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VOLUME 1 OF 1

TECHNICAL SPECIFICATIONS

S P E C

FOR

MURPHEY CANDLER PARK – IMPROVEMENTS

SOUTH TRAIL

PROJECT MANUAL:

CITY OF BROOKHAVEN, GEORGIA

PROJECT #15092.00 A
BID #21-101

PREPARED BY:

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TECHNICAL PROVISIONS

DIVISION 0 - BIDDING/CONTRACT REQUIREMENTS

Section Title

DIVISION 1 - GENERAL REQUIREMENTS

Section Title

DIVISION 2 - SITE WORK

Section Title

END OF SECTION 00002

South Trail – Murphey Candler Park.

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BID FORM

MURPHEY CANDLER PARK – SOUTH TRAIL

BROOKHAVEN, GEORGIA

1. Bid as Advertised: Yes _____
   No _____

2. Bid Expires:_____Month_____Day_____Year
   (Minimum of 90 days)

3. Bid Received From: (Company) _____

   (Address) _____

   (Phone) _____

   (Contact) _____

Project Number: 15092.00-A

Bid Number: **ITB No. 21-101**

I. INTRODUCTION:
The City of Brookhaven is in the process of accepting bids from qualified Contractors for the specified improvements in Murphey Candler Park and providing a South Multi-Use Trail and Bridges per the Scope of Work.

II. INSTRUCTIONS:
Failure to adhere to the instructions below and elsewhere in the Invitation To Bid may result in the bid being deemed non-responsive.

A. Bidder shall not attach information in lieu of completion of the forms provided below and any specifically requested attachments. All information requested by the Client must be provided.

B. Bidder's qualifications and ability to complete this project will be determined based upon the information presented. All questions must be answered in full.

Bidder acknowledges receipt of the following addenda:

Addendum No._____ Dated _____

Addendum No._____ Dated _____

Addendum No._____ Dated _____

Addendum No._____ Dated _____

BASE BID LUMP SUM WITH UNIT PRICES

Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Clark, Patterson, Lee (CPL) and their sub-consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment services, and all calculated allowances below, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated **Lump Sum** of:

_____
Dollars

($_____)

(Total transferred from the Construction Items Bid Schedule

BID GUARANTEE

The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 ten days after a written Notice of Award, if offered within 60 sixty days after receipt of bids, and on failure to do so agrees to forfeit to Owner the Bid Bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

_____ Dollars ($_____)

SUBCONTRACTORS AND SUPPLIERS

The Bidder shall execute subcontracts for the portions of the Work as indicated on the attached List of Sub-contractors.

TIME OF COMPLETION

The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed

to be issued by Owner and shall fully complete the Work within 120 calendar days.

The City of Brookhaven will charge the Contractor Five Hundred Dollars and no cents ($500.00) per day for liquidated damages for every day beyond the contracted Time of Completion March 1, 2021 that the Work is not complete.

Note: Completed Construction Items Bid Schedule must be completed in full and attached to this Bid Form or be declared Non-Conforming:
See Instructions to Bidders ITB

Bidder further declares that the full name and resident address of Bidder's Principal is:

_____ _____
Authorized Representative Authorized Representative
(Print or Type) *(Signature)*

Signed, sealed, and dated this_____day_____, 202_

Notarized_____ (Seal)

My Commission Expires _____

Company Name and Address:

_____

_____

_____

Principal: _____

Title: _____

LIST OF SUBCONTRACTORS – SOUTH TRAIL

I do_____,/do not_____, propose to subcontract some of the work on this project. I propose to Subcontract work to the following subcontractors:

NAME AND ADDRESS	TYPE OF WORK

COMPANY NAME_____

AUTHORIZED REPRESENTATIVE SIGNATURE_____

SECTION 01010

SUPPLEMENTAL CONDITIONS

1.1 General: These Conditions are a Supplemental Conditions to the General Conditions of the Contract for Construction

1.2 Drawings and Specifications: See Cover Sheet of Drawings for list of Contract Drawings.

See Table of Contents of Project Specifications for list of Technical Specification Sections. Pay close attention to Division 1 as they apply to the General Conditions.

Permits:
Building Permit: There is a separate building permit required for each of the two bridges.
Land Disturbance Permit: Consultant has applied for the LDP.
EPD Stream Buffer Variance has been granted and a copy is in the Appendix of this manual.
ACOE: No permit is needed for this project:

1.3 Temporary Equipment: See Section 01600 Materials and Equipment for more detail.

1.4 Lifting Devices and Hoisting Facilities: The Contractor shall provide, operate and maintain construction cranes for hoisting materials, as well as other type hoists, as may be required for execution of the work of all trades as identified in the contract documents and specifications. Such apparatus, equipment and construction shall meet the requirements of labor laws and other applicable state and federal laws.

1.5 Temporary Support Facilities: See Section 01500 Construction Facilities.

1.6 Layout of Site Work: See Section 01050 Field Engineering for general descriptions.

Specific Requirements:
Before commencing any work, the Contractor shall verify all grades, lines, levels and dimensions as indicated on the Drawings. He shall report any errors or inconsistencies to the Landscape Architect before commencing work.

The Contractor shall stake the entire project, both as to location of all construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. This stakeout shall be made early in the construction process and preserved for reference during construction.

The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation which can only be determined by the Landscape Architect. This variation is an aesthetic decision, the amount of adjustment most often determined by the existing trees, terrain, soil conditions, utilities, sub-surface water and by other intangibles which are impractical to survey in absolute accuracy.

The Contractor shall notify the Landscape Architect at least five working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography, and all other objects and conditions on the site. At this time the Landscape Architect will clearly mark all trees and other vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.

During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.

The staking inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction, and planting is subject to adjustment to accommodate existing conditions and to save trees and other vegetation.

Any work progress delays caused by inadequate, incomplete or improper staking shall not merit an extension of the contract or delay charges by the contractor.

Landscape Architect shall have 2 days to respond to any request to come adjust a stakeout. Landscape Architect shall have a minimum of three (3) days to resolve any problems created by unknown conditions discovered during the stakeout or construction.

Sequencing: Contractor shall be responsible to adequately schedule his work to allow constant work to continue. When unknown conditions inhibit the flow of work, the contractor shall continue unhindered portions elsewhere on the project and notify the Landscape Architect immediately.

1.7 Unknown Conditions: Subsurface Conditions: Should the Contractor encounter, during the progress of the work, subsurface latent physical conditions at the site, materially differing from those shown on the drawings or specified for unknown conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the drawings and Specifications, the attention of the Landscape Architect shall be called immediately to such conditions before they are disturbed. The Landscape Architect shall thereupon promptly investigate the condition, and if he finds that they do so materially differ, the contract price shall, with the written approval of the Owner, be increased or decreased in accordance with such conditions.

1.8 Geo-Technical Assistance. The Contractor shall coordinate the involvement and schedule of the Geotechnical Consultant for the project.

The city obtained a geotechnical report for the two bridge locations from Matrix. A copy of that report is in the Appendix of this Project Manual.

The Owner will retain at his own expense the services of a qualified geo-technical engineer to advise on all construction techniques involved in the work, including the design, checking and approval of temporary bracing, shoring, underpinning and other items pertinent to the work, and on construction methods for solution of problems which may be encountered. The

geo-technical engineer shall be primarily concerned with construction methods necessary to prevent settlement or failure of walkways, foundations, and/or damage to such surrounding structures as sidewalks, roads, utilities, and embankments on the Owner's property.

1.9 Existing Utilities Shown. Existing utility lines shown on the drawings, such as, cables, ducts, conduits, and piping shall, if damaged (unless they are to be abandoned) be immediately repaired, protected, and maintained in use until relocation of same has been completed or shall be cut and capped where directed or shall be prepared for service connections when so required.

1.10 Utilities Not Shown. Contractor shall be responsible for securing the services of a utility locator to determine any unknown utilities that may be on the site. Any utilities encountered that are not shown on the drawings and are to remain as active utilities, if inadvertently damaged by the Contractor, shall be repaired by him. An adjustment in the contract price will be made at rates determined by the Contractor and approved by the Landscape Architect. If an extra expense is incurred in protecting and maintaining any utility line not shown on the drawings, an adjustment in the price will be made. Contractor shall not be compensated if the utility was improperly located or omitted by locator if it is deemed that the utility could have been detected.

1.11 Inclusion of Accessories: Unless specifically mentioned otherwise, all anchors, bolts, screws, fittings, fillers, hardware accessories, trim and other parts required for, or in connection with, an item of material to make a complete, serviceable, finished and first quality installation shall be furnished and installed as part of the item whether or not shown on the drawings or specified.

1.12 Protection: All materials shall be shipped, stored and handled in a manner that will afford protection and ensure their being in first class condition at the time they are used in the work.

After installation all materials shall be properly protected against damage to ensure their being in first class condition when the project is completed and accepted by the Owner.

1.13 Installation: All items shall be installed in a workmanlike manner in accordance with the best recognized practice of the trade. Manufactured items shall be installed in strict accordance with the manufacturer's printed directions, specifications and/or recommendations. All working parts shall be properly adjusted after installation and left in perfect working order. Unless otherwise indicated, items exposed to weather or subject to flooding shall be installed to shed water. Items shall in all cases be installed plumb and true and/or in proper relation to surrounding materials.

Samples: Contractor shall be responsible for preparing samples as required in the technical specifications and to obtain approvals prior to construction of the item.

1.14 Reference to Standard Specifications: When standard specifications such as The American Society for Testing and Materials, Federal Specifications, Department of Commerce (Commercial Standards), American Institute of Steel Construction, or other well known public or trade associates are cited as a standard to govern materials, and/or workmanship, such specifications or portions thereof as referred to shall be equally as binding and have the

full force and effect as though it were copied into these specifications. Such standard as are mentioned are generally recognized by and available to the trades concerned.

1.15 Reference to Manufacture's Publications: Unless otherwise specifically stated, all manufacturer's catalogs, specifications, instructions or other information or literature that are referred to in the specifications shall be considered as the latest edition and/or revision of such publication that is in effect on the date of the Invitation or Advertisement for Bids.

1.16 Document Signatures: See General Conditions and Instructions to Bidders.

1.17. Materials Furnished by Others: Whenever the Contractor or any Subcontractor shall receive items from another contractor or from the Owner for storage, erection or installation, the Contractor or Subcontractor receiving such items shall give receipts for items delivered, and any necessary replacing of item or items received. No adjustment will be made to contract price for increased insurance premiums, except for materials and/or equipment furnished by the Owner and not listed as such in other Contract Documents.

1.18. Substitute Materials and Equipment: See Section 01631 Substitutions for more detail.

Approval, by the Landscape Architect, of substitute materials and equipment shall not relieve the Contractor from his responsibility to supply and install any additional materials, equipment, or labor required to make the substitution properly function within the intent of the Contract Documents, as issued for Bid, whether or not recognized by the Landscape Architect or Contractor. The Contractor shall supply and install such required additional cost to the Owner.

1.19. Protection of Existing Structures: The Contractor shall be liable for all damage to existing structures that occurs as a result of his negligence to provide proper and adequate protective measures, including but not limited to buildings, walls, fences, paving, conduits, furniture, pipe, wiring, drains, underground utilities and equipment.

The Contractor shall be liable for all damage to trees, shrubs, turf and other vegetation. See Tree Penalty Clause in Section 02112.

1.20. Security & Construction Access Considerations: Construction shall not interfere with reasonable access to the adjacent park facilities and playing fields. Neither shall the Contractor interfere with reasonable use of the park and any of the public site facilities.

Access for construction shall follow the route is least resistance as determined on site with the Client representative. Concrete trucks can pump from distances as needed. Contractor can use the east parking lot for loading and staging as directed by the Client. Vehicles shall follow the existing road network of the park as much as possible with additional protection as determined in the field. Contractor will protect existing roads, trails, sidewalks, and turf from damage. Any damage caused by the contractor shall be repaired by the contractor at no cost to the owner. See Construction Access layout plan as provided by the City.

Staging areas shall be worked out with the City in advance of construction. Contractor is responsible to inspect the site prior to bidding to determine the best route and process for delivery and construction of the project.

1.21. Working Hours: See General Conditions and Instructions to Bidders.

1.22. Order of Construction: Contractor shall submit a progress schedule at the pre-construction conference outlining the order of his construction process - Priorities within this schedule shall be coordinated with the Owner. See Section 01040 Coordination for more detail.

Sequence of Work. Work is to be processed in an orderly manner. The organization of the Specifications or contract drawings does not necessarily indicate the order of sequence in which work is to be performed. If prior construction or other contractors on the project site shall interfere with this work, the Landscape Architect shall declare the time and date when this project contract can be started on the site.

Contractor shall not be granted extensions or delay charges when it is deemed clearly that Contractor could have continued work on other components of the project or locations on the site without suffering a delay in the process.

1.23. Record of Construction Changes and As-Built Documents: On completion of the work, the Contractor shall mark the appropriate contract drawings in indelible ink showing the final locations of all underground installations including, but not limited to, power lines, irrigation lines, sewage lines, drainage lines, septic tanks, fuel tanks, etc. They also shall record the proper location of all installations above ground where they have been changed on the site from designated locations on the plans.

Contractor shall provide a flash drive containing the as-built plans to the Owner upon completion of the project.

1.24. Guarantee: See Section 017040 Warranties for more detail descriptions. All landscape materials shall be guaranteed by the Contractor in accordance with Section 02900.

1.25. Application for Payment: See Section 01027 Application of Payment for detail instructions.

1.26. Certificates for Payment: Upon receipt of Application for Payment, Owner's Representative with the Landscape Architect shall make an inspection and issue to the Contractor a Certificate for Payment or state in writing to the Contractor a Certificate for Payment or state in writing to the Contractor the corrections which must be made according to the plans and Specifications before he shall be paid. These corrections shall be made at once, and the Owner's representative shall issue a Certificate for Payment on their acceptance. The Owner shall pay the full amount of the Certificate within fifteen (15) days after receiving the Certificate for Payment from the Owner's Representative.

1.27. Quantities and Measurements: **NOTE TO CONTRACTOR:**
The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents: (a) as between figures given on drawings and the scaled measurements, the scaled measurements shall govern; (b) as between large-scale

drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings Form of Agreement and Specifications, requirements of the Form of Agreement shall govern.

1.28. Maintenance: The Contractor shall be responsible for all maintenance, as required, until completion and acceptance of the work. Various items of maintenance are indicated in applicable sections of the Technical Specifications, to which the Contractor is referred. The Owner shall become responsible for maintenance upon completion and final acceptance of the work.

END OF SUPPLEMENTAL CONDITIONS

SECTION 01026

SCHEDULE OF VALUES

PART 1 GENERAL

1. SCOPE

The work under this Section includes preparation and submittal of a Schedule of Values.

The Construction Items Bid Schedule may substitute for the Schedule of Values when the project is bid by using a Construction Items Bid Schedule to determine the Total Bid Price. In that case, the Construction Items Bid Schedule can be substituted for the Schedule of Values in this Section of the Specifications.

See Section 00-350 Construction Items Bid Schedule
See Section 01027 Application for Payment for more detail.

2. GENERAL

A. Timing of Submittal: Submit to the Landscape Architect, a Schedule of Values allocated to the various portions work, within 10 days after Notice to Proceed. The first progress payment will not be made until the next pay cycle following the Landscape Architect's approval of the Contractor's Schedule of Values.

B. Supporting Data: Upon request of the Engineer, support the values with data which will substantiate their correctness.

C. Use of Schedule: The schedule of values, unless objected to by the Landscape Architect, shall be used only as a basis of the Contractor's Application for Payment.

D. Construction Items Bid Schedule may serve as the Schedule of Values.

E. Construction Items Bid Schedule form is available through the Consultant in Excel electronic format upon request.

3. FORM AND CONTENT OF SCHEDULE OF VALUES

A. Form and Identification
   1. Prepare schedule of values on 8-1/2 x 11-inch paper in landscape format.
   2. Contractor's standard forms and automated printout may be used.
   3. Identify schedule as: ***Murphey Candler Park Improvements–South Trail***
      a. Title of project and location: ***South Trail, Murphey Candler Park***
      b. Landscape Architect
      c. Name and address of Contractor

d. Contract designation
c. Date of submission

B. Schedule shall list the installed value of the component parts of the Work in enough detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by number and construction items, for ease of field verification of quantities completed in each line item.

See Section 01027 Applications for Payment for more detail.

C. Format
1. Follow the Construction Items Bid Schedule of the Contract Documents as the format for listing the component items quantities and costs.
2. Identify each item with the number and name of the respective item on the Schedule.

D. For each major line item, list sub-values of major products or operations under the items as shown on the Construction Items Bid Schedule and Bid Form.

E. For the Various Portions of the Work:
1. Each construction item shall exclude any proportional amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored materials, break down the value into:
a. The cost of the materials delivered and stored, with taxes paid.
b. Total installed value, less Contractor's overhead and profit and less item a. stated above.
c. Copies of the delivery manifest and supplier invoice.

A. Mobilization is identified as a separate line item that allows the contractor to bill ahead to secure operational capital to begin the project.

B. General Conditions and Overhead shall be shown as a percentage in a separate line item at the bottom of the Construction Items Bid Schedule and not calculated into the unit items costs.

C. Additional Items: At the end of the Construction Items Bid Schedule the contractor may add additional line items that he feels were not listed or should have been broken down into more line items or for the addendum items. .

D. When the Construction Items Bid Schedule is used to bid the project, the Sum of all the values listed on the Construction Items Bid Schedule plus all addenda shall equal the Bid Total or Contract Amount as shown on the Bid Form.

END OF SECTION 01026

SECTION 01027

APPLICATIONS FOR PAYMENT

1.1 GENERAL

A. Coordinate the Construction Items Bid Schedule and Applications for Payment with the Contractor's Schedule of Payment, Submittal Schedule, and List of Subcontracts.

B. Coordinate preparation of the Construction Items Bid Schedule with preparation of the Contractor's Project Construction Schedule of Work.

1. Correlate line items in the Construction Items Bid Schedule with other required administrative schedules and forms, including:

a. Contractor's Project Construction Schedule.
b. Application for Payment forms, including Continuation Sheets.
c. List of subcontractors and consultants.
d. List of products.
e. List of principal suppliers and fabricators.
f. Schedule of submittals.
g. Schedule of materials stored

2. Submit the Project Construction Timeline Schedule at the earliest possible date but no later than 7 days before the date scheduled for submittal of the first Application for Payment.

C. Format and Content: Use the Construction Items Bid Schedule as the format for establishing the Schedule of Payment. Provide at least one-line item for each Unit Item on the Construction Items Bid Schedule as a payment item.

1. Include the following Project Identification ***Murphey Candler Park South Trail - City of Brookhaven –***

a. Project name and location – *South Trail Murphey Candler Park*
b. Name of Consultant – *CPL Inc.*
c. Project number. *See Instructions to Bidders*
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Payment items in tabular form with separate columns to indicate the following for each item listed:

a. Item number.
b. Name of the item.
c. Total quantity of the item.
d. Unit price.
e. Total price.

f. Current work completed by dollar value.
g. Previous dollar amount completed.
h. Percentage of Item Sum completed to nearest one-hundredth percent.

3. Provide separate backup for each part of the Work where the Application for Payment includes materials or equipment, purchased or fabricated and materials stored, but not yet installed.

4. Change Orders or Construction Change Directives that change the Contract Sum must be pre-approved before commencing the work or applying for payment. Pre- approved change orders may be attached to the application for payment as a new items line at the bottom of the Payment Schedule after completion and acceptance of the change order work.

5. Maintain a chronological and on-going Ledger List of minor field deletions or additions to the contract to be attached to each payment request.

6. Consultant can provide a sample Pay Request if requested by contractor.

D. Applications for Payment shall be consistent with previous applications and payments as certified by the Owner's Representative and paid to date by the Owner.

E. Payment-Application Times: Payment dates are indicated in the Agreement. The period covered by each application is the period indicated in the Agreement.

F. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment, or the form supplied by the Owner.

G. Application Preparation: Complete every entry, including notarization and execution by a person authorized to sign on behalf of the Contractor. The Landscape Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Payment and the Contractor's Construction Items Bid Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives approved prior to the last day of the construction period covered by the application.

H. Transmittal: Submit 3 executed original copies of each Application for Payment to the Owner's Representative within 24 hours. One copy shall be complete, including waivers of lien and similar attachments.

1. Transmit each copy with a transmittal listing attachments and recording appropriate information related to the application.

I. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of lien from every entity who may file a lien arising out of the contract and related to the work covered by the payment.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Submit each Application for Payment with Contractor's waiver of lien for the period of construction covered by the application.

   Submit final Applications for Payment with final waivers from each entity involved with performance of the Work who may file a lien.
4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.

J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

Provisions of the contract regarding payment shall supersede any applicable provisions of the Georgia Prompt Payment Act.

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Payments.
4. Contractor's Construction Schedule (*preliminary if not final*).
5. Submittal Schedule (*preliminary if not final*).
6. List of Contractor's staff assignments.
7. Copies of necessary building permits.
8. Copies of required licenses from governing authorities.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Traffic control plan. *If required*

K. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

1. Administrative actions and submittals that shall precede or coincide with this application include the following:

   Provisions of the contract regarding payment shall supersede any applicable provisions of the Georgia Prompt Payment Act:

   a. Occupancy permits.
   b. Warranties and maintenance agreements.
   c. Test/adjust/balance records.
   d. Maintenance instructions.
   e. Meter readings.
   f. Changeover information related to Owner's occupancy.
   g. Final cleaning.
   h. Application for reduction of retainage and consent of surety.

l. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

L. Retainage: Client shall retain 10% of all approved pay requests until substantial completion of the project. Retainage may drop to 5% until final inspection and acceptance with approval of the Owner.
1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Transmittal of Project construction records to the Owner.
4. Certified As-Built survey.
5. Proof that taxes, fees, and similar obligations were paid.
6. Removal of temporary facilities and services.
7. Change of door locks to Owner's access.
8. Fulfillment of all erosion control measures.

M. Final Ledger: Contractor shall request payment for 100% of all construction items as shown on the Construction Schedule and Payment Request. The final tabulation of the ledger will be either a subtraction from the total contract or an addition. In the case of subtractions, the contractor shall enter the total deleted at the bottom of the request. In the case of an addition, the Landscape Architect shall prepare a final change order for approval by the Contractor and Owner.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035

MODIFICATION PROCEDURES

1.1 GENERAL

A. Minor Changes in the Work: The Landscape Architect will issue instructions authorizing changes in the Work that do not alter the contract amount on AIA Form G710.

B. Owner-Initiated Change Order Proposal Requests: The Landscape Architect will issue a description of proposed changes in the Work that require adjustment to the Contract Sum or Time. The description may include supplemental or revised Drawings and Specifications.

1. Proposal requests are for information only (RFI). Do not consider them an instruction to stop work or to execute the proposed change.

2. Within 20 days of receipt of a Change Request, submit an estimate of costs necessary to execute the change for the Owner's review.
   a. Include an itemized list of products required and unit costs, with the total amount of purchases.
   b. Use unit costs from the Schedule of Values. If unit costs have to change, submit detail documentation to explain the need to change a unit price.
   c. Indicate taxes, delivery charges, equipment rental, and amounts of trade discounts.
   d. Indicate the effect the change will have on the Contract Time.

C. Contractor-Initiated Proposals: When unforeseen conditions require modifications, the Contractor may submit a request for a change to the Landscape Architect.

1. Describe the proposed change. Indicate reasons for the change and the effect of the change on the Contract Sum and Time.
2. Include an itemized list of products required and unit costs, with the total amount of purchases.
3. Indicate taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Additional work already included on the Schedule of Values shall be submitted at the same price as originally quoted unless otherwise agreed prior to submittal.

D. Proposal Request Form: Use AIA Document G709.

E. Allowance Adjustment: Base Change Order Proposals on the difference between the purchase amount and the allowance, multiplied by the measurement of work-in-place. Allow for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs only where indicated as part of the allowance.
2. Prepare explanations and documentation to substantiate margins claimed.

3. Submit substantiation of a change in work claimed in the Change Orders related to unit-cost allowances and quantities.

F. Submit claims to increase costs due to a need to change an allowance, whether for purchase order amount or handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of authorization to proceed. The Owner will reject claims submitted later than 21 days.

1. Do not include indirect expense in cost amount unless the Work has changed from that described in Contract Documents.
2. No change to indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

G. Construction Change Directive: When Owner and Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714 instructing the Contractor to proceed with a change.

1. The Construction Change Directive contains a description of the change and designates the method to be followed to determine change in the Contract Sum or Time.

H. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completing the change, submit an itemized account and supporting data to substantiate Contract adjustments.

I. Change Order Procedures: Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order on AIA Form G701.

J. Contractor shall submit Requests for Information (RFI) whenever items or parts of the central documents are unclear or incorrect. Contractor shall maintain a list of Requests by number and date with responses from the Architect.

K. Unit Item Cost: When changes effect unit items for which costs have already been established, change request must utilize the agreed unit prices for additions or deletions.

L. Unit Item Cost Changes: Unit item costs previously accepted by the Owner may be subject to change if the contractor submits sufficient documentation to verify the need for such a change.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040

COORDINATION

1.1 GENERAL

A. This Section includes requirements for coordinating construction operations including, but not necessarily limited to, the following:

1. Coordination drawings.
2. Administrative and supervisory personnel.
3. Coordinate with Project Landscape Architect/Engineer.
4. Clearing and protection coordination with the city arborist.
5. Coordinating with Property Officer or Owner's Representative
6. Staking Layout and Utility Locations
7. Utilities locations and coordination with all utility providers.
8. Coordinate with adjacent sports schedules for field use.
9. Coordinate with athletic associations and groups
10. Coordination with the Gator Bridges to deliver the bridge.
11. Coordination between various sub-contractors.
12. Coordination with other contractors engaged by the Client or utility.
13. Coordination of sleeves, pipe holes, and other items to assist subcontractors

B. Construction Access and Staging: Contractor shall inspect the site and coordinate with the City for staging and construction access through the site. Appropriate measures to protect existing conditions shall be included in the construction costs.

1.2 COORDINATION

A. Coordinate construction to assure efficient and orderly installation of each portion of the Work. Coordinate operations that depend on each other for proper installation, connection, and operation.

1. Schedule operations in a sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. Schedule operations with Parks Director to avoid interference with pre-scheduled events on the fields and with the Athletic Associations.
5. Coordinate regularly with sports groups on site to insure cooperation and notification.
6. Coordinate with local permitting agencies to secure approvals of the work.
7. Coordinate with local law enforcement for bridge delivery.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
2. Notify Owner when pre-scheduled operations may constitute a hardship for the contractor.
3. Prepare weekly reports during construction to be given to industrial park tenant

C. Administrative Procedures: Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Delivery of materials and processing of submittals.
3. Progress meetings.
4. Project closeout activities

D. Conservation: Coordinate construction to assure that operations are carried out with consideration for conservation of energy, water, and materials.

1. At the request of the Owner, salvage materials and equipment involved in performance of, but not incorporated in, the Work.
2. Deliver salvaged items to location to be specified by the owner.

E. Coordination Drawings: Prepare coordination drawings if needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.

1. Show the relationship of components shown on separate shop drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "*Submittals*."

F. Staff Names: On date of Pre-Construction meeting, submit a list of the Contractor's staff assignments, including the superintendent and other personnel assigned to the Project. Identify individuals and their responsibilities. List their addresses and telephone numbers.

1. Provide copy of list to the owner and Landscape Architect/Engineer.
2. Post copies in the Project meeting room, the temporary field office, and each necessary telephone number.
3. Contractor shall always maintain a list of site tenants and their contact information on site in the construction trailer.

G. Subcontractor Assistance:

It is the Contractor's duty to coordinate with his subcontractors in advance so that pipe holes, sleeves, inserts, etc., for subcontractors are installed as work progresses. This includes coordination with other independent Contractors working on related work.

1.3 **PRODUCTS** (Not Applicable)

1.4 EXECUTION

A. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected. Provide photographs and daily reports of the inspected conditions.

B. Coordinate temporary enclosures with inspections and tests to minimize the need to uncover completed construction.

C. Clean and protect construction in progress and adjoining materials, during handling and installation. Apply protective covering to assure protection from damage.

D. Coordinate with the environmental inspections and erosion control inspections.

E. Contractor shall mark the critical setbacks to be visible to the inspectors.

F. Clean and maintain completed construction as necessary through the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

G. Limiting Exposures: Supervise construction to assure that no part is subject to harmful, dangerous, or damaging exposure. Such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Water exposure
5. Solvents and chemicals.
6. Abrasion.
7. Soiling, staining, and corrosion.
8. Combustion.

END OF SECTION 01040

SECTION 01045

CUTTING AND PATCHING

1.1 GENERAL

A. Cutting and Patching Proposal: Submit a proposal describing procedures in advance of the time cutting and patching will be performed. Request written approval by the Project Landscape Architect/Engineer to proceed. Include the following:

1. Describe extent of cutting and patching. Describe how action will be performed and indicate why it cannot be avoided.
2. Describe changes to existing construction. Include changes to structural elements, operating components, changes to the building's appearance and/or other significant visual elements.
3. List products to be used and firms that will perform work.
4. Indicate dates and completion timeline for cutting and patching to be performed.
5. Utilities: List utilities that will be disturbed or relocated and those that will be temporarily out-of-service. Indicate dates and timeline of service that will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Approval to proceed does not waive the Project Landscape Architect/ Engineer's right to later require complete removal and replacement of unsatisfactory work.

B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would affect their load-carrying capacity or load-deflection ratio.

1. Obtain written approval from the Project Engineer before cutting and patching the following structural elements:

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a. Bearing and retaining walls.
b. Utility lines or storm pipes.
c. Sidewalks and trails.
d. Free standing walls of fences.

C. Operational Limitations: Do not cut and patch operating elements in a manner that would reduce their capacity to perform as intended. Do not cut and patch operating elements in a manner that would increase maintenance or decrease operational life or safety.

1. Obtain permission for operating utility provider before cutting a utility.

2. Advise the Property Officer of any utility shut down before work begins.

D. Visual Requirements: Do not cut and patch exposed construction in a manner that would, in the Project Landscape Architect's opinion, reduce the structure's aesthetic qualities. Do not cut and patch in a manner that would result in visual evidence of cutting and patching. Remove and replace any construction cut and patched that is deemed visually unsatisfactory by the Project Landscape Architect and Owner.

E. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged in such a manner as not to void warranties.

1.2 PRODUCTS

A. Use materials identical to existing materials. Use materials that visually match adjacent surfaces to the fullest extent possible if identical materials are unavailable. Use materials whose performance will equal that of existing materials.

1.3 EXECUTION

A. Examine surfaces to be cut and patched and conditions under which work is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action:
   1. Before proceeding, meet with parties involved. Review areas of potential interference and conflict for the tenants of the parks. Coordinate procedures and resolve potential conflicts before proceeding:

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect existing construction to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.

D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Avoid cutting pipe, conduit, or ductwork serving the project site or business, but scheduled to be removed or relocated until provisions have been made to bypass them.

F. Performance: Employ skilled workmen. Proceed at the earliest feasible time and complete without delay:

   1. Coordinate construction so as to install necessary components and/or perform construction (i.e. subsequent fitting and patching required to restore surfaces to their original condition).

G. Cutting: Cut using methods that will not damage elements retained or adjoining construction. Comply with the original Installer's recommendations:

   1. Use hand or small power tools designed for sawing or grinding, (i.e. not hammering and chopping). Cut holes and slots as small as possible, neatly to

size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Specification Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

H. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances:

1. Inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removing walls or where partitions extend from one finished area into another, patch and repair ground and wall surfaces. Provide an even surface of uniform color and appearance. Remove ground and wall coverings and replace with new materials to achieve uniform color and appearance.

    a. Where patching occurs in a smooth painted surface, extend final paint coat over entire surface containing the patch after the area has received primer and second coat.
4. Patch, repair, or rehang ceilings as necessary to provide an even-plane surface of uniform appearance.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar items. Clean piping, conduit, and similar features before applying paint or finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050

FIELD ENGINEERING

1.1 GENERAL

A. This Section specifies requirements for field-engineering services including, but not limited to, the following:
   1. Land survey work to locate easement, utilities, and subterranean objects.
   2. Civil engineering services to assure positive drainage.
   3. Location of underground utilities.
   4. Geotechnical monitoring.
   5. Field adjustments to layout.
   6. Erosion Control measurements.
   7. Trail and abutment installation
   8. Prefabricated bridge installation
   9. Construction access and stagilng

B. Submit a certificate certifying location and elevation of improvements.

C. Project Record Documents: Submit a record of Work performed and record copy of survey data collected in the field. TerraMark has already surveyed the entire site and the survey is available to the contractors in Cad format upon request.

D. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located.

E. Geotechnical Data: When required, engage qualified Geotechnical Engineers familiar with the conditions of the site who is approved by the Owner.

F. Professional Design Services: Secure design consultants and engineers licensed in the state and approved by the Owner.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Identification: The surveyor will identify existing control points, setbacks, buffers, and property line corner stakes. Boundaries are indicated on the existing survey by TerraMark.

B. Verify layout information, in relation to property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

   1. Do not change or relocate benchmarks or control points without written approval. Report destroyed reference points or requirements to relocate reference points because of changes in grades.

2. Replace destroyed Project control points. Base replacements on the original survey control points and property corner pins.

C. Field locate stream buffer lines on the ground to use as reference during staking and construction.

D. Existing Utilities: The existence of underground utilities and construction is not guaranteed. Verify location of underground utilities and other construction before beginning site work or excavation.

1. Prior to construction, verify location and invert elevation at points of connection to storm sewers, and water-service piping, and underground utility boxes.
2. Locate existing lateral sanitary sewer line as shown on the existing site survey.

E. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and to locate each element. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every element for line, level, and plumb.

F. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.

1. Record deviations from lines and levels. Advise the Architect when deviations exceed tolerances. On Project Record Drawings, record deviations that are accepted and not corrected.
2. On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

G. Site Improvements: Locate and lay out site improvements, including pavements, grading stakes, fill and topsoil placement, conduit locations, utility routes, and invert elevations.

I. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing curbs, fences, utility poles, lines, signs, or other appurtenances located in or affected by construction. Coordinate with local authorities and utility providers having jurisdiction.

J. Geotechnical Monitoring: Contractor shall coordinate the services of the Owner’s Geotechnical Engineer to take the soil borings necessary to verify the construction requirements for the following project elements are acceptable.

