                                                                                                         |                                     |                         |            | NORTHING: <b>875582</b>                                                                                                                                                    |                           | EASTING: <b>1855492</b> |               |                                                          |    |    |    |         |       |
| DRILLING METHOD: <b>2¼" H.S.A.</b>                                                                                               |                                                                                   |                                                                                                                                                                                                                                         |                                     |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |         |       |
| DEPTH<br>(feet)                                                                                                                  | GRAPHIC<br>LOG                                                                    | MATERIAL DESCRIPTION                                                                                                                                                                                                                    | WATER LEVEL                         | ELEVATION<br>(feet-MSL) | SAMPLE NO. | SAMPLE TYPE                                                                                                                                                                | BLOW COUNT<br>/ CORE DATA |                         |               | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS |    |    |    | N VALUE |       |
|                                                                                                                                  |                                                                                   |                                                                                                                                                                                                                                         |                                     |                         |            |                                                                                                                                                                            | 1st 6in / RUN #           | 2nd 6in / REC           | 3rd 6in / RQD | 10                                                       | 20 | 30 | 60 | 80      |       |
|                                                                                                                                  |  | <b>SURFACE MATERIAL</b> - 4 inches of Topsoil.<br><br><b>PIEDMONT RESIDUUM - CLAYEY SAND (SC)</b><br>- mostly fine to medium sands, some medium plasticity fines, moist, light brown, very loose.                                       |                                     |                         | SS-1       |                                                                                         | 1                         | 2                       | 2             |                                                          |    |    |    |         | 4     |
| 5                                                                                                                                |  | <b>PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)</b> - mostly fine to medium sands, some low plasticity fines, dry to moist, mottled light brown and light gray, very dense.<br><br>Boring terminated at 5.5 ft due to auger refusal |                                     | 423.0                   | SS-2       |                                                                                         | 12                        | 50/5"                   |               |                                                          |    |    |    |         | 50/5" |

**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.



|                                                                                                         |                |                                                                                                                                                                                         |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
|---------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|--|--|--|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                                         |                | BORING LOG B- 6                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 465.0 ft                                                                                                                                                                     |                | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |            |                  |                                                                                |                                                                            |  |  |  |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 28.0 ft                                                                                                                                                                   |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                                            |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                                          |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                                         |                | NORTHING: 875489                                                                                                                                                       |            | EASTING: 1855814 |                                                                                |                                                                            |  |  |  |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                                         |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                    | WATER<br>LEVEL | ELEVATION<br>(feet-MSL)                                                                                                                                                | SAMPLE NO. | SAMPLE TYPE      | BLOW COUNT<br>/ CORE DATA<br>1st 6in / RUN #<br>2nd 6in / REC<br>3rd 6in / RQD | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br>10 20 30 60 80 |  |  |  | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL- 2 inches of Topsoil.                                                                                                                                                  |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |  |  |  |         |
| 5                                                                                                       |                | PIEDMONT RESIDUUM - SILTY SAND (SM) - mostly fine to medium sands, some low plasticity fines, dry to moist, speckled light brown and white, very dense.                                 |                | 460.0                                                                                                                                                                  | SS-1       |                  | 16 25 32                                                                       |                                                                            |  |  |  | 57      |
|                                                                                                         |                |                                                                                                                                                                                         |                |                                                                                                                                                                        | SS-2       |                  | 25 31 36                                                                       |                                                                            |  |  |  | 67      |
|                                                                                                         |                |                                                                                                                                                                                         |                |                                                                                                                                                                        | SS-3       |                  | 19 27 32                                                                       |                                                                            |  |  |  | 59      |
| 10                                                                                                      |                | CLAYEY SAND (SC) - mostly fine to medium sands, some medium plasticity fines, dry to moist, trace fine rock fragments, mottled pale brown and white, dense.                             |                | 455.0                                                                                                                                                                  | SS-4       |                  | 12 20 26                                                                       |                                                                            |  |  |  | 46      |
| 15                                                                                                      |                | PARTIALLY WEATHERED ROCK (PWR) - CLAYEY SAND (SC) - mostly fine to coarse sands, some medium plasticity fines, dry to moist, trace fine rock fragments, mottled brown and white, dense. |                | 450.0                                                                                                                                                                  | SS-5       |                  | 22 50/5.5"                                                                     |                                                                            |  |  |  | 50/5.5" |
| 20                                                                                                      |                |                                                                                                                                                                                         | HC             | 445.0                                                                                                                                                                  | SS-6       |                  | 24 50/5.5"                                                                     |                                                                            |  |  |  | 50/5.5" |
| 25                                                                                                      |                |                                                                                                                                                                                         |                | 440.0                                                                                                                                                                  | SS-7       |                  | 35 50/4"                                                                       |                                                                            |  |  |  | 50/4"   |

**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.



| PROJECT: <b>Mid-Carolina Commerce Park - Parcel 6<br/>Prosperity, South Carolina<br/>S&amp;ME Project No. 206769</b> |                                                                                   |                                                 |                                     |                         |            | <b>BORING LOG    B- 6</b>                                                                                                                                                  |                           |                         |               |                                                          |    |    |    |    |         |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------|-------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------|---------------|----------------------------------------------------------|----|----|----|----|---------|
| DATE DRILLED: <b>3/15/21</b>                                                                                         |                                                                                   |                                                 | ELEVATION: <b>465.0 ft</b>          |                         |            | <b>NOTES:</b> Northing/Easting correlated from Latitude/Longitude estimated from Google Earth. Elevations estimated from Google Earth. No formal survey performed by S&ME. |                           |                         |               |                                                          |    |    |    |    |         |
| DRILL RIG: <b>CME 550</b>                                                                                            |                                                                                   |                                                 | BORING DEPTH: <b>28.0 ft</b>        |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |    |         |
| DRILLER: <b>H. Wessinger</b>                                                                                         |                                                                                   |                                                 | WATER LEVEL: <b>Not Encountered</b> |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |    |         |
| HAMMER TYPE: <b>Automatic</b>                                                                                        |                                                                                   |                                                 | LOGGED BY: <b>JPL</b>               |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |    |         |
| SAMPLING METHOD: <b>Split spoon</b>                                                                                  |                                                                                   |                                                 |                                     |                         |            | NORTHING: <b>875489</b>                                                                                                                                                    |                           | EASTING: <b>1855814</b> |               |                                                          |    |    |    |    |         |
| DRILLING METHOD: <b>2¼" H.S.A.</b>                                                                                   |                                                                                   |                                                 |                                     |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |    |         |
| DEPTH<br>(feet)                                                                                                      | GRAPHIC<br>LOG                                                                    | MATERIAL DESCRIPTION                            | WATER LEVEL                         | ELEVATION<br>(feet-MSL) | SAMPLE NO. | SAMPLE TYPE                                                                                                                                                                | BLOW COUNT<br>/ CORE DATA |                         |               | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS |    |    |    |    | N VALUE |
|                                                                                                                      |                                                                                   |                                                 |                                     |                         |            |                                                                                                                                                                            | 1st 6in / RUN #           | 2nd 6in / REC           | 3rd 6in / RQD | 10                                                       | 20 | 30 | 60 | 80 |         |
|                                                                                                                      |  | Boring terminated at 28 ft due to auger refusal |                                     |                         |            |                                                                                                                                                                            |                           |                         |               |                                                          |    |    |    |    |         |

S&amp;ME BORING LOG 206769 BORING LOGS.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 3/30/21

**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.



|                                                                                                         |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
|---------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             | BORING LOG B- 7         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 412.0 ft                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                         | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |             |                                                                                |                                                                            |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 20.0 ft                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                         | NORTHING: 875501                                                                                                                                                       |             | EASTING: 1854994                                                               |                                                                            |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                           | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.                                                                                                                                                             | SAMPLE TYPE | BLOW COUNT<br>/ CORE DATA<br>1st 6in / RUN #<br>2nd 6in / REC<br>3rd 6in / RQD | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br>10 20 30 60 80 | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL- 2 inches of Topsoil.                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                         |                                                                                                                                                                        |             |                                                                                |                                                                            |         |
|                                                                                                         |                | PIEDMONT RESIDUUM - CLAYEY SAND (SC)<br>- mostly fine to medium sands, some medium plasticity fines, moist, trace fine roots, mottled light brown and red, loose.<br><br>--- @ 3.5 feet - trace fine rock fragments, light brown with white specks, medium dense.<br><br>--- @ 6 feet - absent rock fragments, dense.<br><br>--- @ 8.5 feet - mostly fine to medium sands, some low plasticity fines, dry to moist, mottled light brown, light gray and white. |             |                         | SS-1                                                                                                                                                                   |             | 1 1 5                                                                          |                                                                            | 6       |
| 5                                                                                                       |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             | 407.0                   | SS-2                                                                                                                                                                   |             | 7 12 14                                                                        |                                                                            | 26      |
|                                                                                                         |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                | HC          |                         | SS-3                                                                                                                                                                   |             | 9 14 17                                                                        |                                                                            | 31      |
| 10                                                                                                      |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             | 402.0                   | SS-4                                                                                                                                                                   |             | 14 20 24                                                                       |                                                                            | 44      |
| 15                                                                                                      |                | PARTIALLY WEATHERED ROCK (PWR)- SILTY SAND (SM) - mostly fine to coarse sands, some low plasticity fines, dry to moist, mottled light brown, light gray and white, very dense.                                                                                                                                                                                                                                                                                 |             | 397.0                   | SS-5                                                                                                                                                                   |             | 15 31 50/5"                                                                    |                                                                            | 50/5"   |
| 20                                                                                                      |                | Boring terminated at 20 ft                                                                                                                                                                                                                                                                                                                                                                                                                                     |             | 392.0                   | SS-6                                                                                                                                                                   |             | 24 50/5"                                                                       |                                                                            | 50/5"   |

**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.



|                                                                                                         |                |                                                                                                                                                                           |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
|---------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                           |             | BORING LOG B- 8                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 428.0 ft                                                                                                                                                       |             | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |            |                  |                                                                                |                                                                            |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 12.0 ft                                                                                                                                                     |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                              |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                            |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                           |             | NORTHING: 875242                                                                                                                                                       |            | EASTING: 1854936 |                                                                                |                                                                            |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                           |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                      | WATER LEVEL | ELEVATION<br>(feet-MSL)                                                                                                                                                | SAMPLE NO. | SAMPLE TYPE      | BLOW COUNT<br>/ CORE DATA<br>1st 6in / RUN #<br>2nd 6in / REC<br>3rd 6in / RQD | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br>10 20 30 60 80 | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL- 3 inches of Topsoil.                                                                                                                                    |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
|                                                                                                         |                | PIEDMONT RESIDUUM - SILTY SAND (SM) - mostly fine to medium sands, some low plasticity fines, dry to moist, mottled light brown, light gray and white, medium dense.      |             |                                                                                                                                                                        | SS-1       |                  | 3 6 15                                                                         |                                                                            | 21      |
|                                                                                                         |                | PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM) - mostly fine to medium sands, some low plasticity fines, dry to moist, trace mica, mottled brown and white, very dense. |             |                                                                                                                                                                        | SS-2       |                  | 22 50/5"                                                                       |                                                                            | 50/5"   |
| 5                                                                                                       |                |                                                                                                                                                                           | HC          | 423.0                                                                                                                                                                  | SS-3       |                  | 50/5.5"                                                                        |                                                                            | 50/5.5" |
|                                                                                                         |                | --- @ 8.5 feet - mostly fine to coarse sands, trace fine rock fragments.                                                                                                  |             |                                                                                                                                                                        | SS-4       |                  | 50/3"                                                                          |                                                                            | 50/3"   |
| 10                                                                                                      |                |                                                                                                                                                                           |             | 418.0                                                                                                                                                                  |            |                  |                                                                                |                                                                            |         |
|                                                                                                         |                | Boring terminated at 12 ft due to auger refusal                                                                                                                           |             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |

**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.



|                                                                                                         |                |                                                                                                                                                                                                                   |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
|---------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------|---|----|-----------------------------------------------------------------------------------|--|--|--|---------|
| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                                                                   |             | BORING LOG B- 9         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 468.0 ft                                                                                                                                                                                               |             |                         | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |             |                                                                             |   |    |                                                                                   |  |  |  |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 15.5 ft                                                                                                                                                                                             |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                                                                      |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                                                                    |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                                                                   |             |                         | NORTHING: 875300                                                                                                                                                       |             | EASTING: 1855337                                                            |   |    |                                                                                   |  |  |  |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                                                                   |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                                                              | WATER LEVEL | ELEVATION<br>(feet-MSL) | SAMPLE NO.                                                                                                                                                             | SAMPLE TYPE | BLOW COUNT / CORE DATA<br>1st 6in / RUN #    2nd 6in / REC    3rd 6in / RQD |   |    | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br><div>1020306080</div> |  |  |  | N VALUE |
|                                                                                                         |                | <b>SURFACE MATERIAL</b> - 4 inches of Topsoil.                                                                                                                                                                    |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
|                                                                                                         |                | <b>PIEDMONT RESIDUUM - CLAYEY SAND (SC)</b><br>- mostly fine to medium sands, some medium plasticity fines, moist, few fine to coarse rock fragments, mottled dark bluish-gray and brown, dense.                  |             |                         | SS-1                                                                                                                                                                   |             | 3                                                                           | 7 | 26 |                                                                                   |  |  |  | 33      |
|                                                                                                         |                |                                                                                                                                                                                                                   |             |                         | SS-2                                                                                                                                                                   |             | 50/4"                                                                       |   |    |                                                                                   |  |  |  | 60/4"   |
| 5                                                                                                       |                | <b>PARTIALLY WEATHERED ROCK (PWR) - CLAYEY SAND (SC)</b> - mostly fine to medium sands, some medium plasticity fines, dry to moist, few fine to coarse rock fragments, mottled bluish-gray and brown, very dense. |             | 463.0                   | SS-3                                                                                                                                                                   |             | 50/3"                                                                       |   |    |                                                                                   |  |  |  | 60/3"   |
|                                                                                                         |                |                                                                                                                                                                                                                   | HC          |                         | SS-4                                                                                                                                                                   |             | 50/3"                                                                       |   |    |                                                                                   |  |  |  | 60/3"   |
| 10                                                                                                      |                | <b>POORLY GRADED GRAVEL (GP)</b> - mostly fine to coarse quartz rock fragments, few fine to coarse sands, trace low plasticity fines, dry, white and brown, very dense.                                           |             | 458.0                   |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
|                                                                                                         |                |                                                                                                                                                                                                                   |             |                         | SS-5                                                                                                                                                                   |             | 50/0"                                                                       |   |    |                                                                                   |  |  |  | 60/0"   |
| 15                                                                                                      |                | --- @ 13.5 feet - No recovery                                                                                                                                                                                     |             | 453.0                   |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |
|                                                                                                         |                | Boring terminated at 15.5 ft due to auger refusal                                                                                                                                                                 |             |                         |                                                                                                                                                                        |             |                                                                             |   |    |                                                                                   |  |  |  |         |

**NOTES:**

- THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



| PROJECT: Mid-Carolina Commerce Park - Parcel 6<br>Prosperity, South Carolina<br>S&ME Project No. 206769 |                |                                                                                                                                                                               |                | BORING LOG B-10                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
|---------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------|
| DATE DRILLED: 3/15/21                                                                                   |                | ELEVATION: 451.0 ft                                                                                                                                                           |                | NOTES: Northing/Easting correlated from Latitude/Longitude estimated from Google Earth.<br>Elevations estimated from Google Earth. No formal survey performed by S&ME. |            |                  |                                                                                |                                                                            |         |
| DRILL RIG: CME 550                                                                                      |                | BORING DEPTH: 21.5 ft                                                                                                                                                         |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| DRILLER: H. Wessinger                                                                                   |                | WATER LEVEL: Not Encountered                                                                                                                                                  |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| HAMMER TYPE: Automatic                                                                                  |                | LOGGED BY: JPL                                                                                                                                                                |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| SAMPLING METHOD: Split spoon                                                                            |                |                                                                                                                                                                               |                | NORTHING: 875218                                                                                                                                                       |            | EASTING: 1855685 |                                                                                |                                                                            |         |
| DRILLING METHOD: 2¼" H.S.A.                                                                             |                |                                                                                                                                                                               |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| DEPTH<br>(feet)                                                                                         | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                                                                                                                          | WATER<br>LEVEL | ELEVATION<br>(feet-MSL)                                                                                                                                                | SAMPLE NO. | SAMPLE TYPE      | BLOW COUNT<br>/ CORE DATA<br>1st 6in / RUN #<br>2nd 6in / REC<br>3rd 6in / RQD | STANDARD PENETRATION TEST DATA<br>(blows/ft)<br>/REMARKS<br>10 20 30 60 80 | N VALUE |
|                                                                                                         |                | SURFACE MATERIAL - 4 inches of Topsoil.                                                                                                                                       |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
|                                                                                                         |                | PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL) - mostly medium plasticity fines, some fine sands, moist, trace fine rock fragments, mottled red, light brown and light gray, stiff. |                |                                                                                                                                                                        | SS-1       |                  | 3 4 7                                                                          |                                                                            | 11      |
| 5                                                                                                       |                | PARTIALLY WEATHERED ROCK (PWR) - CLAYEY SAND (SC) - mostly fine sands, some medium plasticity fines, dry, mottled dark bluish-gray and light brown, very dense.               |                | 446.0                                                                                                                                                                  | SS-2       |                  | 16 26 50/5"                                                                    |                                                                            | 50/5"   |
|                                                                                                         |                | PIEDMONT RESIDUUM - SILTY SAND (SM) - mostly fine sands, some low plasticity fines, dry to moist, grayish-blue, dense.                                                        |                |                                                                                                                                                                        | SS-3       |                  | 21 27 22                                                                       |                                                                            | 49      |
| 10                                                                                                      |                | CLAYEY SAND (SC) - mostly fine sands, some medium plasticity fines, mottled grayish-blue and white, dense.                                                                    |                | 441.0                                                                                                                                                                  | SS-4       |                  | 17 24 30                                                                       |                                                                            | 54      |
|                                                                                                         |                |                                                                                                                                                                               | HC             |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |
| 15                                                                                                      |                | PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM) - mostly fine sands, some low plasticity fines, dry to moist, mottled grayish-blue and white, very dense.                    |                | 436.0                                                                                                                                                                  | SS-5       |                  | 34 50/5"                                                                       |                                                                            | 50/5"   |
| 20                                                                                                      |                | --- @ 18.5 feet - No recovery                                                                                                                                                 |                | 431.0                                                                                                                                                                  | SS-6       |                  | 50/0"                                                                          |                                                                            | 50/0"   |
|                                                                                                         |                | Boring terminated at 21.5 ft due to auger refusal                                                                                                                             |                |                                                                                                                                                                        |            |                  |                                                                                |                                                                            |         |

**NOTES:**

- THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.





## Summary of Field Procedures

### ◆ Boring and Sampling

#### Soil Test Boring with Hollow-Stem Auger

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*. Borings were made by mechanically twisting a continuous steel hollow stem auger into the soil. At regular intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-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.

#### Bulk Samples

At selected locations and depths, representative bulk samples of the soils were obtained by randomly taking shovel loads from the cuttings or spoil brought to the surface, until a sample of 30 to 50 pounds was obtained. The sample was placed in a cloth or plastic sack marked with appropriate descriptive information. Samples were protected from freezing at all times.

#### Refusal to Drilling

Refusal to the soil drilling methods used at this site may result from encountering hard cemented soil, soft weathered rock, coarse gravel, cobbles or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling would be required to determine the character and continuity of materials below refusal of the soil auger in natural soils. Where fills are present, refusal to drilling may also result from encountering buried debris, building materials, or objects. Backhoe test pits would be required to expose and identify buried materials below refusal levels in filled areas.

#### Borehole Closure

Following collection of relevant geotechnical data, boreholes were filled by slowly pouring auger cuttings into the open hole such that minimal "bridging" of the material occurred in the hole. Backfilling of the upper two feet of each hole was tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface. Where boreholes exceeded five feet in depth, a plastic hole plug was firmly tamped into place within the backfill at a depth of about two feet.

#### Preservation and Transporting of Soil Samples with Control of Field Moisture

Procedures for preserving soil samples obtained in the field and transportation of samples to the laboratory generally followed those given in ASTM D4220, *Standard Practice for Preserving and Transporting Soil Samples* for Group B samples as defined in Section 4. Group B samples are those samples not suspected of being contaminated and for which only water content and classification, proctor, relative density, or profile logging

will be performed. Group B samples also include bulk samples that are intended to be remolded in the laboratory for compaction, swell pressure, percent swell, consolidation, permeability, CBR, or shear testing. Representative samples of the cuttings or split spoon samples, or representative bulk samples, were placed in suitably identified, sealed glass jars or plastic containers and transported to the laboratory. Sample identification numbers on the containers corresponded to sample numbers recorded on field boring records or test pit records. Thin-walled tube samples were sealed at the ends with paraffin and capped with plastic end caps.

## ◆ Field Tests of Earth Materials

The subsurface conditions encountered during drilling were reported on a field test boring record by the chief driller. The record contains information about the drilling method, samples attempted and sample recovery, indications of materials in the borings such as coarse gravel, cobbles, etc., and indications of materials encountered between sample intervals. Representative soil samples were placed in glass jars and transported to the laboratory along with the field boring records. Recovered samples not expended in laboratory tests are commonly retained in our laboratory for 60 days following completion of drilling. Field boring records are retained at our office.

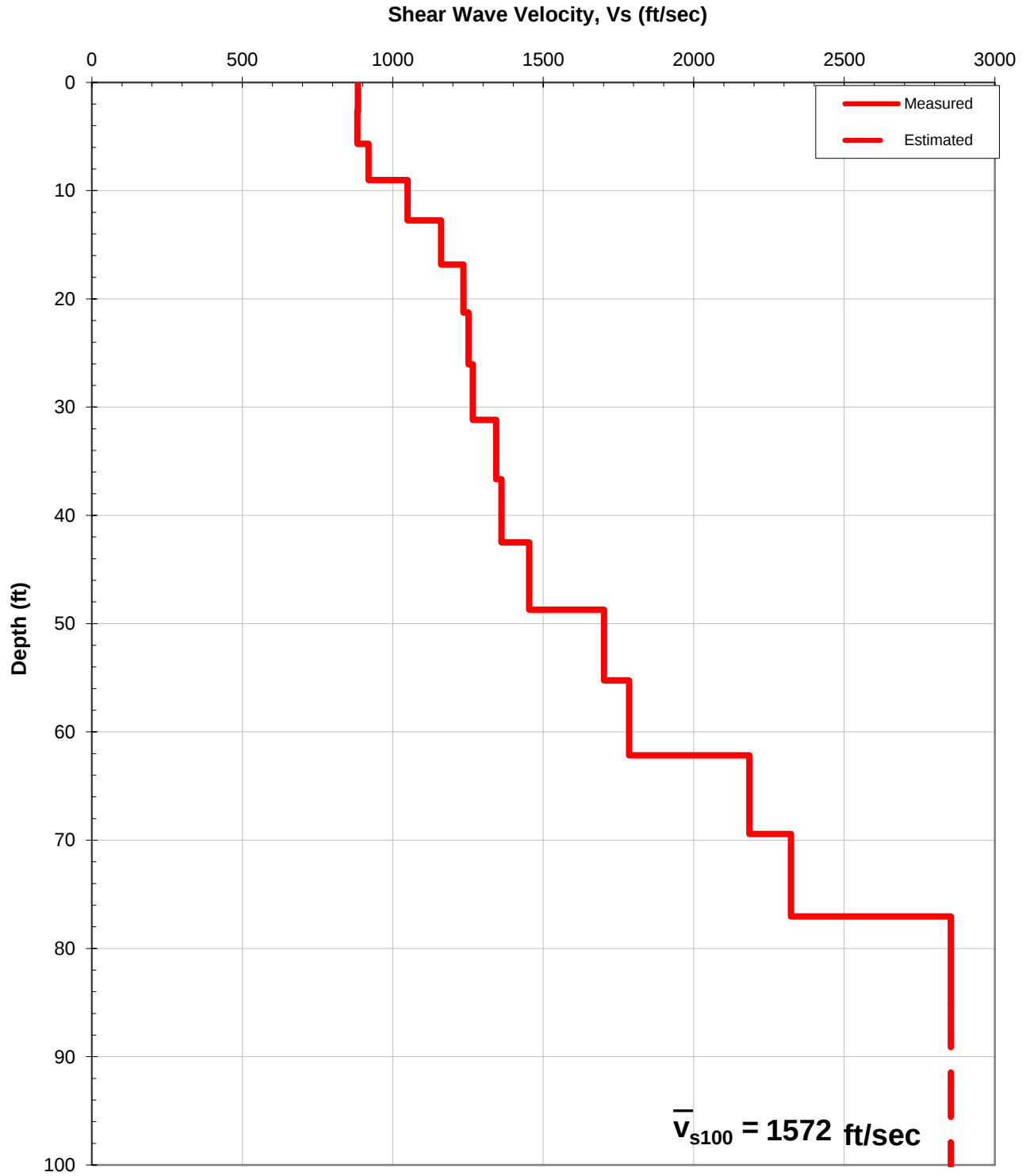
### Measurement of Static Water Levels

Water level readings were made in the open boreholes immediately after completing drilling and withdrawal of the tools. Where feasible, measurements were repeated after an elapsed period of 24 hours to gauge the stabilized water level. Procedures for measurement of liquid levels in open boreholes are described in ASTM D4750, *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*. A calibrated cable with electrical wire encased, equipped with a weighted sensing tip at one end and an electric meter at the other, was slowly lowered into each borehole until the liquid surface was penetrated by the weighted end. Contact with the water closed an electric circuit and was recorded by the meter. The depth reading on the cable was then recorded relative to a reference point on the surface. Measurements made by this method were then repeated until approximately consistent values were obtained.

## **Appendix II-B – Previous Field Data**



Shear Wave Velocity Profile SW-2  
Mid-Carolina Commerce Park  
Prosperity, South Carolina  
1611-12-378



## **Appendix III – Laboratory Data**

Revision Date: 08/16/17

## LABORATORY DETERMINATION OF WATER CONTENT



ASTM D 2216 ☒

AASHTO T 265 ☐

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

|                  |                                     |                 |         |
|------------------|-------------------------------------|-----------------|---------|
| Project #:       | 206769                              | Report Date:    | 3-26-21 |
| Project Name:    | MCCP - Parcel 6                     | Test Date(s):   | 3-24-21 |
| Client Name:     | Alliance Cosulting Engineers        |                 |         |
| Client Address:  | PO Box 8147, Columbia SC 29202      |                 |         |
| Sample by:       | Southern Drill                      | Sample Date(s): | 3-18-21 |
| Sampling Method: | Bulk - Boring B-9, BS-1, 0 to 10 ft | Drill Rig :     | CME 550 |

|                |               |                          |                 |                                     |             |       |                   |          |
|----------------|---------------|--------------------------|-----------------|-------------------------------------|-------------|-------|-------------------|----------|
| <b>Method:</b> | <b>A (1%)</b> | <input type="checkbox"/> | <b>B (0.1%)</b> | <input checked="" type="checkbox"/> | Balance ID. | 24996 | Calibration Date. | 11-11-20 |
|                |               |                          |                 |                                     | Oven ID.    | 24457 | Calibration Date: | 11-11-20 |

[illegible]

|                                 |                           |
|---------------------------------|---------------------------|
| Notes / Deviations / References | Olive silty SAND with PWR |
|---------------------------------|---------------------------|

Jason Colvin

Laboratory Manager

Robert C. Bruorton, P.E.

3/26/21

# LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

|                 |                                |              |                       |
|-----------------|--------------------------------|--------------|-----------------------|
| Project #:      | 206769                         | Report Date: | 3-26-21               |
| Project Name:   | MCCP - Parcel 6                | Test Date(s) | 3-24-21               |
| Client Name:    | Alliance Consulting Engineers  |              |                       |
| Client Address: | PO Box 8147, Columbia SC 29202 |              |                       |
| Boring #:       | B-9                            | Sample #:    | BS-1                  |
|                 |                                | Sample Date: | 3-18-21               |
| Location:       | Offset: N/A                    |              | Elevation: 0 to 10 ft |

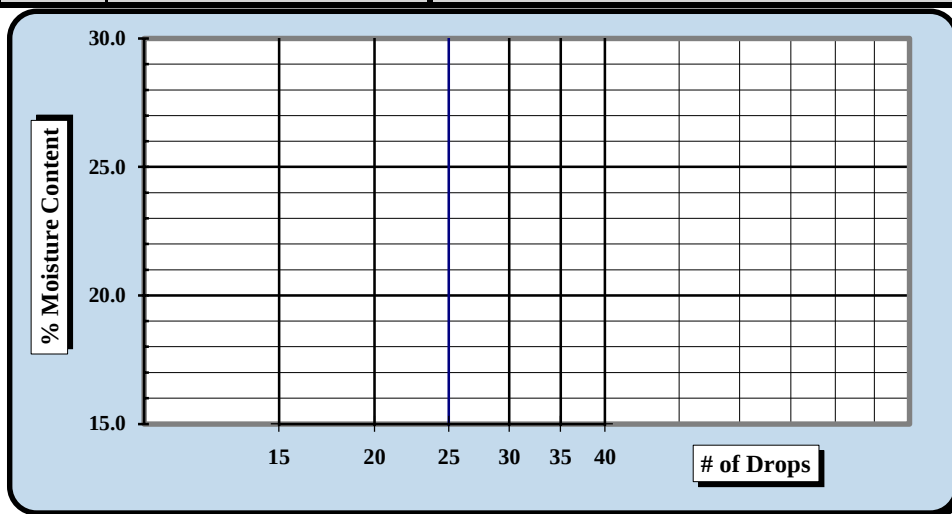
Sample Description: Olive silty SAND with PWR

| Type and Specification | S&ME ID # | Cal Date:  | Type and Specification | S&ME ID # | Cal Date: |
|------------------------|-----------|------------|------------------------|-----------|-----------|
| Balance (0.01 g)       | 24496     | 11/11/2020 | Grooving tool          | 34452     | 9/9/2020  |
| LL Apparatus           | 34453     | 9/9/2020   |                        |           |           |
| Oven                   | 24457     | 11/11/2020 |                        |           |           |

| Pan #   |                       | Liquid Limit |  |  |  |  |  | Plastic Limit |  |  |
|---------|-----------------------|--------------|--|--|--|--|--|---------------|--|--|
| Tare #: |                       |              |  |  |  |  |  |               |  |  |
| A       | Tare Weight           |              |  |  |  |  |  |               |  |  |
| B       | Wet Soil Weight + A   |              |  |  |  |  |  |               |  |  |
| C       | Dry Soil Weight + A   |              |  |  |  |  |  |               |  |  |
| D       | Water Weight (B-C)    |              |  |  |  |  |  |               |  |  |
| E       | Dry Soil Weight (C-A) |              |  |  |  |  |  |               |  |  |
| F       | % Moisture (D/E)*100  |              |  |  |  |  |  |               |  |  |
| N       | # OF DROPS            |              |  |  |  |  |  |               |  |  |
| LL      | LL = F * FACTOR       |              |  |  |  |  |  |               |  |  |
| Ave.    | Average               |              |  |  |  |  |  |               |  |  |

Non-plastic

Moisture Contents determined by  
ASTM D 2216



| One Point Liquid Limit |        |    |        |
|------------------------|--------|----|--------|
| N                      | Factor | N  | Factor |
| 20                     | 0.974  | 26 | 1.005  |
| 21                     | 0.979  | 27 | 1.009  |
| 22                     | 0.985  | 28 | 1.014  |
| 23                     | 0.99   | 29 | 1.018  |
| 24                     | 0.995  | 30 | 1.022  |
| 25                     | 1.000  |    |        |

|                 |                                     |
|-----------------|-------------------------------------|
| NP, Non-Plastic | <input checked="" type="checkbox"/> |
| Liquid Limit    | NP                                  |
| Plastic Limit   | NP                                  |
| Plastic Index   | NP                                  |
| Group Symbol    | ML                                  |

Multipoint Method ☒  
One-point Method ☐

Wet Preparation ☒ Dry Preparation ☐ Air Dried ☒ Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jason Colvin  
Technician Name

Lab Manager  
Position

Robert C. Bruorton, P.E.  
Technical Responsibility

3-26-21  
Date

This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.