1. Trail stabilization.
2. Sidewalk stabilization.
3. Abutment foundations.

4. Bridges.

K. Subsurface Conditions: Contractor is responsible to correct all subsurface conditions necessary to ensure the structural integrity of all elements of the project. Reference each section of the Technical Specifications for detailed execution requirements.

L. Contractor shall secure geotechnical borings to ensure the bearing capacity of the existing soil prior to construction. If soil bearing is below the expected bearing, then the contractor and Owner shall make adjustments to the contr

END OF SECTION 01050

SECTION 01095

REFERENCE STANDARDS AND DEFINITIONS

1.01 GENERAL

A. Definitions: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated" refers to graphic representations, notes, or schedules on the Construction Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

C. Where the word or words "as directed", "as required", "as approved", "as permitted" “as selected”, “as requested”, “as authorized”, or words of like effect are used ln the specifications or on the drawings, the Contractor shall understand that direction, requirement, approval or permission of the Landscape Architect is intended. Similar words "approved", "acceptable", "satisfactory", or words of like import mean approved by, acceptable to or satisfactory to the Landscape Architect.

D. "Approved": When used in conjunction with the Project Landscape Architect's action on the Contractor's submittals, applications, and requests, is limited to the Project Landscape Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the work.

F. "Furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install" describes operations at the project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide" means to furnish and install, complete and ready for the intended use.

I. "Installer" is the Contractor, or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

2. Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter."

J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the project. The extent of the project site is shown on the Construction Drawings and may or may not be identical with the description of the land on which the project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

L. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-division format and "Master Format" numbering system.

1. Abbreviated Language: Language used in the Specifications is abbreviated. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

M. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

N. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

O. Copies of Standards: Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

P. Abbreviations and Names: Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Inc.'s "Encyclopedia of Associations," which is available in most libraries.

Q. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the work.

R. Engineer, Architect, Landscape Architect, all indicate the design consultant responsible to the Owner for observing the construction of the project.

1.02 PRODUCTS (Not Applicable)

1.03 EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01200

PROJECT MEETINGS

1.1 GENERAL

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Preinstallation conferences.
3. Progress meetings.
4. Weather Records and Calendar
5. Special sub-contractor pre-installation meetings
6. Final punch list inspection

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction. Review responsibilities and personnel assignments.

C. Attendees: Authorized representatives of the Owner, Landscape Architect, and their consultants; the Contractor and its superintendent; major subcontractors; and other concerned parties shall attend.

1. Participants shall be familiar with the Project and authorized to conclude matters relating to the Work.

D. Agenda: Discuss items that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Submittal of Shop Drawings, Product Data, and Samples.
4. Use of the premises.
5. Special Feature schedules
6. Weather conditions and schedule
7. Sequencing

E. Preinstallation Conferences: Conduct a conference before each activity that requires coordination with other operations.

F. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation shall attend. Advise the Landscape Architect of scheduled meeting dates.

1. Review the progress of other operations and preparations for the activity under consideration at each preinstallation conference, including requirements for the following:

a. Compatibility problems and acceptability of substrates.

b. Time schedules and deliveries.
c. Manufacturer's recommendations.
d. Warranty requirements.
e. Inspecting and testing requirements.

2. Record significant discussions and agreements and disagreements, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Landscape Architect.

3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate actions necessary to resolve problems and reconvene the conference.

G. Progress Meetings: Conduct progress meetings at the Project Site at regular intervals as agreed in the contract. Notify the Owner and the Architect of scheduled dates. Coordinate meeting dates with preparation of the Payment Request.

H. Attendees: The Owner, Architect, and other entities concerned with current progress or involved in planning, coordination, or future activities shall be represented. Participants shall be authorized to conclude matters relating to the Work.

I. Agenda: Review and correct or approve minutes of the previous meeting. Review items of significance that could affect progress. Include topics for discussion appropriate to Project status.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule. Determine how to expedite construction behind schedule; secure commitments from parties involved to do so. Discuss revisions required to ensure subsequent activities will be completed within the Contract Time.

2. The schedule shall indicate the dates for the starting and completion of various stages of construction and shall be revised monthly as required by the conditions of the work.

3. Review the present and future needs of each entity present, including the following:
a. Time.
b. Sequences.
c. Status of submittals.
d. Deliveries and off-site fabrication issues.
e. Temporary facilities and services.
f. Quality and work standards.
g. Change Orders.
h. Daily reports and weather conditions
i. Shop drawings and submittals
j. Onsite inspections and adjustments

3. Reporting: Distribute meeting minutes to each party present and to parties who should have been present. Include a summary of progress since the previous meeting and report.
4. Schedule Updating: Revise the Contractor's Construction Schedule after each meeting where revisions have been made. Issue the revised schedule concurrently with the report of each meeting.
7. Record Drawings: Contractor shall maintain a current and complete set of all Contract Documents on-site at all times.
8. Review 'Requests for Information' and resolve.
9. Review 'Change Orders' and resolve.
10. Review pay requests and schedule of payments.
11. Resolve on-site issues and adjustments.
12. Review weather reports and status of schedule and delays.

J. Daily Construction Reports: Contractor shall prepare a daily report recording events on the site. Submit duplicate copies to the Landscape Architect at weekly intervals. Include the following information:

1. Daily record showing work engaged, completed, and started
2. List of subcontractors at the site
2. High and low temperatures, general weather conditions.
3. Accidents and unusual events.
4. Stoppages, delays, shortages, and losses.
5. Meter readings and similar recordings.
6. Emergency procedures.
7. Orders and requests of governing authorities.
8. Services connected, disconnected.
9. Equipment or system tests and startups.
10. Substantial Completions authorized
11. Materials delivered or stored
12. Inspection or testing completed
13. Official visitors to the site

K. Construction Records: Contractor shall maintain the following reports and records for review at each Program Meeting. See Section 1300 submittals for more detail of each report.

1. As Built Field Set:
   Set of approved plans kept inside for the purpose of updating and recording all changes and modifications. Update with red lines to record changes as they occur. Update with red lines to record changes as they occur. Said redlines must be issues in Meeting Minutes.

2. Request for Information (RFI) Book:
   Sequential record of all requests and their subsequent answers.

3. Shop drawings and approved site field changes

4. Documents and Samples of special product to the Site:

5. Change Orders:
Sequential record of all accepted or pending change orders with backup data.

L. Documents and Samples at the Site:

In addition to instruments mentioned in this section, include copies of all Requests for Payment and correspondence between Landscape Architect and Contractor. Maintain all copies in orderly files in Contractor's job site office. Records shall be available for reference during all on-site project meetings.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01220

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. See Construction Items Bid Schedule in the Instructions to Bidders in Division 1.

1.2 SUMMARY

A. This Section includes:

1. Unit price work as shown on the Construction Items Bid Schedule.
2. List of unit prices required.
3. Procedures for unit price work.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form and Construction Items Bid Schedule, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 SUBMITTALS

A. Supporting Data: When applications for payment include unit price work submit substantiated measurement of quantity installed or executed.

1.5 PROCEDURES

A. Unit Prices include all costs necessary to satisfactorily complete the work identified, including materials, delivery, labor, and installation. Insurance, overhead, profit and other General Conditions are shown separately as a percentage added.

B. Measurement and Payment: Refer to the individual Specification Sections for work that requires establishment of a unit price. Methods of measurement and payment for unit price items are specified in this section.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and the right to have such work measured, at Contractor’s expense, by an independent surveyor acceptable to Owner.

D. List of Unit Prices: A list of unit prices is included on the Construction Items Bid Schedule. Specification Sections and details are referenced on the bid schedule that identifies requirements for materials described under each unit price item.

E. Unit Price Quantities: In case of unit price quantity discrepancies between Bid Form, Construction Items Bid Form and this form, or any other section, the unit price quantities stated in this section shall prevail.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. **Unit Price a: Rock Excavation;**

1. Description: Removal of unexpected rock forming a void to be filled. Excavate and remove the rock from the site.
2. Purpose: To adjust the contract sum when actual rock is encountered, and a quantity is determined.
3. Unit of Measurement: Cubic Yard removed.
4. Quantity to be included in Contract Sum: **40 CY Allowance:**
5. Include only the following in the unit price: Excavation, loading, hauling and dumping fees to remove the materials from the site.
6. Overhead and profit to show as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.
9.

B. **Unit Price b: Rock Trench Excavation;**

1. Description: Removal of unexpected rock in line of a proposed trench to be filled. Excavate and remove the rock from the site.
2. Purpose: To adjust the contract sum when actual rock is encountered, and a quantity is determined.
3. Unit of Measurement: Cubic Yard removed.
4. Quantity to be included in Contract Sum: **20 CY Allowance:**
5. Include only the following in the unit price: Excavation, loading, hauling and dumping fees to remove the materials from the site
6. Overhead and profit to show as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

C. **Unit Price c:** :Excavation and Removal of Unsatisfactory soil

1. Description: Removal of unsatisfactory soils encountered and requiring excavation as defined in the specifications.
2. Purpose: To adjust the contract sum when actual quantity is determined.

3. Unit of Measurement: Cubic Yard
4. Quantity to be included in Contract Sum: **N/A**
5. Include only the following in the unit price: Excavation to plan subgrade, hauling and disposal off site.
6. Overhead and profit to show as a separate percentage.
7. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.
8.

D. **Unit Price d: Replace with satisfactory earth fill**:

1. Description: Removal of unsatisfactory soils leaves an unexpected void to be filled. Fill the void with earth fill up to proposed subgrade.
2. Purpose: To adjust the contract sum when actual quantity is determined.
3. Unit of Measurement: Cubic Yard
4. Quantity to be included in Contract Sum: **200 CY Allowance:**
5. Include only the following in the unit price: Securing and bringing suitable earth fill material from off site to fill the void to the original level of the soils removed.
6. Overhead and profit to show as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

E. **Unit Price e: Replace with Graded Aggregate Base (GAB) or #57 Stone:**

1. Description: Removal of unsatisfactory soils leaves an unexpected void to be filled. Fill the void with GAB or #57 stone up to proposed subgrade.
2. Purpose: To adjust the contract sum when actual quantity is determined.
3. Unit of Measurement: Cubic Yard
4. Quantity to be included in Contract Sum: **250 CY Allowance:**
5. Include only the following in the unit price: Securing and bringing GAB or #57 stone from off site to fill the void to the original subgrade level of the soils removed.
6. Overhead and profit to show as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

F. **Unit Price f: Replace with Surge Stone**

1. Description: Removal of unsatisfactory soils leaves an unexpected void to be filled. Fill the void with surge stone up to proposed subgrade.
2. Purpose: To adjust the contract sum when actual quantity is determined.
3. Unit of Measurement: Cubic Yard
4. Quantity to be included in Contract Sum: **250 CY Allowance:**
5. Include only the following in the unit price: Securing and bringing surge stone material from off site to fill the void to the original level of the soils removed.
6. Overhead and profit to show as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

G. Unit Price g: Vertical Helical Pier

1. Description: Additional vertical length sections of Helical Piers for supporting the vertical loading of the abutment caps for the Gator Bridges.
2. Purpose: To adjust the contract sum when actual in field quantity is determined based on field conditions or additional soil borings.
3. Unit of Measurement: Linear feet per additional section:
4. Quantity to be included in Contract Sum: **200 lf. Allowance:**
5. Include only the following in the unit price: Purchase, delivery, cost of installing and testing until loading is achieved.
6. Overhead and profit are included as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

H. Unit Price h: Diagonal Helical Pier

1. Description: Additional diagonal length sections of Helical Piers into the creek bank to stabilize the abutments supporting the Gator Bridges.
2. Purpose: To adjust the contract sum when actual in field quantity is determined based on field conditions or additional soil borings.
3. Unit of Measurement: Linear feet per additional section:
4. Quantity to be included in Contract Sum: **100 lf. Allowance:**
5. Include only the following in the unit price: Purchase, delivery, cost of installing and testing until loading is achieved.
6. Overhead and profit are included as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

I. Unit Price i: Silt Fence

1. Description: Construction of additional silt fence where needed in the field and not shown on the plans.
2. Purpose: To adjust the contract sum when actual quantity is determined in the field.
3. Unit of Measurement: Linear Foot
4. Quantity to be included in Contract Sum: **200 LF**
5. Include only the following in the unit price: Material and construction of the silt fence per detail; maintenance, repair, replacement and removal of silt fence;
6. Overhead and profit are included as a separate percentage.
7. Include all other costs in contract sum.
8. Method of measurement: Measurement will be made as outlined in the specifications and verified by the owner.

END OF SECTION 01220

SECTION 01300

SUBMITTALS

1.1 GENERAL

A. Submittal Procedures: Coordinate submittal preparation with construction, fabrication, other submittals, and activities that require sequential operations. Transmit in advance of construction operations to avoid delay.

1. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Landscape Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.
2. Processing: Allow 2 weeks for initial review. Allow more time if the Landscape Architect must delay processing to permit coordination. Allow 2 weeks for reprocessing.

    a. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

3. Submittal Preparation: Place a permanent label on each submittal for identification. Provide a 4- by 5-inch (100- by 125-mm) space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label for processing and recording action taken.

    a. Project name.
    b. Date.
    c. Name and address of the Architect/Landscape Architect.
    d. Name and address of the Contractor.
    e. Name and address of the subcontractor.
    f. Name and address of the supplier.
    g. Name of the manufacturer.
    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.

4. Submittal Transmittal: Package each submittal appropriately. Transmit with a transmittal form. The Architect will not accept submittals from sources other than the Contractor.

5. Transmittal Form: Use AIA Document G810. On the form, record requests for information and deviations from requirements. Include Contractor's certification that information complies with requirements.

B. Contractor's Construction Schedule: Prepare a horizontal bar-chart-type, contractor's construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first working day of each week. Use the same breakdown of Work indicated in the "Schedule of Values." See Section 01026 Indicate estimated completion in 10 percent increments. As Work progresses, mark each bar to indicate actual completion.

1. Submit on date of Pre-Construction Meeting.
2. Prepare the schedule on stable transparency, or other reproducible media, of width to show data for the entire construction period.
3. Secure performance commitments from parties involved. Coordinate each element with other activities; include minor elements involved in the Work. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
4. Coordinate with the Schedule of Payment, list of subcontracts, Submittal Schedule, payment requests, and other schedules.
5. Indicate completion in advance of Substantial Completion. Indicate Substantial Completion to allow time for the Architect's procedures necessary for certification of Substantial Completion.
6. Phasing: Show how phased completion affects the Work.
7. Work Stages: Indicate important stages for each portion of the Work.
8. Area Separations: Provide a separate time bar to identify each construction area for each portion of the Work. Indicate where each element must be sequenced with other activities.

C. Submittal Schedule: After developing the Contractor's Construction Schedule, prepare a schedule of submittals. Submit within 10 days of submittal of the Construction Schedule.

1. Coordinate with list of subcontracts, Schedule of Values, list of products, and the Contractor's Construction Schedule.
2. Prepare the schedule in chronological order. Provide the following information:

    a. Date for first submittal.
    b. Related Section number.
    c. Submittal category (Shop Drawings, Product Data, or Samples).
    d. Name of the subcontractor.
    e. Description of the Work covered.
    f. Date for the Architect's final approval.

3. Schedule Distribution: Distribute copies of the Contractor's Construction Schedule and the Submittal Schedule to the Architect, Owner, subcontractors, and parties required to comply with submittal dates. Post copies in the field office.

    a. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their Work and are no longer involved in construction activities.

b. Updating: Revise the schedule after each meeting or activity where revisions have been made. Issue the updated schedule concurrently with the report of each meeting.

D. Daily Construction Reports: See Section 1200 for more detail

E. Shop Drawings: See Section 01340 for more detail about Shop Drawings. See Shop Drawings in respective Technical Sections as identified.

Do not use Shop Drawings without an appropriate final stamp indicating action taken.

F. Product Data: Collect Product Data into a single submittal for each element of construction. Mark each copy to show applicable choices and options. Where Product Data includes information on several products, mark copies to indicate applicable information.

1. Include the following information:

a. Manufacturer's printed recommendations.
b. Compliance with trade association standards.
c. Compliance with recognized testing agency standards.
d. Application of testing agency labels and seals.
e. Notation of dimensions verified by field measurement.
f. Notation of coordination requirements.

2. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.

3. Submittals: Submit 2 copies; submit 4 copies where required for maintenance manuals. The Landscape Architect will retain one and return the other marked with action taken.

a. Unless noncompliance with Contract Documents is observed, the submittal serves as the final submittal.

4. Distribution: Furnish copies to installers, subcontractors, suppliers, and others required for performance of construction activities. Show distribution on transmittal forms. Do not proceed with installation until a copy of Product Data is in the Installer's possession.

a. Do not use unmarked Product Data for construction.

G. Samples: Submit full-size Samples cured and finished as specified and identical with the material proposed. Mount Samples to facilitate review of qualities.

1. Include the following:

a. Specification Section number and reference.
b. Generic description of the Sample.
c. Sample source.
d. Product name or name of the manufacturer.
e. Compliance with recognized standards.
f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture, for a check of these characteristics, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations.

   a. Refer to other Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar characteristics.
   b. Refer to other Sections for Samples to be incorporated in the Work. Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
   c. Samples not incorporated into the Work, or designated as the Owner's property, are the Contractor's property and shall be removed from the site.

3. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from standard choices. The Architect will review and return submittals indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. One set will be returned marked with the action taken. Maintain sets of Samples, at the Project Site, for quality comparison.

   a. Unless noncompliance with Contract Documents is observed, the submittal may serve as the final submittal.
   b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

5. Distribution of Samples: Distribute additional sets to subcontractors, manufacturers, and others as required for performance of the Work. Show distribution on transmittal forms.

H. Quality Assurance Submittals: Submit quality-control submittals, including design data, certifications, manufacturer's instructions, and manufacturer's field reports required under other Sections of the Specifications.

1. Certifications: Where certification that a product or installation complies with specified requirements is required, submit a notarized certification from the manufacturer certifying compliance.

    a. Signature: Certification shall be signed by an officer authorized to sign documents on behalf of the company.

I. Sample Panels:

1. Contractor shall construct sample panels in accordance with the Technical Specifications for review and approval by Landscape Architect.
2. Samples shall be prepared in advance of construction sequencing to allow time for modifications and approvals.
3. Contractor shall allow Landscape Architect five days to respond to a request to see a sample.
4. Full scale construction of any work requiring a pre-approved sample shall not begin until after Landscape Architect issues a statement of approval.

J. Architect's Action: Except for submittals for the record or information, where action and return are required, the Architect will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.

1. Action Stamp: The Architect will stamp each submittal with an action stamp. The Architect will mark the stamp appropriately to indicate the action taken.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01300

SECTION 01340

SHOP DRAWINGS

PART 1 GENERAL

1.01 SCOPE

A. The work under this Section includes submittal to the Owner's Representative of shop drawings, product data and samples required by the various sections of these Specifications. The following item will require shop drawings.

1. Gator Bridge manufacturer shop drawings for specified bridges.
2. Bridge abutments if additional soil borings are needed.
3. Soil Borings for the bridges are provided in the Appendix of this Project Manual.

B. Electronic Submittals: The Client prefers electronic submittals of Shop Drawings to the Client Website. https://www.brookhavenga.gov/

C. Submittal Contents: The submittal contents required are specified in each section of the Project Manual Technical Specifications. Owner prefers electronic submittals.

D. Project Drawings include typical sections and details of the proposed bridge abutment for reference relative to height and location. These details are provided to the contractor for use in understanding the extent of the abutment and the need to develop Shop Drawings after the soil borings are taken.

E. Definitions: Submittals are categorized as follows:

1. Shop Drawings:

a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.

b. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail Shop Drawings. Show dimensions and note dimensions that are based on actual field measurements. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final "Action" markings by the Project Landscape Architect for Owner's Representative.

2. Product Data
   a. Product data includes standard printed information on materials, products and systems, not specially prepared for this project, other than the designation of selections from among available choices printed therein.

   b. Collect required data into one submittal for each unit of work or system and mark each copy to show which choices and options are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.

3. Samples
   a. Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.

   b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Project Landscape Architect's selection is required. Prepare samples to match the Project Landscape Architect's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by the Project Landscape Architect. Project Landscape Architect will note "test" samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.

4. Miscellaneous submittals related directly to the Work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the Work but not processed as shop drawings, product data or samples.

1.02 ROUTING AND SUBMITTALS

A. Submittals and routine correspondence shall be routed as follows:
   1. Supplier to Contractor (through product representative if applicable)
   2. Contractor to Owner's Representative to review/approve submittals.
   3. Owner to forward to Landscape Architect or other project professionals prior to submitting back to Contractor if deemed necessary.
   4. Project Landscape Architect to Owner's Representative to Contractor

5. Contractor back to Supplier

PART 2 PRODUCTS

2.01 Manufacturer's Literature

A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Owner's Representative and Project Landscape Architect's review.

B. Submit the number of copies which are required to be returned (not to exceed (3) three) plus three copies which will be retained by the Owner's Representative.

2.02 Samples

A. Samples shall illustrate materials, finishes, colors, equipment or workmanship and established standards by which completed work is judged.

B. Unless otherwise specifically directed by the Owner or Project Landscape Architect, all samples shall be of the precise article proposed to be furnished.

C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Owner's Representative.

2.03 Colors

A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Owner's Representative for review and selection.

B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

PART 3 EXECUTION

3.01 Contractor's Coordination of Submittals

A. Prior to submittal for the Owner's Representative to review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:

1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
2. Coordinate as required with all trades and all public agencies involved.
3. Submit a written statement of review and compliance with the requirements of all

applicable Technical Specifications as well as the requirements of this Section.

4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.
5. Have a qualified design professional registered in the State of Georgia to design, review and approve the elements being designed in the Shop Drawings.

B. Each copy of the shop drawings and data shall bear the Contractor's professional stamp showing that they have been so checked by a Georgia Certified design professional. Shop drawings submitted to the Owner's Representative without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.

C. The Owner may back charge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two (2) times to receive a "*No Exceptions Taken"* mark.

D. Grouping of Submittals

1. Unless otherwise specifically permitted by the Owner's Representative, make all submittals in groups containing all associated items.

2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Owner's Representative along with Contractor's comments as to compliance, non-compliance or features requiring special attention.

E. Schedule of Submittals

1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and a measure of time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.02 Timing of Submittals

A. Make all submittals far enough in advance of scheduled dates for delivery and installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, for placing orders and securing timely delivery.

B. In scheduling, allow sufficient time for the Owner's Representative and Project Landscape Architect's plans review following the receipt of the submittal.

3.03 Reviewed Shop Drawings

A. Owner's Representative Review

1. Allow a minimum of 30 days for the Owner's Representative initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Owner's Representative will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two (2) weeks for reprocessing each submittal. Advise the Owner's Representative on each submittal as to whether processing time is critical to progress of the Work, and therefore the Work would be expedited if processing time could be foreshortened.

2. Acceptable submittals will be marked "No Exceptions Taken". A minimum of three copies will be retained by the Owner's Representative for Project Landscape Architect's and the Owner's use and the remaining copies will be returned to the Contractor.

3. Submittals requiring minor corrections before the product is acceptable will be marked "*Make Corrections Noted*". The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked "No Exceptions Taken" prior to installation or use of products.

4. Submittals marked "*Amend and Resubmit*" must be revised to reflect required changes and the initial review procedure repeated.

5. The "*Rejected - See Remarks*" notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.

6. Only two (2) copies of items marked "*Amend and Resubmit"* and "*Rejected - See Remarks"* will be reviewed and marked. One copy will be retained by the Project Landscape Architect and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.

B. No work or products shall be installed without a drawing or submittal bearing the *"No Exceptions Taken*" notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Project Landscape Architect's stamp and approved by the Owner.

C. Substitutions: In the event the Contractor obtains the Owner's Representative

approval for the use of products other than those which are listed first and bid into the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Project Architect, make any changes to structures, piping and electrical work that may be necessary to accommodate products.

D. Use of the "*No Exceptions Taken*" notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Owner's Representative and or Project Landscape Architect's review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.04 Resubmission Requirements

A. Shop Drawings

1. Revise initial drawings as required and resubmit as specified for initial submittal, with the resubmittal number shown.

2. Indicate on drawings all changes which have been made other than those requested by the Owner's Representative.

B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with the resubmittal number shown.

END OF SECTION 01340

SECTION 01400

QUALITY CONTROL

1.1 GENERAL

A. Quality control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Landscape Architect.

B. Contractor Responsibilities: Unless they are the responsibility of another entity, Contractor shall provide inspections and tests specified elsewhere and required by authorities having jurisdiction. Costs for these services shall be included in the Contract Sum.

1. Where inspections and tests are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform these services. Costs for these services are included in the Contract Sum.

2. Where inspections and tests are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

3. Where inspections and tests are the Owner's responsibility, the Owner will engage the services of a qualified independent testing agency to perform those services. Payment will be made from the Inspection and Testing Allowance, as authorized by Change Orders.

    a. Where the Owner engages an agency to test or inspect part of the Work and the Contractor is required to engage an entity to test or inspect the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless the Owner agrees in writing.

C. Retesting: The Contractor is responsible for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.

1. The cost of retesting is the Contractor's responsibility where tests performed indicated noncompliance with requirements.

D. Auxiliary Services: Cooperate with agencies performing inspections and tests. Provide auxiliary services as requested. Notify the agency in advance of operations to permit assignment of personnel. Auxiliary services include the following:

1. Providing access to the Work.
2. Furnishing incidental labor and facilities to assist inspections and tests.
3. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
4. Providing facilities for storage and curing of test samples.

5. Delivering samples to testing laboratories.
6. Providing preliminary design mix proposed for use for materials mixes that require control by the testing agency.
7. Providing security and protection of samples and test equipment.

E. Duties of the Testing Agency: The testing agency shall cooperate with the Landscape Architect and the Contractor in performing its duties. The agency shall provide qualified personnel to perform inspections and tests.

1. The agency shall notify the Landscape Architect and the Contractor of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency shall not release, revoke, alter, or enlarge requirements or approve or accept any portion of the Work.
3. The agency shall not perform duties of the Contractor.

F. Coordination: Coordinate activities to accommodate services with a minimum of delay. Avoid removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling inspections, tests, taking samples, and similar activities.

G. Submittals: The testing agency shall submit a certified written report, in duplicate, of each inspection and test to the Landscape Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection or test through the Contractor.

1. Submit additional copies of each report to the governing authority, when the authority so directs.

2. Report Data: Reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

H. Qualifications for Service Agencies: Engage inspection and testing service agencies that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each agency shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Repair and Protection: Upon completion of inspection, testing, and sample taking, repair damaged construction. Restore substrates and finishes. Comply with Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities and protect repaired construction.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for inspection and testing.

END OF SECTION 01400

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.1 GENERAL

A. Summary: This Section specifies construction facilities and temporary controls including temporary utilities, support facilities, and security and protection facilities.

B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Local Police, fire department, and rescue squad rules.
5. Environmental protection regulations.
6. City Parks Department and Athletic Associations for park access.

C. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

E. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. Submit reports of tests, inspections, meter readings, and procedures performed on temporary utilities. At the earliest time, change over from use of temporary service to use of permanent service.

F. Construction Access and Staging: Contractor shall coordinate with the City to determine the best access route for delivery and construction of the project. Staging may take place in areas designated by the City. Refer to the Construction Access and Staging plans provided by the City.

1.2 PRODUCTS

A. Materials: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

1. Lumber and Plywood: All lumber Provide UL-labeled, fire-treated lumber and plywood for temporary offices and sheds. Provide exterior, Grade B-B high-density concrete form overlay plywood for signs. Provide 5/8-inch- (16-mm-) thick exterior plywood for other uses.
2. Roofing Materials: UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of temporary offices, shops, and sheds.
3. Paint: Comply with Division 9 Section "Painting."

    a. For exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
    b. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
    c. For interior walls of temporary offices, provide 2 coats interior latex-flat wall paint.

4. Tarpaulins: Waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
5. Water: Potable water approved by local health authorities.
6. Open-Mesh Fencing: 0.120-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chain link fabric fencing 6 feet (2 m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts.

B. Equipment: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

1. Water Hoses: 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long. Provide adjustable shutoff nozzles at hose discharge.
2. Electrical Outlets: Properly configured, NEMA-polarized outlets. Provide outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
3. Electrical Power Cords: Grounded extension cords. Use hard-service cords where exposed to abrasion and traffic.
4. Lamps and Light Fixtures: General service incandescent lamps. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
5. Heating Units: Temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
6. Fire Extinguishers: Hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried,

portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

a. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.3 EXECUTION

A. Installation, General: Use qualified personnel to install temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

1. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
2. Conditions of Use: Keep temporary facilities clean and neat in appearance. Operate safely and efficiently. Relocate as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire- prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

B. Temporary Utility Installation: Engage the local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.
5. Temporary Water Service: Install temporary water service and distribution piping of sizes and pressures adequate for construction. Maintain service until permanent water service is in use. Sterilize piping prior to use.
6. Temporary Electric Power: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear. Install service underground.

    a. Power Distribution: Install wiring overhead and rise vertically where least exposed to damage.

b. Temporary Lighting: Provide temporary lighting with local switching to fulfill security requirements and illumination for construction operations and traffic conditions.

7. Temporary Heat: Provide temporary heat for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations. Coordinate ventilation requirements to produce ambient condition required and minimize consumption of energy.

   a. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel oil heaters with individual space thermostatic control. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.

8. Temporary Telephones: Provide telephone service for each personnel engaged in construction. Provide a separate line for each temporary office and first aid station on site. Provide a dedicated telephone line for a fax machine in the field office. At each telephone, post a list of important telephone numbers.
9. Sanitary Facilities: Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers.

   a. Toilets: Install self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

      1) Provide separate facilities for male and female personnel.

   b. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up. Dispose of drainage properly. Supply cleaning compounds.

      1) Provide safety showers, eyewash fountains, and similar facilities for safety, and sanitation of personnel.

   c. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled drinking-water units.

10. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor

drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

a. Filter out soil, construction debris, chemicals, and similar contaminants that might clog sewers or pollute waterways.

b. Connect temporary sewers to the municipal system, as directed by sewer department officials. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

c. Provide earthen embankments and similar barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.

C. Support Facilities Installation: Locate field offices, storage sheds, and other construction and support facilities for easy access and in coordination with the Owner. Maintain facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

1. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.
2. Field Offices: Provide heated and air-conditioned, insulated, weather tight temporary offices of size to accommodate personnel at the Project Site. Provide offices on foundations adequate for normal loading. Provide units with lockable entrances, operable windows, and serviceable finishes. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

a. Furnish field offices with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase. Equip with a water cooler and toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.

3. Storage and Fabrication Sheds: Install sheds equipped to accommodate materials and equipment involved. Sheds may be open shelters or fully enclosed spaces within the building.

4. Temporary Paving: Construct temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Comply with Division 2 Section "Hot-Mixed Asphalt Paving."

a. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.

1) Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.

b. Delay installation of the final course of permanent paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.
c. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

5. Dewatering Facilities and Drains: For temporary drainage and dewatering operations not directly associated with construction, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain excavations and construction free of water.
6. Temporary Enclosures: Provide temporary enclosures for protection of construction from exposure, foul weather, other construction operations, and similar activities. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions.

a. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
b. Close openings through floor or roof decks and horizontal surfaces with loadbearing, wood-framed construction.

7. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees.
8. Temporary Elevator Use: Refer to Division 14 Sections for elevators.
9. Project Signs: Install project identification and other signs where indicated to inform the public and persons seeking entrance to the Project. Support on framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs. Engage an experienced sign painter to apply graphics. Comply with details indicated.
10. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
11. Waste Collection and Disposal: Collect waste daily. Comply with requirements of NFPA 241. Enforce requirements strictly. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

a. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80° F (27° C).

12. Pest Control: Retain an exterminator or pest control company to perform extermination and control procedures at regular intervals so the Project will be

free of pests at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

13. Stairs: Provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

D. Security and Protection Facilities Installation: Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion.

1. Temporary Fire Protection: Until permanent facilities supply fire-protection needs, install and maintain temporary fire-protection facilities of types needed to protect against controllable fire losses. Comply with NFPA 10 and NFPA 241.

    a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell. Maintain unobstructed access to fire extinguishers.
    b. Store combustible materials in containers in fire-safe locations.
    c. Prohibit smoking in hazardous fire-exposure areas.
    d. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

2. Permanent Fire Protection: At the earliest date, complete installation of the permanent fire-protection facility and place into operation and use. Instruct key personnel on use of facilities.

3. Barricades, Warning Signs, and Lights: Comply with code requirements for erection of barricades. Paint with appropriate colors, graphics, and warning signs. Where appropriate and needed, provide lighting, including flashing red or amber lights.

4. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates to enclose the entire site or the portion sufficient to accommodate construction.

    a. Provide open-mesh, chain link fencing with posts set in a compacted mixture of gravel and earth.

    b. Provide plywood fence, 8 feet (2.5 m) high, framed with four 2-by-4-inch (50-by-100-mm) rails, and preservative-treated wood posts spaced not more than 8 feet (2.5 m) apart.

5. Covered Walkway: Erect a protective covered walkway along the public steet Coordinate with entrance gates. Comply with regulations of authorities having jurisdiction.

    a. Construct walkways, if needed, using wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs,

lights, safe and well-drained walkways, and similar provisions for protection. Extend back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner.

6. Security Enclosure and Lockup: Install temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, and theft. Provide a secure lockup where materials and equipment are of value and must be stored.
7. Environmental Protection: Operate temporary facilities and conduct construction in ways that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making equipment to hours that will minimize complaints.

E. Operation: Enforce discipline in use of temporary facilities. Limit availability to intended uses to minimize waste and abuse.

F. Maintenance: Maintain facilities in operating condition until removal. Protect from damage by freezing temperatures and similar elements. Maintain temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid damage.

G. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect during excavation.

H. Termination and Removal: Remove each temporary facility when the need has ended, when replaced by a permanent facility, or no later than Substantial Completion. Complete or restore permanent construction delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

2. Remove temporary paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with oil, asphalt and other petrochemical compounds, and substances that might impair growth of plant materials or lawns. Repair or replace paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period.

   a. Replace air filters and clean inside of ductwork and housings.
   b. Replace worn parts and parts subject to unusual operating conditions.
   c. Replace burned out lamps.

END OF SECTION 01500

SECTION 01600

MATERIALS AND EQUIPMENT

1.1 GENERAL

A. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.