S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

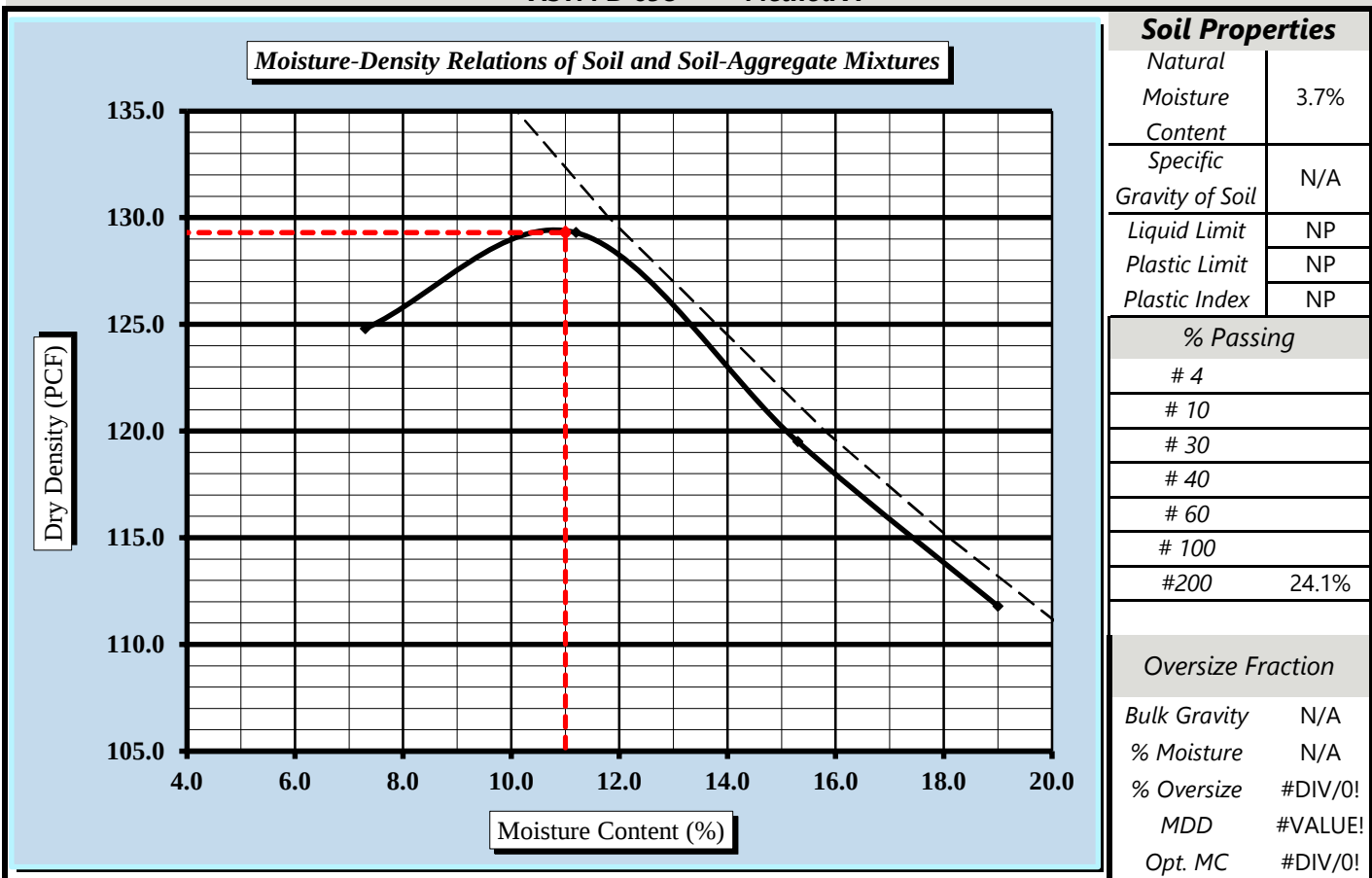
*This report shall not be reproduced, except in full without the written approval of S&ME, Inc.*

# MOISTURE - DENSITY REPORT



## Quality Assurance

|                                                                         |                               |               |                          |
|-------------------------------------------------------------------------|-------------------------------|---------------|--------------------------|
| S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501 |                               |               |                          |
| S&ME Project #:                                                         | 206769                        | Report Date:  | 3-26-21                  |
| Project Name:                                                           | MCCP - Parcel 6               | Test Date(s): | 3-24-21                  |
| Client Name:                                                            | Alliance Consulting Engineers |               |                          |
| Client Address:                                                         | PO Box 8147, Columbia SC      |               |                          |
| Boring #:                                                               | B-9                           | Sample #:     | BS-1                     |
| Location:                                                               | boring                        | Sample Date:  | 3/18/2021                |
|                                                                         | Offset:                       | N/A           | Depth:                   |
|                                                                         |                               |               | 0-10 ft                  |
| Sample Description: Olive silty SAND with PWR                           |                               |               |                          |
| Maximum Dry Density                                                     | 129.3                         | PCF.          | Optimum Moisture Content |
|                                                                         |                               |               | 11.0%                    |
| <b>ASTM D 698 - - Method A</b>                                          |                               |               |                          |



|                                                    |                                                   |                                                                        |
|----------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------|
| Moisture-Density Curve Displayed:                  | Fine Fraction <input checked="" type="checkbox"/> | Corrected for Oversize Fraction (ASTM D 4718) <input type="checkbox"/> |
| Sieve Size used to separate the Oversize Fraction: | #4 Sieve <input checked="" type="checkbox"/>      | 3/8 inch Sieve <input type="checkbox"/>                                |
| Mechanical Rammer <input type="checkbox"/>         | Manual Rammer <input checked="" type="checkbox"/> | Moist Preparation <input type="checkbox"/>                             |
|                                                    |                                                   | Dry Preparation <input type="checkbox"/>                               |

## References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass  
ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

|                                                                                                 |                           |                                 |                |
|-------------------------------------------------------------------------------------------------|---------------------------|---------------------------------|----------------|
| <u>Jason Colvin</u>                                                                             | <u>Laboratory Manager</u> | <u>Robert C. Bruorton, P.E.</u> | <u>3-26-21</u> |
| Technician Name                                                                                 | Position                  | Technical Responsibility        | Date           |
| This report shall not be reproduced, except in full, without the written approval of S&ME, Inc. |                           |                                 |                |



## Summary of Laboratory Procedures

Recovered disturbed and undisturbed samples and the drillers' field logs were transported to the laboratory where they were examined by the geotechnical engineer. Selected samples representative of certain groups of soils were subjected to simple classification tests by hand or other simple means. Other samples were tested in the laboratory to determine their strength or consolidation properties.

### ♦ Laboratory Tests of Soil

#### Examination of Split Spoon Soil Samples

Soil and rock samples and field boring records were reviewed in the laboratory by the geotechnical engineer. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. The geotechnical engineer also prepared the final boring records enclosed with this report.

#### Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D2216, "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass." This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent. No attempt was made to exclude any particular particle size from the portion split from the sample.

#### Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D4318, *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*. Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the liquid limit of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The plastic limit defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The plasticity index (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D4318. The liquid limit of each sample was determined using the multipoint method (Method A) described in Section 11. The liquid limit is by definition the moisture content

where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three widely spaced combinations of N versus moisture content. When plotted on semilog paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D2216.

### Percent Fines Determination of Samples

A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D1140, *Standard Test Method for Amount of Material Finer Than the No. 200 Sieve*. Method A, using water to wash the sample through the sieve without soaking the sample for a prescribed period of time, was used and the percentage by weight of material washing through the sieve was deemed the "percent fines" or percent clay and silt fraction.

### Compaction Tests of Soils Using Standard Effort

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D698, *Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft<sup>3</sup>)*.

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6 inch diameter molds with a 5.5 lbf rammer dropped from a height of 12 inches, producing a compactive effort of 12,400 lbf/ft<sup>3</sup>. ASTM D 698 provides three alternative procedures depending on material gradation:

*Method A (Shall be used if 20 percent or less by weight is retained on No. 4 sieve)*

- ◆ All material passes No. 4 sieve size
- ◆ 4 inch diameter mold
- ◆ Soil in 3 layers with 25 blows per layer

*Method B (Shall be used if 20 percent by weight is retained on the No. 4 sieve and 20 percent or less by weight is retained on the 3/8-inch sieve)*

- ◆ All material passes 3/8 inch sieve
- ◆ 4 inch diameter mold
- ◆ Soil in 3 layers with 25 blows per layer

*Method C (Shall be used if more than 20 percent by weight is retained on the 3/8-inch sieve and less than 30 percent is retained on the 3/4-inch sieve)*

- ◆ All material passes  $\frac{3}{4}$  inch sieve
- ◆ 6-inch diameter mold
- ◆ Soil in 3 layers with 56 blows per layer

Soil was compacted in the mold in three layers of approximately equal thickness, each compacted with either 25 or 56 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content was determined and the procedure repeated. Separate soils were used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the maximum dry density and optimum moisture content to be determined from the resulting curvilinear relationship.

**SECTION 02 41 00  
DEMOLITION**

**PART 1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- A. Section 01 70 00 - Execution Requirements.
- B. Section 31 10 00 – Site Preparation.
- C. Section 31 23 23.13 – Backfill and Compaction.
- D. Section 31 25 00 – Erosion and Sedimentation Controls.

**PART 2 PRODUCTS -- NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 5. Do not close or obstruct roadways or sidewalks without permit.
  - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  - 7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until built elements to be salvaged or relocated have been removed.

- C. Protect existing structures and other elements that are not to be removed.
  - 1. Provide bracing and shoring.
  - 2. Prevent movement or settlement of adjacent structures.
  - 3. Stop work immediately if adjacent structures appear to be in danger.

### **3.02 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

### **3.03 MEASUREMENT AND PAYMENT**

- A. Payment will be made for work under this Section per the Contractor's bid for the related items listed in Specification Section 00 41 00 Bid Form.

**END OF SECTION**

## **SECTION 03 40 00**

### **PRECAST CONCRETE**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Outlet Structures

##### **1.02 RELATED SECTIONS**

- A. 33 41 00 – Storm Drainage Piping

##### **1.03 REFERENCES**

- A. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 2014.
- B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.
- C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.
- D. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1997.
- E. ASTM A 416/A 416M - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete; 1998.
- F. ASTM A 497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement; 1997
- G. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- H. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 1999.
- I. ASTM A 767/A 767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 1997.
- J. ASTM C 150 - Standard Specification for Portland Cement; 1999a.
- K. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2000.
- L. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society; 1998.
- M. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products; Precast/Prestressed Concrete Institute; 2013, Tenth Edition.
- N. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1999.
- O. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1988, Second Edition.

#### **1.04 DESIGN REQUIREMENTS**

- A. Size components to withstand design loads in a restrained condition as follows:
  - 1. Horizontal Assembly: 150 psf live and dead loads.
  - 2. Vertical Assembly: 20 psf wind load.
  - 3. As shown on the drawings.
- B. Maximum Allowable Deflection: 1/180 span.
- C. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.
- D. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.
- E. Shall be manufactured in accordance with Prestressed Concrete Institute's Manual 116 Manual for quality control for plans and production of Precast, prestressed concrete products and SC D.O.T. Standard Specifications.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.
- C. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.
- D. Samples: Submit two panels, 24 x 24 inches (610 x 610 mm) in size, illustrating surface finish treatment.
- E. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

#### **1.06 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with requirements of PCI MNL-116S, PCI MNL-120, and PCI MNL-123.
- B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Erector Qualifications: Company specializing in erecting products of this section with minimum five (5) years of documented experience.
- D. Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State of South Carolina.
- E. Welder: Qualified within previous 12 months in accordance with AWS D1.1 and AWS D1.4.

## **1.07 REGULATORY REQUIREMENTS**

Conform to ACI 318 for design load and construction requirements applicable to work of this section.

## **1.08 PRE-INSTALLATION MEETING**

- A. Convene a pre-installation conference one week prior to commencing work of this section.
- B. Instruct others when field cutting of required openings are 10 inches (254 mm) and smaller.

## **1.09 DELIVERY, STORAGE AND HANDLING**

- A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.
- B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- C. Protect members to prevent staining, chipping, or spalling of concrete.
- D. Mark each member with date of production and final position in structure.

## **1.10 PROJECT/SITE CONDITIONS**

Coordinate the work of framing components not pre-tensioned but associated with the work of this section.

# **PART 2 PRODUCTS**

## **2.01 MANUFACTURERS**

- A. Precast Concrete:
  - 1. Sherman Precast.
  - 2. Tindall Concrete Products.
  - 3. Hanson
  - 4. Approved Equal.

## **2.02 MATERIALS**

- A. Cement: White Portland, conforming to ASTM C 150, Type I.
- B. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirements and PCI MNL-116S.

## **2.03 REINFORCEMENT**

- A. Tensioning Steel Tendons: ASTM A 416/A 416M, Grade 250 (1725); seven-wire stranded steel cable; low-relaxation type; full length without splices; uncoated.
- B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
  - 1. Plain billet-steel bars.
  - 2. Unfinished.

- 3. Shop fabricated and bent cold.
- C. Welded Steel Wire Fabric: ASTM A 185 plain type; in flat sheets; unfinished.

#### **2.04 ACCESSORIES**

- A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, and inserts conforming to PCI MNL-123, and as follows:
  - 1. Material: Carbon steel conforming to ASTM A 36/A 36M.
  - 2. Finish: Prime painted, except where device surfaces will be in contact with concrete or will require field welding.
- B. Grout:
  - 1. Non-shrink, non-metallic, minimum yield strength of 10,000 psi (69 MPa) at 28 days.
  - 2. Epoxy.
- C. Bearing Pads: High density plastic, Vulcanized elastomeric compound molded to size, Neoprene (Chloroprene), or Tetrafluoroethylene (TFE); Shore A Durometer; 1/8 inch (3 mm) thick, smooth both sides.
- D. Bolts, Nuts and Washers: High strength steel type recommended for structural steel joints.

#### **2.05 FABRICATION**

- A. Fabrication procedure to conform to PCI MNL-116S.
- B. Maintain plant records and quality control program during production of precast members. Make records available upon request.
- C. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings.
- D. Tension reinforcement tendons as required to achieve design load criteria.
- E. Provide required openings with a dimension larger than 10 inches (250 mm) and embed accessories provided under other sections of the specifications, at indicated locations.

#### **2.06 FINISHES**

- A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.
- B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- C. Architectural Finish: Surface holes or bubbles over 1/4 inch (6 mm) filled with matching cementitious paste, fins or protrusions removed and surface ground smooth.
- D. Precast manufacturer shall coat inside of all wet well structures and receiving manholes (manhole force main discharges into) with two-component, self-priming, chemically cured, coal tar epoxy protective coating.

## **2.07 FABRICATION TOLERANCES**

- A. Conform to PCI MNL-116S.
- B. Maximum Variation from Nominal Dimension: 1 inch (25 mm).
- C. Maximum Variation from Intended Camber: 5/8 inch (15 mm).
- D. Maximum Out of Square: 1/8 inch/10 feet (3 mm/3 m), non-cumulative.
- E. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch (3 mm).
- F. Maximum Bowing of Members: Length of Bow/ 360.

## **2.08 SOURCE QUALITY CONTROL AND TESTS**

- A. Section 01 40 00 - Quality Requirements: Provide mix design for concrete.
- B. Test samples in accordance with applicable ASTM standard.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that site conditions are ready to receive work and field measurements are as shown on shop drawings.

### **3.02 PREPARATION**

- A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

### **3.03 WETWELLS, UTILITY VAULTS, OUTLET STRUCTURES AND MANHOLES**

- A. Concrete bases may be precast or cast-in-place. The concrete base of precast and cast-in-place structures shall be placed on an (eight) 8-inch No. 57 stone mat or as shown on the drawings. Each precast section shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar installation. Brick or concrete ring to support cover shall be a minimum of 3 inches high but not more than 18 inches high.
- B. Openings larger than 1-1/2 inches in diameter shall be precast into the appropriate section.
- C. Any openings added during construction shall be approved by the precast manufacturer and be formed by coring. No other method for adding holes will be considered.
- D. Joints of the precast sections shall be tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to ASTM C443 or preformed mastic sealer. In addition, the joint shall be sealed inside and out with cement mortar using one part Portland cement to two parts clean sand meeting ASTM C144. The joints shall be watertight.
- E. Shaped bottoms shall be as shown on the drawings. They shall be constructed of one monolithic pour using 3000-psi concrete.
- F. Brickwork required to complete the precast concrete structures shall be constructed using mortar of one part Portland cement to two parts clean sand, meeting ASTM C144 and thoroughly mixed to a workable plastic consistency.

- G. Any damage to the coating during storage, handling, transportation or installation of the section shall be repaired immediately to provide complete coverage and protection per manufacturer's recommendations. Mortar joints shall receive two (2) coats of waterproofing after the section is installed and the mortar has set and dried.

### **3.04 ERECTION**

- A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- B. Align and maintain uniform horizontal and vertical joints, as erection progresses.
- C. Maintain temporary bracing in place until final support is provided. Protect members from staining.
- D. Provide temporary lateral support to prevent bowing, twisting, or warping of members.
- E. Adjust differential camber between precast members to tolerance before final attachment.
- F. Install bearing pads.
- G. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12.
- H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.
- I. Grout underside of column bearing plates.
- J. Secure units in place. Perform welding in accordance with AWS D1.1.

### **3.05 ERECTION TOLERANCES**

- A. Erect members level and plumb within allowable tolerances.
- B. Conform to PCI MNL-116S.
- C. Design and erect to the following tolerances:
  - 1. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch/10 feet and 3/8 inch in 100 feet (6 mm/3 m and 9 mm in 30 mm), non-cumulative.
  - 2. Maximum Offset from True Alignment between Members: 1/4 inch (6 mm).
  - 3. Maximum Variation from Dimensions Indicated on Reviewed Shop Drawings: Plus or minus 1/8 inch (3 mm).
- D. Exposed Joint Dimension: 3/8 inch (9 mm) plus or minus 1/4 inch (6 mm).
- E. When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise the Engineer. Execute modifications as directed.

### **3.06 PROTECTION**

- A. Protect members from damage caused by field welding or erection operations.
- B. Provide non-combustible shields during welding operations.

### **3.07    CLEANING**

Clean weld marks, dirt, or blemishes from surface of exposed members.

**END OF SECTION**

## **SECTION 31 00 00**

### **EARTHWORK**

#### **PART 1 GENERAL**

##### **1.01 SCOPE**

- A. This Section includes earthwork and related operations, including, but not limited to dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading and any other similar, incidental or appurtenant earthwork operations which may be necessary to properly complete the work.
- B. The Contractor shall provide all services, labor, materials and equipment required for all earthwork and related operations, necessary or convenient to the Contractor, for furnishing complete work as shown on the Drawings or specified in these Contract Documents.

##### **1.02 RELATED SECTIONS**

- A. Section 00 21 13 – Instructions to Bidders
- B. Section 31 10 00 - Site Preparation
- C. Section 31 22 00 – Grading
- D. Section 31 23 16 - Excavation
- E. Section 31 25 00 - Erosion and Sedimentation Control

##### **1.03 GENERAL**

- A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonably accurate information about the existing elevations. They are not precise and the Contractor shall become satisfied as to the exact quantities of excavation and fill required.
- B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.
- C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.
- D. The Contractor shall control grading in a manner to prevent surface water from running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Free access must be provided to all fire hydrants and meters.
- E. Tests for compaction and density shall be conducted by an independent testing laboratory selected in accordance with Section 01 45 29 of these Specifications.
  - 1. The soils testing laboratory is responsible for the following:

- a. Field compaction testing shall be based on using the maximum dry density determined by the Standard Proctor Compaction Test in accordance with ASTM D 698.
  - b. Determination of in-place backfill density shall be done in accordance with ASTM D 1556, "Density and unit weight of Soil In Place by the Sand-Cone Method", ASTM D 2937, "Density of Soil In Place by the Drive-Cylinder Method" or ASTM D 2922, "Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)".
  - c. Field density tests for each lift; one test for each 5,000 square feet of fill or minimum one test per lift.
  - d. Inspecting and testing stripped site, subgrades and proposed fill materials.
- 2. Contractor's duties relative to testing include:
  - a. Notifying laboratory of conditions requiring testing.
  - b. Coordinating with laboratory for field testing.
  - c. Providing representative fill soil samples to the laboratory for test purposes. Provide 50 pound samples of each fill soil.
- 3. Inspection
  - a. Earthwork operations, suitability of excavated materials for fill and backfill and placing and compaction of fill and backfill is subject to inspection. Engineer will observe earthwork operations.
  - b. Foundations and shallow spread footing foundations are required to be inspected by an engineer to verify suitable bearing and construction.
- F. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching and Shoring and Subpart O, Motor Vehicles, Mechanized Equipment and Marine Operations and shall be conducted in a manner acceptable to the Engineer.
- G. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains. The Contractor shall be responsible for providing all services, labor, equipment and materials necessary or convenient to the Contractor for completing the work within the time specified in these Contract Documents.
- H. Safety
 

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

## PART 2 PRODUCTS

### 2.01 SOILS CLASSIFICATIONS

Bedding materials listed here include a number of processed materials plus the soil types defined according to the Unified Soil Classification System (USCS) in ASTM D 2487, Standard Method for Classification of Soils for Engineering Purposes. (See below for description of soil classification). These materials are grouped into five broad categories according to their suitability for this application:

- A. Class I - Angular, 1/4 to 1 1/2 inches (6 to 40 mm) graded stone, including such as coral, slag, cinders, crushed shells and crushed stone. Note - The size range and resulting high voids ratio of Class I material make it suitable for use to dewater trenches during pipe installation. This permeable characteristic dictates that its use be limited to locations where pipe support will not be lost by migration of other embedment materials into the Class I material. When such migration is possible, the material's minimum size range should be reduced to finer than 1/4 inch (6 mm) and the gradation properly designed to limit the size of the voids.
- B. Class II - Coarse sands and gravels with maximum particle size of 1 1/2 inch (40 mm), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class. Note - Sands and gravels which are clean or borderline between clean and with fines should be included. Coarse-grained soils with less than 12% but more than 5% fines are neglected in ASTM D2487 and the USCS and should be included. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material may be critical to the pipe support and stability of the foundation and embedment if the material is imported and is not native to the trench excavation. A gradation other than well graded, such as uniformly graded or gap graded, may permit loss of support by migration into void spaces of a finer grained natural material from the trench wall and foundation.
- C. Class III - Fine sand and clayey (clay filled) gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil Types SM, GC, SM and SC are included in this class.
- D. Class IV - Silt, silty clays and clays, including inorganic clays and silts of not to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class. Note- Caution should be used in the design and selection of the degree and method of compaction for Class IV soils because of the difficulty in properly controlling the moisture content under field conditions. Some Class IV soils with medium to high plasticity and with liquid limits greater than 50% (CH, MH, CH-MH) exhibit reduced strength when wet and should only be used for bedding, haunching and initial backfill in arid locations where the pipe embedment will not be saturated by ground water, rainfall and/or exfiltration from the pipeline system. Class IV soils with low to medium plasticity and with liquid limits lower than 50% (CL, ML, CL-ML) also require careful consideration in design and installation to control moisture content but need not be restricted in use to arid locations.
- E. Class V - This class includes the organic soils OL, OH and PT as well as soils containing frozen earth, debris, rocks larger than 1 1/2 inch (40 mm) in diameter and other foreign materials. These materials are not recommended for bedding, haunching or initial backfill.

## DESCRIPTION OF EMBEDMENT MATERIAL CLASSIFICATIONS

| SOIL<br>CLASS         | SOIL<br>TYPE | DESCRIPTION MATERIAL CLASSIFICATION                                                                                                                                                                                      |
|-----------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Class I<br>Soils *    | ---          | Manufactured angular, granular material, 3/4 to 1-1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone, or rock, broken coral, crushed slag, cinders, or crushed shells. |
| Class II<br>Soil **   | GW           | Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.                                                                   |
|                       | GP           | Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean                                                                  |
|                       | SW           | Well-graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.                                                                              |
|                       | SP           | Poorly graded sands and gravelly sand, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.                                                                             |
| Class III<br>Soil *** | GM           | Silty gravels, gravel-sand-silt mixtures. 50% or more retained on No. 200 sieve.                                                                                                                                         |
|                       | GC           | Clayey gravels, gravel-sand-clay mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.                                                                                                 |
|                       | SM           | Silty sands, sand-silt mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.                                                                                                              |
|                       | SC           | Clayey sands, sand-clay mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.                                                                                                             |
| Class IV<br>Soils     | ML           | Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve.                                                                                    |
|                       | CL           | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limit 50% or less. 50% or more passes No. 200 sieve.                                                           |
|                       | MH           | Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.                                                                          |
|                       | CH           | Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.                                                                                                          |
| Class V<br>Soils      | OL           | Organic silts and organic silty clays of low plasticity. Liquid limit 50% or less. 50% or less. 50% or more passes No. 200 sieve.                                                                                        |
|                       | OH           | Organic clays of medium to high plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve.                                                                                                                  |

PT Peat, muck and other highly organic soils.

\* Soils defined as Class I materials are not defined in ASTM D2487.

\*\* In accordance with ASTM D2487, less than 5% pass No. 200 sieve.

\*\*\* In accordance with ASTM D2487, more than 12% pass No. 200 sieve. Soils with 5% to 12% pass No. 200 sieve fall in borderline classification, e.g. GP-GC.

## **2.02 FILL MATERIAL**

- A. Sand Fill: Material shall consist of a clean sand with a fineness modulus of 1.6 to 3.1 and containing not more than 10 percent by weight finer than No. 200 U.S. Standard Sieve.
- B. Earth Fill: Material shall consist of inorganic material free of roots, cobbles and boulders and classified as SM, ML, SC, or CL by ASTM D2487-85 "Standard Methods for Classification of Soils for Engineering Purposes". Earth Fill shall also conform to the following:
  - 1. Liquid Limit = 50 maximum
  - 2. Plasticity Index = 20 maximum
  - 3. Dry Unit Weight = 90 pcf minimum maximum density

## **2.03 UNSUITABLE SITE FILL MATERIAL**

- A. Material which does not conform to the above classifications (soil classification SP, SW.GM, CH, MH, OH, OL and PT) may be used as Site Fill material in areas identified on the drawings as "spoil areas", in areas with no structures and or roads and other non-critical areas.

## **2.04 SHEETING, BRACING AND TIMBERING**

- A. Sheeting, Bracing and Timbering: The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures, or utilities outside of the trench or pit.
  - 1. General
    - a. Cofferdams and bracing design, including computations, shall be prepared before commencing construction operations. Drawings and design computations shall be signed and sealed by a professional engineer registered in the State of South Carolina. The drawings and design computations shall be submitted to the Engineer for informational purposes only.
    - b. Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Drawings and as ordered by the Engineer.
    - c. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety.
    - d. All sheeting in contact with the concrete or masonry shall be cut off as directed by the Engineer and left in place.

2. Timber: Timber may be substituted for steel sheet piling when approved by the Engineer. Timber for shoring, sheeting or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.
3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and/or live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Steel piling shall be removed, unless otherwise directed by the Engineer.
4. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the structures and adjacent property. Leave sheeting in place when, in the opinion of the Engineer, it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

## 2.05 FILTER FABRIC

- A. Filter fabric associated with bedding shall be a UV stabilized, spunbonded, continuous filament, needle punched, polypropylene, nonwoven geotextile.
- B. The fabric shall have an equivalent open size (EOS or AOS) of 120 - 70. The fabric shall also conform to the minimum property values listed in the following table:

| Fabric Property         | Unit                | Test Procedure | Average Value |         |
|-------------------------|---------------------|----------------|---------------|---------|
|                         |                     |                | Typical       | Minimum |
| Weight                  | oz/yd <sup>2</sup>  | ASTM D 3776    | 8.3           |         |
| Thickness               | mils                | ASTM D 1777    | 105           |         |
| Grab Strength           | lbs.                | ASTM D 4632    | 240           | 210     |
| Grab Elongation         | %                   | ASTM D 4632    | >50           | 50      |
| Tear Strength           | lbs.                | ASTM D 4533    | 100           | 85      |
| Mullen Burst            | psi                 | ASTM D 3786    | 350           | 320     |
| Puncture Resistance     | lbs.                | ASTM D 4833    | 115           | 100     |
| Permittivity            | sec <sup>-1</sup>   | ASTM D 4491    | 1.7           |         |
| Water Permeability      | cm/sec              | ASTM D 4491    | 0.4           |         |
| Water Flow Rate         | gpm/ft <sup>2</sup> | ASTM D 4491    | 120           |         |
| UV Resistance (500 hrs) | %                   | ASTM D 4355    | >85           |         |
| PH                      |                     |                | 2 – 13        |         |

- C. Filter fabric shall be Polyfelt TS 700, Trevira 1125, SuPac 7-MP or approved equal.

## 2.06 CONCRETE

Concrete for initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing

steel shall conform to the requirements of ASTM A 615, Grade 60.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Safety: Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Occupational Safety and Health Act and all other applicable safety regulations.
- B. Topsoil
  - 1. Remove all topsoil to a depth at which subsoil is encountered, from all areas under buildings, pavements and from all areas which are to be cut to lower grades or filled.
  - 2. With the Engineer's approval, topsoil to be used for finish grading may be stored on the site.
  - 3. Other topsoil may be used for fill in non-critical areas with approval of the Engineer.
  - 4. Properly dispose of all excess topsoil in the designated area.
- C. Bracing and Sheeting
  - 1. Furnish, put in place and maintain all sheeting, bracing and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the work, adjacent property or workers.
  - 2. Properly support all excavations where necessary to conform to all pertinent rules and regulations and these Specifications, even though, such locations are not indicated on the Drawings.
  - 3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.
  - 4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved by the Engineer.
- D. Obstructions
  - 1. Remove and dispose of all boulders, sidewalks, driveways, pavement, pipes and the like, as required for the performance of the work.
  - 2. Exercise care in excavating around catch basins, inlets and manholes so as to not disturb or damage these structures.
  - 3. Avoid removing or loosening castings or pushing dirt into catch basins, inlets and manholes.
  - 4. Damaged or displaced structures or casting shall be repaired, replaced and dirt entering the structures during the performance of the work shall be removed at no additional cost to the Owner.
- E. Utilities to be Abandoned
  - 1. When pipes, conduits, sewers, or other structures are removed from the trench,

leaving dead ends in the ground, such ends shall be fully plugged or sealed with brick and non-shrink grout.

2. Abandoned structures such as manholes or chambers shall be entirely removed.
3. All materials from abandoned utilities shall be removed from the site.
4. All salvageable materials shall become the property of the Owner.
5. All equipment to be salvaged is noted in the Specifications and shall be turned over to the Owner at a designated location.

F. Extra Earth Excavation

1. In case soft or excessively wet material which, in the opinion of the Engineer, is not suitable, is encountered below the final subgrade elevation of an excavation or underneath a structure, the Engineer may order the removal of this material and its replacement with crushed stone, filter fabric, or other suitable material in order to make a suitable foundation for the construction of the structure.

G. Cutting Paved Surfaces and Similar Improvements

1. Remove existing pavement as necessary for installing pipe utilities and appurtenances or as otherwise shown on the Drawings.
2. Before removing any pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
3. Break asphalt pavement along the marks using rotary saws or other suitable tools. Break concrete pavement along the marks by use of scoring with a rotary saw and breaking below the score by the use of jackhammers or other suitable tools.
4. Do not pull pavement with machines until completely broken and separated from pavement to remain.
5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. No additional payment will be made for removing and replacing damaged adjacent pavement.
6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
7. The Contractor may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

### 3.02 EXCAVATION

A. Method

1. All excavation shall be by open cut from the surface except as indicated on the Drawings.
2. All excavations for pipe appurtenances and structures shall be made in such a manner and to such depth and width, as will give ample room for building the structures and for bracing, sheeting and supporting the sides of the excavation, for pumping and draining groundwater which may be encountered and for the removal from the excavation of all materials excavated.

3. Take special care so that the soil below the bottom of the structure to be built is left undisturbed.
- B. Grades: Excavate to grades indicated on the Drawings. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.
- C. Disposal of Excavated Material
  1. Remove and properly dispose of all excavated material not needed to complete filling, backfilling and grading.
  2. Dispose of excess earth and rock excavated materials at locations on-site designated by the Engineer. Off-site disposal of all other material shall be and in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street. No debris shall be deposited on any private property, except by written consent of the property owner. In no case shall any material be shoved onto abutting private properties, or be buried in embankments or trenches on the Project.

### **3.03 EXCAVATING FOR STRUCTURES**

- A. Earth Excavation: Earth excavation shall include all substances to be excavated other than rock. Earth excavation for structures shall be to limits not less than two feet outside wall lines, to allow for formwork and inspection and further as necessary to permit the trades to install their work. All materials loosened or disturbed by excavation shall be removed from surfaces to receive concrete or crushed stone.
- B. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock or compacted materials to insure proper bearing.
  1. Unsuitable Foundation Material: Any material, in the opinion of the Engineer, which is unsuitable for foundation shall be removed and replaced with compacted crushed stone, or with compacted fill material as directed by the Engineer. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.
  2. Pipe Trenches Beneath Structures: Where piping or conduit passes beneath footings or slabs resting on grade, trenches shall be excavated to provide a minimum 6-inch clearance from all surfaces of the pipe or conduit. The trench shall be backfilled to the base of the structure with concrete.
  3. Unauthorized Excavation: Care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings and compacted crushed stone or other approved material under slabs. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete, or formwork shall be provided, as directed by the Engineer.
- C. Unsuitable Bearing
  1. If suitable bearings for foundations are not encountered at the elevations indicated on the Drawings, immediately notify the Engineer.
  2. Do not proceed further until instructions are received.

### **3.04 DEWATERING REQUIREMENT**

- A. The Contractor may use any dewatering method he deems feasible so long as it results in working in the dry and stable soil conditions.
- B. The Contractor shall conform and meet all conditions, obtain necessary permits and requirements of the regulatory agencies that have jurisdiction.
- C. It is the intent of these specifications that an adequate dewatering system be installed to lower and control the groundwater in order to permit excavation, construction, grading and the placement of fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the excavation.
- D. The Contractor shall be solely responsible for the arrangement, location and depths of dewatering system necessary to accomplish the work described under this section of the specifications. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level in the construction area are a minimum of three (3) feet below the prevailing excavation surface and any surface to be compacted; will prevent the loss of fines, seepage, boils, quick conditions, or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in the dry.
- E. The Contractor shall promptly dispose of all water removed from the excavations in such a manner as will not endanger public health, damage public or private property, or affect adversely any portion of the work under construction or completed by him or any other Contractor. Contractor shall obtain written permission from the Owner for any property involved before digging ditches or constructing water courses for the removal of water.
- F. The disposal of water from the dewatering system shall meet the requirements of all regulatory agencies having jurisdiction.
- G. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation strata, or instability of the slopes, or damage to the foundations or structures may occur. The supply of all labor and materials and the performance of all work necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by the Contractor subject to the approval of the Engineer and at no additional expense to the Owner.

### **3.05 COMPACTION**

- A. Fill materials supporting roadways, parking areas, sidewalks, structures and buildings and backfill around structures shall be compacted to 95 percent of the standard proctor density. The top 12-inches of fill materials supporting structures or pavement shall be compacted to 98 percent of the standard proctor density. Fill placed for general site grading shall be compacted to 90 percent of the standard proctor density.
- B. Compaction of embankments shall be by vibratory sheepsfoot or pad-foot rollers with staggered, uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend at least 5 feet beyond the final contours sufficiently to insure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer shaping the face of the embankment.