1. "Named Products" are items identified by the manufacturer's product name, including make or model number or designation, shown or listed in the manufacturer's published product literature.

B. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

D. Product List: A list of products required is included at the end of this Section. Prepare a schedule in tabular form showing each product listed. Include the manufacturer's name and proprietary product names for each item listed. Coordinate product list with the Contractor's Construction Schedule and Submittal Schedule.

1. Form: Prepare product list with information on each item tabulated under the following column headings:

a. Related Specification Section number.
b. Generic name used in Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.

2. Within 60 days after date of commencement of the Work, submit 3 copies of the product list. Provide a written explanation for omissions of data and variations from Contract requirements.
3. The Architect will respond within 2 weeks of receipt of the list. No response within this period constitutes no objection to listed manufacturers or products but does not waive the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable products.

E. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected.

F. Nameplates: Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

G. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage and to prevent overcrowding construction spaces. Coordinate with installation to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
2. Deliver products in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
3. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
4. Store products to facilitate inspection and measurement of quantity or counting of units. Store heavy materials away from the structure in a manner that will not endanger the supporting construction.
5. Store products subject to damage by the elements aboveground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.2 PRODUCTS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.

2. Semiproprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.

    a. Where products are specified by name, accompanied by the term "or equal," comply with provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that provides the characteristics and otherwise complies with requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply and are recommended for the application. Manufacturer's recommendations may be contained in product literature or by the manufacturer's certification of performance.
6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
7. Visual Matching: Where Specifications require matching a Sample, the Architect's decision on whether a product matches will be final. Where no product in the specified category matches and complies with other requirements, comply with provisions concerning "substitutions" for selection of a matching product in another category.
8. Visual Selection: Where requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a

product that complies with other requirements. The Architect will select the color, pattern, and texture from the product line selected.

1.3 EXECUTION

A. Comply with manufacturer's instructions for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631

SUBSTITUTIONS

1.1 GENERAL

A. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed after award of the Contract are considered requests for substitutions. The following are not a request for substitutions:

1. Substitutions requested during the bidding period and accepted by Addendum prior to award of the Contract.
2. Revisions to the Contract Documents requested by the Owner.
3. Specified options included in the Contract Documents.
4. Contractor's compliance with regulations issued by governing authorities.

B. Substitution Request Submittal: The Architect/Engineer or Client Representative will consider requests for substitution received within 60 days after commencement of the Work.

1. Submit three (3) copies of each request for substitution. Submit requests according to procedures required for change-order proposals.
2. Identify the product or method to be replaced in each request. Include related Specification Section and Drawing numbers.
3. Provide documentation showing compliance with the requirements for substitutions and the following information:

    a. Coordination information, including a list of changes needed to other Work that will be necessary to accommodate the substitution.
    b. A comparison of the substitution with the Work specified, including performance, weight, size, durability, and visual effect.
    c. Product Data, including Drawings and descriptions of products and installation procedures.
    d. Samples, where applicable or requested.
    e. A statement indicating the effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the substitution on Contract Time.
    f. Cost information, including a proposal of the net change, if any in the Contract Sum.
    g. Certification that the substitution conforms to the Contract Documents and is appropriate for the applications indicated.
    h. The Contractor's waiver of rights to additional payment or time that may become necessary because of the failure of the substitution to perform adequately.

4. Architect's Action: If necessary, the Architect will request additional information within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection within 2 weeks of receipt of the request. Acceptance will be in the form of a change order.

    a. Use the product specified if the Architect cannot make a decision within the time allocated.

1.2 PRODUCTS

A. Conditions: The Architect will receive and consider a request for substitution when one or more of the following conditions are satisfied. Otherwise, the Architect will return the requests without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.
2. Changes are in keeping with the intent of the Contract Documents.
3. The specified product cannot be provided within the Contract Time. The Architect will not consider the request if the specified product cannot be provided as a result of failure to pursue the Work promptly.
4. The request is related to an "or-equal" clause.
5. The substitution offers the Owner a substantial advantage, in cost, time, or other considerations, after deducting compensation to the Architect for redesign and increased cost of other construction.
6. The specified product cannot receive approval by a governing authority, and the substitution can be approved.

B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction not complying with the Contract Documents do not constitute an acceptable request for substitution, nor do they constitute approval.

1.3 EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01700

CONTRACT CLOSEOUT

1.1 GENERAL

A. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

B. Substantial Completion: Before requesting inspection for certification of Substantial Completion, complete the following:

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete.
   a. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
5. Deliver tools, spare parts, extra stock, and similar items.
6. Changeover locks and transmit keys to the Owner.
7. Complete startup testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.
8. Gator bridge maintenance training by Gator Bridge provider.
9. Complete final cleanup requirements, including touchup painting.
10. Touch up and repair and restore marred, exposed finishes.

C. Inspection Procedures: On receipt of a Request for Inspection, the Landscape Architect will proceed or advise the Contractor of unfilled requirements. The Landscape Architect will prepare the Certificate of Substantial Completion following inspection or prepare a Punch List to advise the Contractor of construction items that must be completed or corrected before the certificate will be issued.

1. The Landscape Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. One inspection by Gator Bridge representative for final approval.
3. Results of the completed inspection will form the basis of requirements for final acceptance.

D. Final Acceptance: Before requesting inspection for certification of final acceptance and final payment, complete the following:

1. Final payment request with releases and supporting documentation. Include insurance certificates where required.
2. Submit a statement, accounting for changes to the Contract Sum.
3. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
4. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.
5. Submit consent of surety to final payment.
6. Submit a final settlement statement.
7. Submit evidence of continuing insurance coverage complying with insurance requirements.

E. Re-inspection Procedure: The Landscape Architect will re-inspect the Work upon receipt of notice that the Work has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Landscape Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Landscape Architect will advise the Contractor of Work that is incomplete or obligations that have not been fulfilled but are required in the form of a Punch List.
2. If necessary, re-inspection will be repeated.

F. Record Document Submittals: Do not use record documents for construction. Protect from loss in a secure location. Provide access to record documents for the Landscape Architect's reference.

G. Record Drawings: Maintain a set of prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.

1. Mark sets with red pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Organize record drawing sheets into manageable sets. Bind with durable-paper cover sheets; print titles, dates, and other identification on the cover of each set.
3. Upon completion of the work, submit one reproducible copy of the Record Drawings to the Owner.

H. Record Specifications: Maintain one copy of the Project Manual, including addenda. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications. Give attention to substitutions and selection of options and information on concealed construction. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Landscape Architect for the Owner's records.
2. Submit complete copies of all testing data and shop drawings to the Owner.

I. Maintenance Manuals: Organize operation and maintenance data into sets of manageable size. Bind in individual, heavy-duty, 2-inch (51-mm), 3-ring, binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Shop Drawings and Product Data.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires maintenance to provide instruction in proper operation and maintenance. Include a detailed review of the following items:

1. Maintenance manuals.
2. Spare parts, tools, and materials.
3. Lubricants and fuels.
4. Identification systems.
5. Control sequences.
6. Hazards.
7. Warranties and bonds.
8. Maintenance agreements and similar continuing commitments.

B. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.

1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and foreign substances. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even- textured surface.

C. Pest Control: Engage a licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

E. Removal of Protection: Remove temporary protection and facilities.

F. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.

END OF SECTION 01700

SECTION 01740

WARRANTIES

1.1 GENERAL

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
2. Refer to Section 02900 for plant material warranties.
3. All conditions of this Section shall also apply to warranties stated in other sections.

4’ Refer to Gator Bridges literature for warranties on products and materials.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

G. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as

limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

H. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

I. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

J. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (*115-by-280-mm*) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. List of Warranties: As follows:
Gator Bridges, storm pipes, and any other products under warranty.

B. Schedule: Provide warranties on products and installations as specified in the included Sections: Division 2, thru Division 16.

END OF SECTION 01740

CONTRACTOR WARRANTY FORM

PROJECT: CITY OF BROOKHAVEN – MURPHEY CANDLER PARK- SOUTH TRAIL

LOCATION: BROOKHAVEN, GEORGIA

OWNER: CITY OF BROOKHAVEN

GENERAL CONTRACTOR:

We_____, contractor
(Company Name)

for_____, as described in Specification Section (s)
(list trade)

_____ do hereby warrant
(list appropriate sections of specifications)

that all labor and materials furnished and work performed in conjunction with the above referenced project are in accordance with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of one year from Date of Substantial Completion and that all street signs will be free from defects due to defective materials or workmanship for a period of seven years from Date of Substantial Completion.

This warranty commences at 12:00 noon on _____
and expires at 12:00 noon on_____. Should any defect develop during the warranty period due to improper materials, workmanship or arrangement, the defect shall, upon written notice by the Owner, be repaired or replaced by the undersigned at no expense to the Owner.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

DATE:_____ FOR: _____
(COMPANY NAME)

BY: _____

TITLE: _____

END OF SECTION 01740A

SUB-CONTRACTOR WARRANTY FORM

PROJECT: CITY OF BROOKHAVEN – MURPHEY CANDLER PARK- SOUTH TRAIL

LOCATION: BROOKHAVEN, GEORGIA

OWNER: CITY OF BROOKHAVEN

SUB-CONTRACTOR:

We_____, subcontractor
(Company Name)

for_____, as described in Specification Section (s)
(list trade)

_____ do hereby warrant
(list appropriate sections of specifications)

that all labor and materials furnished and work performed in conjunction with the above referenced project are in accordance with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of one year from Date of Substantial Completion and that all street signs will be free from defects due to defective materials or workmanship for a period of seven years from Date of Substantial Completion.

This warranty commences at 12:00 noon on _____

_____ and expires at 12:00 noon on_____. Should by any defect develop during the warranty period due to improper materials, workmanship or arrangement, the defect shall, upon written notice by the Owner, be repaired or replaced by the undersigned at no expense to the Owner.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

DATE: _____ FOR:_____
(COMPANY NAME)

BY: _____

TITLE: _____

END OF SECTION 01741

SECTION 02060

SITE DEMOLITION

PART 1 GENERAL

1.01 SCOPE

The work in this Section consists of furnishing all material and equipment and performing all labor necessary for demolishing and disposing of designated elements indicated on the Drawings.

Due to proximity of trees to the trail, some of the demolition should be performed by small lightweight equipment.

Demolition items shall consist of the removal of signs, pipes, fences, sidewalks, and drainage structures, and other items within the limits of construction. Relocation items shall consist of signs, fire hydrants, utility poles, and any other element within the limits of construction.

Utilities: Contractor shall notify and secure permission from utility companies effected by the demolition.

All underground utilities in the construction area shall be marked prior to any demolition of excavation.

Code Compliance: Contractor shall comply with all applicable codes, ordinances, rates, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction over the project.

Demolition process and construction procedures shall not interfere with use of any of the parking lot within the park.

1.02 SUBMITTALS

The Contractor shall submit a safety plan, to include a detailed demolition procedure, to the Owner’s Representative and Landscape Architect for approval at least ten (10) days before demolition begins. The demolition procedure shall include a detailed description of the methods and equipment to be used for each operation and the sequence of work. The demolition procedures shall provide for safe conduct of the work, and protection of the property, which is to remain undisturbed and coordination with other work or operations, which may be in progress.

The ballfields will be available to the public during the construction process. The contractor shall submit a plan that allows the public to have access to the park facilities.

1.03 PERMITS

Contractor is responsible for securing all permits necessary to demolish and dispose of all demolition items and to use local roadways for access and egress. Contractor shall secure any and all permits to allow work to be executed in the park boundaries.

1.04 DEFINITIONS

Limits of Disturbance: (LOD) The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Limits of Work: (LOW) The boundary within only maintenance type of work can occur, no new construction shall occur within the LOW.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 EXPLORITORY TRENCHING:

A. In all locations where, underground utilities may exist or are known to exist, the Contractor shall dig exploratory trenches in line with proposed new utilities to discover true depth, size, and location of existing utilities before beginning utility construction.
B. Contractor shall notify all utility companies of their excavation schedule prior to actual excavation.

3.02 DEMOLITION

A. All site material shall be removed as necessary for construction.

B. Utilities: The location of existing utilities is approximate and shall be field verified prior to beginning demolition. If the elevation or location is substantially different from that shown on the plans or if a conflict exists, the Landscape Architect shall be notified. Any damage or unauthorized interruption of existing utilities shall be the sole responsibility of the Contractor and shall be repaired at contractor's expense.

C. Any element, or part thereof, remaining below grade shall be mechanically fractured so that subsurface water will freely pass through the slab or floor of the structure, and so that no void will remain after backfilling the work site to grade as shown on the Drawings.

D. The Contractor shall be responsible for removing all existing service connections to the site and permanently plugging the pipes where required in accordance with requirements of the utility companies concerned. The Contractor shall contact all utility companies prior to beginning work to coordinate disconnection of active utilities, removal or relocation of meters and marking existing underground utilities.

E. The Contractor will be responsible for any damage caused to other site elements and shall be held liable for any and all repairs, replacement of parts or renovations required to restore any structure, portion of structure, equipment or items, not intended for demolition. The Contractor shall restore any damaged elements to their condition prior

to demolition provided the damage was result of the demolition. If the Contractor does not repair any such damage immediately, or if the repairs are not suitable to the Owner, the Owner reserves the right to have such repairs made by another party and deduct the cost of required repairs from money due Contractor.

F. All salvageable materials shall remain the property of the Brookhaven Parks Department and shall be cleaned and stored on the Owner's property as directed by the Owner's Representative.

G. Rip rap on the site may be salvageable for reuse at the headwalls if available.

H. Any underground fuel, storage, septic or other tanks encountered shall be demolished according to the most recent environmental standards.

I. Any contaminated soils discovered on site shall be removed at owners' expense. Contractor shall report such conditions to the Landscape Architect immediately.

J. Any materials left on the site by other construction crews shall be brought to the attention of the Owners Representative and removed per his instructions.

3.03 DISPOSAL

A. All materials, which are not delivered to the Owner as specified above, shall become the property of the Contractor, and shall be demolished, moved or otherwise disposed of at the option of the Contractor by a method approved by the Owner. All debris shall be disposed of off-site by the Contractor. No burial, salvage or sale of demolished materials on site will be allowed.

B. All demolished elements and materials shall be removed from the work site by the Contractor.

C. All demolished elements and materials, which are either left in place or removed to the disposal site shall be in a non-hazardous condition.

D. Manhole frames and covers to be removed are the property of the Owner and shall be delivered to a place designated by the Owner's Representative.

E. Poles, transformers, equipment that belongs to respective utility companies and designated for removal or salvage shall be delivered to the respective utility company.

F. All items marked salvage shall be removed and delivered to the county parks maintenance facility for storage.

G. All unusable rock excavated on the site shall be removed and disposed of according to local codes and regulations.

3.04 COORDINATION:

A. Traffic Control and Safety: Contractor shall work with City of Brookhaven and local Police officials to prepare a traffic control and safety plan and process for the execution of work within the park boundaries. Traffic Control and Safety plan may be provided to the Owner after the contractor is selected.

END OF SECTION 02060

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Conditions of Section 02112 Tree Protection and Clean Up shall apply to this section. Related Sections 02060 Demolition, 02540 Erosion and Sediment Control,

1.2 SCOPE:

A. This Section describes materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The Contractor shall furnish all materials, equipment and labor necessary to complete the work. Precautionary measures that prevent damage to existing trees and other site features to remain are part of the Work.

B. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.

C. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

D. Construction Access shall conform to all erosion control protection requirements.

E. Contractor shall always maintain reasonable access to the park for use of the citizens.

F. Contractor shall coordinate with the Owner's Representative to be aware of special events taking place in the park and to take reasonable measures to accommodate the events.

1.3 CLEARNG AND GRUBBING:

A. Within the limits schematically identified on the Drawings, the site will be cleared and grubbed to prepare for construction.

B. The Contractor shall verify existing conditions on the site, and examine all adjoining roadways to the site, which in any way may affect completion of the work. Report to the Landscape Architect or Owner's Representative in writing any condition which will prevent the proper performance of the proposed site construction work. The site premises shall be accepted as found. The Landscape Architect and Project Engineer assume no responsibility for conditions of the site.

C. Clearing:

1. All vegetable growth such as trees, shrubs, brush, logs, upturned stumps and roots of down trees, and all other similar debris shall be removed where shown on the Drawings and disposed of properly by the Contractor as specified below. Cultivated growth shall be removed and trees felled as necessary within the limits of construction work site and as indicated on the drawings.

2. Any construction activities, including trench excavation and fill compaction, which could detrimentally impact existing trees larger than 10- inch diameter (defined as DBH) or their root systems shall be reviewed by and coordinated with the Landscape Architect and City Arborist.

3. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the appropriate utility
.

4. All fences, lumber piles, trash and obstructions, except utility poles, shall be removed as noted on the Drawings and disposed of by the Contractor. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
.

4. All paving and curbs adjoining any excavation area or embankment that may be damaged or buried shall be carefully removed, stored and replaced.

5. All trees that are designated to be saved but the roots have been damaged shall have their exposed roots carefully cut using a hand-held saw. The exposed end of the roots shall be coated with Orange Shellac and covered with aged hardwood mulch.

D. Grubbing:
Remove all stumps, roots and root clusters having a diameter of one inch or larger to a depth of at least two feet below subgrade elevation for concrete structures and at lease one foot below the subgrade under walks, paving and in areas to receive landscape planting.

E. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of properly by the Contractor as specified below. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and walkways or two feet below finish grade, whichever is lower. Refer to Section 02112 of the specifications for additional requirements.

F. Tree Protection fencing shall be kept in good order. See detail on drawings.

1.4 TESTING AND INSPECTION SERVICES:

A. Soil testing will be performed by an independent testing laboratory approved by the Owner. Payment for soil testing shall be made by the Owner.

B. The soils testing laboratory is responsible for the following:
1. Compaction tests in accordance with ASTM D 698.
2. Field density tests for each one foot of lift; one test for each 2,500 square feet of fill.
3. Inspecting and testing stripped site, subgrades and proposed fill materials.

C. The Contractor's duties relative to testing include:
1. Notifying the laboratory of conditions requiring testing.
2. Coordinating with the laboratory for field-testing.
3. Providing representative fill soil samples to laboratory for test purposes. Provide 50-pound samples of each fill soil.
4. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.

D. Inspection:
1. Earthwork operations, suitability of excavated materials for fill and backfill, and placing and compaction of fill and backfill is subject to inspection. The Geo-Technical Engineer will observe earthwork operations and provide recommendations as necessary for subgrade improvement.
2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer to verify suitable bearing and construction.

1.5 DEFINITIONS

Limits of Disturbance: (LOD) The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Limits of Work: (LOW) The boundary within only maintenance type of work can occur, no new construction shall occur within the LOW.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION:

A. Maintain benchmarks, monuments and other reference points. Re-establish, at no cost to the Owner, any such reference points if disturbed or destroyed.

B. Maintain tree protection fencing and erosion control fencing.

3.2 CLEARING:

A. Clear areas required for access to site and execution of the work.

B. Remove trees and vegetation within the area to be cleared. All trees to be saved within the grading limits are shown on the Drawings. Coordinate removal of trees and shrubs with the Landscape Architect or Owner's Representative.

3.3 STAKING:

A. The Contractor shall stake the entire site, both as to location of major construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. See Paragraph 1.6 of Section 01010 Supplemental Conditions.

B. The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation, which can only be determined by the Landscape Architect. This variation is an aesthetic decision; the amount of adjustment most often is determined by the existing trees, terrain, and soil conditions sub-surface water and by other intangibles, which are impractical to survey in absolute accuracy.

C. The Contractor shall notify the Landscape Architect and Owners Representative at least three (3) working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography and all other objects and conditions on the site. At this time, the Landscape Architect will clearly mark all perimeter trees and other vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.

D. During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.

E. The staking-inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction and planting is subject to adjustment to save trees and other vegetation.

3.4 TOPSOIL REMOVAL:

A. Topsoil is defined as a friable sandy loam surface soil found at a depth of not less than 4". Satisfactory topsoil is reasonable free of subsoil, clay lumps, stones, roots, debris, and other objects over 2" in diameter.

B. Topsoil of reusable quality shall be stripped from the site to be cleared, cleaned of objectionable materials and stockpiled on site for reuse in turf and plant bed areas.

C. Where trees are to remain standing, stop topsoil stripping a sufficient distance from such trees to prevent damage to the main root system.

D. Topsoil shall be stockpiled in storage piles where directed by the Owner and Landscape Architect. It shall not be stockpiled under trees or over constructed elements. Construct piles to drain freely of surface water. Cover piles, if necessary, to prevent erosion and dust.

3.5 DISPOSAL OF REFUSE:

A. The refuse resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream, body of water, or in any street or ditch. In no case shall any material be left on the site or shoved onto abutting private properties.

B. Contractor may not dispose of refuse by burning or burial on site. All refuse must be removed and properly disposed of offsite.

C. This is an active park and the contractor shall take great care to not damage any of the site outside the construction limits nor dispose of refuse materials on the site.

3.6 STAGING AREA:

The east parking lot and several other site locations may be available to the Contractor for use in staging and storage within the Park. These sites must be pre-approved by the Owner prior to utilization.

END OF SECTION 02100

SECTION 02112

TREE PROTECTION AND CLEANUP

PART 1 GENERAL

1.01 SCOPE

A. Tree Protection, selective site clearing, and pruning shall be accomplished in all areas to be graded or covered by new construction. Operations include but are not limited to the following:
   1. Staking of the plan on the site, removal of existing vegetation, selective pruning as directed by the Landscape Architect or City Arborist in the field, removal of miscellaneous structures, topsoil stripping, protection of existing trees designated to remain, erosion control and facilities protection.
   2. Woodland pruning and clearing within the limits of work as defined on the construction documents and drawings.
   3. See Section 015639 – Tree Care and Protection for treating existing trees.

1.02 QUALITY ASSURANCE

A. Code Compliance: The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.

B. Qualification of the Workmen: The Contractor shall provide at least one person who shall be present always during tree clearing and grubbing operations and who shall direct the trimming of roots and limbs where required. The Contractor shall provide at least one person who is qualified in the various other trades involved including demolition, protection of property and erosion control.

1.03 JOB CONDITIONS

A. Dust Control: Use all means necessary to prevent the spread of dust during performance of the work of this Section. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the work on the site and surrounding areas.

B. Erosion Control: Install and maintain berms, swales and bales as required to trap waterborne soil particles. As work progresses, relocate and/or add to erosion control system as necessary.

C. Protection: Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately make all repairs and replacements necessary to the approval of the Landscape Architect or Owner's Representative at no additional cost to the Owner.

D. Tree Protection: Protect existing trees and other vegetation indicated to remain in place with county approved tree protection fencing set to the critical root zone of trees to be saved. Protect existing trees against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation to be left standing.

F. Water existing trees and other vegetation, which are to remain and are within the limits of the contract work as required to maintain their health during the course of construction operations. Trees should have a minimum of 1" of water per week under the drip line of the trees either by natural rainfall or supplemental watering by the Contractor.

G. Provide protection for roots over 1 1/2" diameter that are cut during construction operation. Coat any cut faces with emulsified asphalt, or other acceptable coating, especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots with wet burlap to prevent from drying out; provide earth cover as soon as possible.

H. Repair or replace trees and vegetation damaged by construction operations, in a manner acceptable to the Landscape Architect. Tree damage repair shall be performed by a qualified tree surgeon. Replace trees, which cannot be repaired and restored to full-growth status, as determined by the tree surgeon.

I. Protect tree root system from damage due to deleterious materials in solution caused by run-off or spillage during mixing of construction materials or drainage from stored materials. Protect root system from flooding, erosion or excessive wetting resulting from de-watering operations.

PART 2 PRODUCTS

2.01 TEMPORARY BARRICADES:

A. Unless otherwise approved by the Landscape Architect or City Arborist, use only new and solid lumber of utility grade or better to construct temporary barricades around trees and areas designated to remain undisturbed.

2.02 PRUNING PAINT:

A. Use only a pruning paint specifically formulated for horticultural application to cut or damaged plant tissue and approved by the Landscape Architect for use on this work. Preferably, use ‘Orange Shellac’ as pruning paint when available.

PART 3 EXECUTION

3.01 SITE INSPECTION:

A. Prior to any work of this section, carefully inspect the entire site and all objects designated to be removed and all objects to be preserved. Locate all existing utility lines traversing the site and determine the requirements for the protection of those designated to remain.

3.02 SCHEDULING:

A. Schedule all work in a careful manner with all consideration for neighbors and the general public, in conformance with local noise ordinances.

B. Notify the Landscape Architect at least five (5) full working days prior to commencing any work of this section.

3.03 DISCONNECTION OF UTILITIES:

A. Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or agency involved.

3.04 STAKING: See Section 01010 Supplemental Conditions paragraph 1.6.

A. All lines, grades, levels and benchmarks shall be established and maintained by the Contractor.

B. Before commencing any work, the Contractor shall verify all grades, lines, levels and dimensions as indicated on the Drawings. He shall report any errors or inconsistencies to the Landscape Architect and Owner's Representative before commencing work.

C. The Contractor shall stake the entire site, both as to location of all construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. This stakeout may be made early in the construction process and preserved for reference during construction.

D. The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation, which can only be determined by the Landscape Architect. This variation is an aesthetic decision, the amount of adjustment most often determined by the existing trees, terrain, soil conditions, sub-surface water and by other intangibles which are impractical to survey in absolute accuracy.

E. The Contractor shall notify the Landscape Architect at least five (5) working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography and all other objects and conditions on the site. At this time the Landscape Architect will clearly mark all trees and other

vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.

F. During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.

G. The staking-inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction and planting is subject to adjustment to save trees and other vegetation.

3.05 DEMOLITION:
See Section 02060

3.06 MULCH:

A. 1" topping of pine straw shall be placed as mulch in all disturbed areas within the limits of the work without digging into or breaking up the surface roots of trees.

B. Trees to be protected shall have a 3” layer of aged hardwood mulch covering their root zones out to the driplines.

3.07 CLEARING:

A. Clear the site of brush, rubbish, grass, weeds and any other plants designated by the Landscape Architect to be removed. No trees shall be removed, or limbs and roots cut without prior approval of Landscape Architect or Owner’s Representative.

B. Stump Grinding: Grind all stumps that have roots entangled in adjacent trees that are identified to remain. Remove sawdust left from grinding and replace with structural fill under the trail or topsoil in the natural areas.

C. Remove all stumps, roots and root clusters having a diameter of one inch or larger to a depth of at least two (2) feet below subgrade elevation for concrete structures and at least one foot below the subgrade under walks, asphalt roadway and in areas to receive heavy grading. Do not remove stumps in areas to remain natural or where they will damage roots or remaining trees.

3.08 GRADING:

A. Grading shall be kept at a minimum order to reduce the impact of the construction on the natural systems. All grading work shall be confined to the limits of construction work.

B. Contractor shall use equipment and tools that do not expand beyond the limits of construction.

C. Disruption of the existing grade should be kept at a minimum and fill used whenever possible to create uniform surfaces for paved surface materials. No form of root rake shall be used.

D. Near existing trees, grading work should be kept to hand labor and tools rather than heavy machinery.

E. Vehicles may not turn or park under the tree preservation or protection areas.

F. Staging and operations may occur in the open areas where there are no trees. Any damage to existing lawn grasses or fences as a result of construction operations shall be repaired.

3.09 FILL PLACEMENT OVER TREE ROOTS:

A. Where fill dirt is necessary to establish acceptable finished grades over tree roots, contractor shall use the following method:
1. Rake away the existing mulch and natural humus materials.
2. Cover the area with #57 stone to within 3" of finish grade and lightly roll compact.
3. Lay filter fabric over top of the #57 Stone
. 4. Lay 3" of Topsoil over the filter cloth and lightly roll compact.
5. Cover the topsoil with 3" of pine straw or aged hardwood mulch.

3.10 EROSION CONTROL:

A. Install erosion control measures (i.e. silt fencing, rip rap, straw bales, check dams) as necessary during construction to prevent erosion of disturbed areas and prevent damage to downstream property from runoff and silt.

3.11 SILT CONTROL:

A. Prior to any grading or on-site construction, the Contractor shall install silt barriers in all adjacent locations necessary to prevent eroded material from silting paved areas, creeks and adjacent lots.

3.12 CLEANUP:

A. Contractor shall be responsible for removing all rubbish, refuse, soil, waste, and other products or elements resulting from the construction effort.

B. All the natural mulch areas disturbed by the construction activity shall be repaired by raking back to natural grade and covering with 1"-layer pine straw mulch. All pruning rubbish shall be removed from the site or ground and spread as mulch in the natural areas.

END OF SECTION 02112

SECTION 02125B

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) COMPLIANCE

PART 1 - GENERAL

1.01 SCOPE

A. The work specified in this Section consists of the following under the requirements for Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD).

- Notice of Intent (N.O.I.) – Electronic submittal to EPD by Owner
- Updates to the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan – By Landscape Architect
- Comprehensive Monitoring Plan (CMP) – By Landscape Architect
- Compliance Inspections and Monitoring – By Contractor
- Notice of Termination (N.O.T.) – By Owner after appraisal of site by Landscape Architect.

1.03 QUALITY ASSURANCE

A. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

B. Provide all materials and promptly take all actions necessary to monitor, document and achieve effective erosion and sedimentation control in accordance with the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD) and these Specifications.

C. The temporary and permanent erosion and sedimentation control measures shown on the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation shall be updated on the ES&PC Plan and submitted to the Designer for approval by the Contractor at no additional cost to the Owner.

PART 2 - EXECUTION

2.01 NOTICE OF INTENT

A. Issuance of the Notice of Intent (N.O.I.) and other related requirements is the responsibility of the Owner.

2.02 EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN UPDATES

A. Project Civil Engineer has prepared the ES&PC Plan for the South Trail – Murphey Candler Park Improvements in accordance with Georgia's new NPDES Permit for Storm Water Discharges Associated with Construction Activities. To meet the requirements of the permit, the Project Civil Engineer that prepared the ES&PC Plan has provided the required Engineer's certification on the plans.

B. Upon direction from the Owner's Representative, the Project Civil Engineer will conduct the initial inspection of the Best Management Practices (BMPs) for the construction site. The permit requires that the Engineer certifying the ES&PC Plan must also perform the initial BMP inspection.

C. Per the NPDES regulations, the ES&PC Plan is a dynamic document. The project Civil Engineer is responsible for updating the ES&PC Plan if needed. Major changes and amendments to the ES&PC Plan must be certified by a licensed professional engineer, including changes in design, construction, operation, or maintenance which has a significant effect on the potential for the discharge of pollutants to waters of the state. Appropriate Certification of the ES&PC Plan site change updates shall be the responsibility of the General Contractor and the project Civil Engineer.

D. Due to the fact that the trail lies within the flood plain of Nancy Creek and some sections are within the state buffer setback. Therefore, the contractor shall consider using Erosion Control Sock instead of trenching in Erosion Control Fence. The decision can be made in the field by the Owner and Landscape Architect with the Contractor.

2.03 COMPREHENSIVE MONITORING PLAN

A. The Contractor shall prepare the Comprehensive Monitoring Plan (CMP), as required under the NPDES permit. The purpose of the CMP is to define the methods used to monitor performance of on-site BMPs and storm water runoff. The plan shall include sampling strategies and monitoring locations for the site, along with details of the record keeping and reporting requirements applicable to the site. The plan shall also include example record keeping and reporting forms to assist with the documentation necessary to maintain compliance under the permit. The CMP shall be provided in an oversized 3-ring binder, and all records and inspection logs kept in a central on- site location.

B. Per the NPDES regulations, the CMP is a dynamic document and major changes and amendments to the Plan, such as changing sampling locations, must be certified by a

licensed professional. The Contractor who prepared the CMP will be responsible for updating and certifying the CMP.

2.04 ON-SITE COMPLIANCE INSPECTIONS AND MONITORING

A. The Contractor shall provide daily, weekly, monthly, and rainfall dependent BMP inspections and associated storm water monitoring, as required under the permit. According to the permit, inspections and monitoring shall be conducted by "Qualified Personnel" under the supervision of the Primary Permittee. For this project, the Contractor is the Operator and shall perform all daily inspections and BMP maintenance. A summary of inspections required under the permit, are as follows.

B. Daily - Daily inspections must be conducted of petroleum storage usage and handling areas and construction entrances/exits by "Qualified Personnel". In addition, daily rainfall data must be recorded.

C. Weekly - Qualified personnel shall inspect site BMPs at least once every 7 calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater.

D. Monthly - Inspections are required monthly until a N.O.T. is submitted for areas that have undergone final stabilization.

E. Qualifying Rainfall Event - Sampling after each qualifying rainfall event is required until the N.O.T. is submitted with the final sampling data. Qualifying sampling events as measured by the on-site rain gauges provided by the Contractor and monitored by the Owner, are defined under Section 6, subsection d.3. of the General NPDES Permit No. GAR100001, effective August 1, 2018.

F. All monitoring results will be recorded onto appropriate forms and provided in the CMP binder, so all records and inspection logs can be kept in a central on-site location. All monitoring results shall also be submitted monthly to Georgia Environmental Protection Division (EPD) as required under the permit.

2.05 NOTICE OF TERMINATION

A. At completion of construction, the Contractor is responsible for preparing and submitting the N.O.T. form. The N.O.T must be approved by the Designer/Landscape Architect before submittal. Final acceptance of this project by the Cobb County PARKS will not be issued until the N.O.T. requirements have been satisfied.

END OF SECTION 02125B

SECTION 02125

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE:

A. Work described in this section includes the containment of sediment transport, control of erosion and treatment of pollutants prior to, during and throughout all construction operations; establishment of permanent vegetative cover and continued maintenance of said measures in accordance with Part III, paragraph 3.4 of this section.

B. This Section also specifies removal of temporary erosion and sedimentation controls.

C. Temporary and permanent erosion and sedimentation controls include grassing and mulching of disturbed areas and structural barriers at those locations, which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by the Georgia Erosion and Sedimentation Control Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations and laws of local, state, and municipal authorities having jurisdiction. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.

D. Land disturbance activity shall not commence until a Land Disturbance Permit has been issued by governing authority.

E. All control measures shown on the Drawings are to be considered the minimum required; additional measures may be required. Provide same as required.

F. Contractor is solely responsible for protection of downstream properties from encroachment or damage from soil erosion and/or the discharge of pollutants by water or air to any areas off the Project site.

1.02 SUBMITTALS:

A. Four complete copies of engineering data, including shop drawings, for all products shall be submitted to the Landscape Architect and Engineer for approval.