- C. Compaction of backfill next to walls shall be accomplished with hand-powered tamping equipment. The backfill shall be placed in 8-inch maximum lifts, with each lift compacted to 95 percent of standard proctor density.
- D. If tests indicate that density of fill is less than that specified, the area shall be, as directed by the Engineer, either recompact or undercut, filled and compacted until specified density is achieved.

### **3.07 FILL**

#### **A. Controlled Fill**

1. The fill for roadways, parking areas, walks, structures and building slabs on grade shall be controlled fill.
2. After the existing ground or excavated area has been proofrolled and examined by the Engineer, all holes and other irregularities shall be filled and compacted before the main fill is placed.
3. The fill shall be placed in even layers not exceeding 8-inches in depth and shall be thoroughly compacted as herein specified.
4. If an analysis of the soil being placed shows a marked difference from one location to another, the fill being placed shall not be made up of a mixture of these materials.
5. Each different type of material shall be handled continuously so that field control of moisture and density may be based upon a known type of material.
6. No fill shall be placed following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.

#### **B. Proofrolling**

1. All areas where roadways, parking areas, sidewalks, structures and buildings are to be constructed on cut areas, compacted fill and other areas where indicated on the Drawings, shall be proofrolled to detect soft spots prior to the placement of fill material or building foundations.
2. Proofrolling shall be performed using a fully loaded tandem-axle dump truck 20 tons or other suitable pneumatic tired equipment over the subgrade before the subgrade is shaped.
3. Proofrolling shall be witnessed by the Engineer.
4. Subgrade shall be proofrolled with 10 overlapping passes of the roller. Depressions that develop during the proofrolling operation shall be filled with suitable material and those filled areas shall be proofrolled with six passes of the roller. If, after having been filled and proofrolled, the subgrade areas that still "pump" or "rut", shall be further evaluated by a geotechnical engineer and remedial work be determined based on the conditions found at locations under structures or pavement. The contractor shall execute remedial work determined by the geotechnical engineer to achieve a subgrade acceptable to the Engineer.
5. After the proofrolled subgrade has been accepted by the Engineer, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 1/4-inch at

every point.

6. Conduits, pipes, culverts and underdrains shall be neither disturbed nor damaged by proofrolling operations. Rollers shall neither pass over, nor approach closer than five feet to, conduits, pipes, culverts and underdrains unless the tops of those products are deeper than three feet.

C. Placement

1. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed in accordance with this Section. The area shall then be scarified to a depth of at least 6-inches.
2. Fill materials shall be placed in continuous, approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practical and having an uncompacted thickness of not over 8-inches.

D. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

E. Excess Material: Surfaces and slopes of waste fills shall be left smooth and free to drain.

F. Moisture

1. Fill materials shall be placed at optimum moisture content within practicable limits, but not less or more than two percent of optimum. Optimum moisture shall be maintained by sprinkling the layers as placed or by allowing materials to dry before placement.
2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.
3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

### **3.08 BACKFILLING**

A. Backfill carefully to restore the ground surface to its original condition. Dispose of excess material in accordance with this Section.

B. Compact backfill underlying roadways, parking areas, sidewalks, structures and buildings in accordance with the requirements of Article 3.06 of this Section.

C. Backfilling Around Structures

1. General

- a. Remove debris from excavations before backfilling.
- b. Do not backfill against foundation walls until so directed by the Engineer nor until all indicated perimeter insulation and/or waterproofing is in place.
- c. Protect such insulation and/or waterproofing during filling operations.

- d. Do not backfill against water retaining structures until successful leakage tests have been completed.
  - e. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.
  - f. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.
  - g. Backfilling against walls shall take place after all the concrete in the affected members has attained the specified strengths.
  - h. To prevent excessive lateral pressure on external walls, large compaction equipment shall not be allowed within a zone wall footing.
2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

### **3.09 GRADING**

- A. General: Perform all rough and finish grading required to attain the elevations indicated on the Drawings. Perform finish grading to an accuracy of  $\pm 0.10$  foot.
- B. Treatment After Completion of Grading
  - 1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the Engineer.
  - 2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

### **3.09 SETTLEMENT**

- A. The Contractor shall be responsible for all settlement of backfill, fills and embankments which may occur within one year after final acceptance of the Work by the Owner.
- B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

### **3.13 CLEAN-UP**

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

### **END OF SECTION**

**SECTION 31 10 00**  
**SITE PREPARATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Selective demolition of built site elements.
- B. Clearing and protection of vegetation.
- C. Removal of existing debris.

**1.02 RELATED SECTIONS**

- A. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- B. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- D. Section 01 74 19 - Waste Management: Limitations on disposal of removed materials; requirements for recycling.
- D. Section 31 11 00- Clearing and Grubbing.
- E. Section 31 22 00 - Grading
- F. Section 31 23 16 - Excavation.
- G. Section 31 23 23.13 – Backfill and Compaction.
- H. Section 31 25 00- Erosion and Sediment Control.

**1.03 REFERENCES**

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2009.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
  - 1. Vegetation removal limits.
  - 2. Areas for temporary construction and field offices.
  - 3. Areas for temporary and permanent placement of removed materials.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

**1.05 PROJECT CONDITIONS**

- A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- B. Comply with other requirements specified in Section 01 70 00.

**PART 2 PRODUCTS**

**PART 3 EXECUTION**

**3.01 EXISTING UTILITIES**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.

- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least seven (7) days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least three (3) days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

### **3.02 VEGETATION**

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be improved.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Do not remove or damage vegetation beyond the following limits:
  - 1. Limits of Disturbance as illustrated on Construction Drawings
  - 2. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
  - 3. Exception: Specific trees and vegetation indicated on drawings to be removed.
  - 4. Exception: Selective thinning of undergrowth specified elsewhere.
- D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- E. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
  - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
  - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
  - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
  - 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
  - 5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

### **3.03 DEBRIS**

- A. Remove debris, junk, and trash from site.

### **3.04 WASTE REMOVAL**

- A. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

### **3.05 MEASUREMENT AND PAYMENT**

- A. No separate measurement or direct payment will be made for the work under this section and all costs for same shall be included in the overall lump sum bid for this project.

**END OF SECTION**

**SECTION 31 11 00**  
**CLEARING AND GRUBBING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work included: Remove all organic vegetative mater as required to complete the construction is indicated on the construction plans.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Section 31 10 00 – Site Preparation.
  - 3. Section 31 25 00 – Erosion and Sediment Control.
  - 4. Section 32 92 00 – Turf and Grasses.

**1.02 QUALITY ASSURANCE**

- A. Use required number of workmen that are properly trained and have experience in the crafts and who are completely familiar with the specified requirements herein and the methods for proper performance of the work specified in this section.
- B. Use the proper equipment that is adequate in size, capacity and numbers to accomplish the work within the timeframe of the Project schedule.
- C. Comply with requirements of governmental agencies having jurisdiction within the Project area.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.01 AREA INCLUDED**

- A. All areas where new construction is taking place, or as illustrated on the plans.

**3.02 PROCEDURES**

- A. Clearing and grubbing: The entire area within the limits described above shall be cleared and grubbed.
- B. Areas that are to be selectively cleared shall consist of removing vegetation, brush, stumps, etc., from the area. Special care shall be taken to avoid damage to trees that are left. Grubbing will not be required in areas designated for selective clearing.
- C. Removal of trees and shrubs: All trees being taken down must be removed avoiding damage to trees and existing features that are to remain. All parts of the trees being removed are to be completely taken from the site and properly disposed of. Any shrubs or small trees that are undesirable may be selectively removed as directed.
- D. Stumps and roots: All stumps and roots larger than 2-inches in diameter shall be completely removed by grubbing except in areas of building site, parking areas and drives; they must be cut off no less than 18-inches below any subgrade. The area of operation then shall be cleared of resulting debris and matted roots, weeds and other organic matter shall be hauled away from the site. Generally, all material that cannot be compacted to 90-percent maximum density in lawn areas and 95-percent of maximum density elsewhere must be removed.
- E. Protection of trees: Trees that are to remain in place will need to be protected in areas where earthwork cut or fill is eighteen inches or less and in existing parking areas. Contractor must obtain approval from Engineer prior to removal of significant trees covered by local tree ordinances. Existing trees that are remaining in place during and after construction must be protected by constructing barricades around each tree.
- F. Erosion and Sediment Control: Construct and maintain erosion and sediment control devices as illustrated on the construction plans and in accordance with Section 31 25 00 of these specifications.

### **3.03 MEASUREMENT AND PAYMENT**

- A. Payment will be made at the unit price per "Acre" as stated in the Bid Form for Clearing and Grubbing.

**END OF SECTION**

## **SECTION 31 22 00**

### **GRADING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Work included: Cut, fill, excavate, backfill, compact and grade the site as necessary to bring the Building Pad, BMP Basins, and open areas to the lines and grades shown on the drawings.
  - 1. The work includes, but is not necessarily limited to:
    - a. Building Pad
    - b. Construction and lining of treatment basins.
  - 2. Subsurface Classification: All excavation is unclassified and excavation of every description, regardless of material encountered within the grading limits of the project, shall be performed to the lines and grades indicated.
- B. Removal and storage of topsoil.
- C. Rough grading the roadway alignment and pump station site for improvements.
- D. Spread the topsoil and finish grading to slopes and open spaces.

##### **1.02 RELATED REQUIREMENTS**

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these specifications.
- B. Section 02 30 00 - Subsurface Investigation.
- C. Section 31 10 00 – Site Preparation.
- D. Section 31 11 00 – Clearing and Grubbing.
- E. Section 31 23 16 – Excavation.
- F. Section 31 23 23.13 – Backfill and Compaction.
- G. Section 31 25 00 – Erosion and Sediment Control.
- H. Section 32 11 23 – Aggregate Base Course.
- I. Section 32 92 00 – Turf and Grasses.

##### **1.03 DEFINITIONS:**

- A. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.
- B. Maximum density: Maximum weight in pounds per cubic foot of a specific material.
- C. Optimum moisture: Percentage of water in a specific material at maximum density.
- D. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be removed by dragline, dredge or other special equipment, are designated as muck. No extra payment will be made for muck removal.
- E. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technician. In addition to organic matter, sod, muck, roots and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
- F. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.
- G. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil

Classification types SW, SM, GW or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2-inches in diameter.

- H. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.
- I. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

#### **1.04 SUBMITTALS**

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with the Lexington County Department of Public Works and the South Carolina Department of Transportation (SCDOT) standards.
  - 1. Maintain one copy on site.
- B. 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.
- C. Comply with requirements of governmental agencies having jurisdiction.
- D. A testing laboratory retained by the Owner will make such tests as are deemed advisable. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts of fill material and shall keep the laboratory informed of his progress. The cost of the initial tests shall be paid for by the Owner. Subsequent tests required as a result of improper compaction shall be paid for by the Contractor.

#### **1.06 PROJECT CONDITIONS**

- A. Protect above- and below-grade utilities that remain.
- B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.
- C. The Contractor must determine for himself the volume of material required by the site.

#### **1.07 PRODUCT HANDLING**

- A. Comply with pertinent provisions of Section 01 60 00.

#### **1.08 JOB CONDITIONS**

- A. Notification of intent to excavate:
  - 1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil penalty of up to one thousand dollars (\$1,000) for each violation of the Act.
  - 2. Notification of intent to excavate may be given by calling this toll-free number: 811.

### **PART 2 PRODUCTS**

#### **2.01 SOIL MATERIALS**

- A. General:
  - 1. Soil material used as fill, backfill, subgrade for structures or pavements, embankments, or site grading shall consist of suitable material as found available on site until such supply of on-site material is depleted.
    - a. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6-inches in greatest dimension, and with not more than 15-percent of the rocks or lumps larger than 2-1/2-inches in their greatest dimension.

- b. Do not permit rocks having a dimension greater than 1-inch in the upper 6-inches of fill or embankment.
  - 2. Should the quantity of suitable on-site material be insufficient to complete the work, suitable borrow material as approved by the Engineer shall be provided by the Contractor at no additional expense to the Owner.
  - 3. Select materials may be provided from on-site if acceptable material as approved by the Engineer is available on site. Otherwise approved select material shall be provided by the Contractor from an off-site source
- B. Topsoil:
- 1. Use topsoil consisting of material removed from the top 3-inches to 6-inches of existing on-site soils.
  - 2. Use topsoil containing no stones, roots or large clods of soil.
  - 3. Stockpile topsoil separate from other excavated material.
- C. Other Fill Materials:

## **2.02 SPECIAL SOIL MATERIALS**

- A. Provide basin liner soils consisting of fine-grained soils selected from excavated area or approved borrow sites, stockpiled and then placed and compacted in areas to receive liner.
- B. Sufficient material for the liner, as selected by the Engineer, shall be stockpiled, kept separate from other excavated materials and piled free of undesirable materials.

## **2.03 WEED KILLER**

- A. Provide a dry, free-flowing, dust free chemical compound, soluble in water, capable of inhibiting growth of vegetation and approved for use on this work by governmental agencies having jurisdiction.

## **2.04 EQUIPMENT**

- A. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner without undue waste or damage of material.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Surface Conditions:
  - 1. 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.

## **3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.
- E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- G. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- H. Clearing and grubbing: Clear and grub areas to be graded prior to commencement of the grading operations.
- I. Where so directed by the Owner, protect and leave standing designated desirable trees.

- J. Complete any demolition and/or removal work as may be required prior to grading operations.
- K. Dispose of all clearing, grubbing and demolition debris and other deleterious material off the project site. Vegetation, roots, brush, rubbish, stumps, etc. may be burned on-site where permitted by local authorities and regulations and approved by the Engineer.
- L. Topsoil: Strip topsoil to a depth of 3-inches to 6-inches without contamination from the subsoil and stockpile topsoil separate from other excavated materials.
  - 1. Transport and deposit topsoil in storage piles convenient to areas that are to receive topsoil or in other locations as indicated or approved by the Engineer.
  - 2. Deposit topsoil in areas that are already graded and will not be disturbed by on-going construction.
  - 3. Dispose of unsuitable or unusable stripped material off-site or as otherwise directed by the Engineer.
- M. Sampling and preliminary testing:
  - 1. Prior to beginning the grading operations, the Contractor shall submit to the Engineer his proposed sequence of excavation operations.
  - 2. Based upon the sequence of excavation, samples of the fill materials will be obtained as excavation proceeds and tested for grain size permeability and moisture density relationship using the Standard Proctor Method (ASTM D698, Method A).
  - 3. Allow sufficient time for completion of laboratory tests before any fill operations begin, using the soils being tested.

### **3.03 ROUGH GRADING**

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.
- G. Suitable excavated materials:
  - 1. Use all suitable materials removed from the excavation as far as practicable in the formation of the embankments, subgrades, shoulders, building sites and other places as directed.
  - 2. Unless otherwise indicated on the drawings or approved by the Engineer, surplus suitable material shall be removed from the site and disposed of by the Contractor.
- H. Unsuitable excavated material: Remove from the site and dispose of all unsuitable material unless otherwise approved by the Engineer.
- I. Unauthorized excavation:
  - 1. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.
  - 2. Unauthorized over excavation shall be backfilled and compacted without any additional expense to the Owner.
- J. In the event that it is necessary to remove unsuitable material to a depth greater than that shown on the drawings or otherwise specified, the Contractor, upon receiving direction from the Engineer, shall remove, replace and compact such material as directed by the Engineer at no additional expense by the Owner.
- K. Filling and Backfilling
  - 1. Use fills formed of suitable material placed in layers of not more than 8-inches in depth measured loose and rolled and/or vibrated with suitable equipment until compacted.

2. Do not place rock that will not pass through a 6-inch diameter ring within the top 12-inches of the surface of the completed fill or rock that will not pass through a 2-inch diameter ring within the top 6-inches of the completed fill.
  3. Do not use broken concrete or asphaltic pavement in fills.
  4. Selection of borrow material:
    - a. Material in excess of that available on the site shall be suitable material furnished by the Contractor from private sources selected by the Contractor. The material shall be approved by the Engineer before use. All expenses involved in securing, developing, transporting and placing the material shall be borne by the Contractor.
- L. Placing and compacting:
1. Place backfill and fill materials in layers not more than 8-inches in loose depth.
  2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
  3. Compact each layer to required percentage of maximum density for the area.
  4. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
  5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
  6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.
- M. Moisture control:
1. Do not use soil material that is either too dry or too wet to achieve proper compaction.
  2. Where subgrade or layer of soil material is too dry to achieve proper compaction, uniformly apply water to surface of soil material such that free water does not appear on the surface during or subsequent to compacting operations.
  3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
  4. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the Engineer.
- N. Compaction requirements:
1. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor).
  2. Beneath Roadways:
 

|                              |     |
|------------------------------|-----|
| a. Top 12-inches of Subgrade | 98% |
| b. All other fill material   | 95% |
  3. Embankments:
 

|                              |     |
|------------------------------|-----|
| a. Top 12-inches of Subgrade | 98% |
| b. All other fill material   | 95% |
  4. Lawns and unpaved areas:
 

|                            |     |
|----------------------------|-----|
| a. All other fill material | 90% |
|----------------------------|-----|
- O. Placing of Special Materials:
1. Placing impervious liner materials:
    - a. Place selected fine grain soils on bottom and side slopes of the basin to the indicated depth.
    - b. Inspect and proofroll the stripped and grubbed subgrade prior to placement of any liner material, as specified hereinafter.
    - c. Spread liner material in 8-inches maximum, loose lift thickness to provide a 6-inches compacted lift thickness.
    - d. Adjust soil moisture content to 1 to 3 percentage points "wet" of the optimum moisture contents.
    - e. Compact at 98-percent of maximum density.

- f. Maintain liner material sufficiently moist to prevent drying and cracking, until such time as the basin is filled.
- P. See Section 31 23 23.13 for filling procedures.
- Q. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

### **3.04 SOIL REMOVAL**

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.

### **3.05 FINISH GRADING**

- A. General:
  - 1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
  - 2. Smooth the finished surfaces within specified tolerance.
  - 3. Grade with uniform levels or slopes between points where elevations are shown on the drawings, or between such points and existing grades.
  - 4. Where a change of slope is indicated on the drawings, construct a rolled transition section having a minimum radius of approximately 8-feet and 0-inches, unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.
- B. Before Finish Grading:
  - 1. Verify building and trench backfilling have been inspected.
  - 2. Verify subgrade has been contoured and compacted.
- C. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- D. Grading adjacent to structures: Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.
- E. Ditches and gutters and swales:
  - 1. Cut accurately to the cross sections, grades and elevations shown.
  - 2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the work.
  - 3. Dispose of excavated materials as specified herein; do not in any case deposit materials within 3-feet and 0-inches of the edge of a ditch.
- F. Upon completion of site grading and other related site work, topsoil shall be uniformly spread over the graded or improved areas. Topsoil shall be evenly distributed to conform to final grade elevations shown on the plans.
- G. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- H. Place topsoil to the following compacted thicknesses:
  - 1. Areas to be Seeded with Grass not less than: 3 inches.
  - 2. Areas to be Sodded: 4 inches.
  - 3. Shrub Beds: 18 inches.
  - 4. Flower Beds: 12 inches.
- I. Place topsoil during dry weather.
- J. Remove roots, weeds, rocks, and foreign material while spreading topsoil.
- K. Near plants spread topsoil manually to prevent damage.
- L. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- M. Lightly compact placed topsoil.
- N. Any surplus topsoil materials shall be disposed of in approved areas on the site.

### **3.06 TOLERANCES**

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

### **3.07 REPAIR AND RESTORATION**

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Engineer as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.
- D. Construct areas outside of building or structure lines true to grades shown.
  - 1. Where no grade is indicated, shape finish surface to drain away from buildings or structures, as approved by the Engineer.
- E. Degree of finish shall be that ordinarily obtainable from blade grader, supplemented with hand raking and finishing.

### **3.08 FIELD QUALITY CONTROL**

- A. See Section 31 23 23.13 for compaction density testing and the following:
- B. Secure the Engineer's construction review and observation and approval of subgrades and fill layers before subsequent construction is permitted thereon.
- C. Field density determinations will be made, at no cost to the Contractor, to ensure that the specified densities are being obtained. Field density tests will be performed as determined by the Engineer, considering the following:
  - 1. At areas to receive paving, at least one field density test for every 5,000 sq. ft. of subgrade area, but not less than three tests.
  - 2. In each compacted fill layer, one field density test for every 5,000 sq. ft. of overlaying paved area, but not less than three tests.
  - 3. In fill beneath structures, one field density test for every 2,500 sq. ft. in each layer.
  - 4. Other tests as deemed necessary by the Engineer.
- D. If, in the Engineer's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing until specified requirements are met.
  - 1. Additional testing will be provided by the Owner's selected testing laboratory and all costs for the additional testing will be borne by the Contractor.
- E. Proofrolling:
  - 1. The Contractor shall proofroll subgrade of areas to receive paving, structures on fill or impervious lining material.
    - a. Make not less than three (3) passes of a 25 to 50 ton rubber tired roller over the full area.
    - b. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory materials, compacted as specified herein.

### **3.09 CLEANING**

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.
- C. Existing utilities:
  - 1. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly notify the Engineer and take necessary steps to assure that service is not interrupted.
  3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
  4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
  5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- D. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.
  2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
  3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.
- E. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- F. Maintain access to adjacent areas at all times.
- G. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

### **3.10 MAINTENANCE**

- A. Protection of newly graded areas:
1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
  2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

### **3.11 MEASUREMENT AND PAYMENT**

- A. No separate measurement or direct payment will be made for the items under this Section and all costs for same shall be included in the lump sum price bid for the project.

**END OF SECTION**

**SECTION 31 23 16**  
**EXCAVATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavating for Building Pad and Storm Drainage.

**1.02 RELATED REQUIREMENTS**

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.
- B. Section 01 70 00 – Execution Requirements: General requirements for dewatering of excavations and water control.
- C. Section 02 30 00 – Subsurface Investigation.
- D. Section 31 10 00 – Site Preparation.
- E. Section 31 22 00 – Grading.
- F. Section 31 23 23.13 – Backfill and Compaction.
- G. Section 31 25 00 – Erosion and Sediment Control.
- H. Section 31 37 00 – Riprap.
- I. Section 33 41 00 – Storm Drainage Piping.

**1.03 PROJECT CONDITIONS**

- A. Verify that survey benchmarks and intended elevations for the Work are as indicated.
- B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

**1.04 CLASSIFICATION:**

- A. Classification: All excavation is unclassified and excavation of every description, regardless of material encountered within the excavation limits of the structure, shall be performed to the lines and grades indicated.

**1.05 DEFINITIONS:**

- A. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.
- B. Maximum density: Maximum weight in pounds per cubic foot of a specific material.
- C. Optimum moisture: Percentage of water in a specific material at maximum density.
- D. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck. No extra payment will be made for muck removal.
- E. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, muck, roots, and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
- F. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.
- G. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil

Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2-inches in diameter.

- H. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C 33.
- I. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

#### **1.06 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. Comply with requirements of governmental agencies having jurisdiction.
- C. Testing: A testing laboratory retained by the Owner will make such tests as are deemed advisable.
  - 1. Schedule fill and backfill operations so as to permit a reasonable time for inspection and testing before placing succeeding lifts and keep the laboratory and Engineer informed of progress.
  - 2. Notify the Engineer and allow sufficient time for observation and/or testing of foundation subgrades prior to commencing any work on the exposed excavation.
  - 3. Contractor shall be responsible for coordination and fees associated with Construction Materials Testing Services associated with the Construction of the proposed Speculative Building.

#### **1.07 JOB CONDITIONS**

- A. If conditions encountered during construction warrant additional removal of unsuitable material below foundation subgrades, then remove unsuitable material and replace it as specified at no additional expense to the Owner.

#### **1.08 PRODUCT HANDLING**

- A. Comply with pertinent provisions of Section 01 60 00.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

#### **3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 10 00 for additional requirements.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Protect plants, lawns, rock outcroppings, and other features to remain.

#### **3.03 EXCAVATING**

- A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Preparation for Piling Work: Excavate to working elevations. Coordinate special requirements for piling.
- C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- D. Do not interfere with 45 degree bearing splay of foundations.

- E. Cut utility trenches wide enough to allow inspection of installed utilities.
- F. Hand trim excavations. Remove loose matter.
- G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 22 00.
- I. Conform to elevations and dimensions shown within a tolerance of 0.10-feet, and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for construction observation.
- J. Where earth will stand, shallow footing excavations may be cut to the exact size of the footing.
- K. Separate suitable materials and stockpile for future use.
- L. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- M. Remove excavated material that is unsuitable for re-use from site.
- N. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 10 00.
- O. Remove excess excavated material from site.

### **3.04 FOUNDATION SUBGRADES**

- A. Excavate foundations and footings to a level bottom in firm, solid, suitable material.
- B. Take care not to disturb the bottom of the excavation unless further compaction of the subgrade is required.
- C. Notify the Engineer in due time to permit observation of the completed excavation prior to performing work on the foundation subgrade.
- D. Should unsuitable or soft material be encountered at subgrade elevation, remove such material and replace with compacted suitable material or crushed stone from firm earth up to the indicated elevation.
  - 1. In wet excavations or where groundwater is normally present, replace unsuitable material with crushed stone or lean concrete.
  - 2. In dry excavations above the normal groundwater level, replace unsuitable material with compacted suitable material.
  - 3. Unsuitable material shall be removed and replaced at no expense to the Owner.
  - 4. Where rock is encountered at foundation level:
    - a. Use drilling, picking, wedging or similar methods leaving the foundation rock in an entirely solid and unshattered condition.
    - b. Roughen approximately level surfaces to provide satisfactory bond with concrete.
    - c. Cut steps or benches in sloped surfaces to provide satisfactory bond.

### **3.05 DRAINAGE**

- A. Provide drainage and control grading in the vicinity of the work to prevent drainage into the excavation.

### **3.06 UNAUTHORIZED EXCAVATION**

- A. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.
- B. Backfill and compact unauthorized over excavation at no expense to the Owner.
  - 1. In wet excavations or excavations below normal groundwater elevations: Use crushed stone or lean concrete as directed by the Engineer.
  - 2. In dry excavations above normal groundwater elevations: Use compacted suitable material.

### **3.07 DEWATERING**

- A. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.

- B. Maintain the water level below the excavation subgrade during excavation and construction.
  - 1. Material disturbed below the foundation subgrade due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.
  - 2. Use sumps, pumps, drains, trenching or well point system as necessary to maintain a dry excavation.
  - 3. Dewatering by trench pumping will not be permitted if migration of fine-grained natural material (running sand) from bottom, side walls or bedding material will occur.
- C. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.
  - 1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
  - 2. Prevent flooding of streets, roadways, or private property.
  - 3. Provide engines driving dewatering pumps with residential type mufflers.

### **3.08 FIELD QUALITY CONTROL**

- A. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

### **3.09 PROTECTION**

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.
- D. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
- E. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly notify the Engineer and take necessary steps to assure that service is not interrupted.
- F. Barricade open holes and depressions occurring as part of this work, and post warning lights on property adjacent to or with public access. Operating warning lights during hours from dusk to dawn each day and as otherwise required.
- G. Side slopes: Slope, bench and/or shore sides of excavations and trench walls to maintain stability of the wall or sides. Pile materials obtained from the excavation a minimum of four feet from the edge of the excavation.
- H. Shoring and sheeting: Where necessary, shore and sheet excavations with members of sizes and arrangement sufficient to prevent injury to persons, damage to structures or injurious caving or erosion.
  - 1. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage. Any movement or bulging that may occur shall be corrected immediately by the Contractor. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted.
  - 2. Take all precautions to prevent distress of existing structures because of sheeting installation or removal. Where the removal of sheeting may cause damage to existing or newly constructed structures, such sheeting shall be left in place at no expense to the Owner.
  - 3. All sheeting and shoring operations and maintenance thereof shall be the responsibility of the Contractor.

### **3.10 MEASUREMENT AND PAYMENT**

- A. No separate measurement or direct payment will be made for the work under this section and all costs for same shall be included in the lump sum price bid.

**END OF SECTION**

## **SECTION 31 23 23.13**

### **BACKFILL AND COMPACTION**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Filling, backfilling and compacting.

##### **1.02 RELATED SECTIONS**

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Sections in Division 01 of these Specifications.
- B. Section 02 30 00 – Subsurface Investigation.
- C. Section 31 22 00 – Grading.
- D. Section 31 23 16 – Excavation.
- E. Section 31 25 00 – Erosion and Sedimentation Control.
- F. Section 31 37 00 – Riprap.
- G. Section 03 40 00 – Precast Concrete.

##### **1.03 REFERENCES**

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).
- B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.
- C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2000a.
- D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.
- E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 2002
- F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994(R 2001).
- G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.
- H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

### **BACKFILL AND COMPACTION**

- J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils; 2005.

#### 1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.
- C. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.
- D. Maximum density: Maximum weight in pounds per cubic foot of a specific material.
- E. Optimum moisture: Percentage of water in a specific material at maximum density.
- F. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck. No extra payment will be made for muck removal.
- G. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, muck, roots and rubbish, highly plastic clay soils of the CH and MH descriptions and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
- H. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.
- I. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2 inches in diameter.
- J. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C 33.

#### 1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Samples: 10 lb (4.5 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

## **1.06 PROJECT CONDITIONS**

- A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.

## **1.07 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. Comply with requirements of governmental agencies having jurisdiction.
- C. Testing: A testing laboratory, retained by the Contractor and approved by the Owner, will make such tests as are deemed advisable.
  - 1. Schedule fill and backfill operations so as to permit a reasonable time for inspection and testing before placing succeeding lifts and keep the laboratory and Engineer informed of progress.
  - 2. Notify the Engineer and allow sufficient time for observation and/or testing of foundation subgrades prior to commencing any work on the exposed excavation.

## **1.08 JOB CONDITIONS**

- A. Comply with pertinent provisions of Section 01 60 00 – Product Requirements.

## **PART 2 PRODUCTS**

### **2.01 SOIL MATERIAL GENERAL**

- A. Soil material used as fill, backfill or subgrade for structures shall consist of suitable material.
  - 1. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6 inches in greatest dimension and with not more than 15% of the rocks or lumps larger than 2-1/2 inches in their greatest dimension.
  - 2. Do not permit rocks having a dimension greater than 1 inch in the upper 6 inches of fill or subgrade.
- B. Where select material is indicated on the drawings or specified, use select granular material as defined herein and approved by the Engineer.
- C. Where indicated on the drawings or specified, use gravel or crushed stone as defined herein.

## **BACKFILL AND COMPACTION**

- D. Where indicated on the drawings or otherwise where desired, provide a lean concrete "mud slab" beneath foundations.
- E.
  - 1. Use 2000 psi concrete and a minimum thickness of 2-1/2 inches.
  - 2. With prior approval of the Engineer, a "mud slab" may be substituted for gravel base material except where the gravel base is required for drainage or for use with pressure relief valves.

## **2.02 FILL MATERIALS**

- A. General Fill: Subsoil excavated on-site.
  - 1. Graded.
  - 2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm) and debris.
  - 3. Conforming to ASTM D 2487 Group Symbol CL.
- B. Granular Fill - Fill Type #57: Coarse aggregate, conforming to State of South Carolina Highway Department standard.

## **2.03 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Identify required lines, levels, contours and datum locations.

### **3.02 PREPARATION**

- A. Scarify subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### **3.03 FILLING AND BACKFILLING**

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.

## **BACKFILL AND COMPACTION**

- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 2 inches in 10 ft (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Correct areas that are over-excavated.
  - 1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- G. Compaction Density Unless Otherwise Specified or Indicated.
- H. Reshape and re-compact fills subjected to vehicular traffic.
- I. Use suitable material for all filling and backfilling operations.
- J. Fill under structures: Deposit suitable material in layers not exceeding 8" in depth and compact each layer using proper equipment.
- K.
  - 1. Do not place rock that will not pass through a 6-inch diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3-inch diameter ring within the top 6 inches of the completed fill.
  - 2. Do not place broken concrete, bricks, or asphaltic pavement in fills.
  - 3. Where indicated on the drawings, provide select granular material.
- L. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:
  - 1. Inspection and acceptance of construction below finish grade including, where applicable, damp proofing and waterproofing.
  - 2. Inspecting, testing, approving and recording locations of underground utilities.
  - 3. Removing concrete formwork.
  - 4. Removing shoring and bracing and backfilling of voids with satisfactory materials.
  - 5. Removing trash and debris.
  - 6. Foundation walls have been in place seven days.
- M. Placing and compacting:
  - 1. Place backfill and fill materials in layers not more than 8 inches in loose depth.
  - 2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content within  $\pm 2\%$ .
  - 3. Compact each layer to required percentage of maximum density for area.
  - 4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

#### BACKFILL AND COMPACTION

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
7. Do not operate heavy equipment closer to foundation or retaining walls than a distance equal to height of backfill above the footing.
  - a. Compact remaining area using power driven hand tampers.
8. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

### **3.04 FILL AT SPECIFIC LOCATIONS**

- A. Over Buried Utility Piping, Conduits and Duct Bank in Trenches:
  1. Bedding: Use general fill.
  2. Cover with general fill.
  3. Fill up to subgrade elevation.
  4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.
- B. At Lawn Areas:
  1. Use general fill.
  2. Fill up to 6 inches (150 mm) below finish grade elevations.
  3. Fill up to subgrade elevations.
  4. Compact to 95 percent of maximum dry density.
  5. See Section 31 22 00 - Grading for topsoil placement.