B. Schedule of operations: Submit schedule of exact dates operations including program of erosion, sediment and pollution control measures, maintenance of all said measures including control facilities, structures and devices and vegetative practices. Show anticipated starting and completion dates for land-disturbing activities including excavation, filling and rough grading, finished grading, construction of temporary and permanent control measures, and disposition of temporary erosion sediment and pollution control measures.

1.03 PROJECT CONDITIONS:

A. Furnish and install all control measures prior to or concurrent with any land disturbance

activity. The Contractor is responsible for the initial provision and installation of all control

measures and then the continued provision and installation of all measures throughout all construction operations and all sequences of construction operations.

B. Schedule grading operations to allow permanent erosion control to take place in the same construction season. Avoid or minimize exposure of soils to winter weather. Maintain all controls until vegetative cover has been established.

C. Construct and maintain temporary control measures until such time as permanent measures are effective in control of erosion, sediment and pollution from the site. Extent of measures shall be responsibility of Contractor.

D. Stop all erosion, sediment or pollution from leaving the site and encroaching on downstream or surrounding properties.

E. Temporary grassing shall be applied to all disturbed areas left idle for 72 hours.

F. Contractor is responsible for all quantities of all control measures regardless if shown on the Drawings. The extent of soil erosion control measures shown on the Drawings should be considered minimum.

G. All expenses related to the removal, relocation, replacement and/or rerouting of any and all existing utilities or other built, stored, stockpiled items of any kind, surface or subsurface is the responsibility of the contractor and will be included in the Contract Sum.

1.04 QUALITY ASSURANCE:

A. Procedures shall comply with "Manual for Erosion and Sediment Control in Georgia", latest edition published by the Georgia Soil and Water Conservation Committee." Contractor is required to keep a logbook on site documenting his inspection of all control devices (minimum once/week and within 24 hours of any storm event) and noting any corrections or modifications. General Contractor must also file a "Notice of Termination" when the site is finally stabilized, and all stormwater management systems have been constructed and have been proven to be functioning in accordance with the Design Concept(s).

B. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner

C. Reference the Drawings for any other procedural manuals, publications, permits or other field guidelines required for the Contractor to obtain, understand and utilize in the performance of his work. Be reference of same, said materials are made a part of these Specifications.

D. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner.

B. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

C. Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Control Act of 1975 as amended (OCGA §12-7-1, et. seq.), local ordinances, other permits, local enforcing agency guidelines and these Specifications.

D. Basic Principles:
1. Coordinate the land disturbance activities to fit the topography, soil types and conditions.
2. Minimize the disturbed area and the duration of exposure to erosive elements.
3. Provide temporary or permanent stabilization to disturbed areas immediately after rough grading is complete.
4. Safely convey run-off from the site to a stable outlet to prevent flooding and damage to downstream facilities resulting from increased runoff from the site.
5. Retain sediment on-site that was generated on-site.
6. Minimize encroachment upon watercourses.

E. Implementation:
1. The Contractor is solely responsible for the control of erosion within the Project site and the prevention of sedimentation from leaving the Project site or entering waterways.
2. The Contractor shall install temporary and permanent erosion and sedimentation controls, which will ensure that runoff from the disturbed area of the Project site shall pass through a filter system before exiting the Project site.
3. The Contractor shall provide temporary and permanent erosion and sedimentation control measures to prevent silt and sediment from entering any waterways and any designated wetland areas.
4. The Contractor shall limit land disturbance activity to those areas shown on the Drawings.
5. The Contractor shall maintain erosion and sedimentation control measures within disturbed areas on the entire site at no additional cost to the Owner until the final acceptance of the Project. Maintenance shall include mulching, re-seeding, clean out of sediment barriers and sediment/detention ponds, replacement of washed-out or undermined rip rap and erosion control materials, to the satisfaction of the Owner and Landscape Architect.

PART 2 - PRODUCTS

2.01 SEDIMENT BARRIER:

A. Silt Fence:
1. Type A silt fence shall meet the requirements of Section 171 of the Georgia Department of Transportation Standard Specifications, latest edition.

2. Type C Silt Fence is a combination of Type A silt Fence with woven wire reinforcement. Type C Silt Fence reinforcement shall meet the requirements of Section 171 of Georgia D.O.T. Specifications. Netting shall be ½ - inch, galvanized steel, chicken wire mesh.
3. Silt fence fabric shall be an approved product on the Georgia DOT Qualified Product List No. 36, latest edition.

B. Hay Bales: Hay bales shall be clean, seed-free cereal hay, rectangular in shape and contain five cubic feet or more of material.

C. Concrete Blocks: Concrete blocks shall be hollow, non-load-bearing type.

D. Plywood shall be 3/4-inch thick exterior type.

E. Filter stone shall be crushed stone conforming to Georgia Dept. of Transportation Table 800.0IH, Size Number 3.

F. Erosion Control socks to be used where tree roots should not be cut by silt fence trencher.

2.02 CONSTRUCTION EXIT STONE:

A. Use sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable, aggregate size shall be in accordance with the National Stone. Association Size R-2 (1.5 to 3.5-inch stone) or Type 3 riprap stone conforming to Section 805.01 of the Georgia Department of Transportation Standard Specifications.

2.03 CONCRETE:

A. Concrete 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 C94.

2.04 RIP RAP:

A. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and unless noted otherwise, stone riprap shall be Type 1.
1. Type 1 Rip Rap: Size and gradation shall conform to Section 805.01 of the Georgia DOT Standard Specification for Type 1 Stone Dumped Rip Rap.
2. Type 3 Rip Rap: size and gradation shall conform to Section 805.01 of the Georgia DOT Standard Specifications for Type 3 Stone Dumped Rip Rap.
3. River Stone: Where designated Contractor shall use river stone comparable to Type l.

2.05 PLASTIC FILTER FABRIC:

A. All plastic filter fabric shall conform to the Georgia Department of Transportation Standard Specifications, Section 881.06 for non-woven filter fabrics on most applications for this project, except for underneath riprap areas or stone construction entrances.

B. A plastic filter fabric shall be an approved product on the Georgia Department of Transportation Qualified Product List No. 28, latest edition.

C. Filter fabric for silt fences shall be a 36" Georgia DOT approved pervious sheet of synthetic polymer filaments non-woven from continuous filaments with wire fence backing. Filter fabric shall be of type recommended by its manufacturer for the intended application. The filter fabric shall meet the following requirements:
   1. APS 600 Series Silt Stop, as manufactured by Applied Polymer Systems, Woodstock, Georgia, Contact Steve Iwinski (678) 494-5998.
   2. GeoPolymer as manufactured by GeoStop.
   3. Soil Mulch Polymer as manufactured by Soil Mulch.

D. Polymer shall be applied utilizing a hydro seeder mix of appropriate seed, fertilizer, lime and mulch for the same acre or without seed/fertilizer/lime/mulch mix.

E. Follow all manufacturers' instructions and recommendations. Do not mechanically disturb treated areas after application. (This does not include foot traffic as necessary to install erosion control blanket).

F. Contractor shall furnish and install as necessary a minimum 200 lbs. of erosion control polymer for incidental "touch-up" or "point source erosion areas".

G. Furnish two forms of synthetic polymer:
   1. Emulsion polymer for hydro seeder application with 30% active strength.
   2. Powder polymer for hand spreading with an active strength of 95%.

2.06 GRASSING:

A. Grassing materials shall meet the requirements of the following sections of the Georgia Department of Transportation Standard Specifications, latest edition:

Material	Section
Topsoil	893.01
Seed and Sod	890
Fertilizer	891.01
Agricultural Lime	882.02
Mulch	893.02
Inoculants	893.04

B. Seed species shall be provided as shown on the Drawings.

C. Mulch Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Project Landscape Architect. The mulch binder shall be non-toxic to plant and animal life and shall be approved by the Project Landscape Architect.

D. Water: Water shall be free of excess and harmful chemicals, organisms and substances, which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used. Water shall be furnished by the Contractor.

PART 3 - EXECUTION

3.01 GENERAL:

A. Temporary and permanent erosion and sedimentation control measures shall prevent erosion and prevent sediment from exiting the site. If, in the opinion of the Owner or Project Landscape Architect, the Contractor's temporary erosion and sedimentation control measures are inadequate, the Contractor shall provide additional maintenance for existing measures or additional devices to control erosion and sedimentation on the site at no additional cost to the Owner.

B. All erosion and sedimentation control devices and structures shall be inspected by the Contractor at least once a week and immediately after to each rainfall occurrence. Any device or structure found to be damaged shall be repaired or replaced by the end of the day.

C. All erosion and sedimentation control measures and devices shall be constructed and maintained as indicated on the Drawings or specified herein until adequate permanent disturbed area stabilization has been provided and accepted by the Project Landscape Architect. Once adequate permanent stabilization has been provided and accepted by the Project Landscape Architect, all temporary erosion and sedimentation control structures and devices shall be removed.

D. Contractor may consider relocating the double silt fence into the already cleared sewer easement to avoid cutting tree roots adjacent to the trail. Relocation will have to be staked and approved in the field by the Landscape Architect and Owner prior to installation.

3.02 TEMPORARY EROSION CONTROL DEVICES:

A. Construct temporary sediment barriers of silt fence at all points where surface water flows from construction area bypassing a temporary sediment traps if the area is subject to soil erosion; or as otherwise indicated on Drawings or as deemed necessary by inspectors.

B. Install temporary sediment traps and temporary sediment basins in accordance with the location and details shown on the Drawings. Remove accumulated sediment when they are one-third full of silt continually until permanent vegetative cover is established.

C. Install construction exit as indicated on Drawings. Maintain to prevent tracking and flow of mud onto public roads.

D. Construct diversion berms, dikes (2'-0" wide x 1'-6" tall) or ditches at the tops of all slopes or otherwise indicated on the Drawings. Machine compact these elements and plant temporary seed until permanent vegetative cover can be established.

E. Maintain temporary barriers until permanent erosion control measures are established. Repair and replace barriers damaged or displaced by construction activity

3.03 SEDIMENT CONTROL:

A. Construction Exit:
   1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Project Landscape Architect. A construction exit shall be located at any point traffic will be leaving a disturbed area to a public right-of-way, street, alley, sidewalk, or parking area.
   2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The plastic filter fabric shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.
   3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights-of-way and paved surfaces as directed by the Project Landscape Architect.
   4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of when the disturbed area has been properly stabilized, the tracking or flow of soil onto public rights-of-way or paved surfaces has ceased and as directed by the Project Landscape Architect.

B. Sediment Barriers:
   1. Sediment barriers shall include, but are not necessarily limited to, silt fences, hay bales, and any device, which prevents sediment from exiting the disturbed area.
   2. Silt fences and hay bales shall not be used in any flowing stream, creek or river.
   3. Sediment barriers shall be installed as shown on the Drawings and as directed by the Owner or Project Landscape Architect.
   4. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one-half of the original height of the barrier or as directed by the Project Landscape Architect. Torn, damaged, destroyed or washed-out barriers shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Owner or Project Landscape Architect.
   5. Sediment Barrier Removal:
      a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Project Landscape Architect.
      b. Accumulated sediment shall be removed from the barrier and replaced and stabilized on site as directed by the Owner or Project Landscape Architect.
      c. All non-biodegradable parts of the barrier shall be disposed of properly.
      d. The disturbed area created by barrier removal shall be permanently stabilized.

E. Sediment Boxes: All inlet grates shall be covered with sediment boxes during grading operations and shall remain so covered until all open areas are permanently stabilized against erosion.

3.4 GROUND COVER

A. Protect all exposed soils with mulching (temporary measure) and vegetative ground cover (permanent measure).

B. Ground cover consists of temporary seeding on all graded areas which will not receive final grading or permanent planting within three (3) days.

C. All grassing, or planting operations shall include mulching as stabilization until ground cover by planting is effective.

D. Reseed as required until full vegetative coverage is established.

3.5 MAINTENANCE

A. Inspect all control elements after each rainfall event and a minimum of every two (2) weeks when no rainfall event(s) occur. Clear all debris and accumulated sediment from behind barriers when half full so their functional capacity is not reduced. Repair and replace any and all damaged measures of any kind.

B. Contractor is expected to maintain the erosion control compliance in accordance with NPDES Standards. See Section 02125B of this Project Manual.

B. Maintain all erosion, sedimentation, pollution control measures for delivery of correct pond volume for a period of thirty (30) calendar days.

3.6 REMOVAL OF TEMPORARY EROSION CONTROL DEVICES

A. Remove all debris resulting from temporary erosion control from Project site.

B. Control dust from disturbed areas by means of mulching, irrigation, calcium chloride or other method subject to the Engineer's review.

3.07 CLEAN-UP:

A. Dispose of all excess erosion and sedimentation control materials in a manner satisfactory to the Owner and Landscape Architect.

B. Final clean up shall be performed in accordance with the requirements of these Specifications and to the satisfaction of the Owner and Landscape Architect.

END OF SECTION 02125

SECTION 02125B

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) COMPLIANCE

PART 1 - GENERAL

1.01 SCOPE

A. The work specified in this Section consists of the following under the requirements for Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD).

- Notice of Intent (N.O.I.) – Electronic submittal to EPD by Owner
- Updates to the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan – By Landscape Architect
- Comprehensive Monitoring Plan (CMP) – By Landscape Architect
- Compliance Inspections and Monitoring – By Contractor
- Notice of Termination (N.O.T.) – By Owner after appraisal of site by Landscape Architect.

1.03 QUALITY ASSURANCE

A. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

B. Provide all materials and promptly take all actions necessary to monitor, document and achieve effective erosion and sedimentation control in accordance with the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD) and these Specifications.

C. The temporary and permanent erosion and sedimentation control measures shown on the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation shall be updated on the ES&PC Plan and submitted to the Designer for approval by the Contractor at no additional cost to the Owner.

PART 2 - EXECUTION

2.01 NOTICE OF INTENT

A. Issuance of the Notice of Intent (N.O.I.) and other related requirements is the responsibility of the Owner.

2.02 EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN UPDATES

A. Project Civil Engineer has prepared the ES&PC Plan for the Discovery Boulevard Property Improvements in accordance with Georgia's new NPDES Permit for Storm Water Discharges Associated with Construction Activities. To meet the requirements of the permit, the Project Civil Engineer that prepared the ES&PC Plan has provided the required Engineer's certification on the plans.

B. Upon direction from the Owner's Representative, the Project Civil Engineer will conduct the initial inspection of the Best Management Practices (BMPs) for the construction site. The permit requires that the Engineer certifying the ES&PC Plan must also perform the initial BMP inspection.

C. Per the NPDES regulations, the ES&PC Plan is a dynamic document. The project Civil Engineer is responsible for updating the ES&PC Plan if needed. Major changes and amendments to the ES&PC Plan must be certified by a licensed professional engineer, including changes in design, construction, operation, or maintenance which has a significant effect on the potential for the discharge of pollutants to waters of the state. Appropriate Certification of the ES&PC Plan site change updates shall be the responsibility of the General Contractor and the project Civil Engineer.

2.03 COMPREHENSIVE MONITORING PLAN

A. The Contractor shall prepare the Comprehensive Monitoring Plan (CMP), as required under the NPDES permit. The purpose of the CMP is to define the methods used to monitor performance of on-site BMPs and storm water runoff. The plan shall include sampling strategies and monitoring locations for the site, along with details of the record keeping and reporting requirements applicable to the site. The plan shall also include example record keeping and reporting forms to assist with the documentation necessary to maintain compliance under the permit. The CMP shall be provided in an oversized 3-ring binder, and all records and inspection logs kept in a central on- site location.

B. Per the NPDES regulations, the CMP is a dynamic document and major changes and amendments to the Plan, such as changing sampling locations, must be certified by a licensed professional. The Contractor who prepared the CMP will be responsible for updating and certifying the CMP.

2.04 ON-SITE COMPLIANCE INSPECTIONS AND MONITORING

A. The Contractor shall provide daily, weekly, monthly, and rainfall dependent BMP inspections and associated storm water monitoring, as required under the permit. According to the permit, inspections and monitoring shall be conducted by "Qualified Personnel" under the supervision of the Primary Permittee. For this project, the Contractor is the Operator and shall perform all daily inspections and BMP maintenance. A summary of inspections required under the permit, are as follows.

B. Daily - Daily inspections must be conducted of petroleum storage usage and handling areas and construction entrances/exits by "Qualified Personnel". In addition, daily rainfall data must be recorded.

C. Weekly - Qualified personnel shall inspect site BMPs at least once every 7 calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater.

D. Monthly - Inspections are required monthly until a N.O.T. is submitted for areas that have undergone final stabilization.

E. Qualifying Rainfall Event - Sampling after each qualifying rainfall event is required until the N.O.T. is submitted with the final sampling data. Qualifying sampling events as measured by the on-site rain gauges provided by the Contractor and monitored by the Owner, are defined under Section 6, subsection d.3. of the General NPDES Permit No. GAR100001, effective August 1, 2018.

F. All monitoring results will be recorded onto appropriate forms and provided in the CMP binder, so all records and inspection logs can be kept in a central on-site location. All monitoring results shall also be submitted monthly to Georgia Environmental Protection Division (EPD) as required under the permit.

2.05 NOTICE OF TERMINATION

A. At completion of construction, the Contractor is responsible for preparing and submitting the N.O.T. form. The N.O.T must be approved by the Designer/Landscape Architect before submittal. Final acceptance of this project by the Cobb County PARKS will not be issued until the N.O.T. requirements have been satisfied.

END OF SECTION 02125B

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY OF WORK

A. This Section includes earthwork as shown on the drawings and specified herein. Included is:

1. Preparation of subgrade for walks and pavement.
2. Preparation of granular base for pavement.
3. Excavation and backfilling for utility systems.
4. Excavation and backfilling for, foundations, and retaining walls.
5. Site grading and filling to indicated elevations.

1.03 SUBMITTALS

A. Test Reports: Submit copies of following reports directly to the Engineer

1. Test reports on borrow material.
2. Field density test reports.
3 One optimum moisture-maximum density curve for each type of soil encountered.

B. Based on testing service reports and inspection, subgrade or fills which have been placed at below specified density, provide additional compaction and testing at no additional expense to Owner.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork and site grading in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Services: Owner will engage testing and inspection service, to include testing of soil materials proposed for use in work and field facilities for quality control testing during earthwork and site grading operations. All test reports must be signed by a licensed engineer.

C. Tests for Proposed Soil Materials: Test soil materials proposed for use in work and promptly submit test result reports. Provide one optimum moisture-maximum density curve for each type of soil encountered in

subgrade fills. Determine the maximum densities in accordance with ASTM D 698. Testing service will determine suitability of materials to be used as fill. For borrow materials, perform a mechanical analysis (ASTM 422), plasticity index (ASTM 424), moisture-density curve (ASTM D 698).

1.05 PROJECT CONDITIONS

A. Subsoil: Promptly notify soil testing service of unsuitable sub-surface conditions.

B. Existing Utilities: Locate existing underground utilities in areas of work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner, and public and private utility companies, in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utilities services have been provided. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.

C. Use of Explosives: Use of explosives is not permitted.

D. Temporary Protection: Barricade open excavations made as part of earthwork operations and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction. Protect bottoms of excavations and soil beneath and around foundations from frost and freezing. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods, as required to prevent cave-ins or loose dirt from entering excavations.

1.06 DEFINITIONS

Limits of Disturbance: (LOD) The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Limits of Work: (LOW) The boundary within only maintenance type of work can occur, no new construction shall occur within the LOW.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Backfill and Fill Materials: Use satisfactory soil materials, complying with the American Association of State Highway and Transportation Officials (AASHTO) Designation M145, soil classification groups A-1, A-2-4, A-2-5,

and A-3. Fill to be free of rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter, as determined by the soils testing service.

B. Granular Base: Properly graded mixture of natural or crushed gravel or crushed stone that will readily compact to required density. Use material complying with applicable sections of the current edition of "Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges".

PART 3 EXECUTION

3.01 EXCAVATION

A. General: Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations. Obtain approval from the Architect.

B. Excavation Classifications: The following classifications of excavation will be made when unanticipated rock excavation is encountered in work. Do not perform such work until material to be excavated has been cross-sectioned and classified by soils testing laboratory. Rock excavation will be paid for at established unit prices, upon approval of Architect.

C. Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

D. Rock excavation consists of removal and disposal of materials encountered that cannot be excavated with a 3/4 cubic yard capacity power shovel without drilling, or continuous use of a ripper or other special equipment, except such materials that are classified as earth excavation.

E. Trench rock excavation consists of removal and disposal of material classified as rock where the least horizontal dimension of required excavation is greater than three feet. Intermittent drilling that may be performed to increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.

F. Mass rock excavation consists of removal and disposal of material classified as rock where the least horizontal dimension of required excavation is greater than three feet. Intermittent drilling that may be performed to

increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.

G. Rock payment lines are limited to the following:

1. Two feet outside of concrete work for which forms are required, except footings.
2. One foot outside perimeters of footings.
3. In pipe trenches, 6" below invert elevation of pipe and 2' wider than the outside diameter of pipe, but not less than 3' minimum trench width.
4. Near outside dimensions of concrete work where no forms are required.
5. Under slabs on grade, 6" below bottom of concrete slab.

H. Unauthorized excavation consists of removal of materials beyond indicated elevations or side dimensions without the specific direction of the Architect. Replace unauthorized excavation by backfilling and compacting as specified for authorized excavations of same classification, unless otherwise directed by Landscape Architect.

I. There will be no additional compensation for excavation, backfilling, concrete fill, or other cost due to unauthorized over-excavation in any direction. The Contractor is responsible for all additional testing costs associated with over-excavation.

J. Quoted unit prices shall include full compensation for labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, de-watering, backfilling, compacting, and other necessary items for complete installation.

K. Unit prices for the following items, as set forth in the form of Proposal and as provided in the General Conditions, will apply in the event additions to the work are required and authorized by a written order from the Architect to the Contractor.

1. Mass Rock Excavation (per cu. yd.)
2. Trenched Rock Excavation (per cu. yd.)

L. Additional Excavation: When excavation has reached required subgrade elevations, notify soil testing laboratory to allow for inspection of conditions. If unsuitable materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by soils testing laboratory.

M. De-watering: Prevent surface water and subsurface or ground water from flowing into excavations, and flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other de-watering system components necessary to convey water away from site. Convey water removed from excavations and rainwater to collecting or run-off areas. Do not use trench excavations for site utilities as temporary drainage ditches.

N. Material Storage: Stockpile excavated materials classified as satisfactory soil material where directed, until required for fill. Place, grade and shape stockpiles for proper drainage. Maintain excavated soil materials separately from topsoil stockpile. Dispose of excess unsatisfactory soil material, trash and debris, as specified.

O. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.

P. Excavation for Trenches: Dig trenches to uniform width required for particular item to be installed, sufficiently wide to provide working room. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.

3.02 COMPACTION

A. General: Control soil compaction during construction, providing the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements: Compact soil to not less than following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D 698; and not less than following percentages of relative density, determined in accordance with ANSI/ASTM D 4318, D 4253 AND D 4254, for soils which will not exhibit well-defined moisture-density relationship:

1. Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material to not less than 90% of the maximum dry density.
2. Pavements: Compact top 12" of subgrade and each layer of backfill or fill material to not less than 95% of the maximum dry density.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or

scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.03 BACKFILL AND FILL

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontals so that fill material will bond with existing surface.

B. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" loose depth for material compacted by hand-operated equipment. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content of soil material. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approval, and recording location of underground utilities, as required.

3.04 GRADING

A. General: Uniformly grade areas within limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. Degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.

B. Grading Around Trees: Where excavating, filling, or grading is required within branch spread of trees that are to remain, perform work as follows:

When trenching occurs around trees that are to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.

C. Unpaved Areas: Finish areas to receive topsoil to within not more than 1" above or below required subgrade elevations, compacted as specified, and free from irregular surface changes.

D. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, dicing, and any moisture or aerating required to provide optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil

materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross-section as indicated.

3.05 PAVEMENT SUBBASE COURSE

A. General: Subbase course consists of placing subbase course material, in layers of specified thickness, over subgrade surface to support a pavement base or surface course. See other Division - 2 sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Placing: Place subbase course material on prepared subgrade conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

3.06 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and dispose of it off Owner's property.

END OF SECTION 02200

SECTION 02523

CONCRETE TRAILS

PART 1 - GENERAL

1.01 SCOPE

A. Concrete trail shall be staked and constructed so as to be woven through the project site and tree canopy. The staking and construction of the trail shall be adjusted to accommodate existing site features including, but not limited to, trees, vegetation and their root systems. Adjustments to staking and construction is an interactive process between the Project Landscape Architect, Contractor and Surveyor.

B. Concrete trail shall be constructed in a manner that does not disrupt the tree root systems or require unnecessary removal of trees or cutting roots.

C. Concrete trail shall be constructed at the locations and to the dimensions, lines, grades and cross section indicated on the Construction Drawings and in conformity with the provisions and requirements set out in these Specifications.

D. Concrete trail construction shall include all the necessary excavation, filling, subgrade and subbase preparation, backfilling, final clearing up and testing, as indicated on the Construction Drawings or as directed in writing by the Project Landscape Architect.

E. Site adjustments shall be made to adapt the alignment and elevations to the existing conditions of the site. Contractor to stake the location and grades of the proposed trail and hold a site meeting with the Owner and Landscape Architect prior to construction.

1.02 QUALITY ASSURANCE

A. Comply with applicable requirements of Georgia Department of Transportation, Standard Specifications for Construction of Roads and Bridges, current edition.

1.03 PROTECTION

A. Contractor shall not encroach upon any areas outside the proposed concrete trail surface and shoulder. Equipment shall not twist, turn or backup into adjacent spaces outside the area of the graded trail unless approved in writing by the Project Landscape Architect.

B. Contractor shall not park vehicles, store or stage any materials or equipment under the overhanging branches or within the drip line of trees to be saved. Drip

line is defined as the area of ground perpendicularly below the outer reaches of the trees branches.

C. Contractor shall submit all construction adjustment considerations to the Project Landscape Architect for approval prior to implementation.

D. Contractor shall keep detailed field notes of all adjustments and changes.

E. Contractor shall utilize gravel fill base material when paved surfaces or trails are placed over any tree root systems or under any tree canopies. Refer to Section 02112.

F. The Contractor shall be responsible for protecting all trees, vegetation and root systems. If trees, vegetation and root systems are damaged, the Contractor will be held liable and shall replace materials in accordance with Section 02112.

G. The Contractor shall be responsible for protecting all project site elements including but not limited to utilities, structures, and streams. The Contractor will be held liable for any damage incurred at no additional cost to the Owner.

H. The contractor shall use rubber tire small equipment and hand labor to build the trails under the tree canopy.

1.04 SUBMITTALS

A. Provide testing reports stating that the materials supplied comply with Specifications. Certificates shall be signed by the concrete producer, Contractor and Geotechnical Engineer.

B. Data relative to the Contractor's equipment and methods shall be submitted to the Project Landscape Architect for approval prior to installation.

1.05 CONDITIONS

A. Weather Limitations:
1. Do not conduct concrete paving operations when surface is saturated, or contains excess of moisture that would prevent uniform distribution and required penetration.
2. Construct concrete trail sections only when atmospheric temperature in the shade is above 40 degrees F.
3. Place base course when air temperature is above 35 degrees F and rising. No base course shall be placed on a frozen, saturated, or otherwise unsuitable subgrade material.
4. Refer to Section 02523 / 3.09 and 3.12 for base course requirements.
5. Placement of concrete shall be in accordance with weather conditions as required by G.D.O.T. specifications.

B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations as per the Construction Drawings, Specifications and under written direction of the Project Landscape Architect.

1.06 INSPECTION AND TESTING

A. Project Geotechnical Engineer shall hand probe, hand auger and/or engage the services of a boring rig to determine structural conditions along the route of the trail prior to grading.

B. Geotechnical Engineer shall conduct a review of all subsurface conditions following preliminary grading. Based on the observations and recommendations of the Geotechnical Engineer, Contractors shall adjust subsurface conditions in order to proceed with placement of gravel fill base.

C. Geotechnical Engineer shall conduct a review of the sub-base conditions. Based on the observations of the Geotechnical Engineer, Contractor shall adjust the sub-base conditions in order to proceed with placement of pavement.

D. Pavement and base testing will be performed by an independent testing laboratory as approved by the Project Landscape Architect and the Owner.

E. The testing agency shall test in-place courses for compliance with specified density, thickness and surface finish requirements.

F. Earthwork and compaction operations shall conform to the requirements of Section 02200 of these specifications.

G. Concrete Strength: One set of acceptance and field cylinders (a total of four) from the same batch of concrete will be made for each 50 cubic yards or fraction thereof, not less than once for each 5,000 square feet of pavement in each day's placing for each class and mix design.

1. Each batch of concrete shall be tested for slump prior to placement. Slump shall be between 2 and 4 inches as determined by AASHTO Test Method T119.
2. Acceptance cylinders are compression test cylinders molded in the field, stored and cured in the field for the first 24 hours after molding and thereafter in the laboratory of the testing agency until time of testing. Average breaking strength at 28 days of a set of two acceptance cylinders will comprise test.
3. Field cylinders are compression test cylinders molded in the field, stored and cured on the work site in the same location and subject to the same exposure as job concrete of which it is a representative. Each set of two acceptance cylinders will have two matching field cylinders.

4. One field cylinder will be broken at seven days and the remaining will be held in reserve.

H. Allowable Variation in Thickness:

1. Aggregate Base Course: ±1/2-inch.
2. Surface Course: ± 1/4-inch.

I. Surface Smoothness: Test finished surface of each course for smoothness using a 16-foot straightedge. Intervals of tests shall be as approved by the Project Landscape Architect. Surfaces will not be acceptable if exceeding the following:

1. Base Course: 1/4-inch in 16 feet.
2. Surface Course: 1/8-inch in 10 feet.

J. Contractor's Duties Relative to Testing:

1. Notifying laboratory of conditions requiring testing.
2. Coordinating with laboratory for field testing.
3. Paying costs for additional testing performed beyond the scope of that required and for retesting, where initial tests reveal non-conformance with specified requirements.
4. Paying the cost of overlays or pavement removal and replacement that does not comply with the specified testing limits.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials used in the construction of concrete trails, in addition to Section 03300 and other general requirements of these Specifications, shall conform, unless otherwise stipulated by the Geotechnical Engineer and approved by the Project Landscape Architect, to the following:

1. Portland cement shall conform to ASTM C 150, Type 1.
2. Graded aggregate base shall be uniform throughout and conform to requirements of Section 815.01 of the Georgia Department of Transportation Specifications.
3. Sand: Dune sand, bank-run sand and manufactured sand are not acceptable. Only builder’s sand shall be used.
4. Fiber Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
5. Pre-molded joint filler for expansion joints shall conform to the requirements of ASTM D 1751 or ASTM D 1752. The joint sealer for the

joints in the concrete pavement shall meet the requirements of Federal Specification SS-S-164 and shall be hot-poured type.

6. Concrete Color: Concrete shall be grey concrete mix and shall be from same supplier and same batch mixture. Finished concrete shall have a **medium broom finish** perpendicular to traffic flow on all trail sections.
8. All concrete, except where shown or specified otherwise, shall have the following minimum compressive strengths at 28 days, and slump at time of placement:

Location	Strength	Maximum Aggregate Size	Slump
Footings, Bases	3000 psi	1-1/2"	2"-4”
Walls	3000 psi	3/4"	2"-4”
Pavement, Trails	4000 psi	1-1/2"	2"-4”

B. Staking Materials shall be placed in field according to the plans and shall consist of the following:
1. 1" x 2" x 3’ tall stakes for center line stakeout
2. 1" x2" x 18" short stakes for corners
3. Plastic flagging tape-
Red- Indicates trees to remove
Yellow - Indicates trees to save
Blue - Indicates centerline
Orange - control points
4. Wire Flags (Pink)
5. 2" x 2" x 12" Hub stakes
6. Mallet - Short handle for driving stakes

C. Plastic Pipe: 4" perforated Schedule 40 ultraviolet light resistant PVC.

D. Geosynthetic Materials:

1. Filter Fabric: Filter Fabric utilized for separation of controlled fill materials from existing subgrades or sediment deposition shall conform to the requirements of the Georgia Department of Transportation Standard Specifications, Section 881.06 for non-woven, needle punched filter fabrics. The requirements outlined under Item 2.02 of this Specification Section will typically be sufficient for most applications. Filter fabric samples, as well as specific manufacturer's property characteristics and installations guidelines, shall be submitted to the Project Landscape Architect for review and written approval with specific identification of each proposed application.

2.02 FORM MATERIALS

A. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, natal-farmed plywood faced or other acceptable panel-type

materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to the joint system specified. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

B. Lumber used in construction of wood forms shall be free of bulge or warp, of uniform width, not less than 2-inches in thickness, and shall be sound and free from loose knots. 1-inch thick boards may be used to form curves. Stakes shall be not less than 2" x 4" lumber of sufficient length that, when driven, will hold the forms rigidly in place.

C. Metal forms shall be of approved sections and shall have a flat surface on top. Metal forms shall present a smooth surface of the desired contour, sufficiently thick and braced to withstand the weight of the concrete without bulging or becoming displaced.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. No track type equipment shall be used in the construction of this work. Rubber tire vehicles shall be used exclusively and shall be limited to small back hoes, bobcats, pickup trucks, dump trucks and small concrete mixers.

B. Equipment used to install concrete shall have a total width not to exceed the width of the trail section plus 2’-0”. The use of large heavy-duty track vehicles is prohibited.

Commented [RMM1]: Most spreaders have to have two feet on either side of the opening for the spreader for gears, wheels and other machinery. Therefore the machine can be no smaller than width of concrete plus 4’.

C. All equipment necessary and required for the construction of concrete trails shall be in working condition and approved by the Project Landscape Architect, before construction will be permitted to begin.

D. A one bag mixer will be permitted when the total output of concrete, per 10-hour day, does not exceed 25 cubic yards.

E. Satisfactory floats, edgers, spades and tamps shall be furnished. Tamps of not over 8-inch diameter and weighing not less than 25 pounds shall be provided for tamping subgrade. Contractor shall furnish a ten foot (10’) longitudinal float of the inverted T-type with plough handles attached for manipulation, and a rigid float not less than 18-inches longer than the width of the trail.

3.02 LAYOUT

A. Contractor shall stake trail coordinate control points as per Construction Drawings. Each 3’-0” tall wooden stake shall be flagged with orange tape and shall be identified with coordinate data provided on the Construction Drawings.