### **3.05 COMPACTION REQUIREMENTS**

- A. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor).
- B. Existing in place subgrade below structures where subgrade has been disturbed by water, improper dewatering, or construction traffic.
  1. Top 12 inches of subgrade: 100%
  2. Below top 12 inches of subgrade: 98%
- C. Fill beneath structures and beneath an area extending 10 feet beyond the limits of the foundation:
  1. Top 12 inches of subgrade: 100%

2. Below top 12 inches of subgrade: 98%
- D. Compaction of suitable material used to replace unsuitable material below foundation subgrades:
1. Top 12 inches of subgrade: 100%
  2. Below top 12 inches of subgrade: 98%

### **3.06 BACKFILLING, FILLING AND COMPACTION**

- A. Use suitable material for all filling and backfilling operations.
- B. Fill under structures: Deposit suitable material in layers not exceeding 8 inches in depth and compact each layer using proper equipment.
1. Do not place rock that will not pass through a 6-inch diameter ring within the top 12 inches of the surface of the completed fill or rock that will not pass through a 3-inch diameter ring within the top 6 inches of the completed fill.
  2. Do not place broken concrete, bricks, or asphaltic pavement in fills.
  3. Where indicated on the drawings, provide select granular material.
- C. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:
1. Inspection and acceptance of construction below finish grade including, where applicable, damp proofing and waterproofing.
  2. Inspecting, testing, approving and recording locations of underground utilities.
  3. Removing concrete formwork.
  4. Removing shoring and bracing and backfilling of voids with satisfactory materials.
  5. Removing trash and debris.
  6. Foundation walls have been in place seven days.
- D. Placing and compacting:
1. Place backfill and fill materials in layers not more than 8 inches in loose depth.
  2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content within  $\pm 2\%$ .
  3. Compact each layer to required percentage of maximum density for area.
  4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
  5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
  6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

### **BACKFILL AND COMPACTION**

7. Do not operate heavy equipment closer to foundation or retaining walls than a distance equal to height of backfill above the footing.
  - a. Compact remaining area using power driven hand tampers.
8. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

### **3.07 TOLERANCES**

- A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations

### **3.08 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Secure the Engineer's construction observation and approval of subgrades and fill layers before subsequent construction is permitted thereon.
- C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.
- E. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- F. Frequency of Tests:
  1. At areas to receive paving, at least one field density test for every 5,000 sq.ft. of subgrade area, but not less than three (3) tests.
  2. In each compacted fill layer, one field density test for every 5,000 sq.ft. of overlaying paved area, but not less than three (3) tests.
  3. In fill beneath structures, one field density test for every 2,500 sq.ft. in each layer.
  4. Other tests as deemed necessary by the Engineer
- G. If, the Engineer's opinion based on reports of the testing laboratory, subgrade or fills that have been placed are below specified density, provide additional compacting and testing until specified requirements are met.
  1. Additional testing will be provided by the Owner's selected testing laboratory and all costs for the additional testing will be borne by the Contractor.
- H. Proofrolling:
  1. Upon request by the Engineer, proofroll the subgrade of structure foundations.
    - a. Make not less than three (3) passes of a 25 to 50 ton rubber tired roller over the full area.

## **BACKFILL AND COMPACTION**

- b. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory material and compacted as specified herein.

### **3.09 DEWATERING**

- A. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.
- B. Maintain the water level below the excavation subgrade during excavation and construction.
  - 1. Material disturbed below the foundation subgrade due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.
  - 2. Use sumps, pumps, drains, trenching or well point system as necessary to maintain a dry excavation.
  - 3. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.
- C. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.
  - 1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
  - 2. Prevent flooding of streets, roadways, or private property.
  - 3. Provide engines driving dewatering pumps with residential type mufflers.

### **3.10 CLEAN-UP**

- A. Leave unused materials in a neat, compact stockpile.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.
  - 1. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory material and compacted as specified herein.
- C. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stock

### **3.11 MEASUREMENT AND PAYMENT**

- A. No separate measurement or direct payment will be made for the work under this section and all costs for same shall be included in the lump sum bid.

### **END OF SECTION**

### **BACKFILL AND COMPACTION**

**SECTION 31 25 00**  
**EROSION AND SEDIMENT CONTROL**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Work included: Provide protection of the environment during the construction of this project to reduce soil erosion and siltation to the lowest reasonably achievable level.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Section 31 10 00 – Site Preparation.
  - 3. Section 31 11 00 – Clearing and Grubbing.
  - 4. Section 31 37 00 – Riprap.

**1.02 GENERAL**

- A. Exercise every reasonable precaution, throughout the life of the project, to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground or roadway surfaces, or other property. Erosion control practices to be used for this project are shown on the drawings and are to conform to South Carolina Department of Health and Environmental Control regulations.

**PART 2 - PRODUCTS**

**2.01 CRUSHED STONE**

- A. Provide #57 crushed stone for project entrance and exit.
- B. Provide #57 crushed stone for temporary sediment barriers around inlets and for temporary stone check dams.

**2.02 GRASSING**

- A. Comply with Section 32 92 00 – Turf and Grasses.

**2.03 SILT FENCE**

- A. Posts:
  - 1. Posts shall be self-fastener angle steel, 5-feet in length.
- B. Woven wire shall conform to the requirements of ASTM A 116, Class I zinc coating for wire. Each woven square shall measure 5.33-inches X 12-inches. The top and bottom wires shall be 10 gauge. All other wires shall be 12-1/2 gauge.
- C. Filter fabric shall be Mirafi 700X synthetic fabric or approved equal.

**2.04 EROSION CONTROL BLANKET**

- A. Use Erosion Control Blanket North American Green SC-150 or approved equal on slopes and ditches as represented on the Construction Plans.

**2.05 RIP-RAP**

- A. Comply with Section 31 37 00 – Riprap.

**2.06 FILTER FABRIC (TEMPORARY STONE CHECK DAM)**

- A. Use Stabilenka Filter Fabric (T-140N), Mirafil (140N) or approved equal under all hand placed Riprap or Check Dams.

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. Construct and maintain all erosion control measures until the substantial completion of the project.

### **3.02 TEMPORARY CONSTRUCTION ENTRANCE/EXIT**

- A. Construct a gravel area or pad at points where vehicles enter and leave a construction site.
- B. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade and place gravel to the grade and dimensions shown on the plans.
- C. Construct drainage channels to carry water to a sediment trap or other suitable outlet.
- D. Use geotextile fabrics to improve stability of the foundation in locations subject to seepage or high-water table.
- E. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site by periodic top dressing with two inches of stone.
- F. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary.
- G. Immediately remove objectionable materials spilled, washed, or tracked onto public roadways.

### **3.03 TEMPORARY GRASSING**

- A. Provide a temporary cover for erosion control on disturbed areas that will remain un-stabilized for a period of more than thirty (30) days in accordance with Section 02921.
- B. This practice applies to cleared areas, diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles where vegetation is needed for less than one (1) year.
- C. Provide grassing on slope 5-percent or greater within fourteen (14) days of disturbance. Comply with Section 32 92 00.

### **3.04 SILT FENCE**

- A. Provide silt fence barrier where shown on the plans and on utility construction parallel to the disturbed trench where perpendicular sheet flow runoff occurs on disturbed areas with slopes greater than 4-percent.
- B. Place at the extreme limits of the area to be disturbed as shown.
- C. Construct temporary sediment barriers of filter fabric, buried at the bottom, stretched and supported by posts and install below small disturbed areas as indicated on the drawings to retain sediment by reducing the flow velocity to allow sediment deposition.
- D. Provide spacing between posts 6-feet on center, minimum.
- E. Remove sediment deposits prior to reaching one-third height of the fence.
- F. Monitor site frequently and place additional silt fencing should evidence indicate that erosion is about to occur at locations other than those shown on plan.

### **3.05 EROSION CONTROL BLANKET**

- A. Provide on areas as shown on the plans or on all embankments with slopes equal to or steeper than 3:1.

### **3.06 TEMPORARY STONE CHECK DAMS**

- A. Utilize temporary stone check dams as indicated on the plans or directed by Engineer.
- B. Provide temporary stone check dams constructed of both rip-rap and #57 stone, as illustrated on the plans. Sediment Tubes may be used in place of rock check dams.

### **3.07 MAINTENANCE**

- A. Place all erosion control devices or measures prior to any land disturbing activity within the drainage area they are located.
- B. Periodically check erosion control devices and clean or otherwise remove silt build-up as necessary to maintain them in proper working order.

### **3.08 REMOVAL**

- A. Remove temporary structures after disturbed areas have stabilized.

### **3.09 MEASUREMENT AND PAYMENT**

- A. Payment will be made at the unit price per "Each" as stated in the Bid Form for Erosion and Sediment Control.
- B. Payment will be made at the unit price per "Linear Foot" as stated in the Bid Form for Erosion and Sediment Control.
- C. Payment will be made at the unit price per "Square Yard" as stated in the Bid Form for Erosion and Sediment Control.

**END OF SECTION**

## **SECTION 31 37 00**

### **RIPRAP**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Furnishing all labor, materials, and equipment and performing all operations in conjunction with placing protective coatings of broken stone in accordance with these specifications and in conformity with the lines, grades and thicknesses shown on the plans or established by the Engineer.

##### **1.02 RELATED REQUIREMENTS**

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.
- B. Section 31 25 00 – Erosion and Sediment Control.
- C. Section 31 23 16 – Excavation.
- D. Section 31 23 23.13 – Backfill and Compaction.

##### **1.03 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of South Carolina Department of Transportation Highways standard.
- B. 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.
- C. Maintain one copy of each document on site.

##### **1.04 SUBMITTALS**

- A. Comply with pertinent provisions of Section 01 30 00.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Riprap: Granite type; broken stone; solid and nonfriable; 6-inch minimum size, 12-inch maximum size.
- B. Aggregate: Granular fill as specified in Section 32 11 23.
- C. Filter Fabric
  - 1. Comply with Section 31 25 00.

#### **PART 3 EXECUTION**

##### **3.01 RIP-RAP PLACEMENT**

- A. Place riprap at culvert pipe ends, embankment slopes, and as indicated.
- B. Where thickness is not shown on the plans, it shall be 12-inches.
- C. The slope upon which this rip-rap is to be placed shall conform with the cross section shown on the plans or as directed by the Engineer.
- D. Properly compact depressions that may be filled in trimming and shaping the slope.
- E. Install filter fabric, lapping sides 12-inches.
- F. Begin placing in a trench at least 2-feet below the toe of the slope.
- G. Firmly imbed against the slope and the adjoining piece with the sides in contact and with broken joints.
- H. Fill the spaces between the larger pieces with spalls of suitable size, thoroughly ram into place.
- I. The finished surface shall present an even, tight surface true to line, grade and section.

### **3.02 MEASUREMENT AND PAYMENT**

- A. Payment will be made at the price per "Square Yard" as stated in the Bid Form for Riprap.

**END OF SECTION**

**SECTION 32 11 23**  
**AGGREGATE BASE COURSE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Stone Base Course.

**1.02 RELATED REQUIREMENTS**

- A. Documents affecting work of this Section include, but are not necessarily limited to Sections in Division 1 of these Specifications.
- B. Section 31 22 00 – Grading: Preparation of site for base course.
- C. Section 31 23 23.13 – Backfill and Compaction: Topsoil fill at areas adjacent to aggregate base course.

**1.03 REFERENCE STANDARDS**

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010
- C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012.
- E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 2012.
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

**1.04 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.

**1.05 PRODUCT HANDLING**

- A. Comply with pertinent provisions of Section 01 60 00.

**1.06 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.

- D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. Aggregate Storage, General:
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey benchmarks and intended elevations for the Work are as indicated.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Coarse Aggregate Type retained on No. 4 sieve: Coarse aggregate, conforming to State of South Carolina Highway Department standard.
  - 1. Furnish a coarse aggregate consisting of hard, durable particles of stone, reasonably free from soft, thin, elongated or laminated pieces and deleterious substances.
  - 2. Furnish aggregate with an abrasion loss of less than 65% as measured by the Los Angeles Abrasion Test.
- B. Fine Aggregate: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
  - 1. Furnish a fine aggregate consisting of material produced by stone crushing operations.
  - 2. Liquid limit shall not exceed 25 and the plasticity index shall not exceed 6 when tested in accordance with AASH TO T-89 and T-90, respectively.
  - 3. Grade in accordance with ASTM D2487 Group Symbol SW.
  - 4. Graded in accordance with ASTM C136; within the following limits:
    - a. No. 4 sieve: 100 percent passing.
    - b. No. 14 sieve: 10 to 100 percent passing.
    - c. No. 50 sieve: 5 to 90 percent passing.
    - d. No. 100 sieve: 4 to 30 percent passing.
    - e. No. 200 sieve: 0 percent passing.
- C. Composite Mixture:
  - 1. Produce in one crushing operation or by blending the fine and coarse aggregate in proper proportions.
  - 2. Graded in accordance with ASTM C136; within the following limits:
    - a. No. 2-0" Sieve 100 Percent Passing
    - b. No. 1-1/2" Sieve 95-100 Percent Passing
    - c. No. 1-0" Sieve 70-100 Percent Passing
    - d. No. 0-1/2" Sieve 48-75 Percent Passing
    - e. No. 4 Sieve 30-50 Percent Passing
    - f. No. 30 Sieve 11-30 Percent Passing
    - g. No. 200 Sieve 0-12 Percent Passing
    - h. Liquid Limit 25 max.
    - i. Plasticity Index 6 max.
- D. Provide Aggregate Type Materials that comply with Section 305 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.

#### **2.02 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

- C. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance will be provided before delivery to site.
- D. If tests indicate materials do not meet specified requirements, change material and retest.
- E. Provide materials of each type from same source throughout the Work.

### **2.03 PRIME ASPHALT**

- A. Use either MC-30, RC-30, RC-70, or EA-P complying with requirements of Sections 406, 407 and 408 of the South Carolina Department of Transportation specifications.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

### **3.02 PREPARATION**

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.
- C. Proofroll all areas to receive crushed stone paving.
  - 1. Make not less than three passes over the full area, using a 35 to 50 ton rubber tired roller.
- D. Remove all soft, unstable or unsuitable material that will not compact readily.
  - 1. Remove to full depth of unsuitable material, or to a depth of 30-inches, whichever is less.
  - 2. Replace with satisfactory materials.
- E. Fill all holes, ruts or depressions which develop in the subgrade with approved on-site material, bringing subgrade to indicated line and grades.
- F. Compact subgrade using suitable construction procedures to provide not less than 95% Standard Proctor Maximum Dry Density.
- G. Seal roll the subgrade surface with a steel wheel roller, sealing the surface against excessive water infiltration.
- H. Preparation of Subgrade
  - 1. Proofroll all areas to receive crushed stone paving.
    - a. Make not less than three passes over the full area, using a 35 to 50 ton rubber tired roller.
  - 2. Remove all soft, unstable or unsuitable material that will not compact readily.
    - a. Remove to full depth of unsuitable material, or to a depth of 30-inches, whichever is less.
    - b. Replace with satisfactory materials.
  - 3. Fill all holes, ruts or depressions which develop in the subgrade with approved on-site material, bringing subgrade to indicated line and grades.
  - 4. Compact subgrade using suitable construction procedures to provide not less than 95% Standard Proctor Maximum Dry Density.
  - 5. Seal roll the subgrade surface with a steel wheel roller, sealing the surface against excessive water infiltration.

### **3.03 INSTALLATION**

- A. Spread aggregate over prepared substrate to a total compacted thickness of 6 inches.
- B. Under Bituminous Concrete Paving:
  - 1. Compact to 95 percent of maximum dry density.
- C. Place aggregate in maximum 4-inch layers and roller compact to specified density.
- D. Place aggregates using spreader boxes or other approved spreaders uniformly on one operation.

- E. Take care to avoid segregation of the fine from the coarse aggregate during handling, spreading or shaping operations.
- F. Mix, while at proper moisture, with motor grader or other equipment and maintain to required section and grade until thoroughly compacted.
- G. Level and contour surfaces to elevations and gradients indicated.
- H. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- I. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- J. Perform using 3-wheel steel wheel roller weighing not less than 10-tons, tandem roller weighing at least 8-tons, or other rollers approved by the Engineer.
- K. Start rolling at edges and proceed toward the center, continue rolling until aggregates are firmly keyed or set.
- L. When initial compaction is completed, should voids remain, place fine aggregates on the surface in an amount only sufficient to fill the voids.
- M. Broom, wet and roll until coarse aggregate is set, bonded and thoroughly compacted for full width and depth.
- N. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- O. Apply herbicide to finished surface.

#### **3.04 TOLERANCES**

- A. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 1/2-inch.
  - 1. Depth measurements will be made by digging through the base at intervals no closer than 250-feet, nor greater than 500-feet apart.
  - 2. Where thickness is less than depth specified minus 1/2-inch, it shall be corrected as directed by the Engineer.
- B. Variation From Design Elevation: Within 3/8- inch in 10-feet, parallel to the center line of the roadway nor more than 1/2-inch from a template conforming to the cross-sections illustrated on the Construction Plans.
- C. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

#### **3.05 FIELD QUALITY CONTROL**

- A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.
- F. Allow no traffic on surface until mixture has hardened sufficiently to prevent distortion.

#### **3.06 PLACING PRIME COAT**

- A. Allow base course to season sufficiently to permit uniform penetration.
- B. Do not apply to wet surfaces or when the temperature is below 60°F in the shade and falling, or below 55°F in the shade and rising.
- C. Clean surfaces of all dust, dirt, clay, etc. using mechanical brooms, etc.

- D. Apply prime material, using pneumatic mounted distributors, at a rate of 0.25 to 0.30 gallon per square yard.
- E. Permit no traffic on primed surfaces until bituminous material has penetrated and dried sufficiently that it does not pick up under traffic.

### **3.07 CLEANING**

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.
- D. Allow no traffic on surface until mixture has hardened sufficiently to prevent distortion.

### **3.08 MEASUREMENT AND PAYMENT**

- A. Payment will be made at the unit price "square yard" as stated in the Bid Form for Aggregate Base Course.

**END OF SECTION**

## **SECTION 32 92 00**

### **TURF AND GRASSES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Seeding and Fertilization
- B. Provide grassing for the area specified herein, or as indicated, for a complete and proper installation.

##### **1.02 RELATED REQUIREMENTS**

- A. Documents affecting work in this section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.
- B. Section 31 23 23.13 – Backfill and Compaction.
- C. Section 31 25 00 – Erosion and Sedimentation Control.

##### **1.03 DEFINITIONS**

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnsongrass, Poison Ivy, Nut Sedge, Nimble Will, Blindweed, Bentgrass, Wild Garlic, Perennial Sorrel, and Brome Grass.

##### **1.04 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. Seed: Conform to all State laws and to all requirements and regulations of the South Carolina Department of Agriculture.
  - 1. Deliver to site each variety of seed individually packaged and tagged to show name, net weight, origin, and lot number.
- C. Fertilizer: Conform to State fertilizer law.

##### **1.05 SUBMITTALS**

- A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.
- B. Comply with pertinent provisions of Section 01 30 00 – Administrative Requirements.
- C. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Complete materials list of items proposed to be provided under this Section.
  - 2. Material Safety Data Sheets for all materials to be used.

3. Installation/Application Instructions for all relevant materials (i.e. erosion blankets, hydraulic mulches)

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- C. Comply with pertinent provisions of Section 01 60 00 – Produce Requirements
- D. At time of delivery, furnish the Engineer invoices of all materials received in order that application rates may be determined.
- E. Immediately remove from the site materials that do not comply with the specified requirements, and promptly replace with materials meeting the specified requirements.

### **PART 2 PRODUCTS**

#### **2.01 GRASS SEED**

- A. Provide grass seed that is:
  1. Free from noxious weed seeds
  2. Current year crop seed
  3. Treated with appropriate fungicide at time of mixing
  4. Delivered to the site in sealed containers with dealer's guaranteed analysis
- B. Water: Clean, fresh and free of substances that could inhibit vigorous growth of grass.
- C. Stakes: Softwood lumber, chisel pointed
- D. String: inorganic fiber
- E. Lime and pH Adjustment
  1. For Dry Seeding operations provide agricultural grade, standard ground limestone conforming to the current "Rules, Regulations and Standards of the Fertilizer Board of Control" issued at Clemson University.
  2. For Hydraulic Seeding operations, provide NeutraLime Dry by Profile Products or approved equal to raise pH or Aqua-pHix by Profile Products or approved equal to lower pH at rate determined by soil analysis or at manufacturer's recommended rate.
  3. Bag tags or delivery slip for bulk loads shall indicate brand or trade name, calcium carbonate equivalent, and other pertinent data to identify the lime.

F. Wood Fiber Mulch

1. Provide 100% thermally processed wood fiber or blended 70/30 wood/cellulose fiber manufactured specifically for discharging uniformly on the ground surface when dispersed by a hydro-seeding machine.
2. Material shall contain thermally processed wood fibers so as to contain no germination or growth inhibiting factors and to achieve phyto-sanitization.
3. Material shall contain basic green dye to facilitate visual metering.

G. Flexterra HP-FGM or approved equal

1. Provide Flexterra HP-FGM as manufactured by Profile Products or approved equal.
2. Material shall contain thermally refined wood fibers and crimped synthetic fibers so as to contain no germination or growth inhibiting factors.
3. Materials shall contain non-toxic green dye to facilitate metering.
4. Material shall be 100% Bio-degradable.

H. Straw Mulch/Dry Applied Mulching Pellets

1. Provide straw or hay material.
  - a. Straw to be stalks of wheat, rye, barley or oats.
  - b. Hay to be timothy, peavine, alfalfa, or coastal Bermuda
2. Material to be reasonably dry and reasonably free from mature seed bearing stalks, roots, or bulblets or Johnson Grass, Nutgrass, Wild Onion or any other Noxious weeds detailed in part 1.04 of this Section.
3. Seed Aide Aero® manufactured by Profile Products or approved equal at a rate of 3,000 LBS/ACRE can be used as a weed free alternative to straw mulch.

I. Erosion Control Blanket

1. Provide on areas as shown on the plans
2. Provide Erosion Control Blanket S-2, from Western Excelsior, or approved equal.

**2.02 TESTS**

- A. Provide analysis of topsoil fill under provisions of Section 01 40 00 – Quality Requirements
- B. Analyze to ascertain the percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter, and pH value.
- C. Submit minimum 10 oz (280 g) sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

- D. Testing is not required if recent test are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.
- E. If pH is not in the range of 6.0 to 7.0, adjust accordingly with Lime.
- F. Organic matter must be 2.0% or greater. If organic matter percentage is less than 2%, contractor shall apply JumpStart or approved equal and/or BioPrime by Profile Products or approved equal to modify soil organic matter. JumpStart or approved equal and BioPrime or approved equal to be applied at rate determined by soil analysis or at manufacturer's recommended rate

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that prepared soil base is ready to receive the work of this Section.

### **3.02 PREPARATION**

- A. Seed these areas immediately upon completion of grading or construction and cleanup operations.
  - 1. Slopes greater than 4:1
  - 2. Utility right-of-ways or any other disturbed area adjacent to wetlands.
- B. Bring all areas to proper line, grade and cross section indicated on the plans.
- C. Repair erosion damage prior to commencing seeding operations.
- D. Loosen seed bed to a minimum depth of 3" and track in slope so as the direction of the track marks is perpendicular to the direction of the slope.
- E. Ensure a minimum of 2-inches of topsoil exists in areas to be seeded.
- F. Remove all roots, clods, stones larger than 1" in any dimension, and other debris.

### **3.03 FERTILIZATION**

- A. Apply fertilizer in accordance with manufacturer's instructions and the Soil Analyses as detailed in part 2.03 of this Section.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- D. If seeding using a hydro-seeder apply fertilizer in slurry with mulch, seed, and lime.
- E. Spread uniformly over areas to be seeded at:
  - 1. Rate of 11 LBS/1000 sq. ft. when using 19-19-19.
  - 2. Rate of 20 LBS/1000 sq. ft. when using 10-10-10.

3. Use approved mechanical spreaders for dry seeding application.
- F. Second Application of Fertilizer
1. When plants are established and showing satisfactory growth, apply Nitrogen at the rate of 1 lb. per 1000 sq. ft.
  2. Apply using dry seeding application unless otherwise directed by Engineer.
  3. Do not apply to stands of temporary grasses.

### 3.04 SEEDING

- A. Mixtures of different types of seed for the various schedules shall be weighted and mixed in proper proportions in the presence of the Engineer.
- B. Permanent Seeding Mix – Slopes 4:1 or Greater
1. Schedule No. 1 – Planting Dates April 1 – September 15:
    - a. Slopemaster Spring/Summer Mix by Pennington Seed, Inc. or approved equal.  
 25% Hulled Sahara Bermudagrass  
 25% Unhulled Sahara Bermudagrass  
 25% Pensacola Bahiagrass  
 10% Durana White Clover  
 10% Brown Top Millet  
 5% Weeping Lovegrass
    - b. Rate 75 LBS/ACRE or 1.75 LBS/1000 sq. ft.
    - c. Seed to be coated with MYCO Advantage by Pennington Seed, Inc. or approved equal.
  2. Schedule No. 2 – Planting Dates September 15 – March 31:
    - a. Slopemaster Fall/Winter Mix by Pennington Seed, Inc. or approved equal.  
 25% Unhulled Sericea Lespedeza  
 20% Unhulled Sahara Bermudagrass  
 20% Greystone Tall Fescue  
 10% Pensacola Bahiagrass  
 10% Durana White Clover  
 10% Rye Grain  
 5% Weeping Lovegrass
    - b. Rate 100 LBS/ACRE or 2.25 LBS/1000 sq. ft.
    - c. Seed to be coated with MYCO Advantage by Pennington Seed, Inc. or approved equal.
- C. Permanent Seeding Mix – Slopes 4:1 or Less
1. Schedule No. 1 – Planting Dates April 1 – September 15:

- a. Hulled Sahara Bermudagrass
    - b. Rate 75 LBS/ACRE or 1.75 LBS/1000 sq. ft.
  - 2. Schedule No. 2 – Planting Dates September 15 – March 31:
    - a. Unhulled Sahara Bermudagrass
    - b. Rate 100 LBS/ACRE or 2.25 LBS/1000 sq. ft.
- D. Temporary Seeding Mix – All Disturbed Areas
  - 1. Schedule No. 1 – Planting Dates April 1 – September 15:
    - a. Brown Top Millet
    - Rate 45 LBS/ACRE or 1 LBS/1000 sq. ft.
  - 2. Schedule No. 2 – Planting Dates September 15 – March 31:
    - a. Rye Grain
    - Rate 80 LBS/ACRE or 2 LBS/1000 sq. ft.
- E. Do not seed areas in excess of that which can be mulched on same day.
- F. Do not sow during rain, when the ground is too dry, or during windy periods.
- G. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.
- H. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- I. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 mm by 100mm).

### **3.05 SOWING METHODS**

- A. General:
  - 1. Perform seeding during the periods and at the rates specified in the seeding schedules.
  - 2. Do not conduct seeding work when ground is frozen or excessively wet.
  - 3. Produce satisfactory stand of grass regardless of period of the year the Work is performed.
- B. Seeding, slopes less than four horizontal to one vertical:
  - 1. Seeding of slopes of 4:1 or less will be done in one of the following two ways:
  - 2. Dry Seeding:

- a. Sow seed not more than 24 hours after application of fertilizer and lime.
- b. Use mechanical seed drills on accessible areas, rotary hand seeders, power sprayers, etc. may be used on steep slopes or areas not accessible to seed drills.
- c. Cover seed and lightly compact with culti-packer if seed drill does not.
- d. Within 24 hours following compaction of seeded areas, uniformly apply straw mulch, as defined in Section 2.01, at a rate of 4000 LBS/ACRE or 90 LBS/1000 sq. ft.

3. Hydraulic Seeding:

- a. Apply seed, fertilizer, lime, and wood fiber mulch using hydraulic equipment.
- b. Equipment to have built-in agitation system with capacity to agitate, suspend and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, lime, and water.
- c. Minimum capacity of slurry tank: 1000 gallons.
- d. Apply 100% wood or 70/30 wood/cellulose blend fiber mulch, defined in Section 2.01, at a rate of 2500 LBS/ACRE or 60 LBS/1000 sq. ft.
- e. Regulate slurry mixture so that amounts and rates of application will result in uniform application of all materials at not less than the specified amounts.
- f. Apply slurry in two directions so as to avoid "shadowing."
- g. Use color of fiber mulch as guide, spraying the prepared seed bed until a uniform visible coat is obtained.

C. Seeding, slopes greater than four horizontal to one vertical:

- 1. Seeding of slopes of 4:1 or greater will be done in one of the following two ways

2. Dry Seeding:

- a. Sow seed not more than 24 hours after application of fertilizer and lime.
- b. Use mechanical seed drills on accessible areas, rotary hand seeders, power sprayers, etc. may be used on steep slopes or areas not accessible to seed drills.
- c. Cover seed and lightly compact with culti-packer if seed drill does not.
- d. Within 24 hours following compaction of seeded areas, uniformly lay double netted excelsior blanket, as defined in Section 2.01, over seeded areas. Excelsior blanket installation and staple pattern shall conform strictly to manufacturer's instructions.

3. Hydraulic Seeding:

- a. Apply seed, fertilizer, lime, and Flexterra HP-FGM or approved equal mulch using hydraulic equipment.
- b. Equipment to have built-in agitation system with capacity to agitate, suspend and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, lime, and water.
- c. Minimum capacity of slurry tank: 1000 gallons.
- d. Apply Flexterra HP FGM or approved equal, as defined in Section 2.01, at a rate of 3000 LBS/ACRE or 68 LBS/1000 sq. ft.
- e. Regulate slurry mixture so that amounts and rates of application will result in uniform application of all materials at not less than the specified amounts.
- f. Apply slurry in two directions so as to avoid "shadowing."
- g. Use color of fiber mulch as guide, spraying the prepared seed bed until a uniform visible coat is obtained.

**3.06 MAINTENANCE**

- A. Water to prevent grass and soil from drying out.
- B. Roll surface to remove minor depressions or irregularities.
- C. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.
- D. Remedy damage resulting from improper use of herbicides.
- E. Areas not showing satisfactory evidence of germination within six weeks of the seeding or which show bare spots, shall be immediately reseeded, fertilized and/or mulched.
- F. Protect seeded areas with warning signs during maintenance period.
- G. Maintain all seeded areas in satisfactory condition until final acceptance of Work.
- H. Repair any eroded areas.
- I. Mow as necessary to maintain healthy growth rate until final acceptance of the Work.

**3.07 ACCEPTANCE**

- A. Permanently seeded areas will be accepted when the stand of grass reaches 70% coverage.
- B. No acceptance will be made of temporary seeded areas.

**3.08 MEASUREMENT AND PAYMENT**

- A. Payment will be made at the unit price "acre" as stated in the Bid Form for grassing.

**END OF SECTION**

**SECTION 33 41 00**  
**STORM DRAINAGE PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Storm drainage piping, fittings, and accessories.
- C. Detention outlet structure and Detention basin.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 16 – Excavation.
- B. Section 31 23 23.13 – Backfill and Compaction.
- C. Section 03 40 00 – Precast Concrete.

**1.03 DEFINITIONS**

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

**1.04 REFERENCE STANDARDS**

- A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2003.
- B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2013a.
- C. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines; 2013.
- D. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2011.
- E. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2011.
- F. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2013a.
- G. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]; 2013a.
- H. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2009).
- I. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.
- J. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.
- K. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2011.
- L. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.
- M. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2011.
- N. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- O. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.
- P. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

## **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories, and pipe class.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Project Record Documents:
  - 1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## **1.06 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for materials and installation of the Work of this section.

## **PART 2 PRODUCTS**

### **2.01 PIPE MATERIALS**

- A. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class III with Wall Type A; mesh, Tongue and Groove end joints.
- B. Furnish pipe with joints designed for flexible watertight gaskets.
- C. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

### **2.02 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS**

- A. Precast drop inlets, catch basins, outlet structures, etc. shall be as manufactured by Tindall Concrete Products, Inc. or equal units by others.
- B. All other precast structures (i.e., headwalls, flared end sections, etc.) shall be approved by Engineer prior to installation.
- C. Use precast manholes:
  - 1. Provide reinforced precast concrete ring and eccentric cone sections complying with ASTM C-478 and the following.
  - 2. Use portland cement complying with ASTM C-150, Type II.
  - 3. Cast ladder rungs into the units.
  - 4. Provide tongue and groove or o-ring rubber gasketed joints.
  - 5. Use vulcanized butyl rubber sealant with tongue and groove joints.
  - 6. Provide flat slab tops where manhole depth is less than 4'0".
- D. Steps:
  - 1. Use aluminum or plastic steps.
  - 2. Provide steps having non-skid top surfaces, safety stops at each end, minimum width of 10" and not less than 5" projection from wall.
  - 3. Aluminum steps shall support 1000-pound load at center with no deformation, coat embedded ends with bituminous paint.
  - 4. Provide polypropylene plastic steps reinforced with 3/8" diameter steel rod, M.S.A. Industries, Inc. Model PS-K, or equal.
- E. Frames and covers:
  - 1. Provide gray iron castings, complying with ASTM A 48, Class 30 iron.
  - 2. Machine all bearing surfaces.
  - 3. Provide frames weighing not less than 195 lbs. with inside opening between 21" and 24".
  - 4. Provide circular cover with two "pick" holes and weighing not less than 120 lbs.
  - 5. Covers to have the words "STORM SEWER" cast in the metal.
  - 6. Coat frames and covers with two (2) shop coats of bitumastic paint.
  - 7. Provide watertight covers, where indicated, conforming to above requirements and with frame tapped for four bolts, countersunk in cover.

- a. Provide rubber gasket between frame and cover.

### **2.03 BEDDING AND COVER MATERIALS**

- A. Bedding: As specified in Section 31 23 23.13.
- B. Cover: As specified in Section 31 23 23.13.

### **2.04 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

## **PART 3 EXECUTION**

### **3.01 TRENCHING**

- A. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### **3.02 INSTALLATION - PIPE**

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
  - 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.
- E. Make connections through walls through sleeved openings, where provided.
- F. Connect to building collection pits, through installed sleeves.

### **3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS**

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated.
- E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

### **3.04 FIELD QUALITY CONTROL**

- A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

### **3.05 PROTECTION**

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

### **3.06 MEASUREMENT AND PAYMENT**

- A. Payment will be made at the unit price per "each" item for structures and per "linear foot" for piping as stated in the Bid Form for Storm Drainage piping.

**END OF SECTION**