B. Contractor shall stake centerline of the trail as per Construction Drawings. Centerline shall be staked in 50’ increments. All stakes shall be 3’-0” tall and be flagged with blue tape.

C. Contractor shall stake the beginning and end point of each trail curve as per the Construction Drawings. All stakes shall be 3’-0” tall and flagged with blue tape.

D. Upon completion of the initial staking, the Contractor, surveyor and Project Landscape Architect shall walk the staking alignment for the purpose of making adjustments to the layout.

E. The Contractor and Surveyor shall make field notes and transfer field adjustments to the project record drawings.

F. Based on the initial field adjustments and information recorded on the record drawings, the Contractor shall revise the field staking.

G. Upon completion of the revised field staking, the Contractor, Surveyor and Project Landscape Architect shall walk the staking alignment for the purpose of making minor modifications as deemed necessary by the Project Landscape Architect.

H. All revised data shall be transferred to the record drawings by the Contractor prior to commencing grading activities.

I. Contractor must receive written approval of all field staking, including revisions, prior to commencing grading activities.

3.03 CLEARING AND GRUBBING

A. Clearing and grubbing shall be performed in accordance with the requirements of Section 02110 – Clearing and Grubbing.

B. Tree protection and selective trimming shall be performed in accordance with Section 02112 – Tree Protection and Selective Clearing.

3.04 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

A. Unless otherwise indicated or stipulated, the removal of structures, obstructions, etc., will be performed in accordance with the requirements of Section 02060 – Demolition of Existing Facilities and Section 02100 – Site Preparation.

3.05 TRAIL AND DRAINAGE EXCAVATION

A. Trail and drainage excavation shall be performed in accordance with the requirements of Section 02200 – Earthwork.

3.06 EMBANKMENT CONSTRUCTION

A. Embankment construction shall be performed in accordance with the requirements of Section 02200 - Earthwork.

3.07 EARTHWORK AND COMPACTION

A. Earthwork and compaction operations shall be performed in accordance with requirements of Section 02200 - Earthwork.

3.08 SUBGRADE PREPARATION

A. Fine grading shall proceed to remove bumps, dips and holes from the trail bed. Stump holes must be filled and compacted per the direction of the Geotechnical Engineer.

B. Contractor shall limit construction activities and access to the area defined on the Construction Drawings as the limit of work. Contractor shall stage construction in a manner that will limit the use of construction equipment to the area defined as the trail corridor. Contractor shall be limited to use of the trail route as the construction access route for the placement of all trail components including, but not limited to sub-base, drainage pipes, foundations, abutments, pedestrian bridges and pavement surfaces.

C. Subgrade shall be graded and compacted so that the finished concrete trail surface will slope to direct water into the natural drainage swales and conform to natural drainage patterns to the extent possible within the construction limits defined by the Construction Drawings and Specifications.

D. The subgrade for the trails shall be to a depth equal to the thickness of the concrete plus the base course. Excavation shall allow for compaction of the subgrade as per the direction of the Geotechnical Engineer and written approval of the Project Landscape Architect.

E. In areas where the trail is located within the dripline of existing trees and vegetation, the Contractor shall review the site conditions with the Geotechnical Engineer and Project Landscape Architect and receive written direction, prior to commencing subgrade excavation. Refer to Section 02112.

F. Yielding or unsuitable material shall be removed and back filled with satisfactory material per the direction of the Geotechnical Engineer and written approval of the Project Landscape Architect.

3.09 BASE COURSE

A. Contractor shall limit work to within the proposed edges of subbase.

B. Contractor shall place graded aggregate base under trails, as directed by the Geotechnical Engineer. Graded aggregate base shall be compacted thoroughly and finished to a smooth, unyielding surface. Finish elevations of graded aggregate base shall accommodate placement of finished concrete trail surface such that existing drainage patterns are preserved.

C. All subgrade preparation shall be of such width as to permit the proper installation and bracing of the forms.

D. Additional stabilization of poor subgrade areas may be necessary to achieve compaction criteria for aggregate base. These additional subgrade stabilization measures shall be performed under the direct supervision of the Geotechnical Engineer and approved in writing by the Project Landscape Architect. These measures may include, but are not limited to, placement of geogrid reinforcement materials, aggregate bridge lifts, undercutting of unsuitable soils, and soil cement admixtures.

E. Where the trail passes under or through the drip line of a tree or trees, the Contractor shall place a special fill material system consisting of varying depths of graded aggregate fill placed over geotextile fabrics or geogrid subgrade reinforcements. The Geotechnical Engineer shall be utilized to take soil borings as necessary to determine the subsurface conditions, and determine the profile of base material to be used. The Geotechnical Engineer's recommendations shall be submitted to Project Landscape Architect for written approval.

3.10 FORMS

A. All forms shall be set upon the prepared subgrade and held rigidly in place so as not to be disturbed or displaced during the placing of the concrete. The placement of the forms shall adhere to the trail staking alignment and finish elevations established during the layout process. Refer to Section 02523 / 3.02. The top of the form shall be set to finish grade elevations and the depth of the forms shall be equal to the thickness of the proposed concrete.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades and achieve level and plumb work of all finished structures. Provide for opening, offsets, sinkages, keyways, recesses, moldings, rustifications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in work. Use selected materials to obtain specified finishes. Solidly butt joints and provide back-up at joints to prevent leakage of concrete material.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage

cast-in-place concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Use kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

E. Immediately before placing the concrete, the forms shall be given a coat of light oil and where being removed and used again, the forms shall be thoroughly cleaned and oiled prior to each use.

F. Forms shall be removed within 24 hours after placing concrete, and no pressure shall be exerted upon the cast-in-place concrete during the removal of the forms.

G. Where the concrete trail is to adjoin an existing trail or sidewalk, the existing structure, if not in proper condition for the junction, shall be cut to a neat line perpendicular to both the centerline and the surface of the new trail, or as directed by the Project Landscape Architect.

3.11 EXPANSION JOINTS

A. The trail is designed to accommodate bike, skateboards, wheelchairs and strollers. The use of trowel joints is prohibited. Only saw joints are permitted.

B. Unless otherwise indicated on the Construction Drawings or as directed by the Project Landscape Architect, pre-moulded expansion joints, 1/2-inch in thickness, shall be placed in locations where the trail abuts non-flexible pavement and / or structures. Transverse expansion joints for concrete trails shall be 1/2-inch thick. All pre-moulded expansion joints must be cut to full width or length of the proposed construction and shall be recessed 1/8” from the top of the finished surface. All longitudinal expansion joints shall be placed as indicated on the Construction Drawings or as directed by the Project Landscape Architect.

C. All expansion joints shall be caulked flush to trail surface. Caulk shall be Silaflex brand or equal. Color of caulk shall match color of pavement surface.

D. All protruding expansion joint material shall be trimmed as directed by the Project Landscape Architect.

E. Locate and install control joints as shown on the construction drawings. (Contractor shall mark the locations of all control joints with a non-permanent chalk. Project Landscape Architect shall approve all locations of control joints prior to installation.)

F. Slab-on-grade: Locate and install control joints as shown on drawings. (Contractor shall mark the locations of all control joints with a non-permanent

chalk. Project Landscape Architect shall approve all locations of control joints prior to installation.)

G. Contractor shall review the need for additional joints with the Project Landscape Architect prior to installation. Location of joints shall not impact the strength and / or appearance of the trail.

3.12 MANUFACTURING AND PLACING CONCRETE

A. Immediately before placing concrete, the depth of the proposed concrete shall be checked by means of a template cut true to the cross section of the proposed construction. Any irregularities shall be corrected prior to placing concrete.

B. Immediately before placing concrete, all subgrade shall be thoroughly sprinkled or wetted.

C. Concrete shall not be placed upon a frozen subgrade or subbase.

D. The concrete shall be manufactured and placed in accordance with the requirements of Section 03300 of these Specifications.

E. The concrete shall be placed immediately after mixing. The edges, sides, etc., shall be thoroughly spaded and the surfaces tamped sufficiently to thoroughly compact the concrete and bring the mortar to the surface. The concrete shall be deposited and compacted in a single layer.

F. During the placement of concrete, contractor shall spade and tamp as necessary to achieve specified compaction.

G. Each vertical section of concrete that is placed shall be done as a single integral pour that is placed to the full depth of the slab specified. The pouring of multiple layers of concrete to achieve specified finished elevations is prohibited.

H. Each horizontal section of concrete that is placed shall be coordinated such that the pour begins and ends in pre-determined locations that correspond to the placement of expansion joints.

3.13 FINISHING

A. The concrete shall be stuck-off with a transverse template resting upon the side forms and shall be floated with a 10 foot longitudinal float. The float shall be worked transversely across the concrete in a sawing motion parallel to the edges of the trail in a manner that facilitates the removal of all surplus water, laitance and inert material from the surface. This operation shall be continued until the surface of the concrete shows no variation when checked with a 10-foot

straightedge. If necessary, additional concrete shall be added to fill depressions, and the longitudinal float process shall be repeated.

B. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be finished with a float. The longitudinal surface variations shall be not more than 1/8-inch over a five-foot transverse section. The surface of the concrete must be finished to facilitate positive drainage.

C. The edges of the trail shall be carefully finished and rounded with an edging tool having a radius of 1/2-inch. Internal control and expansion joints shall not be tooled.

D. Control joints shall be saw cut. All marks caused by edging shall be removed with a wetted brush or wooden float.

E. Trails shall have a Medium Broom Finish perpendicular to traffic flow. (Broom finish to be performed after float finish is completed)

F. Contractor shall be responsible for installing a 10'x10' concrete trail slab that fulfills the requirements specified. The Project Landscape Architect must approve the site sample prior to the installation of concrete along the project trail.

3.14 PROTECTION AND CURING

A. Immediately after finishing the concrete, it shall be covered and cured in accordance with the requirements of Section 03300 of these Specifications. Curing materials shall conform to the requirements of ASTM C 309 (liquid membrane compound) or ASTM C 171. If the temperature falls below freezing, satisfactory heating devices shall be placed under suitable covers to keep the temperature around the concrete above 45 degrees F.

B. Pedestrians will not be allowed on the concrete trail until 24 hours after finishing concrete. No vehicles shall be permitted upon on the concrete trail, until the concrete has sufficient strength to support traffic loads.

C. The Contractor shall construct barricades and protection devices to keep pedestrians and traffic off the trail surface.

D. If any portion of the trail is damaged prior to Final Acceptance, the contractor shall be responsible for repairing damaged sections of the trail. Repair by patching is prohibited. The Project Landscape Architect will review the damaged area with the Contractor and determine the limits of the required repair work.

E. Repair work of damaged trail will include but not be limited to, removal of 10' wide x 10'-0" lengths of concrete slab that correspond to the existing placement of expansion and control joints. The length of material to be removed and

replaced must be determined and approved by the Project Landscape Architect. Replacement material must be of type, kind and finish used in the original construction of the trail. The contractor is responsible for all costs associated with required and acceptable repair work.

3.15 BACKFILLING

A. Contractor shall compact, fine grade and landscape the shoulders of the trail as shown on the Construction Drawings.

B. Contractor shall fine grade and landscape all areas located between the limits of trail shoulders and limits of construction as shown on the Construction Drawings.

3.16 CLEANING

A. All excess or unsuitable material shall be removed and disposed of in accordance with requirements of Section 02200 of these Specifications.

B. Final clean-up shall be performed in accordance with the requirements of Section 01700 of these Specifications.

END OF SECTION 02523

SECTION 02630

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes storm drainage components on the site.

B. Related Sections include the following:
Section 02200 Earthwork
Section 02700 Grouthing of Storm Sewer
Section 02723 Intlets
Section 03300 Cast-in-Place Concrete

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.a
B. EPDM: Ethylene-propylene-diene-monomer rubber.
C. PE: Polyethylene plastic.
D. PVC: Polyvinyl chloride plastic.
E. RCP: Reinforced Concrete Pipe

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Polymer-concrete, channel drainage systems.
3. Backwater valves, cleanouts, and drains.
4. Plastic dry wells.
5. Stormwater disposal systems.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.
B. Protect pipe, pipe fittings, and seals from dirt and damage.
C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products meeting the specifications.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Wall C, for gasketed joints.

1. Gaskets: ASTM C 443, rubber.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.

1. Material for Concrete Pipe: ASTM C 443, rubber.

2.6 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16- inch intervals. Omit steps for manholes less than 60 inches deep.
9. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 60 inches deep.
10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.

3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16- inch intervals. Omit steps for manholes less than 60 inches deep.
5. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
6. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

E. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.7 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.

3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
4. Gaskets: ASTM C 443, rubber.
5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16- inch intervals. Omit steps for catch basins less than 60 inches deep.
7. Steps: ASTM C 478, individual steps or ladder. Omit steps for catch basins less than 60 inches deep.
8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Gaskets: Rubber.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16- inch intervals. Omit steps for catch basins less than 60 inches deep.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channels and Benches: Concrete.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with

ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy- duty service. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum, unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy- duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.8 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy-duty frames and grates according to utility standards..

E. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.

F. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.

G. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates..

H. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.

1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.
2. Material: ASTM A 48, Class 30 minimum, gray-iron casting..
3. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.10 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 3000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Include channels and benches in manholes.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
1) Invert Slope: 2 percent through manhole.

b. Benches: Concrete, sloped to drain into channel.
1) Slope: 8 percent.
2) Slope: 4 percent.

2. Include channels in catch basins.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 1 percent through catch basin.
2) Invert Slope: 2 percent through catch basin.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.11 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregular size and shape, graded stone.

1. Average Size: NSA No. R-5, screen opening 5 inches.

C. Filter Stone: NSA No. FS-2, No. 4 screen opening, average-size, graded stone.

D. Energy Dissipators: NSA No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 4 and NPS 6: High Density Polyethelene pipe and fittings, connecting bands, and banded joints..
2. NPS 8 to NPS 15: High Density Polyethelene pipe and fittings, connecting bands, and banded joints.
3. NPS 18 to NPS 36: High Density Polyethelene pipe and fittings, connecting bands, and banded joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install piping with 12-inch minimum cover.

F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

K. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation

C. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 24 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

F. Install fiberglass manholes according to manufacturer's written instructions.

3.8 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.10 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.11 DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions.

B. Assemble and install stainless-steel drainage systems according to ASME A112.3.1 and manufacturer's written instructions.

C. Install with top surfaces of components, except piping, flush with finished surface.

D. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

E. Embed channel sections and drainage specialties in 4-inch (100-mm) minimum concrete around bottom and sides.

F. Fasten grates to channel sections if indicated.

G. Assemble trench sections with flanged joints.

H. Embed trench sections and drainage specialties in 4-inch (100-mm) minimum concrete around bottom and sides.

I. Make piping connections and install stainless-steel piping with gasketed joints between system components.

3.12 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

3.14 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
3. Pump remaining pipe full of grout.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches (1000 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Division 2 Section "Earthwork."

3.15 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 02630

SECTION 02700

GROUTING OF SEWER LINES

PART 1 - GENERAL

1.1 CLEANING

A. The term "cleaned" shall mean the removal of all sand, dirt, roots, grease and all other solids or semi-solid materials from the sewer lines. Grouting repairs shall be conducted immediately following cleaning.

1. Cleaning Equipment
   a. The contractor shall provide all equipment necessary for cleaning the sanitary sewers. The equipment used shall be suitable for the sewer conditions and degree of cleaning necessary. The equipment shall meet the following criteria:
      1) Mechanically powered equipment:
         a) A heavy-duty power rodding machine shall be capable of rodding distances of up to 1,000 feet in one step-up. It shall have the ability to spin the rid either clockwise or counterclockwise, but able to be pushed straight out or pulled back without rotating the machine. It shall also be capable of pulling pipe-size swabs or brushed back through the pipeline for cleaning and flushing purposes. A heavy-duty bucket machine shall be used on dragline work to clean the pipeline with buckets, brushes, scrapers, swabs or other similar devices in order to effectively remove the debris and provide a clean sewer or service lateral.
      2) Hydro cleaning Equipment:
         a) Hydraulic high-pressure sewer cleaners used for sanitary and storm sewer cleaning shall be specifically designed and constructed for such cleaning. The sewer cleaner shall have a minimum usable water capacity of 600 gallons and pump capable of delivering at least 30 gallons per minute (GPM) at 1,000 psi. Pressure to the nozzle shall be regulated by a relief valve adjustable from 1-1,500 psi minimum.
   b. Satisfactory precautions shall be taken to protect the sewer from damage that might be inflicted by the improper use of cleaning equipment. Sewers or service laterals damaged, as a result of the Contractor's operations shall be promptly repaired by the Contractor at no cost to the City. This includes damage caused by any materials (liquid or solid) that are blown or pushed back in residents' home through the sewer laterals.
   c. All equipment, devices and tools required for this Contract shall be owned (or leased) and operated by the Contractor.

2. Cleaning Sewers
   a. Selection of sewer cleaning equipment shall be based on the conditions of the sewers at the time the work commences. If cleaning an entire reach of sewer cannot be completed from one manhole, the Contractor shall move to another manhole to complete the work. If the Contractor cannot successfully complete the work after relocating his equipment, the City shall be notified immediately.
   b. Remove all sludge, dirt, sand, grease, roots, and other materials from the pipe and collect and remove resulting debris from the downstream manhole of the sewer section being cleaned. Passing material from section to section which could be detrimental to pumping equipment or cause accumulations in wet wells will not be permitted. When necessary, an approved dam or weir shall be constructed in the downstream manhole in such a manner that construction debris and solids will be trapped and retained.
   c. All roots must be removed prior to grouting. If roots are detected during the sealing of joint/defects/service laterals in a reach, the Contractor will be required to remove his grouting equipment from the line, re-clean to effect root removal and reinsert the grouting equipment to the point where the grouting was stopped and continue the operation.
   d. Existing flows shall not be interrupted for periods longer than one hour without prior written approval from the City. Sewage diverted during cleaning operations shall be returned to the sanitary system and not discharged into the streams or storms drain system. Cleaning of these sewers by means of hydraulic high-pressure jetting will be permitted.

3. Disposal of Debris
   a. Under no circumstances shall sewage or solids be dumped onto the ground surface, streets or into ditches, catch basins or storm drains.
   b. All solids or semi-solids resulting from the operations shall be removed from the site by the Contractor. Trucks hauling solids or semi-solids from the site shall be watertight so that no leakage or spillage will occur.
   c. Disposal shall be at a suitable site selected by the Contractor and approved by the appropriate jurisdictional personnel.

4. Re-Cleaning
   a. If pipeline is found not to be properly cleaned in the opinion of the City, the television and grouting equipment shall be removed, and the sewer re-cleaned at no additional expense to the City.

1.2 GROUTING

A. Prior to commencement of joint air testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a demonstration performed as described herein. The procedure will demonstrate the authenticity of the air test equipment, as no joint will test in excess of the pipe capability. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, then the

requirements will be modified to within the pipe integrity limits. If this test cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the City. This test may be required at any other time during the joint testing program if the City suspects the testing equipment is not functioning properly.

1. Pipe grouting equipment – general requirements
    a. The Contractor shall submit his equipment list to the City.
    b. The Contractor shall allow the City to inspect his equipment. It shall be approved prior to use in the field.
    c. The Contractor shall also demonstrate to the City the operation of and information provided by any gauges, motors or other readouts relating to the pipe and grouting work. This shall include the air test pressure gauge, the linear footage counter, volume of sealing material, etc.
    d. No work shall be considered for payment where measurement equipment and/or measuring techniques are unacceptable to the City at any time during the joint sealing program.
2. Chemical Grout Equipment
    a. Equipment shall be a remote-controlled grout injection rig type with inflatable diaphragms or packers at each end and other suitable approved devices which can be positioned to completely isolate each joint or break in the pipe and simultaneously permit sewage flow.
    b. Equipment shall consist of two (2) open chemical tanks as the chemicals reservoir, from which two (2) positive displacement electric pumps are fed for chemical injection with a combined discharge of no less than 5 GPM are pressures ranging from 1 to 800 psi.
    c. All components in the catalyst system shall be stainless steel, plastics or neoprene. Standard construction materials may be used for the components of the grout and inhibitor system.

3. Grouting materials for pipe
    a. The sealing materials shall be a chemical grout and catalyst system. The chemical grout used shall have a documented service of satisfactory performance in similar usage. The grout used shall be Avanti AV-100®, AV-118® or approved equal.
    b. All the materials shall be delivered to the site in undamaged, unopened containers bearing the manufacturer's original labels. Invoices or other means of providing delivery no more than three months prior to use shall be provided to the Engineer.
    c. Materials shall have the following minimum properties:
        1) A controllable reaction of from five (5) seconds to no more than six (6) hours, at a temperature from ambient to freezing.
        2) Viscosity of approximately 2.0 centipoise water which can be increased with additives.
        3) Viscosity to remain constant throughout the reaction period.
        4) The ability to tolerate some dilution and react in moving water.

5) The final reaction shall produce a continuous, irreversible, impermeable, nonporous still gel in pure form, or a stabilized soil in the ground that will not become rigid or brittle.
6) Root inhibitors, such as dichlobenil, shall be incorporated in the mix when roots are present in the joints. If a root inhibiting grout is unavailable from the grout manufacturer, the Contractor shall incorporate Casoron W50, dichlobenil or equal, at no cost to the City, into the grout mix in a quantity and manner recommended by the manufacturer. In so doing, the Contractor specifically covenants and agrees with the City that it shall make no claim against the City for any damages that it may incur as a result of any adverse effect the chemical Casoron W50, dichlobenil or equal may have upon the Contractor's equipment.
7) Use of catalyst containing dimethyl propionitrile is prohibited.
8) Sealing materials, in place, shall contain no less than 10% of the acrylic base material by volume.

d. The specified materials are considered toxic and irritants to skin and eyes. Therefore, personnel thoroughly familiar with the handling of the chemicals involved shall do the mixing, handling, and pumping of the chemicals. Proper protection outerwear, including eye protection and respirators for dust inhalation protection, shall be used while mixing or when otherwise exposed to by close contact.
1) Chemical Grout
a) The chemical grout shall consist of an intimate mixture of dry Acrylamide and dry N.N. – Methylene-biscrylamide, in such proportions that dilute aqueous solutions, when properly catalyzed, will form still gels.
b) The grout must make a true solution at concentrations as high as the pounds per gallon water.
c) The chemical solution shall have the ability to tolerate groundwater dilution, and to react in moving water.
d) The solution shall have the ability to tolerate groundwater dilution, and to react in moving water.
e) The solution shall have a viscosity of less than 2 cps which remains constant until gelatin occurs.
f) The reaction time shall be controllable from 5 seconds to 6 hours, at temperatures from ambient to freezing.
2) Catalyst
a) The catalyst for the chemical grout shall be Ammonium Persulfate
3) Activator
a) The activator shall be Triethanolamine (T). Activators shall be used with catalyst for all applications at ambient temperature or below.
4) Dye Tracers

a) Dyes may be added to the chemical grout solution for ease in identification. Fluorescein, at concentrations of less than 20 ppm, may be used for this purpose. All other dyes must be checked for possible undesirable prior to use.

5) Insoluble (particulate) Additives
   a) Any inactive solid such as clay or diatomaceous earth may be mixed with the grout as a filler, in any amounts compatible with pumpability and does not affect the quality of the grout. Bentonite may be used to increase the viscosity and strengthen the gel.

6) Other Additives
   a) The effects of additives not specifically mentioned above must be determined by test, prior to approval for field use.

4. Joint Air Tests

a. The Contractor shall be required to air test all sanitary sewer line joints prior to any grouting to determine if the potential for joint leakage exists. The air testing procedures will be as described herein.

b. Joint air testing shall be performed by a void pressure monitoring system. This shall be accomplished by applying a positive air pressure to the joint, allowing time for the system to stabilize and measure the amount of pressure drop over a given length of time.

c. Testing shall be accomplished by isolating the area to be tested with the packer of grouting rig and applying a positive pressure into the void area. Continuous monitoring of the void pressures shall be maintained at all times by means of a pressure testing unit. The pressure meter sensing device shall be located within the void area and accurately transmit this pressure to a readout device located at the technicians TV monitor control panel. The system shall display gauge pressure to the nearest tenth ($1/10^{th}$) psi and shall respond to and record any change on the void pressure instantly. All pressure measurements shall be made at void area.

d. Testing procedures shall generally consist of applying pressure of ½ psi per foot of depth plus one to two psi or a maximum of 10 psi onto each void area created by the testing device. Where sewers are extremely shallow, deep or in poor condition, the City will adjust the required pressure accordingly. Once the specified pressure in the void area has been displayed on the meter above ground, the application of pressure shall be stopped, and a five-second stabilization period shall commence. The meter shall be observed for 20 seconds and should the pressure in the void area drop more than ½ psi, the joint will have failed the test.

e. Upon completing the air testing of each joint, the packer shall be deflated. Should the void pressure meter fail to drop to zero, the Contractor shall be instructed to clean his equipment, or make the necessary repairs to provide for an accurate Void Pressure reading.

f. Any joint failing the air test prior to grouting shall be sealed as specified herein and retested by the same void pressure method and procedures

following sealing to verify the effectiveness of the sealing. This procedure will be repeated until the joint passes the test. Additional sealing and retesting after the initial sealing and retesting shall be at no cost to the City.

5. Sealing Joints
   a. The Contractor shall be required to seal any or all pipe joints, leaks, breaks, holes and other sources of possible groundwater infiltration within a sewer line or service lateral as may be observed on recorded television inspection, and as described herein. Any joint that is sealed shall subsequently be tested by air testing procedures described herein. Costs related to the air test following the sealing will not be measured for payment nor constitute additional cost to the Contract Price, but will be considered as incidental to the Contract.
   b. All pipe joints and breaks shall be sealed by an internal, chemical grouting method. The method used shall not damage, break, move or cause settlement of sewer pipe or manhole structures, and shall be such that the original cross-sectional area and shape of the interior of the sewer shall not be permanently reduced or changed. Any sewer that the City may deem damaged as a result of the Contractor's operations shall be promptly repaired to the City's satisfaction at no expense.
   c. Sealing materials that set to be hard, rigid product capable of intrusion into the sewer line will not be acceptable.
   d. If roots were detected during the television inspection, these roots shall be removed immediately prior to any grouting operations. Costs related thereto will not be measured for payment nor constitute additional cost to the Contract Price, but will be considered as incidental to the Contract, unless chemical root removal is recommended by the City.
   e. If, as determined by the City, concrete sewer pipe had become corroded to the degree that a positive air test cannot be achieved, the Contractor shall direct the back pressure gaging be monitored to determine a proper seal.

6. Application of Chemical Grout
   a. Provide chemical grouting of sewer joints, leaks, and breaks in the pipe by forcing sealing materials into and through any or all pipe line joints, leaks, or beaks, from within the sewer pipe. If grouting operations restrict or prevent simultaneous sewage flow passage, approved plug or by-pass pumping will be required. Maximum interruption of existing flows shall be limited to one hour unless the City gives prior written approval.

   b. The grouting injection rig shall be positioned over the sewer joint, leak, or break in the pipe by means of a closed circuit television camera in the line. Accurate measurement of the location of the joint to be sealed shall be made, using a portion of the grouting rig as "Datum" or measurement point shall also be measurement point. Such measurement or point shall also be used to record measurement of the repaired joint. The grouting

device shall be an open ended cylindrical casing type of a size less than the pipe diameter with two cables connected to both ends to pull it back and forth or positioning it in the line. Any inflatable sleeves that require extreme pressure to "seat" against the periphery of the pipe causing pipe fracture will not be allowed. The sleeves shall be pneumatically expanded from the center to both ends. When in an inflated state, two widely spaced annular bladders shall have been formed, each of elongated shape and producing an annular void around the center portion of the casing. Expansion shall be regulated by precise pressure gages and control. No device which is expanded mechanically will be allowed. The pneumatically expanded sleeves shall seat against the inside periphery of the pipe in such a way as to form a voided area completely isolated from the remainder of the line. Two conduits shall pass through one end of the casing and shall be adapted to supply the sealing material, under pressure, to the space at the center of the casing. Into the isolated area, through hose lines leading from above ground, the chemical sealant shall be pumped with instant reading, metered flow controlled, proportioning pumps with pressure in excess of groundwater pressures.

c. The television, pumping, grouting and air pressure monitoring equipment shall be integrated so that proportions, quantities, and void pressure for materials and sealing can be instantly monitored and regulated in accordance with the type and size of the joint, break in the pipe or leak, void pressure changes and the rate of flow of the sealing solution in relation to the back pressures in order to effect a seal with a minimum amount of material.

d. In the event that large voids are encountered on the outside of the sewer, including the possibility of "piping" holes to the ground surface which could cause excessive use of grout, a change in operating pressures and pumping rates shall be made so as to avoid excessive use of grout. In such instances, changes in operating procedure shall be accomplished by reducing pressures and pumping rates followed by a termination of pumping until a temporary "set" of the gel is obtained on the outside of the pipe, and then, after sufficient lapse of time, followed by an increase in pressure and resumption of pumping until a proper seal of joint or break in the pipe is obtained.

e. Upon completion if the injection, the grouting rig shall be moved forward, wiping away the excess grout and allowing the television camera to move to a suitable position for inspection and/or air test. Each joint, cracks or holes shall then be again air tested as specified hereinbefore. Should any joint fail to pass the air test, it shall be released and retested until the test requirements can be met. If the repair or the other break in the pipe or groundwater leak is deemed to defective by the Owner, the rig shall be moved back into position and the grouting process repeated, with possible

modification of the grout composition, until proper sealing of the joint or break in the pipe has been obtained.

f. The excess grouting material removed from the joint or break by the grouting equipment shall be flushed or pushed forward to the next downstream manhole, removed from the sewer system and disposed of by the Contractor, as specified for disposal of debris resulting from cleaning operations. In no case shall excess grout material from succeeding sections be allowed to accumulate and be flushed down the sewer. The Contractor shall make a tight seal with his equipment at each joint or break to be grouted. If a tight seal is not secured, the Contractor shall remove the equipment and make such adjustments as are necessary to make a tight seal.

7. Monitoring Operations

a. The Contractor shall provide for monitoring by closed circuit television in a manner which shall provide clear and visible pictures of the positioning of group equipment as well as the finished joint.

b. Suitable metering devices shall be attached to the internal inspection equipment so that the exact location of the equipment with in the pipeline can be noted at all times.

8. Records

a. For each section of sewer grouted, complete, accurate videotape and typed records shall be kept of joint sealing performed in each manhole section. The records shall include:

1) Identification of the manhole section sealed.
2) The location of each joint sealed.
3) Sealing pressure used.
4) Number of gallons of sealant used.
5) A statement indicated the sealing results (passed or failed) for each joint sealed.

b. A copy of the typewritten records shall be given to the Owner upon completion of the project.

c. Title of the video tape records shall be given to the Owner upon completion of the project.

d. These records shall show the location of each operation or point on information relative to the centerline distance from adjacent manholes clearly defined. Measurement of location shall be readable at ground level by means of a measuring device. Marking on cable or the like will not be allowed. As each repair is accomplished, notations shall be made on a pertinent location record showing amount to the repair or directed by the City.

9. Obstructions

a. Obstructions may be encountered during the course of the sealing operations that prevent the travel of the packer and camera. Should an

obstruction not be passable, the Contractor shall withdraw the equipment and begin sealing operations from the opposite end. Of the sewer each. Should additional obstructions be encountered after the reemployment and no means are available for passing the obstructions without damage to the equipment, then the remaining sections of the sewer not sealed shall be excluded from the work requirements of the Contract. Costs related to difficulties encountered during sealing operations will not be measured for payment nor constitute any additional costs to the Contract Price, but will be considered as incidental to the Contract.

10. Supervision
    a. Supervision of grouting shall be under the responsibility of a person with a minimum of five (5) years of experience in the application of chemical grout for infiltration control. This person shall be present at all times chemicals are mixed and applied, have overall responsibility for record keeping, and responsibility for safety procedures for protecting all personnel involved with the grouting operation. The name of this person shall be given to the City prior to beginning the grouting work.

11. Guarantee
    a. All work performed by the Contractor shall be guaranteed for a period of one year after the completion and acceptance of the Contract. After a section between manholes has been leak-sealed and accepted by the Engineer, any and all sewer lines joints which develop renewed leakage during the guarantee period shall be resealed by the Contractor at no cost to the Owner. However, the Contractor will not be held responsible for leaks which develop in sewer line joints and are due to structural failure of pipeline or settlement not attributable to his operations.
    b. Prior to expiration of the one-year guarantee period, the Owner may select several sewer sections for an initial retest. The manhole sections selected shall be representative of the majority of the grouting work originally performed. The initial re-test area shall consist of no more than 15% of the lineal feet contained in the original report.
    c. Within the initial re-test area the Contractor shall re-test all previously grouted joints. Any joint failing the re-test shall be re-grouted. If the failure rate of the re-tested joints is 5% or less of the total joints re-tested, the work shall be considered satisfactory and no further re-testing will be necessary. However, if in the initial re-test area, the number of joints to fail exceeds 5% of the total joints re-tested, then all previously grouted joints shall be re-tested. All joints which fail shall be re-grouted.
    d. In order to ensure that re-testing and any necessary re-grouting will be performed, 2% of the total Contract in cost will be retained in escrow until the re-testing has been satisfactorily completed.

END OF SECTION 02700

SECTION 02723

INLETS

PART 1 - GENERAL

1.1 SCOPE:

A. The work covered by this Section shall consist of furnishing all materials for and constructing complete, all curb type inlets at the locations shown on the Drawings or designated by the Engineer.

B. Curb type inlets shall be constructed to the size, shape and dimensions and at the locations shown on the Drawings or as directed by the Engineer. Inlets may be constructed either of brick or concrete masonry at the option of the Contractor. They shall be provided with cast iron frames and gratings as specified herein and shown on the Drawings.

C. Each inlet shall be connected to a nearby storm sewer as indicated on the Drawings by means of appropriate storm sewer and suitable fittings.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Concrete shall be 4,000 psi concrete conforming to the applicable requirements of Section 03300 of these Specifications.

B. Steel reinforcement shall conform to the requirements of Section 03300 of these Specifications.

C. Brick shall conform to ASTM C 32, Grade SM. Sand for mortar shall conform to ASTM C 144. Hydrated lime shall conform to ASTM C 206.

D. Frames and gratings shall be of the type shown on the Drawings. Iron castings shall conform to ASTM A 48, Class 30. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blowholes and other defects affecting their strength. Bearing surfaces between cast frames and gratings shall be machined, fitted together and match marked to prevent rocking. All castings shall be thoroughly cleaned and painted or coated with a coal tar pitch varnish.

E. All reinforced concrete pipe and special fittings shall be reinforced concrete culvert, storm drain, and sewer pipe conforming to the latest requirements of ASTM C 76. Pipe shall be of the Class III and shall have circular reinforcement for circular pipe. All applicable subsections of Section 02720 of these Specifications shall apply to the work of connecting the inlet to the sewer.

F. Precast Concrete Sections:
   1. Precast concrete sections shall consist of a flat slab top section, and a base section conforming with the typical details as shown on the Drawings.

2. Precast concrete sections shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C 478.
3. The minimum compressive strength of the concrete for all sections shall be 4,000 psi.
4. The maximum allowable absorption of the concrete shall not exceed eight percent of the dry weight.
5. The circumferential reinforcement in the riser sections and base wall sections shall consists of one line of steel and shall be not less than 0.17 square inch per lineal foot.
6. The ends of each reinforced concrete riser section and the bottom end of the top section shall be so formed that when the risers and the top are assembled, they will make a continuous and uniform structure.
7. Joints of the sections shall be of the tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to the applicable provisions of ASTM C 443, latest revision, or filled with an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form.
8. Each 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 after installation.
9. Cast iron manhole steps shall be installed in each section in accordance with the details on the Drawings.

G. Joint materials for concrete pipe shall be in accordance with the requirements of Section 02720 of these Specifications.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Excavation shall be in accordance with the requirements of Section 02200 of these Specifications.

3.02 CAST-IN-PLACE CONCRETE CONSTRUCTION:

A. Forms for concrete shall be constructed of such materials and in a manner meeting the requirements of Section 03300 of these Specifications.

B. Cast-in-place inlets shall be constructed in place with the base, walls and top all monolithically cast using removable forms of a material and design approved by the Engineer.

C. The vertical forms, vertical and horizontal wall spacers, steps and placing cone must be carefully positioned and firmly clamped in place before any placement is made. The wall spacers must be located 90 degrees from each other. The forms shall be firmly supported with bottom of forms at the proper elevation to permit the base to be deposited through the vertical forms.

D. The base shall be deposited down through the wall forms onto undisturbed earth or rock bearing. It shall be evenly distributed around the walls and vibrated both inside and outside the forms until there is a minimum slope of 60 degrees from the bottom of the forms to the bearing surface both inside and outside of the inlet. When this is complete and before additional concrete is added, the concrete must be carefully vibrated on each side of each pipe.

E. The base shall be concentric with the inlet and have a minimum diameter of 16-inches greater than the outside diameter of the inlet, and 10-inch minimum thickness under the lowest pipe. Minimum wall thickness shall be 6-inches.

F. Additional concrete must be deposited in evenly distributed layers of approximately 18-inches with each layer vibrated to bond it to the preceding layer. The wall spacers must be raised as the placements are made. The concrete in the area from which the spacer is withdrawn shall be carefully vibrated. Excessive vibration shall be avoided.

G. If adjustment of the frame elevation is called for, concrete "do-nut" sections or brick shall be used.

H. Form marks and offsets shall not exceed 1-inch on the outside surface of the inlet. Form marks and offsets shall not exceed 1/2-inch inside of the inlet. All offsets on the inside surface shall be smoothed and rubbed so there is no projection or irregularity capable of scratching a worker or catching and holding water or solid materials. Honeycombed areas shall be completely removed immediately upon removal of the forms and replaced with a Class "A" concrete as directed by the Engineer.

I. Should circumstances make a joint necessary, a formed groove or reinforcing dowels shall be required in the top of the first placement for shear protection. Immediately before the second placement is made, the surface of the cold joint shall be thoroughly cleaned and wetted with a layer of mortar being deposited on the surface.

3.03 BRICK CONSTRUCTION:

A. Brickwork shall be constructed using one part Portland cement to two parts clean sand, thoroughly mixed to workable plastic mixture. Not over 20 pounds of hydrated lime per sack of cement may be added. No retempered mortar shall be used. Brick shall be laid with mortar joints 3/8-inch thick. The inside of the inlet shall be neatly finished with cement mortar 1/2-inch thick.

B. Each sixth brick course shall be a "Stretcher" course. Inside joints shall be trowel struck flush joints to provide smooth, clean surfaces. Joints shall be broken in successive layers. Wall thickness for inlets 12 feet and less deep shall be 8-inches. Wall thickness for the portion of inlets over 12 feet deep shall be 12-inches.

C. After the foundation has been prepared and has been approved by the Engineer, the bottom shall be constructed to the required line and grade. After the bottom has been

allowed to set for a period of not less than 24 hours, the inlet shall be constructed thereon, care being exercised to form the incoming and outgoing sewer pipe into the wall of the inlet at the required elevation.

D. Manhole steps shall be inserted into the wall of the manhole at the proper locations and elevations as the work progresses and shall be securely embedded in the masonry.

3.04 PRECAST CONCRETE CONSTRUCTION:

A. After the base section has been set, and inverts formed, the precast sections shall be placed thereon, care being exercised to form the incoming and outgoing pipes into the wall of the inlet at the required elevations.

B. Masonry work shall be allowed to set for a period of not less than 24 hours. Outside forms, if any, then shall be removed and the inlet backfilled and compacted. All loose or waste material shall be removed from the interior of the inlet. The inlet grate then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

3.05 INVERTS:

A. All inverts shall be of 3,000 psi concrete meeting the requirements of Section 03300 of these Specifications, and shall conform to the shape indicated on the Drawings or as directed by the Engineer. The invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the inlet shall be made to a true curve with as large a radius as the size of the inlet will permit.

3.06 INLET AND OUTLET PIPE:

A. Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be placed in an inlet. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the groove uphill. Trench bottoms found to be unsuitable for foundations shall be corrected in accordance with Section 02200 of these Specifications prior to installation of pipe in inlets.

B. Pipe placed in the walls for outlet connections shall extend through the wall and beyond the outside surface of the walls to allow for connections, the end of the pipe being placed flush with the inside face of the wall. Masonry shall be carefully constructed around the pipe for the full wall thickness so there will be no leakage around the outer surface.

3.07 CASTINGS:

A. Cast iron frames shall be set accurately to line and finished elevation so that subsequent adjustments will not be necessary.

B. Where inlets are constructed in paved areas or integral with curb and gutter, the top surface of the frame and grate shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement or curb and gutter.

C. Frames shall be set in full cement mortar beds as shown on the Drawings set in place to match the finished concrete surface.

3.08 CLEANING:

A. After completion of the inlet, the interior shall be thoroughly cleaned of all excess materials, the grating placed and all unused materials, tools, equipment and debris removed from the area.

B. After the masonry and frames have had sufficient time to set, but in no case less than 24 hours after placement, the space around the inlet shall be backfilled and tamped to the required grade.

C. Final cleaning shall be performed in accordance with the requirements of the General Conditions of these Specifications.

END OF SECTION 02723

SECTION 02852

TRAIL BRIDGE CONSTRUCTION

PART 1: GENERAL

1.01 SCOPE

This Section describes materials, equipment, and requirements for their use in constructing all bridge items, including the substructure and pre-engineered superstructure. The Contractor shall furnish all materials and equipment and perform all labor necessary to fulfill the requirements of this Section. The bridge manufacturer shall coordinate the delivery of the bridges with the owner and the installation contractor.

Preconstruction Conference: Contractor shall stake the location and elevation of the two bridges identified for the project. Contractor shall then hold a preconstruction conference on site with the bridge manufacturer, helical pier contractor, and concrete abutment contractor to coordinate the location, measurements, size and schedules of the three subcontractors responsible for the bridge and its placement.

1.02 REFERENCES

A. The Standard Specifications for:
02852B - Prefabricated Bridge
03300 – Cast-In-Place Concrete

B. The Standard Specifications for Highway Bridges, Fifteenth Edition, 1992, of the American Association of State Highway and Transportation Officials, as amended by the Interim Specifications-Bridges-1993, are made a part of this Section by reference for design of all bridge components, except as modified herein. The 1992 Standard Specifications for Highway Bridges and the 1993 Interim Specifications shall be referred to herein as the AASHTO Specifications.

C. The ANSI/AASHTO/AWS D1.5 Bridge Welding Code is made a part of this Section by reference for all welding, welder qualifications, pre-qualification of weld details and inspection of welds, except as modified herein. The ANSI/AASHTO/AWS D1.5 Bridge Welding Code shall be referred to herein as the AWS Welding Code.

1.03 QUALIFICATIONS

Submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

1.04 FOUNDATIONS/ABUTMENTS

A. It shall be the responsibility of the bridge manufacturer to furnish support reactions, and anchor bolt placement details. The bridge manufacturer shall coordinate this information with the contractor.

B. Contractor shall prepare shop drawings to conform to the requirements for the bridge abutments. Shop drawings must be reviewed and approved by Project Landscape Architect prior to installation of materials.

1.05 SUBMITTALS

A. Complete fabrication and erection drawings and complete structural design calculations engineering data for the proposed pre-engineered superstructures shall be submitted to the Project Landscape Architect prior to fabrication in accordance with the requirements of Section 01300 of these Specifications. Drawings shall show all construction details, materials to be provided by General Contractor and complete bridge specification for all bridge materials. All drawings shall be signed and sealed by or professional engineer registered in the State of Georgia.

B. Complete product data for the concrete, steel reinforcement, and abutments shall be submitted to the Project Landscape Architect in accordance with the requirements of Section 01300 of these Specifications.

1.06 QUALITY ASSURANCE

A. The manufacturer shall provide written certification to the Project Landscape Architect that all products furnished comply with all applicable requirements of these Specifications.

B. Bridge manufacturer, helical pier installer, and abutment contractor shall specifically with each other to ensure that the location, measurements and size of the bridge and abutment and properly coordinated.

PART 2 – PRODUCTS

2.01 CONCRETE STRUCTURES

A. All concrete and its components used for construction of the bridge substructure and the pre-engineered superstructure shall meet the requirements of the Georgia Standard Specifications. Class A, f’c = 3,000 psi, concrete shall be used for the bridge substructure.

2.02 STEEL STRUCTURE

A. The pre-engineered superstructure shall be designed in accordance with the AASHTO Specifications. The following design parameters shall be used:

1. The structure shall be designed to a sufficient capacity to support either a sidewalk live load of a minimum of 85 pounds per square foot or 10,000 lbs truck loading, including impact and fatigue considerations.
2. The structure shall meet the requirements for a single span bridge in Seismic Performance Category A.
3. The side railings shall be steel and meet all requirements for a bicycle railing.
4. A concrete deck or riding surface shall be incorporated into the pre-engineered superstructure design.
5. The minimum roadway width measured between trusses shall be as shown on the Construction Drawings.
6. Deck drains shall be provided.
7. Bearings and anchor bolts shall be designed and provided as part of the pre-engineered superstructure. Anchor bolt templates or a detailed anchor bolt layout shall be provided to the Contractor. Thermal expansion and contraction shall be considered.
8. Form decking shall be galvanized and welded to floor beams.

B. All steel and steel components used in the pre-engineered superstructure shall meet the requirements of the Georgia Standard Specifications. Structural steel shall be ASTMA 709, Grades 50W (weathering Steel).

C. Anchor bolts and templates: The bridge manufacturer shall coordinate with the abutment contractor to supply proper bolts and template to effectively include in the process of construction the abutment cap on top of the helical piers.

D. Field splices shall be fully bolted with ASTM type 3 high strength bolts in accordance with “Specifications for Structural joints using ASTM A325 or A490 Bolts.

E. All welding, welder qualifications, pre-qualification of weld details and inspection of welds for the pre-engineered superstructure shall meet the requirements of the AWS Welding Code.

F. Steel members shall be cleaned and painted in accordance with Subsection 535.04.A.1 of the Georgia Standard Specifications.

G. All main load carrying members and components subject to tensile stress within the pre-engineered superstructure shall be clearly designated on the shop drawings and shall meet the Charpy V-Notch test requirements as specified in of the Georgia Department of Transportation Standard Specifications.

H. The Contractor shall secure from the pre-engineered superstructure supplier and provide to the Project Landscape Architect, two certified and legible copies of maill test reports showing the results of physical tests and complete ladle analyses for each

heat and grade of steel ordered. The reports shall refer to the ASTM designation of tests used and shall be furnished at the Contractor's expense. In lieu of these requirements, representative samples may be taken from the stock and tested by the Project Landscape Architect. Such sampling and testing will be at the Contractor's expense.

I. Geometry:
   1) Truss: Half-through truss design.
   2) Diagonals: Two diagonal per panel
   3) Camber: Bridge shall be cambered to 1.5% of the total span length. All vertical truss members shall be perpendicular to the ground (horizon) after the bridge is erected, and dead loads applied.
   4) Localized deck slopes shall not exceed 5.0%.

   5) Bridge shall accommodate abutment elevation differences as shown on the drawings.

2.03 EXPANDED MORTAR

A. Expanded mortar and its components shall meet the requirements of the Georgia Department of Transportation Standard Specifications.

2.04 REINFORCEMENT STEEL

A. All reinforcement steel used for construction of the bridge substructure and the pre-engineered superstructure shall conform to the Georgia Department of Transportation Standard Specifications, except as modified herein.

2.05 CLEAN UP

A. All construction debris, waste, spoiled concrete, rebar, formboards and other refuse shall be removed from the site. No waste materials shall be throw into the streams, creeks or lake on site.

END OF SECTION 02852

SECTION 02889

WOODLAND TRAIL CONSTRUCTION

PART 1 GENERAL

All the General and Special Conditions of the contract shall apply to this section

See sections on Earthwork, Tree Protection, and Grading for reference to this section

1.01 Summary

A. The process of building trail in the natural environment is a design – build interactive process between the contractor, landscape architect and owner.
B. The objective is to carefully mold the trail layout and construction to carefully fit the natural conditions of the site topography and vegetation without doing an unnecessary damage.
C. The soil shall not be disturbed any more that is absolutely necessary
D. The layout shall be adjusted and fitted to the slopes and to avoid important trees
E. Switchbacks and swale crossings are to be avoided as much as possible
F. Interruption of the natural flow of runoff is to be avoided.
G. Clearing and grading shall be done with handheld tools and small walk-behind power tools and carts.
H. Routing of the trail shall be approved in the field before construction begins.
I. Contractor shall become familiar with the process prior to bidding the project.
J.

1.02 Quality control

A. The contractor shall demonstrate that he has access to adequate small-scale walk behind equipment to perform the work as herein specified.
B. The contractor shall demonstrate that he has at his disposal adequate manpower to perform the hand labor as herein defined
C. The contractor shall provide a superintendent familiar with and experienced in the process on design build of small woodland trail projects.
D. Contractor and superintendent shall work in close contact with the landscape architect and client staff during the execution of this phase of the work.
E. Contractor shall arrange to have an orientation and demonstration class on site for his superintendent and crew that are designated to build the trail, prior to beginning the construction process
F. .

1.03 Description of work

A. Field stakeout of the proposed trail construction
B. Hand clearing of the proposed route using small equipment
C. Trail grading of the proposed route using small walk behind equipment
D. Construction of small retaining wall of wood or native stone along the trail route
E. Construction of small wooden bridges and swale crossing
F. In field adaptation of generic design details as contained in the contract documents but improvised to fit site conditions as necessary

G. Installation of drain swales, benches, and pipes as needed and defined on the site and in the typical details

PART II PRODUCTS

2.01 Design Process

A. The initial route has been determined by the Master Plan and is drawn over and existing topographic map of the site.

B The contractor shall rough stake the layout of the trail as best shown on the master plan by setting pin flags every 50 feet along the proposed trail route.

C. Landscape Architect shall walk the stake out and make field adjustments to set the trail according to the criteria of the design.

D. Contractor, owner and landscape architect shall walk the adjusted layout to review and verify all the elements of the trail and finalize the location of the trail

E. Contractor shall proceed to do a construction stakeout of the trail placing an offset stake on the uphill edge of the trail as defined by the team.

F. Landscape Architect shall prepare a revised routing plan on the site topography map identifying all the elements and routing of the trail as defined by the team

G. Contractor shall begin construction upon receiving the revised layout plan.

2.02 Design Process

A. Design Criteria

1. Slopes
    a. Overall slope shall not exceed 5%
    b. Cross slopes shall not exceed 3 – 5 %
    c. Out-slopes shall not exceed 3 – 5%
    d. Running slopes shall not exceed 8% at any point on the trail
    e. Running slope shall never exceed 50% of the existing side slope
2. Trail
    a. Width of trail shall be an average of 36”
    b. Trail surface shall be compacted natural soils
    c. All loose rock shall be removed from the surface of the trail
    d. All embedded rock protruding in the trail shall be removed.
    e. All tree roots protruding above the walking surface shall be removed or covered with natural soil
    f. Remove all logs along the edge of the trail
    g. All fill soil shall be hand tamped and compacted.
    h. Entire trail shall be roll compacted upon completion
3. Bench Cuts
    a. Cut all level benches into the side slope
    b. Bench cuts shall always be full bench to ensure that the tread is stable across the entire length
    c. Tread shall have an out-slope of no more than 5%
    d. Full bench shall be cut into existing back slope
    e. Full bench shall be used everywhere except in areas where exposed rock prevents a full cut bench into the back slope

f. Partial bench trails are permissible where full bench is not possible due to exposed rock or site conditions
g. Crib walls shall be used downhill in conjunction with any bench other than full bench.
h. Blend back the cut slopes so water does not run off edge of trail

4. Crib Walls
    a. Install crib walls on the downhill side of all non full benches
    b. Uphill crib walls may be used to save significant vegetation
    c. Crib wall shall be built in pyramid style with the bottom being wider than the top
    d. Wooden crib walls shall be built out of .6 below g round contact treated wood. Do not use on site untreated wood.

5. Climbing Turns
    a. Climbing turns shall be used where a change in direction is necessary in the trail
    b. Where existing cross slope of the hillside is 7% or less and there is sufficient room to make a 50’ diameter turn
    c. Climbing turns shall be out sloped and utilize a full bench cut
6. Rolling Crown Switchbacks
    a. Rolling crown switchbacks shall be used where a change in direction is necessary in the trail.
    b. The existing cross slope exceeds 7% and there is not enough width for a 50’ diameter turn.
    c. The upper leg of the switchback shall be excavated, and the fill used for the platform and part of the lower leg
    d. Native stone shall be collected on site for the walls. Gather stones from as small as baseballs to as large as two men can car handle to use for the wall.
    e. For every 8% or 10% of side slope, a foot of elevation is needed for the crib wall
    f. Backfill for the lower crib wall shall be taken from the upper excavation side of the trail
    g. Large angular rocks are preferred. Largest rocks on the bottom building up in a stack form with a minimum 10-degree rack
    h. Small stone shall be used to fill gaps between larger stones
    i. Begin at the lowest point in the middle with the largest rocks and work outward and upward.
    j. Bottom base stones shall be set on an excavated pad tilted back into the slope. Each succeeding layer shall sit upon the next and shall be canted into the hill and staggered back to allow gravity to hold the stones in place
    k. The bottom tier shall have its base excavated so that the bottom layer of stones has a generally level surface when the stones are butted up to each other. Some stones may have deeper holes that others in order to achieve this base.

l. Backfill shall consist of smaller rocks and fill.
m. Back fill shall be hand tamped to achieve compaction required.
n. Successive tiers shall be butted together with joints staggered from the tier below.
o. Backfill each tier in layers as constructed to achieve maximum compaction
p. Last tier shall be level with the surface of the trail so that no stones are protruding above the trail surface.

B. Equipment
1. Contractor shall have the following equipment available for the project
a. Small rubber tier "gator" or similar four-wheel ATV
b. Small walk behind "dingo" or similar excavator
c. Drum rollers 3' wide like the type used for compacting sod
d. Rubber tire bobcat with front end bucket
e. Motorized wheel barrels or similar earth moving equipment
f. Pull behind chipper for grinding vegetative materials
g. Chain saws, pole saws and other tools for hand clearing and grading.

PART III EXECUTION

3.01 Staking
A. The contractor shall stake the initial master plan routing by setting pin flags every 50' along the proposed centerline of the trial.
B. Contractor shall walk the stakeout with the landscape architect to review the field adjustments made by the landscape architect
C. Contractor shall proceed to do a construction stakeout of the proposed trail alignment by placing wooden stakes every 25' on the uphill edge of the trail
D. Contractor shall walk the construction stakeout with the landscape architect, owner, and trail crew to be sure all parties understand the scope of the work
E. Contractor shall conduct an on-site workshop for the trail construction crew wit the landscape architect by building the first 25' of trail as a demonstration project. Contractor shall also construct at least one sample of each type of trail element that is anticipated along the trail

3.02 Clearing
A. Contractor shall proceed to clear the trail corridor by using hand labor
B. Corridor shall be cleared of all underbrush on either side of the trail width
C. Corridor to be cleared of all low hanging limbs up to 7' above the trail bed
D. Vegetative matter may be chipped and blown out into the adjacent woods
E. All mulch and vegetative matter along the surface of the trail bed shall be raked off the trail and thrown down hill from the trail bed
F. Logs, stumps, debris and rocks shall be removed.
G. Loose stones shall be staked off the trail to be used for crib walls

3.03 Grading

A. Upon completion on the clearing grading operations may begin
B. Contractor shall proceed to grade and bench in the trail bed by using small walk behind and rubber tire equipment to prepare the trail bed
C. Contractor shall construct all crib walls, bridges, benches, drainpipes, swales and other tail elements as he progresses along the trail.
D. Upon completion of the trail, the contractor shall roll compact the finished trail by pulling a water filled drum roller behind a small ATV to finish compacting the trail.

3.04 Cleanup

A. Upon completion of the construction, the contractor shall clean up the site
B. Contractor shall remove all leftover materials, loose soil, debris and mulch left on are near the finished trail
C. Contractor shall install signs as designated on the plans

END OF SECTION 02889

SECTION 02921

HYDROSEED

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division–1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of grass seeding is shown on drawings. Installation of grass seeding and follow–up maintenance extends over three growing seasons, identified herein as Year 1, Year 2, and Year 3, as appropriate.

Types of work required include the following:

1. Fine grading and preparation of grass seeding areas, Year 1only.
2. Furnishing new topsoil (specified Division 2 “Topsoil” section), Year1only, if necessary.
3. Furnishing and application of soil amendments, Years 1, 2 & 3 as needed.
4. Furnishing and application of herbicides, Year 1, 2 and 3 as needed.
5. Hydro-seeding, Year 1 definitely, and Year 2 if necessary.
6. Provision and installation of soil retention blanket material. (Year 1 only)
7. Watering seeded areas. (Year 1 only)
8. Soil Testing (Year 1 only)

Topsoil can be stockpiled within the construction limits at Contractor’s option for re–use in grass seeking work. If quantity of stockpiled topsoil is insufficient, or if material does not meet specifications, provide additional topsoil to complete grass seeding work.

Additional topsoil for grass seeding not available at site:
Furnish topsoil as specified under “Topsoil” section.

1.3 SUBMITTALS:

Manufacturer’s Product Data: Submit manufacturer’s printed product data for the following:

1. Herbicides

Submit product sheet data on herbicides

2. Soil Retention Blanket

Samples: Submit a 24” x 24” sample of soil retention blanket material.

3. Certification of Grass Seed:
Submit grass seed vendor's certified statement for each grass seed to be supplied, stating botanical and common name, percentage by weight, and percentages of purity, seed germination results, date, and weed seed for each grass seed species.

1.4 QUALITY ASSURANCE:

Installer Qualifications: All work must be performed by an installer experienced in the work of this section employing a competent supervisor on site full time during installation of work specified.

1.5 DELIVERY, HANDLING AND STORAGE OF MATERIALS:

Deliver packaged soil amendments in original sealed and labeled containers and store indoors in a dry location.

Stockpile bulk commodities on high, well–drained ground, sheltered as necessary to keep dry.

Deliver seed mixed in hydro-seeder to site ready to plant.

1.6 JOB CONDITIONS AND SCHEDULING:

Planting Time: Plant only from April 1 to September 31.

Perform hydro-seeding only when soil or weather conditions allow proper soil preparation and subsequent hydro-seeding operations.

Notify the Owner's Representative at least 48 hours prior to beginning of hydro-seeding operations.

Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stones, rocks and construction materials, replace with new topsoil.

1.7 SOIL TESTING

Perform or have performed sufficient soil testing to determine pH, percolation rate, and trace element contents of soil to receive seeds prior to planting. Unacceptable conditions shall be connected prior to hydro-seeding. Copies of test results shall be provided for the Owner and Landscape Architect.

PART 2 – PRODUCTS

Acceptable topsoil for typical grass planting areas are as follows:

2.1. pH 6.5–7.5

a. Phosphorus

Weak Bray	22–30 ppm or 100–130 lbs. P O
Strong Bray	40–65 ppm or 250–300 lbs. per acre P O

b. Sulphur 15–20 ppm

c. Cations

Potassium	150–250 ppm
Magnesium	50–100 ppm
Calcium	deficiency rare w/ adequate pH

d. Base Saturation Rate

Potassium	2–5%
Magnesium	10–40%
Calcium	50–80%

e. Trace Elements

Zinc	0.1 NHCI ext. 3–6 ppm DTPA ext. 14–22 ppm
Manganese	0.1 NHCI ext. 20–30 ppm DTPA ext. 14–22 ppm
Iron	20–30 ppm DTPA
Copper	1–1.8 ppm DTPA
Boron	1–1.5 ppm Hot Water Ext.

f. Soluble Salts Less than 1.0 mmhos/cm

Fine Turning: Contractor shall consult with the supplier of the specified seed for hydro-seeding to determine If the above typical specifications need to be modified for the species specified.

2.2 LIME:

Ground or pulverized limestone containing at least 50% total oxides of calcium and magnesium, ground to the following fineness:

100 mesh sieve	75% passing
20 mesh sieve	100% passing

2.3 HERBICIDES

Non–specific systemic herbicide such as “Round–Up” produced by Monsanto. Provide herbicide that complies with all applicable EPA, State and local regulations. Deliver to site in manufacturer’s original unopened containers. Provide for ground reparation prior to planting in Year 1 only.

Broad leaf herbicide applied to site as needed in Years 1, 2 and 3.
A monocot herbicide is not to be used on the site at all once the seeding has been accomplished.

Contractor shall take care to avoid drift of over-spraying of herbicides on ornamental shrubs, trees or other vegetation to remain on site.

2.5 GRASS SEEDING MATERIAL

Tackifier: A tackifier such as A500 Hydro–Stik produced by Finn is to be used. This product is to be a blend of high quality, chill water, dispersible gum and special cross-linking additives, in a granular powder is to be used. The tackifier is to be mixed in a slurry of water, seed, fertilizer and fiber mulch and sprayed onto the seed bed. This product is to be applied at the rate of 6 lbs. per 1000 sq. ft. Substitutions are made only with the approval of the Owner’s Representative.

Wood Fiber Mulch: Mix is to include 35 lbs. per 1000 square feet of wood fiber mulch to be mixed with water.

Grass Seed: Refer to plant list and or erosion control plans for specified seeds species to be applied.

Provide all grass seed in combination, of the following varieties, individual planting rates per 1000 square feet, and minimum acceptable germination standard (MAGS) rates as follows:

Botanical Name	Common Name	Rate/1000 s.f.	MAGS
Cynodon dactylon	Bermuda Grass	1 lb.	80%
Lolium multiflorum	Annual Rye (To be used in the winter)	2 lbs.	80%
	Brown Top Millet (To be used in the summer)	8 oz.	70%
Species XXXXX	Other grasses as chosen	8 oz.	80%

The Minimum Acceptable Germination Standard (MAGS) is the minimum germination percentage that will be accepted for each specified seed variety listed on the plant or grass schedule.

No seed species substitutions are permitted without approval of the Contracting Officer's Representative.

All seed must be approved by the Contracting Officer's Representative.

All seed shall meet requirements of the Local Seed Laws, including testing and labeling for bulk seed, showing name and type of seed. All seed shall have been tested in a certified seed laboratory with certified results submitted to the Contracting Officer's Representative in writing and approved prior to planting of the seed.

Each seed container must have at least one approved State Department of Agriculture seed tag. Seed tags must indicate botanical name, common name, purity, and germination of seed contained, in accordance with Local seed laws.

All seed must be of the previous season's crop, with date of analysis shown on the tag that is within the past 9 months previous to the actual date of planting on the project.

Preserve at least one seed tag of every variety for the Landscape Architect

Available Supplier for various grass seed: Subject to compliance with requirements, a supplier offering this product that may be incorporated in the work includes, but is not limited to the following:

Davenport Seed Company
P.O. Box 187
Davenport, Washington 99122

Purchase all grass seed on a pure live seed (PLS) basis. Indicate germination, including hard-seed, firm-seed, certified seed testing laboratory.

Supply seed mixed with all seed, proper amounts of water, wood–fiber mulch, and tackifier.

Provide seed that is free of noxious weeds. All grass seed must be at least 75% pure.

All seed shall be free of dock, cheat, chess, chickweed, plantain, crabgrass, black medic, and other indigenous or exotic grasses and weed seeds.

Seed which has become wet, moldy, or otherwise damaged in transit or storage prior to being mixed for hydro-seeding will not be accepted.

2.5 SOIL RETENTION MATERIAL:

Soil retention Blanket: Mat designed to minimize sediment loss and maximize vegetative density on Clay slopes 2:1 or greater is a product named Curlex,

manufactured by American Excelsior Company, Arlington, Texas, or approved equal by Landscape Architect. This is a mat of constant thickness weighing approximately 1.25 lbs. per sq. yd. consisting of curled wood excelsior fiber of 80% six–inch or longer strands evenly distributed over entire blanket area with top covering of biodegradable, carbon impregnated extruded plastic mesh or other material acceptable to the Owner's Representative.

Wire Staples: Provide staples fabricated from .091" wire bent to for a "U" shape one inch in width with legs of 6" minimum length.

PART 3–EXECUTION

3.1 TIME OF PLANTING:

Conduct plating under favorable weather conditions during the season specified above and suitable to the grass species selected.

Repeat planting at same rate over same area the next year on bare areas, if necessary.

3.2 SOIL PREPARATION:

In areas where topsoil has been added over excavated areas, refer to Section 02900 for proper soil preparation (Year 1 only, unless otherwise specified):

Limit preparation to areas which will be planted in immediate future.

Spray herbicide on planting area to eradicate existing weeds prior to any ground work.

Remove existing vegetation after prescribed herbicide has killed existing weeds, either by burning, mowing, or weed eater.

Loosen subgrade to a depth of 3–4" in areas that are compacted. Site is to be "tracked" by vehicle vertically to create depressions for the seeds to fall in. It is not necessary to remove stones or roots from the planting area.

Distribute fertilizers over the seed bed during the seed planting operation.

3.3 HYDROSEEDING GRASS AREAS:

Immediately after ground preparation has been performed, uniformly and evenly distribute grass seed, fertilizers, mulch and tackifier over indicated hydro=seeding areas.

Use planting method that will insure direct, positive contact of seed with soil, but do not plant deeper than 1/4" beneath soil surface.

After planting operations are finished, clean all paved areas which have become strewn with soil or other material by sweeping and, if necessary, washing.

Irrigate or water newly planted areas as needed to establish germination and successful development of plants. Take care to not over water and cause washing or erosion of the slopes.

3.4 SOIL RETENTION BLANKET INSTALLATION:

(For one (1) year installations only)
Install soil retention blanket material on areas having 2:1 or steeper slopes. Place immediately after seeding operations have been completed, at least within 24 hours, or when directed by the Owner's Representative.

Install blanket with wood fiber side of blanket in contact with soil over entire area covered. Butt ends and sides together and staple. Run blankets lengthwise from top to toe of slope or parallel to the slope contour.

Secure blanket to ground with wire staples driven vertically into ground approximately 6' apart on each side of blanket width, with one row of staples in center staggered at midpoints between edge staples. Use of a common row of staples along adjoining blanket lengths is permitted. Use four staples at each end of blanket roll.

Immediately after placing and stapling blanket, sprinkle covered area with water.

3.5 ACCEPTANCE OF SEEDED AREAS:

When seeding work is substantially completed, the Owner's Representative will, upon request, make an inspection to determine acceptability.

Grassed areas will be acceptable provided all requirements, including complete preparation and placement of topsoil, seeding, and watering have been complied with, and a healthy and uniform close stand of specified grass is established. This stand is to be relatively free of obvious infestation of weeds, and have no bare spots larger than 2 square feet in area.

Replant rejected work and continue watering until re–inspected by the Owner's Representative and found to be acceptable.

3.6 CLEANUP:

Promptly remove soil, debris, packaging and other refuse created by hydro-seeding work from the work site. Clean wheels of vehicles prior to leaving site to avoid tracking soil onto surfacing of roads.

END OF SECTION 02901

SECTION 02921

TOPSOIL

PART 1 - GENERAL

1.01 SCOPE

A. Topsoil for planting shall consist of a rich, friable soil conforming to the requirements and provisions set out in these Specifications, or as approved by the Project Landscape Architect and obtained from locations indicated on the Construction Drawings. Topsoil shall be placed at the locations indicated on the Construction Drawings, set out in the Specifications or as directed by the Project Landscape Architect and in conformity with the provisions and requirements set out in the Specifications.

B. Suitable topsoil which has been stripped from the project site shall be stockpiled as directed by the Project Landscape Architect. Stockpiled topsoil shall be redistributed in areas indicated on the Construction Drawings and later used before additional topsoil is hauled to the site. Unsuitable material shall not be included in these stockpiles and shall be removed from the project site. The amount of stockpiled topsoil obtained from the site shall be measured by the Project Landscape Architect using the cross-section method and this material shall be excluded from that quantity of material paid for under the of Section 02200 of these Specifications.

PART 2 - MATERIAL

2.01 MATERIAL

A. Topsoil for planting shall be a rich, friable loam containing a large amount of humus obtained from natural north Georgia woodlands, (the purpose of this is to assure a natural "A" soil horizon with adequate michorizal content). Topsoil shall be original surface sandy loam, topsoil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips or other undesirable or harmful material to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.

B. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classified as a loam, silt loam, clay loam or a combination thereof. The pH shall

range from 5.5 to 6.0. Topsoil shall contain not less than two percent by weight, of organic matter as determined by the Wakley-Black Method as described in Soil Chemical Analysis, 1958, Prentice-Hall, Inc.

C. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed in commercial quantities, the product will be homogeneous in nature and will conform to the requirements of these Specifications, and as required by the Project Landscape Architect.

D. Topsoil may not be secured from areas which are, or have been, in cultivation within the past five years.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. All equipment necessary for the proper removal, transportation, protection and maintenance of topsoil must be available, when required, in first class working condition and shall have been approved by the Project Landscape Architect before construction will be permitted to begin.

3.02 MAINTENANCE

A. The Contractor shall maintain all topsoil areas, at Contractor's own expense, in connection with any seeding or planting, or otherwise, until Final Acceptance of the Project. Maintenance shall consist of preserving, protecting, replacing and such other work as may be necessary to keep the Project in a satisfactory condition.

3.03 CLEANING

A. Final cleaning shall consist of completely removing all equipment, rubbish, excess material and unused materials from the project site.

B. All pavements and structures shall be swept clean of all dirt or rubbish which may have become deposited upon them during construction.

C. All pavements and structures shall be cleared of any stains that may have become deposited upon them during construction.

D. Final Cleaning shall be performed in accordance with the requirements of Section 01710 of these Specifications.

END OF SECTION 02921

SECTION 02933

TEMPORARY SEEDING

PART 1 – GENERAL

1.1 SCOPE

A. The work covered by this section consists of the establishment of a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing grass seed. Temporary seeding shall be provided for all exposed soil surfaces that are not to be fine graded or landscaped within 30 days after fine grading.

1.2 PROJECT CONDITIONS

A. Protect all adjacent public and private property from siltation and other damage due to construction activities with silt dams or fences as indicated on the Drawings.

B. Temporary seeding shall be applied to any and all disturbed areas left idle for two weeks and shall be applied no later than the 15th calendar day from last land disturbance activity (i.e. clearing, grubbing, or grading).

1.3 QUALITY CRITERIA

A. Installation shall be in strict compliance with the rules and regulations of the local seed laws.

B. Installation shall comply with all applicable codes, rules, regulations and ordinances related to erosion control and temporary seeding.

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PART 2 – PRODUCTS

2.1 TEMPORARY SEED

A. Select temporary grass seed appropriate to the season and site conditions. Temporary grass shall be a quick growing species such as millet, rye grass, Italian rye grass or cereal grasses suitable to the area providing a temporary cover which will not later compete with grasses sown for permanent cover. Seed shall meet the requirements of the rules and regulations of the Georgia Seed Law.

2.2 LIME

A. Provide agricultural grade ground or pulverized limestone. Lime shall contain not less than 85% carbonates with 50% passing a 100-mesh sieve. Lime shall have tested values of 90% minimum germination and 1% maximum weed content.

2.3 FERTILIZER

A. Provide standard commercial grade fertilizer, either 4-12-12, 6-12-12 or 5-10-15 as required for conditions.

PART 3 – EXECUTION

3.1 SEED-BED PREPARATION

A. Where soils are known to be highly acid (pH 5.5 and lower), apply lime at the rate of two tons per acre (1 #/10 s.f.).

B. Apply fertilizer at a rate of 450 lbs./acre (10 #/1,000 s.f.). Lime and fertilizer shall be incorporated into the top 2 to 4 inches of the soil by tilling.

C. Loosen ground surface by discing, raking or harrowing. If the area has been recently loosened or disturbed, no further roughening shall be required. Remove all large clods, boulders and debris which will interfere with the work. Remove all stones 2" and larger in any given dimension.

3.2 SEEDING

A. Apply seed evenly with a cyclone seeder, drill, culti-packer seeder or hydro-seeder. Small grains shall be planted no more than one inch deep. Grasses and legumes shall be planted no more than ¼ inch deep. Distribution by hand shall not be permitted.

3.3 ROLLING

A. Roll all seeded areas before applying mulch. On steep slopes cover seeds by dragging spiked chains or similar methods.

3.4 MULCHING

A. All seeding in fall for winter cover shall be mulched. Seedings on slopes 4:1 or greater, on adverse soil conditions and in excessively hot or dry weather shall also be mulched.

B. Mulch shall be straw, or hay spread at the rate of approximately two tons/acre, wood cellulose fiber applied at the rate of approximately 1500 lbs./acre. Bituminous treated mulch shall be used on all slopes steeper than 2:1.

C. Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions shall not require mulch if written permission is received by the Engineer.

3.5 WATERING

A. Provide watering as required to establish and maintain healthy vegetative cover.

3.6 RESEEDING

A. Reseed and provide straw cover for bare areas 1 s.f. and larger to establish and maintain vegetative cover and to prevent sheet and rill erosion. Repair erosion damage as required and reseed.

END OF SECTION 02933

SECTION 02975

CLEANUP AND FINISH

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish labor, materials, and equipment required to complete cleanup of all paving, building, grounds, and all other areas outlined on the drawing.

B. Chemicals, paints, cleaning products, concrete or other waste materials shall not be discarded in the planting beds. If such materials are discharged in the plant beds, the contractor shall remove the contaminated soils and replace with viable topsoil.

C. Debris shall not be dumped on any part of the property or any unauthorized place. All debris, construction material, Contractor's buildings or equipment, stumps, roots, boulders or any other extraneous material deposited during construction shall be removed from the site.

END OF SECTION 02975

SECTION 03100

CONCRETE FORM WORK

PART 1 – GENERAL

RELATED DOCUMENTS:
The provisions of Division 1 shall govern this Section.

DESCRIPTION OF WORK:

Work Included: Provide form work in accordance with provisions of this section for cast-in-place concrete shown on the drawings or required by other sections of these Specifications.

RELATED WORK:

Section 02200: Earthwork
Section 03200: Concrete Reinforcement
Section 03300 Cast in Place Concrete
Section 03310: Concrete Work
Section 03523 Concrete Sidewalks

QUALITY ASSURANCE*:*

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. Design of form work is the Contractor's responsibility. Construct and erect concrete form work in accordance with ACI 301, ACI 347 and applicable construction safety regulations for placement of work.

SUBMITTALS:

Comply with pertinent provisions of Division 1.

Product Data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit manufacturer's data and installation instructions for proprietary materials including form coatings, ties and accessories and manufactured form systems if used.

PRODUCT HANDLING:

Comply with pertinent provisions of Division 1.

Store forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 - PRODUCTS:

WOOD FORM MATERIALS:

Plywood: Douglas Fir; high density overlaid one side grade; sound undamaged sheets with clean true edges, 5/8" minimum thickness, 5 ply plywood especially processed to resist moisture and conforming to Plywood Class I, B-B EXT-DEPA of U.S. Product Standard PS-1-66.

Lumber: Southern Yellow Pine species; No.2 grade; with grade stamp clearly visible.

Nails, Spikes, Lag Bolts, Through Bolts, Anchorage: Sized as required, of sufficient strength and character to maintain form work in place while pouring concrete.

FORM WORK ACCESSORIES:

Form Ties: Snap-off metal type of adjustable length; minimum working strength of 30,000 psi when assembled; free of defects that will leave holes larger than 1 inch in concrete surface.

Form Release Agent: Colorless mineral oil which will not stain concrete.

Rustification Strips: Doron Plastics Company No. 1001, 1/4" Radius.

CONCRETE ACCESSORIES:

Formed Construction Joints: Minimum 20-gage thick galvanized steel; tongue and groove type profile; knockout holes at 18 inches on center to receive dowelling complete with anchorage.

PART 3- EXECUTION

SURFACE CONDITIONS:

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.

INSTALLATION*:*

Verify lines, levels, and centers before proceeding with form work. Ensure that dimensions agree with drawings.

Variation of cross-sectional dimensions in the thickness of slabs and walks:

Minus 1/4 in.
Plus 1/2 in.

Apply form release agent on form work in accordance with manufacturer's recommendations. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

INSERTS, EMBEDDED PARTS AND OPENINGS:

Set column anchor bolts in accordance with AISC tolerances. Construct form work, shoring and bracing to meet design and code requirements, so that resultant finished concrete conforms to required shapes, lines and dimensions. Arrange and assemble form work to permit dismantling and stripping, so that concrete is not damaged during its removal.

Align joints and make watertight, to prevent leakage of mortar disfigured appearance of concrete. Keep form joints to minimum.

Obtain Architect/Engineer's review and approval for use of earth forms. When using earth forms, hand-trim sides and bottoms, and remove loose dirt prior to placing concrete.

Arrange forms to allow stripping without removal of principal shores, where and when these are required to remain in place.

Obtain Architect's review before framing openings in structural members, which are not indicated on drawings.

Provide bracing to ensure stability of form work. Prop or strengthen previously constructed form work liable to be overstressed by construction loads. Contractor shall be fully responsible for adequacy of form work in its entirety. Forms will support loads that they will be required to sustain and shall maintain their dimensional and surface correctness to produce members required by the drawings.

Provide rustication strips on corners of beams and columns exposed to view.

Construct non-exposed form work to maintain following maximum tolerances: Deviation from horizontal and vertical lines: 1/4 inch in 10 feet.

Deviation of building dimensions indicated on drawings and position of columns, walls and partitions 1/4 inch.

Deviation in cross sectional dimensions of columns or beams or in thickness of slabs and walls plus or minus 1/4 inch.

Construct form work for exposed architectural concrete to maintain the following maximum dimensional tolerance:

Vertical Variations:

In the lines and surfaces of columns, piers, walls and in arises: In 10 ft. 1/4 in.

Provide formed openings where required for pipes, conduits, sleeves, and other work to be embedded in and passing through concrete members.

Locate and set in place items, which will be cast directly into concrete.

Coordinate work of other sections and cooperate with trades involved in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts. Do not perform work unless specifically indicated on drawings or reviewed prior to installation.

Install concrete accessories in accordance with manufacturer's recommendations straight, level and plumb. Ensure items are not disturbed during concrete placement.

Install waterstops continuous without displacing reinforcement. Heat seal joints watertight.

Place formed construction joints in floor slabs, walls and at other locations as shown on plans.

Provide control joints where necessary to prevent deterioration of concrete members due to expansion and contraction of materials.

Set top screed to required elevations. Secure to resist movement of wet concrete.

Provide temporary ports or openings in form work where required to facilitate cleanings and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close temporary ports to openings with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

FIELD QUALITY CONTROL:

Construct exposed form work with skilled workmen capable of producing architecturally exposed concrete surfaces. Surfaces are intended to be left as cast. Repair minor defects that are repairable as soon as forms are removed. Conform to Portland Cement Association "Suggested Specifications for Architectural Concrete"; a copy of which shall be available on the job site at all times.

Inspect and check completed form work, shoring and bracing to ensure that work is in accordance with form work design, and that supports, fastenings, wedges, ties and parts are secure.

Inform Architect when form work is complete and has been cleaned, to allow for inspection. Obtain review prior to placing concrete. Do not patch form work.

Allow Architect to inspect each section of form work prior to reuse.

Verify strength of concrete by compressive test results

CLEANING:

Clean forms as erection proceeds, to remove foreign matter. Remove cuttings, shavings, and debris from within forms. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

During cold weather, remove ice and snow from within forms. Do not use deicing salts. Do not use water to clean out completed forms, unless form work and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

FORM REMOVAL:

Notify Landscape Architect prior to removing form work.

Do not remove forms, shores and bracing until concrete has gained sufficient strength to carry its own weight, and construction and design loads which are liable to be imposed upon it. Verify strength of concrete by compressive test results.

Remove form work progressively and in accordance with code requirements and so no shock loads or unbalanced loads are imposed on structure.

Loosen form carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces.

Leave forms loosely in place, against vertical surfaces, for protection until complete removal is reviewed by Architect.

Store removed forms, for exposed architectural concrete, in manner that surfaces to be in contact with fresh concrete will not be damaged. Marked or scored forms will be rejected.

Restore structural members where required due to design requirements or construction conditions and as required to permit progressive construction. Remove load-supporting forms only when concrete has attained 75 percent of required 28-day compressive strength, provided construction is restored.

Remove forms not directly supporting weight of concrete as soon as stripping operations will not damage concrete. Wall forms, column forms, and side of beams may be removed after 24 hours, with the Architect's permission.

Under no circumstances shall wood forms be buried in full, or left in contact with earth.

END OF SECTION 03100

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

RELATED DOCUMENTS:

The provisions of Division I shall govern this Section.

DESCRIPTION:

Work Included: Provide concrete reinforcement where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

RELATED WORK:

Section 03100: Concrete Form Work
Section 03300 Cast in place Concrete
Section 03310: Concrete Work
Section 03521 Concrete Curbs
Section 03523 Concrete Sidewalk

QUALITY ASSURANCE:

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.

Comply with pertinent provisions of the following, except as may be modified herein:

ACI 318.
CRSI: Manual of Standard Practice.
ASTM A 615: Specification for Deformed Billet Steel Bars for Concrete Reinforcement.
ASTM A 82: Specification for Cold Drawn Steel Wire for Concrete Reinforcement.
ASTM A 185: Specification for Welded Steel Wire Fabric for Concrete Reinforcement.

SUBMITTALS:

Comply with pertinent provisions of Division 1.

Product Data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

Materials list of items proposed to be provided under this section.
Manufacturer's specifications and other data needed to prove compliance with the specified

requirements.

Shop Drawings showing details of bars, anchors, and other items, if any, provided under this section.

PRODUCT HANDLING:

Comply with pertinent provisions of Division 1.

Delivery and Storage:

Use necessary precautions to maintain identification after bundles are broken.

Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond breaking coatings.

PART 2 - PRODUCTS

REINFORCEMENT MATERIALS AND ACCESSORIES:

Bars:
Provide deformed billet steel bars complying with ASTM A 615, Grade 60.

Steel Wire:
Comply with ASTM A82.
For tie wire, comply with Fed. Spec. QQ-W-461 annealed steel, black, 16-gage minimum.

Welding Electrodes:
Comply with AWS A5.1, low hydrogen. E70 Series.
Bolsters, Chairs, Spacers, and other devices for spacing, supporting, and fastening reinforcement in place: Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the drawings.

Fiber Mesh: Pollyfiber mesh to be air entrained into the concrete mix

Do not use wood, brick, or other non-complying material.

For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic protected legs.

FABRICATION:

General:
Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual. In case of fabricating errors, do not straighten or rebend reinforcement in a manner that will weaken or injure the material.

Reinforcement with any of the following defects will not be acceptable:

Bar lengths, depth, and/or bends exceeding the specified fabrication tolerances.
Bends or kinks not shown on the drawings.
Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

SURFACE CONDITIONS:

Examine the areas and conditions under which work of the section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

INSTALLATION:

General:
Comply with the specified standards for detail and method of placing reinforcement and supports, except as may be modified herein.

Clean reinforcement to remove loose rust and mill scale, earth, and other materials which will reduce or destroy bond with concrete.

Position, support, and secure reinforcement against displacement by form work, construction, and concrete placing operations.

Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.

Place reinforcement to obtain minimum coverage for concrete protection.

Arrange, space and securely tie bars and bar supports together with the specified tie wire.

Set wire ties so twisted ends are directed away from exposed concrete surfaces.

Install welded wire fabric in as long length as practicable, lapping adjoining pieces at least one full mesh.

Provide sufficient numbers of supports, and of strength to carry the reinforcement.

Do not place reinforcing bars more than 2" beyond last leg of any continuous bar support.

Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

CONCRETE COVER:

Metal reinforcement shall be protected by concrete cover. Where not otherwise shown on drawings, the thickness of concrete over reinforcement shall be as follows:

Walls:
2" clear to surfaces exposed to weather; 1" clear to interior surfaces.

Slabs:
1" clear to top and bottom.

Footings:
3" clear to sides and bottom.

WIRE MESH*:*

Splices: Install wire mesh reinforcing in concrete slabs on ground and as otherwise indicated. Lap all joints 6" and wire securely. Extend mesh to within 2" of sides and ends of slabs

Lap Splices:
Tie securely with the specified wire to prevent displacement of splices during placement of concrete.

Splice Devices:
Obtain the Architect's approval prior to using splice devices. Install in accordance with manufacturer's written instructions. Splice in manner developing at least 125% of the yielding strength of the bar.

Welding:
Perform in accordance with AWS D1.4-79.

Do not splice bars except at locations shown on drawings, except as otherwise specifically approved by the Architect.

END OF SECTION 03200

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Concrete trails
   3. Bridge Abutments.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with fly ash; subject to compliance with requirements.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture, indicating quantity of each ingredient and admixtures proposed or required. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength calculations.
   2. For mix designs based on trial, include proportions, test results, and graphic analysis indicating average compressive strength.
   3. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

E. Welding certificates.

F. Qualification Data: For Installer.

G. Material Certificates: For each of the following, signed by manufacturers; indicate compatibility with application of surface applied flooring products where applicable:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Curing compounds.
   6. Bonding agents.
   7. Adhesives.

8. Vapor retarders.
9. Joint-filler strips.
10. Repair materials.

H. Field quality-control test and inspection reports.
1. Include copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to the site.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
1. Comply with requirements of the Concrete Manufacturers Association “Concrete Plant Standards.”

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

C. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
1. Store steel reinforcement off ground, under suitable cover or enclosed.
2. Maintain ease of access for inspection and identification of materials.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal..

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
1. Include supplementary requirement S1.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES**.**

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I or II. Supplement with the following:
a. Fly Ash: ASTM C 618, Class F.

B. Aggregates, General: Tested and passed within 6 months of use for the following:
1. Gradation: ASTM C 136.
2. Material Passing No. 200 Sieve: ASTM C 117.
3. Organic Impurities: ASTM C 40.
4. Soundness: ASTM C 88.
5. Clay Lumps: ASTM C 142.
6. Abrasiveness of Coarse Materials: ASTM C 131.
7. Soft Particles: ASTM C 235.
8. Freeze/Thaw Resistance: ASTM C 66, ASTM C 682.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: As indicated in design mixes.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94 and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. Retarding Admixture: ASTM C 494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products:
      a. Burke by Edoco; BurkeFilm.
      b. ChemMasters; Spray-Film.
      c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
      d. Euclid Chemical Company (The); Eucobar.
      e. L&M Construction Chemicals, Inc.; E-Con.
      f. MBT Protection and Repair, Div. of ChemRex; Confilm.
      g. Meadows, W. R., Inc.; Sealtight Evapre.
      h. Sika Corporation, Inc.; SikaFilm.
      i. Symons Corporation, a Dayton Superior Company; Finishing Aid.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
   1. Characteristics: Acrylic polymer blend; non-yellowing from ultraviolet exposure; dustproofs concrete.
   2. Products:
      a. ChemMasters; Safe-Cure Clear.
      b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; High Seal.
      c. Euclid Chemical Company (The); Diamond Clear VOX.
      d. L&M Construction Chemicals, Inc.; Dress & Seal WB.
      e. MBT Protection and Repair, Div. of ChemRex; MasterKure-N-Seal VOC.
      f. Meadows, W. R., Inc.; Vocomp-20.
      g. Sonneborn, Div. of ChemRex; Kure-N-Seal.
      h. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
      i. Tamms Industries, Inc.; Clearseal WB STD.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
   2. Design mixes to meet or exceed each requirement specified. Adjust mix design to meet the most stringent requirement.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions..
   1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   2. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

B. Bend steel reinforcement in accordance with ACI 318.
   1. Do not heat steel reinforcement for bending. Bend or straighten bars cold.
   2. Do not bend partially embedded steel reinforcement, except as approved.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, paragraphs 1 to 15 and 18 only, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations..

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form- removal operations and curing and protection operations are maintained..
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
   2. Allow six hours between completion of reinforcement installation and placement of concrete for special inspection.

B. Clean reinforcement of dirt, grease, scale, loose rust, oil, paint and other foreign matter prior to installation.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars..
   1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Splicing of Reinforcement: Conform to ACI 318 Chapter 12 for wired lap splices and embedment lengths.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps withwire.

G. Maintain required concrete cover dimensions indicated. Coordinate placement of conduit and inserts with reinforcement. Protect installed reinforcement from damage or displacement prior to and during concrete placement..

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one- fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed and corrections made.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
      a. Supplement mechanical consolidation by hand, spading, rodding, or tamping.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view..

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in- place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. .

3.10 JOINT FILLING**.**

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush- coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch-wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place

patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL**.**

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:.
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31.
    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength

and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 033000

SECTION 03523

CONCRETE SIDEWALKS

PART 1 - GENERAL

1.01 SCOPE:

A. Concrete sidewalks shall be constructed of Portland cement concrete, at the locations and to the dimensions, lines, grades and cross section indicated on the Drawings or as directed by the Owner and in conformity with the provisions and requirements set out in these Specifications.

B. Concrete sidewalks shall include all the necessary excavation, unless otherwise indicated, subgrade and subbase preparation, backfilling, final clearing up and completing all incidentals thereto, as indicated on the Drawings or as directed by the Project Landscape Architect.

C. All materials and methods of construction for concrete sidewalks and pavement shall conform to the requirements of the Georgia Department of Transportation Standard Specifications and ASTM C 94 "Standard Specification for Ready Mixed Concrete".

D. Gravel parking areas and driveways shall conform to aggregate base requirements outlined in this Section of the specifications.

1.02 CONDITIONS

A. Weather Limitations:
1. Do not conduct concrete paving operations when surface is saturated, or contains excess of moisture, which would prevent uniform distribution and required penetration.
2. Construct concrete sidewalk sections only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
3. Place base course when air temperature is above 35 degrees F and rising. No base course shall be placed on a frozen, saturated, or otherwise unsuitable subgrade material.

B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

1.03 INSPECTION AND TESTING:

A. Pavement and base testing will be performed by an independent testing laboratory paid by the Owner.

B. The testing agency shall test in-place courses for compliance with specified density,

thickness and surface smoothness requirements.

C. Earthwork and compaction operations shall conform to the requirements of Section 02200 of these specifications.

D. Concrete Strength: One set of acceptance and field cylinders (a total of four) from the same batch of concrete will be made for each 50 cubic yards or fraction thereof, not less than once for each 5,000 square feet of pavement in each day's placing for each class and mix design.
1. Each batch of concrete shall be tested for slump prior to placement. Slump shall be between 1/2 and 1 1/2 inches as determined by AASHTO Test Method T119.
2. Acceptance cylinders are compression test cylinders molded in the field, stored and cured in the field for the first 24 hours after molding and thereafter in the laboratory of the testing agency until time of testing. Average breaking strength at 28 days of a set of two acceptance cylinders will comprise test.
3. Field cylinders are compression test cylinders molded in the field, stored and cured on the work site in the same location and subject to the same exposure as job concrete of which it is a representative. Each set of two acceptance cylinders will have two matching field cylinders.
4. One field cylinder will be broken at seven days and the remaining will be held in reserve.

E. Allowable Variation in Thickness:
1. Aggregate Base Course: ±1/2-inch.
2. Surface Course: ± 1/4-inch.

F. Surface Smoothness: Test finished surface of each course for smoothness using a 16-foot straightedge. Intervals of tests shall be as directed by the Landscape Architect. Surfaces will not be acceptable if exceeding the following:

1. Base Course: 1/4-inch in 16 feet.
2. Surface Course: 1/8-inch in 10 feet.

G. Contractor's Duties Relative to Testing:
1. Notifying laboratory of conditions requiring testing.
2. Coordinating with laboratory for field-testing.
3. Paying costs for additional testing performed beyond the scope of that required and for retesting where initial tests reveal non-conformance with specified requirements.
4. Paying the cost of overlays or pavement removal and replacement which does not comply with the specified testing limits.

H. Samples:
Contractor shall pour at least 3 samples of colored concrete complete with finish and an adjacent integral curb for approval prior to committing to the entire concrete pour.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Materials used in the construction of sidewalks, in addition to Section 03300 and other general requirements of these Specifications, shall conform, unless otherwise stipulated, to the following:

1. Portland cement shall conform to ASTM C 150, Type 1.
2. Graded aggregate base shall be uniform throughout and conform to requirements of Section 815.01 of the Georgia Department of Transportation Specifications.
3. Sand: Dune sand, bank-run sand and manufactured sand are not acceptable. Only builders sand shall be used.
4. Fiber Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
5. Color: Schofield (Samples to be selected).
6. Premolded joint filler for expansion joints shall conform to the requirements of ASTM D 1751 or ASTM D 1752. The joint sealer for the joints in the concrete pavement shall meet the requirements of Federal Specification SS-S-164 and shall be hot poured type.
7. Concrete Color: Concrete shall include integrated colors in the concrete mix and shall be from same supplier and same batch mixture. Finished concrete shall have a light broom finish parallel to traffic flow on all sidewalk sections.
8. All concrete, except where shown or specified otherwise, shall have the following minimum compressive strengths at 28 days, and slump at time of placement:

Location	Strength	Maximum Aggregate Size	Slump
Footings, Bases	3000 psi	1-1/2"	1"
Walls	3000 psi	3/4"	1"
Pavement, Sidewalks	4000 psi	1-1/2"	1"

2.02 FORM MATERIAL:

A. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, natal-farmed plywood faced or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to the joint system specified. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

B. Lumber used in construction of wood forms shall be free of bulge or warp, of uniform width, not less than 2-inches in thickness, except that 1-inch thickness may be used on curves, and shall be sound and free from loose knots. Stakes shall

be not less than 2" x 4" lumber of sufficient length that, when driven, they will hold the forms rigidly in place.

C. Metal forms shall be of approved sections and shall have a flat surface on top. They shall present a smooth surface of the desired contour, sufficiently thick and braced to withstand the weight of the concrete without bulging or becoming displaced.

PART 3 - EXECUTION

3.01 LABOR:

A. For finishing, competent and skilled finishers shall be provided.

3.02 EQUIPMENT:

A. All equipment necessary and required for the construction of concrete sidewalks must be on the Project, proven to be in first class working condition and approved by the Owner, before construction will be permitted to begin.

B. A one bag mixer will be permitted when the total output of concrete, per 10-hour day, does not exceed 25 cubic yards.

C. Satisfactory floats, edgers, spades and tamps shall be furnished. Tamps of not over 8-inch diameter and weighing not less than 25 pounds shall be provided for tamping subgrade. A 10-foot longitudinal float of the inverted T-type with plough handles attached for manipulation, and a rigid float not less than 18-inches longer than the width of the walk being constructed, shall be provided**.**

3.03 REMOVAL OF STRUCTURES AND OBSTRUCTIONS:

A. Unless otherwise indicated or stipulated, the removal of structures, obstructions, etc., will be performed in accordance with the requirements of Section 02060 of these Specifications.

3.04 EARTHWORK AND COMPACTION

A. Earthwork and compaction operations shall be performed in accordance with requirements of Section 02200 of these specifications.

3.05 SUBGRADE PREPARATION:

A. The subgrade for the sidewalk shall be formed by excavation to a depth equal to the thickness of the concrete plus the base course.

B. All subgrade shall be of such width as to permit the proper installation and bracing of the forms.

C. Yielding, or unsuitable material shall be removed and backfilled with satisfactory material in accordance with recommendations and approval of geo-technical consultant. Place 6-inches of graded aggregate base, as determined by the geotechnical sub-consultant, under concrete sidewalks as necessary for subgrade stabilization, compacted thoroughly and finished to a smooth, unyielding surface and proper line, grade and cross section of the proposed construction.

C. Additional stabilization of poor subgrade areas may be necessary to achieve compaction criteria for aggregate base. These additional subgrade stabilization measures shall be performed under the direct supervision of the geo-technical consultant. These measures may include, but are not limited to, placement of

geogrid reinforcement materials, aggregate bridge lifts, undercutting of unsuitable soils and soil cement admixtures.

3.06 FORMS:

A. All forms shall be set upon the prepared subgrade, true to lines and grade, and held rigidly in place so as not to be disturbed or displaced during the placing of the concrete. The top of the form shall be set to exact grade and the height shall be equal to not less than the thickness of the proposed concrete.

B. Design form work to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades level and plumb work in finished structures. Provide for opening, offsets, sinkages, keyways, recesses, moldings, rustifications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

E. Immediately before placing the concrete, the forms shall be given a coat of light oil and where being removed and used again, the forms shall be thoroughly cleaned and oiled each time.

F. Forms shall be removed within 24 hours after placing concrete and no pressure shall be exerted upon the concrete in removing forms.

G. When the concrete sidewalk is to be joined to an existing sidewalk, the existing sidewalk, if not in proper condition for the junction, shall be cut to a neat line perpendicular to both the centerline and the surface, or as indicated by the Owner.

3.07 JOINTS:

A. Control joints shall be saw scores. No trowel joint shall be permitted or accepted.

B. Unless otherwise indicated on the Drawings or as directed by the Landscape Architect, premoulded expansion joint filler, 3/4-inch in thickness, shall be placed at the locations and in line with expansion joints in the adjoining pavement, gutter or curb. Transverse expansion joints for concrete sidewalks shall be 3/4-inch thick. When expansion joints are not required in the adjoining pavement or gutter, and not otherwise indicated on the Drawings, a 3/4-inch premoulded expansion joint filler shall be placed at intervals of not over 30 feet apart. All premoulded expansion joint filler must be cut to full width or length of the proposed construction and shall extend to within 1/2-inch of the top or finished surface. All longitudinal expansion joints shall be placed as indicated on the Drawings or as directed by the Project Landscape Architect.

C. All expansion joints shall be true, even and present a satisfactory appearance.

D. All expansion joint material protruding after the concrete has been finished shall be trimmed flush as directed by the Landscape Architect.

E. Construction Joints: Locate and install construction joints not shown on the Drawings, so as not to impair strength and appearance of the structure, as acceptable to the Landscape Architect. Review need for additional joints or scores with the Landscape Architect prior to construction.

F. Control Joints in Slabs-on-Ground: Construct control joints in slabs-on-ground to form panels of patterns as shown. Locate expansion type joint at spacing recommended by Portland Cement Association.

G. Control Joints in Sidewalks: Provide joints in pattern as indicated on the Drawings. Locate expansion type joints at spacing as indicated.

H. Saw joints shall be cut no sooner than 7 hours or less than 24 hours from initial pour.

3.08 MANUFACTURING AND PLACING CONCRETE**:**

A. Immediately before placing concrete, the depth of the proposed concrete shall be checked by means of a template cut true to the cross section of the proposed construction and any irregularities shall be corrected.

B. Immediately before placing concrete, all subgrade shall be thoroughly sprinkled or wetted.

C. Concrete shall not be placed upon a frozen subgrade or subbase.

D. Construction joints will be permitted only at grooves or at expansion joints, unless otherwise approved by the Owner.

E. The concrete shall be manufactured and placed in accordance with the requirements of Section 03300 of these Specifications.

F. The concrete shall be placed immediately after mixing; the edges, sides, etc. shall be thoroughly spaded and the surfaces tamped sufficiently to thoroughly compact the concrete and bring the mortar to the surface. The concrete shall be deposited and compacted in a single layer.

3.09 FINISHING:

A. The concrete shall be stuck-off with a transverse template resting upon the side forms and then shall be floated with a 10-foot longitudinal float working the float transversely across the concrete with a sawing motion, always maintaining it parallel to the edges of the sidewalk, or driveway, where practicable, and in such a manner that all surplus water, laitance and inert material shall be removed from the surface. This operation shall be continued until the surface of the concrete shows no variation from a 10-foot straightedge. If necessary, additional concrete shall be added to fill depressions, and the longitudinal float used again. The longitudinal float shall not be moved ahead more than one-half its length at any time.

B. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be gone over and finished with a wooden float so as to produce a sandy texture. The longitudinal surface variations shall be not more than 1/4-inch under a 12-foot straightedge, nor more than 1/8-inch on a five-foot transverse section. The surface of the concrete must be finished so as to drain completely at all times.

D. The edges of the sidewalks or driveways shall be carefully finished and rounded with an edging tool having a radius of 1/2-inch.

E. Finish: The finished surface of the concrete shall be a light broom finish perpendicular to the flow of traffic.

F. The edges of the concrete at contraction joints shall be rounded with an edging tool having a radius of 1/4-inch. The top and ends, where practicable, of expansion joint material shall be cleaned of all concrete and the expansion joint material shall be trimmed so as to be slightly below the surface of the concrete.

All marks caused by edging shall be removed with a wetted brush or wooden float.

G. The surface of sidewalks shall be divided into blocks by use of a grooving tool. Grooves shall be placed so as to cause contraction joints to be placed at a groove line, where practical. The grooves shall be spaced equal to the sidewalk width, but not to exceed 10' spacing between joints. The grooves shall be cut to a depth of not less than 1-inch. The edges of the grooves shall be edged with an edging tool having a radius of 1/4-inch, and any marks caused by edging or otherwise shall be removed with a wetted brush or wooden float so as to give the surface an uniform texture and finish

3.10 PROTECTION AND CURING:

A. Immediately after finishing the concrete, it shall be covered and cured in accordance with the requirements of Section 03300 of these Specifications. Curing materials shall conform to the requirements of ASTM C 309 (liquid membrane compound) or ASTM C 171. If the temperature falls to below freezing, satisfactory heating devices shall be placed under suitable covers to keep the temperature around the concrete at above 45 degrees F.

B. Pedestrians will not be allowed upon concrete sidewalks until 12 hours after finishing concrete, and no vehicles or loads shall be permitted upon any sidewalk or driveway until the concrete has attained sufficient strength for such traffic.

C. The Contractor shall construct such barricades and protection devices as are necessary to keep pedestrians and traffic off the sidewalks.

H. If any sidewalk is damaged at any time previous to final acceptance of the project, it shall be repaired by removing all concrete within the limits of the grooves, and be replaced, at the Contractor's expense, with concrete of the type, kind and finish in the original construction.

3.11 BACKFILLING:

A. Immediately after the concrete has set sufficiently, the spaces along the sides or edges of the sidewalk shall be refilled with suitable material, this material shall be compacted in layers of not over 4-inches each, until firm and solid.

3.12 CLEANING:

A. All excess or unsuitable material shall be removed and disposed of in accordance with requirements of Section 02200 of these Specifications.

B. Final clean up shall be performed in accordance with the requirements of these Specifications.

C. All material becoming the property of the Owner shall be stored in a manner and at locations near or on the Project as directed by the Owner.

END OF SECTION 02523

SECTION 05552

PREFABRICATED BRIDGE

PART 1. - GENERAL

1.0 SCOPE:

These specifications are for a fully engineered clear span bridge(s) of welded aluminum construction and shall be regarded as minimum standards for design and construction as manufactured by Gator Bridge Company or approved equal.

A. Contractor shall provide this Section of the specifications to the Gator Bridge Company when the order is placed to begin the development process for the bridge.

B. All engineering design and related detailing of the bridge(s) shall be provided by the supplier. The design and shall conform to the Applicable Codes and Standards listed in this document and shall comply with the structural drawings/plans prepared by Gator Bridges.

C. Bridge manufacture shall coordinate with the contractor to ensure that the anchor bolts on the abutment are properly sized and in the proper location in coordination with abutment construction and the design of the Gator Bridges.

D. Contractor is responsible to take on site measurements after the bridge is staked in the field to determine the exact length required for the bridge to effectively span from one abutment to the other before manufacturing the bridge structure.

E. Gator Bridge manufacturer is responsible to visit the site and meet with the contractor to coordinate tasks, delivery, and measurements prior to beginning the shop drawings or manufacturing the structure.

F. Manufacturer: Bridge(s) and all its attachments, anchor bolts, templates and parts shall be fully fabricated by a qualified supplier as outlined in this document.

G. Delivery: Supplier shall be responsible for deliver of all bridge materials and sections FOB to the site. Supplier shall coordinate in advance with contractor to determine best and closest route the off-loading point on the site.

H. Qualified Supplier: Each bidder is required to identify their intended bridge supplier as part of the original bid submittal. Qualified supplier must have at least 5 years of experience in fabricating aluminum bridge type structures.

I. Qualifications: The bridge manufacturer shall have in-house capability to provide design shop drawings, professional engineering stamp and fabrication thus providing an integrated approach to deliver design and fabrication services with a single point of responsibility. Brokering is NOT allowed. Professional Engineer shall be able to stamp and seal the shop drawings in the state where the bridge is to be erected.

Pre-approved Manufacturers:
Gator Dock and Marine, LLC
2880 Mellonville Ave,
Sanford FL., 32773.
1 800 256-8857

Gator Bridge Contract: Contactor may contact the following representative for Gator Bridges to begin the project of design and supply of the specified Bridge(s).
Tag Hepner
Regional Sales Manager
GatorDock and GatorBridge
Cell 803 915-9022
thepner@cmilc.com.
www.cmilc.com

J. Suppliers other than those listed above may be used provided they meet all the criteria of this specification and are approved, in writing, no later than two weeks prior to bid date. Bidder to provide exclusive documentation to ensure proposed substitution shall be in compliance with these specifications and shall include the following minimum criteria to be considered:
Representative Design Calculations
Representative Drawings & Details
Anticipated Reaction Forces
Splicing and Erection Procedures
Warranty Information
Inspection and Maintenance Procedures
Welder Qualifications
Certified Weld Inspector Qualifications

K. Style: Bridge(s) shall be a ***'Cascade'*** style aluminum truss bridge as manufactured by Gator Bridge Inc, and as defined in the structural drawings and this specification, or similar in look and function. Style must be approved in accordance with Section 1 of this specification

L. Shop Drawings: Contractor shall be responsible for securing shop drawings from the Bridge Manufacturer that meets the requirements of this specification and Section 01340 Shop Drawings of the Project Manual. Drawings and calculations shall be stamped and sealed by a Georgia Registered professional engineer.

M. Permit: The general contractor shall be responsible to submit the finished shop drawings to the local permitting authorities to secure a building permit for the bridge(s).

N. Bridge 1 shall be bid into the project as part of the *Lump Sum Bid*
Bridge 2 shall be bid into the project as an *Add Alternate* to the Lump Sum.

O. Geotechnical Investigations: A copy of the Geotechnical borings investigation for the bridge abutments is included in the Appendix of the Project Manual. Contractor may secure additional geotechnical investigations on his own if he determines that more are needed for the bridge design and construction.

P. No Rise: A 'No Rise' study was completed for Bridge #2 and is available to the contractor.

Q. Delivery; Delivery to site shall be coordinated with the City Parks staff to ensure access to the unloading site is possible and can be accomplished without damage to the park facilities or paved circulation paths.

R. Bridge fabricator is required to place an ID plate on each end of the bridge showing weight, span, maximum load, and serial number.

S. Both bridges shall be designed for AAST Pedestrian 90 lb. live loading and allowing for an occasional 2500-pound small vehicle load like a golf cart or small maintenance carts or ATVs.

T. Deck Surface shall be Southern Yellow Pine as described in the Materials section of this specification. Wood shall be Ground Contract treated lumber in accordance with Section 06100. Final installation shall be treated with water sealant on site after installation.

U. Relevant Sections:
Section 05661 Helical Piles (Piers)
Section 03300 Cast in Place Concrete
Section 03200 Concrete Reinforcement
Section 06100 Rough Carpentry

2.0 DIMENSIONS

A. Width; Bridge 1: Inside clear width of bridge shall be 10 feet 0 inches.
Bridge 2: Inside clear width of bridge shall be 10 feet 0 inches.

B. Span: Bridge 1: Center to center of bearing of bridge shall be 15 feet 0 inches.
Bridge 2: Center to center of bearing of bridge shall be 30 feet 0 inches.
Measured from outside of end post to outside of end post.

C. Camber: Bridges shall be cambered to offset dead load and appear flat.

D. Bridge(s) shall be fabricated and delivered as continuous and pre-assembled structures unless mid-span splices are required.

E. Bridge(s) shall incorporate an Enclosed Floor System to hide horizontal bracing, floor beams and stringers from view.

F. Bridges(s) shall be designed utilizing an H-section configuration, where the floor support system intersects the truss verticals above the bottom chord to increase buckling stability

G. The top of the top chord shall not be less than 54" above the finished deck at bridge

center in accordance with the structural plans.

H. The top of the chord shall not be less than 54” above the finished deck at bridge center in accordance with the structural plans.

I. . All vertical truss members shall be perpendicular to the ground (horizon) after the bridge is erected and dead loads applied.

J. Incline and Skew: Bridges shall be designed for abutments and / or pier bearing surfaces constructed at constant elevations.

K. Deck: Bridge deck shall be constructed at right angles win the horizontal plane and made of wood as specified in this Section.

L. Bearing Pads: Bridge(s) shall include bearing pads which shall allow the bridge to expand and contract as needed without binding.

3.0 DESIGN

A. Governing Codes and Standards
Bridge(s) shall be designed in accordance with the AASHTO, LRFD Guide Specification for Design of Pedestrian Bridges, latest edition, where applicable and unless otherwise stated in this document.

B. Reference Codes and Standards:
- LRFD AASHTO, Guide Specification for Design of Pedestrian Bridges, latest edition.
- The Aluminum Association, Specifications and Guidelines for Aluminum Structures, latest edition.
- AASHTO LRFD Bridge Design Specifications, latest edition.
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic, latest edition.
- AASHTO Standard Specifications for Highway Bridges, latest edition
- ASCE 7-10, latest edition.
- Aluminum Structures, A Guide to Their Specification and Design, latest edition.
- American Welding Society, Structural Welding Code, D1.2, latest edition.
- National Design Specification for Wood Construction, ANSI NDS, latest edition.
- American Wood Preservers Association Standards, latest edition.

C. Pedestrian Loading Bridges: All bridges in this category shall be designed with AAST pedestrian loading allowing for an occasional 2500-pound small vehicle load with rubber tires.

D. H-5 Loading Bridges: All bridges in this category are designed with H-% (10,000 pound) loading.

E. Open truss bridges shall be designed by a professional engineer experienced in pony truss bridge design and top chord stability criteria utilizing elastic lateral restraints.
In addition to normal dead loads, the bridge shall be designed for the following:

F. Uniform Live Load: Pedestrian bridges shall be designed for an evenly distributed live

load of 90 pounds per square foot of deck area as required by AASHTO standards.

G. Vehicle Load: Bridge(s) will also be designed to withstand a moving concentrated load of 10,000 pounds plus 30% for impact loading.

H. Wind Load (WS): All bridges shall be designed for a minimum wind load of 30 pounds per square foot (approximately 100 mph). The wind is calculated on the entire vertical surface of the bridge as if fully enclosed.

1. Horizontal Wind Load (Wsp & WSf)
The Bridge shall be designed per AASHTO LRFD for a horizontal peak (Strength III) and normal (Fatigue I) wind speeds based on the criteria below, at right angles to the longitudinal axis of the structure. Wind loads shall be proportionally distributed across all exposed primary member surfaces including chords, vertical posts, and truss diagonals on the windward side in combination(s).

ASCE 7-05 Wind Speed (3-sec peak gust) - 90 mph
Wind Importance Factor - 1.15
Gust Effect Factor - 1.14
Bridge Height Above Ground - 15 ft
Height and Exposure Factor - 0.849
Wind Drag Coefficient - 2

Resultant Peak Wind Pressure (WSp) - 46.16 psf
Fatigue Importance Factor - 1
Resultant Normal Wind Pressure (WSf) - 10.4 psf
Fatigue resistance shall be calculated for Infinite cycles
Truck induced fatigue loading is not required.

2. Overturning Wind Load (WSo)
The effect of forces tending to overturn the structure shall be calculated assuming that the wind direction is at right angles to the longitudinal axis of the structure. In addition, an upward force shall be applied at the windward quarter point of the transverse superstructure width. This force shall be 20 pounds per square foot of deck influence area in combination(s).

3. Guards & Railing Live Loads (PLr)
Guard & railing loads shall be analyzed as Live loads in combination(s).

4. Top Rail Load
The top rail and top chord if <54" from the top of deck shall be designed for a simultaneous vertical AND horizontal load of 50 pounds per linear foot AND a 200-pound point load, positioned to produce the maximum load effect.

5. Post Rail Load
The vertical posts shall be designed for a horizontal load of 50 pounds per linear foot AND a 200-pound point load positioned at the top rail height.

6. Infill

The picket, intermediate railing, toe railing, or infill system shall be designed for a 200-pound point load, applied transversely over an area of 1 square foot and positioned to produce the maximum load effect.

I. Seismic Extreme Event Loads (EQ) No seismic analysis is required:
All bridges shall be designed for seismic loads of the intensity required by local codes.

J. Flood Extreme Event Loads (WA) - Based on the wind capacity already accounted for in strength III and section 4.3.1., no additional flood analysis is required

K. Additional Snow Loads (IC) - Based on the ASCE 7 snow maps and capacity already accounted for in strength I and section 4.3.1., no additional snow analysis is required.

L. Deflection

The vertical deflection of the bridge due to pedestrian live load shall not exceed 1/400 of the span length. The maximum deflection due to vehicular loads shall not exceed 1/800 of the span length. The minimum live load used for the deflection check shall be a minimum of 600 pounds per lineal foot of bridge. The horizontal deflection due to lateral wind load shall not exceed 1/500 of the span length.

4.0 RAILINGS & ACCESSORIES

A. Bridge(s) shall include the following in accordance with section 5 of this specification and the structural plans.

B. Guard Rail and Infill - Bridge shall incorporate a Combination Rail system consisting of vertical pickets, a graspable top rail, and curb bottom rail, which shall minimize climbing hazards and serve the function of guard, hand, and toe rail. The Combination Rail system shall meet all the dimensional requirements of FDOT Aluminum Pedestrian/Bicycle Picket Railing – Index No. 860 or pre-approved equal.

C. Top of top rail shall not be less than 42" above the finished deck.

D. Solid toe or curb rail shall prevent the passage of a 2" diameter sphere up to a minimum height of 4" from finished deck.

E. Clear opening between pickets, infill, or rail shall reject the passage of a 4” diameter sphere up to the height specified in 3.8.1.1 of this document.

F. Clear opening between bottom rail and finished deck shall reject the passage of a 2” diameter sphere.

G. Any graspable elements shall be round with a 1 ¼” to 2” OD or equivalent gripping surface.

H. Horizontal elements shall be finished or returned smoothly to floor or posts.

I. Any graspable elements must maintain a 1.5” clear distance between wall and rail must be maintained.

J. All geometry is to be smooth with no sharp corners.

K. All railings shall have a smooth inside surface with no protrusions or depressions. All ends of angles and tubes shall be closed and ground smooth. In accordance with AASHTO standards, railings for bicycle use shall be a minimum height of 54” above the floor deck.

L. Safety Rails: Continuous rails shall be located on the inside of the trusses. The rails will be 42” high horizontal rails with picket a maximum opening of 4 inches with angled top cords.

M. Toe Plate: A 5"x2” tube shall be located 2" above the floor deck.

1. Grab rail - No ADA grab rail is required
2. Toe rail - No Additional Toe Railing is Required
3. Rub rail - No Additional Rub Railing is Required

N. Architectural Elements:

Color & Texture - All exposed metal surfaces to be Brown Powder Coat finish. Contractor to submit color samples for approval.

Cladding - No additional cladding is required

Accent Lighting - No Accent Lighting is Required

O. Maximum Weight

Bridge(s) shall be designed to such that the maximum weight of each assembled span does not exceed 2400 lbs. to ensure the most cost-effective support structure design and installation

5.0 ENGINEERING

A. Dead Loads (DC & DW)
The bridge shall be designed considering its own dead load including structure (DC), originally designed decking (DW), and originally designed utilities only (DW). No additional loads shall be considered. Dead loads shall be designed in combination(s).

B. Pedestrian Live Load (PLu)
Main supporting members, including trusses, primary beams, arches, deck and supporting floor system shall be designed for a uniformly distributed load of 90 pounds per square foot in combination(s).

C. Vehicle Live Loads (LL)
The vehicle bridge shall be designed for an occasional 10,000 lb. vehicle loading. All floor beams and main supporting members shall be designed to support the vehicle load, uniformly distributed across their width at a maximum wheelbase of 6 feet and in combination(s).

D. Design Limitations

1. Resistance & Allowable Stresses
All resistance stresses for aluminum shall be determined in accordance with the most current version of the AASHTO LRFD Bridge Design Specifications - Section 7, supplemented by the Aluminum Association, Specifications and Guidelines for Aluminum Structures, and by Aluminum Structures, A Guide to Their Specification and Design where applicable. Resistance stresses shall be appropriately reduced due to welding and/or fatigue where applicable.

All allowable or resistance stresses for pressure treated pine shall be determined in accordance with NDS, Design values for wood construction.

All allowable or resistance stresses for other materials shall be in accordance with the most relevant standard, manufacturers specifications, or sound engineering judgement.

2. Deflection

   The vertical deflection of the main truss due to unfactored DC, DW, LL, and PL loads in the Service I load combination shall not exceed L/360, where L is the length of the unsupported span.

   The horizontal deflection of the floor system due to unfactored, horizontal, WS and WA loads shall not exceed L/360, where L is the length of the unsupported span.

3. Buckling & Frame Stability

   For half-through trusses, the bridge shall be analyzed per 4.3.1. and Strength I as a lateral U-frame as defined in AASHTO LRFD Guide Specification for Design of Pedestrian Bridges, Section 7 - Stability to carry additional lateral forces induced by secondary or buckling bending forces. For more complex or other structure types, buckling analysis must be conducted using Finite Element Analysis with and a maximum allowable buckling load factor of 4 for any combination of applied loads, to ensure adequate overall stability and stiffness.

4. Vibration

   The 1st mode fundamental frequency of the unloaded pedestrian bridge shall be no less than 3 Hz to avoid the first harmonic.

E. Analysis

Full structural analyses for the primary bridge structure shall be completed using a 3-D finite element analysis. All member end conditions are to be considered fixed. Other analysis methods may be used for secondary members. All analysis and results necessary to determine the structural adequacy per section 4.2 of the bridge shall be reported. The following analyses are required:

F. Load Applications

Resistance & Allowable Stresses

Analysis shall be completed to determine that all bridge members, critical connections, and bridge configurations are sufficiently sized to adequately resist the following loads from these combinations per AASHTO LRFD and in accordance with section 4 of this specification:

Strength I – DC, DW, Plu
Strength I – DC, DW, LL
Strength I – DC, DW, PLr
Strength III – DC, DW, WSp, Wso
Service I – DC, DW, PL, WSp, Wso
Fatigue I – WSn

G. Deflection

Analysis shall be completed to determine that bridge stiffness is sufficient to limit deflections to the maximum allowable per section 4.2.2.

Service I (Vert. Def.) – DC, DW, PLu
Service I (Vert. Def.) – DC, DW, LL
Unfactored (Horiz. Def.) – WSp

Frequency

Frequency analysis shall be completed to determine that the bridge frame is sufficient to avoid resonance due to frequencies likely encountered under normal use for the following load combinations. Unfactored – DC, DW

6.0 MATERIALS

A. Structural Members

All aluminum primary structural members are to be 6061-T6 alloy for its high strength and corrosion resistance. Secondary aluminum members are to be 6000 series aluminum for corrosion resistance.

B. Bearing Pads

All bearing pads shall be 1" thick UHMW adequately dimensioned to provide support to the structure over the full travel resulting from expansion and contraction and supplied by bridge manufacturer.

C. Deck

Pine decking shall be Southern Yellow Pine No. 1 Structural (1200# extreme fiber bending) Stress Grade. Wood decking shall have a minimum CCA (Copper Chromium Arsenate) content equal to .40 pounds per cubic foot for ground contact. Equivalent pressure treating methods are acceptable.

All wood shall comply with American Softwood Lumber Standard PS 20-70. Each piece of lumber shall be identified by the grade and treatment mark of recognized organization or independent agency certified by the American Lumber Standards Committee, Washington, DC to grade the species.

All lumber specified for treatment shall be treated to the requirements of American Wood Preservers Bureau AWPB LP-22 or equal for Ground Contact. .

D. Fasteners

Any and all fasteners required for assembly shall be stainless steel type 304 and supplied by bridge manufacturer. Insulating washers shall be provided where stainless steel and aluminum contact is anticipated to minimize the potential for galvanic action.

Railing**:** No Additional Rub Railing is Required
Cladding**:** No additional cladding is required
Accent Lighting: No Accent Lighting is Required

7.0 FABRICATION & ASSEMBLY

A. Welding

All aluminum members shall be welded using 5356 aluminum filler wire in accordance with AWS D1.2

B. Expansion Slots

Slots shall be cut into bridge bearing area to allow for proper expansion and contraction of the bridge.

C. Delivered Sections

Bridge shall be shipped in pieces if required to ensure that no individual unit exceeds:

Maximum Weight of 2400 lbs., and Maximum length of 15’.

D Mid-Span Splices

When required to accommodate contractor requirements or those of this specification, mid span splices shall be incorporated and be adequately designed to meet all criteria specified in section 4 of this document. Mid-span splices shall be designed and fabricated in accordance with the Aluminum Association, Specifications and Guidelines for Aluminum Structures, supplemented by Aluminum Structures, A Guide to Their Specification and Design

8.0 FINISHES

A. Bridge shall be powder coated by the bridge manufacturer. The manufacturer shall have an AISC certified shop with Sophisticated Paint Endorsement. Color

B. Color: Bridges shall be powder coated brown. Manufacturer to provide color samples through the General Contractor for client approval.

9.0 DELIVERY AND ERECTION

C. Bridges shall be delivered by truck FOB to a location nearest to the site accessible by roads. Hauling permits and freight charges are the responsibility of the manufacturer.

D. Site Contractor (customer) is responsible to off-load the bridge at the site and arrange for its storage or installation upon arrival.

E. The manufacturer will notify the customer in advance of the expected arrival time. Information regarding delays after the trucks depart the plant such as inclement weather, delays in permits, re-routing by public agencies or other circumstances will be passed on to the customer (site contractor) as soon as possible, but the expense of such unavoidable delays will not be accepted by the manufacturer.

F. The manufacturer will advise the customer of the actual lifting weights, attachment points and all necessary information to off-load and install the bridge. Unloading, splicing, bolting, and proper lifting equipment is the responsibility of the site contractor.

G. The site contractor (customer) shall procure all necessary information about the site and soil conditions. Soil tests shall be procured by the owner. The engineering design of the bridge abutments, piers and/or footing shall be by the owner.

H. The Contractor shall install the anchor bolts in accordance with the manufacturer's anchor bolt spacing dimensions. All grounding and lightning protection shall be the responsibility of the Contractor.

10.0 SUBMITTALS

A. Fabrication drawings

Fabrication drawings and calculations shall be prepared and submitted for review after receipt of the order. Submittal drawings shall be unique drawings to this project, prepared to illustrate the specific portion of the bridge(s) being fabricated. All relative design information such as member size, material specification, dimensions, and required critical welds shall be clearly shown on the drawings. Drawings shall have cross referenced details and sheet numbers. All drawings shall be stamped, and signed by a Professional Engineer registered in the state of GA. A stamped electronic soft copy shall be provided to be reviewed and approved exclusively by:

The following minimum criteria must be included for approval:

All Relevant Bridge Dimensions
Bridge Cross sections
Sufficient Detailing
Member Cross sections
General Notes indicating material specifications
Weld Details
Detail of Bolted Splices (if applicable)
Signature and Seal of PE licensed in accordance with this specification
Camber Details

D. Calculations & Results

Structural analysis results and calculations shall be prepared and submitted for review after receipt of the order. All analysis and results necessary to determine the structural adequacy of the bridge shall be shown. A stamped electronic soft copy shall be provided to be reviewed and approved exclusively by:

The following minimum criteria must be included for approval:

Bridge Reactions for all unfactored loads
Expansion and Contraction Requirements and/or induced loads
Critical weld analysis results
Bolted Splice Calculations (if applicable)
Detailed Description of Applied Loads and Conditions for all load combinations
Member maximum allowable for all load and design conditions
FEA boundary conditions
FEA Data Input
FEA results and supplementary calculations for allResistance & Deflection Analyses
FEA results for frame stability analysis (if required)
FEA results for frequency analysis

11.0 WARRANTY

The manufacturer shall provide a warranty against defects in material and workmanship

for period of ten (10) years.

END OF SECTION 05552

SECTION 05663

HELICAL PILES (PIERS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

Related Sections include the following:
1. Division 03 Section "Cast-In-Place Abutment" for concrete and reinforcing steel.

The Geotechnical report for the bridge #1 abutments is included in the Appendix of this Project Manual and is available for use by the contractor.

Borings were also done for the Alternate Bridge #2 abutments. The contractor shall have access to the borings for Bridge #2 as part of figuring the **Add Alternate**. Borings are in the Appendix

1.2 SUMMARY

This Section specifies the furnishing and installation of helical piles, related bracket assemblies, placement procedures and testing.

Add Alternate: The contractor shall provide a cost per linear foot for helical piers in the event that additional piers are needed based on site conditions. Contractor shall bid the quantity provided as an allowance and verify how much of each allowance quantity he uses on the project.

If more quantity is needed than the allowance provides, the contractor shall notify the Owner and keep a log record showing how much was used and how much extra was needed.

1.3 DEFINITIONS

Helical Pile: Manufactured steel foundation piles with one or more helical bearing plates that is rotated into the ground to support structures.

Lead Section: The first section of a Helical Pile to enter the ground. Lead Sections consist of a central shaft with a tapered end and one or more helical bearing plates affixed to the shaft.

Extension Section: Helical Pile sections that follow the Lead Section into the ground and extend the Helical Lead to the appropriate depth. Extension Sections consist of a central shaft and may have helical bearing plates affixed to the shaft.

Brackets: Cap plate, angle, thread bar, or other termination device that is bolted or welded to the end of a helical pile or helical anchor after completion of installation to facilitate attachment to structures or embedment in cast-in-place concrete.

Auguring: Rotation of the shaft with little or no advancement. It can occur when the helical bearing plates pass from a relatively soft material into a comparatively hard material. Auguring can also result from insufficient crowd or downward pressure during installation. In some cases, auguring may be (temporarily) necessary in order to grind through an obstruction.

1.4 ACTION SUBMITTALS

Product Data: For each type of product.

Shop Drawings: Submit design calculations signed and sealed by the qualified professional engineer licensed in Georgia, responsible for their preparation for the helical piles and brackets intended for use on the project.

1. Helical pile and helical anchor product identification number(s) and designation(s).
2. Maximum allowable mechanical compression and tensile strength of the helical piles
3. Number of helical piles and respective design allowable capacities from the drawings.
4. Planned installation depth and the number of lead and extension sections.
5. Preliminary helical configuration (number and diameter of helical bearing plates).
6. Manufacturer’s recommended capacity to installation torque ratio.
7. Minimum final installation torque(s).
8. Product identification numbers and designations for all bracket assemblies and number and size of connection bolts or concrete reinforcing steel detail.
9. Corrosion protection coating on helical piles and bracket assemblies.

Design Calculations: Submit design calculations signed and sealed by the qualified professional engineer licensed in Georgia, responsible for their preparation for the helical piles and brackets intended for use on the project.

10. Reduction in shaft dimension and strength by the sacrificial thickness anticipated based on corrosion loss over the design life for project soil conditions.
11. Considerations for down-drag, buckling, and expansive soils (as appropriate).
12. Minimum installation depth to reach bearing stratum and to achieve pullout capacity (if required).
13. Soil bearing and pullout capacity.
14. Lateral resistance of the shaft (if required).
15. Estimated pile head movement at design loads.

1.5 INFORMATIONAL SUBMITTALS

Qualification Data: For Installer and testing agency.

Welding certificates.

Mill Test Reports: For helical piles and helical anchors, steel castings and steel plate, signed by manufacturer.

Pile-Installing Equipment Data: Include type, make, and calibration information.

Load Test or Proof Load Test Reports: Submit within three days of completing each test.

Pile-Installing Records: Submit within three days of installing each pile.

Certified Piles Survey: Submit within seven days of pile installation completion.

Field quality-control reports.

Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

1.6 QUALITY ASSURANCE

Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-installation records.

Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PRE-CONSTRUCTION TESTING

General: Pile tests are used to verify installed criteria and pile lengths and to confirm allowable load of piles.

1. Determination of actual length of piles is based on results of static pile tests.

Pile Tests: Arrange and perform the following pile tests:

2. Axial Compression Load Test: ASTM D 1143.
3. Axial Tension Static Load Test: ASTM D 3689.
4. Lateral Load Test: ASTM D 3966.

Equip each test pile with two telltale rods, according to ASTM D 1143/D 1143M, for measuring deformation during load test.

Provide pile reaction frame, anchor piles, equipment, and instrumentation with enough reaction capacity to perform tests. Notify Architect at least 48 hours in advance of performing tests. On completion of testing, remove testing structure, anchor piles, equipment, and instrumentation.

5. Allow a minimum of seven days to elapse after installing test piles before starting pile testing.
6. Number of Test Piles: As indicated or per Geotechnical Engineer

Drive test piles at locations indicated to the minimum penetration or driving resistance indicated. Use test piles identical to those required for Project, and drive with appropriate pile-driving equipment operating at rated driving energy to be used in driving permanent piles.

7. Pile Design Load: As indicated.

Approval Criteria: Allowable load shall be the load acting on the test pile when the lesser of the following criteria are met, divided by a factor of safety of 2:

8. Net settlement, after deducting rebound, of not more than 0.01 inch/ton of test load.
9. Total settlement exceeds the pile elastic compression by 0.15 inch, plus 1.0 percent of the tip diagonal dimension.
10. A plunging failure or sharp break in the load settlement curve.

Test Pile-Driving Records: Prepare driving records for each test pile, compiled and attested to by a qualified professional engineer. Include same data as required for driving records of permanent piles.

Test piles that comply with requirements, including location tolerances, may be used on Project.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent buckling or physical damage. Store helical piles, helical anchors, and bracket assemblies on wood pallets or supports to keep from contacting the ground.

1. Painted Piles: Protect finish and touch up paint damage before installing piles.

1.9 FIELD CONDITIONS

Protect structures, underground utilities, and other construction from damage caused by pile installation.

Site Information: A geotechnical report has been prepared for this Project and is included in the Appendix of the Project Manual for information only.

Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Document conditions that might be misconstrued as damage caused by pile driving.

PART 2 - PRODUCTS

2.1 HELICAL PILES AND BRACKETS

Unless noted otherwise, it is the manufacturer's responsibility to select the appropriate size and type of helical piles, helical anchors, and brackets to support the design loads shown on the drawings. These specifications and the drawings provide minimum requirements to aid the manufacturer in making appropriate materials selections. The size and number of helical bearing plates must be such that the helical piles and helical anchors achieve the appropriate torque and capacity in the soils at the site within the minimum and maximum length requirements.

1. Central Shaft: The central shaft shall consist of a high strength structural steel tube meeting the requirements of ASTM A513.
2. Helical Bearing Plates: One or more helical bearing plates shall be affixed to the central shaft. Helical bearing plates shall be attached to central shafts via fillet welds continuous on top and bottom and around the leading edges. Helical bearing plates shall be cold pressed into a near perfect helical shape that when affixed to the central shaft are perpendicular with the central shaft, of uniform pitch, and such that the leading and trailing edges are within 3/8 inch of parallel. Average helical pitch shall be within plus or minus 1/4 inch of the thickness of the helical bearing plate plus 3 inches.
3. Corrosion Protection: Depending on project requirements and soil corrosivity, helical piles, helical anchors, and brackets shall be bare steel, powder coated, or hotdip galvanized (per ASTM A123 or A153 as applicable).
4. Shaft Connections: The helical pile and helical anchor shaft connections shall consist of an external sleeve connection or a welded connection. External sleeve connections shall be in-line, straight and rigid and shall have a maximum tolerable slack of 1/16-inch. Welded connections shall consist of a full penetration groove weld all-around the central shaft. Shaft connections shall have a flexural strength at least as great as the shaft itself.
5. Bolts: Bolts and nuts used to join helical pile and helical anchor sections at the shaft connections shall be bare steel, epoxy coated, or zinc coated to match the corrosion protection used for the central shaft. All helical pile and helical anchor bolts shall be securely snug tightened.
6. Plug Welds: Alternatively, external sleeve connections may be made using plug welds matching the diameter and number of bolt holes.
7. External sleeve: External sleeve helical pile and helical anchor shaft connections shall consist of a high strength structural steel tube outer sleeve meeting the requirements of ASTM A513. The outer sleeve shall be welded to the central shaft via a continuous fillet weld all-around. The fillet weld shall have a throat thickness equal to the external sleeve tube thickness.
8. Couplings: Formed as integral part of the plain and helical extension material.

Brackets: Helical piles shall be fitted with a manufactured bracket that facilitates connection to the structure. Brackets shall be rated for the design loads shown on the drawings. Brackets shall be affixed to the end of helical piles and helical anchors via bolts, plug welds, or continuous penetration welds meeting the requirements for shaft connections given previously in these specifications.

2.2 FABRICATION

Fabricate and assemble piles in shop to greatest extent possible.

Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until installed.

PART 3 - EXECUTION

3.1 EXAMINATION

Site Conditions:

1. Do not start pile installation operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches above bottom of footing or pile cap.
2. Contractor shall locate all utilities and structures above and underground in the area of the Work. Contractor is responsible for protection of utilities and structures shown on the Drawings.
3. Contractor shall review drawings and soil borings in the Contract Documents to determine subsurface conditions for sizing and installation of helical piles and helical anchors.
4. If excavation is required for proper installation of helical piles and helical anchors, Contractor shall make safe excavations in accordance with OSHA standards. If necessary, excavations shall be designed by a registered design professional specializing in the design of excavations and shoring.

3.2 INSTALLATION EQUIPMENT

Torque Motor: Helical piles and helical anchors should be installed with high torque, low RPM torque motors, which allow the helical plates to advance with minimal soil disturbance. The torque motor shall be hydraulic power driven with clockwise and counterclockwise rotation capability. The torque motor shall be adjustable with respect to revolutions per minute during installation. Percussion drilling equipment shall not be permitted. The torque motor shall have torque capacity equal to or greater than the minimum final installation torque required for the project. The connection between the torque motor and the installation rig shall have no more than two pivot hinges oriented 90 degrees from each other.

Installation Equipment: The installation equipment shall be capable of applying adequate crowd and torque simultaneously to ensure normal advancement of the helical piles. The equipment shall be capable of maintaining proper alignment and position.

Drive Tool: The connection between the torque motor and helical pile and helical anchor shall be in-line, straight, and rigid, and shall consist of a hexagonal, square, or round kelly bar adapter and helical shaft socket. To ensure proper fit, the drive tool shall be manufactured by the helical pile manufacturer and used in accordance with the manufacturer’s installation instructions.

Connection Pins: The central shaft of the helical pile or helical anchor shall be attached to the drive tool by ASME SAE Grade 8 smooth tapered pins matching the number and diameter of the

specified shaft connection bolts. The connection pins should be maintained in good condition and safe to operate at all times. The pins should be regularly inspected for wear and deformation. Pins should be replaced with identical pins when worn or damaged.

Torque Indicator: A torque indicator shall be used to measure installation torque during installation. The torque indicator can be an integral part of the installation equipment or externally mounted in-line with the installation tooling. The torque indicator shall be capable of torque measurements with a sensitivity of 500 ft-lb or less. Torque indicators shall have been calibrated within 1-year prior to start of Work. Torque indicators that are an integral part of the installation equipment shall be calibrated on-site. Torque indicators that are mounted in-line with the installation tooling shall be calibrated either on-site or at an appropriately equipped test facility. Indicators that measure torque as a function of hydraulic pressure shall be re-calibrated following any maintenance performed on the torque motor. Torque indicators shall be re- calibrated if, in the opinion of the Engineer, reasonable doubt exists as to the accuracy of the torque measurements.

3.3 INSTALLATION PROCEDURES

General: Constant axial force (crowd) shall be applied while rotating helical piles and helical anchors into the ground. The crowd applied shall be sufficient to ensure that the helical pile and helical anchor advances into the ground a distance equal to at least 80% of the blade pitch per revolution during normal advancement.

General: Connect the lead section to the torque motor using the drive tool and connection pins. Position and align the lead section at the location and to the inclination shown on the drawings and crowd the pilot point into the soil. Advance the lead section and continue to add extension sections to achieve the termination criteria. All sections shall be advanced into the soil in a smooth, continuous manner at a rate of rotation between 10 and 40 revolutions per minute. Snug tight all coupling bolts.

The manufacturer’s torsional strength rating of the helical pile or helical anchor shall not be exceeded during installation.

Bolt hole elongation due to torsion of the shaft of a helical anchor at the drive tool shall be limited to ¼ inch. Helical anchors with bolt hole damage exceeding this criterion shall be uninstalled, removed, and discarded.

When the termination criteria of a celical pile or helical anchor is obtained, the Contractor shall adjust the elevation of the top end of the shaft to the elevation shown on the drawings or as required. This adjustment may consist of cutting off the top of the shaft and drilling new holes to facilitate installation of brackets to the orientation shown on the drawings. Alternatively, installation may continue until the final elevation and orientation of the pre-drilled bolt holes are in alignment. Contractor shall not reverse the direction of torque and back-out the helical pile or helical anchor to obtain the final elevation.

The Contractor shall install brackets in accordance with helical pile manufacturer’s details or as shown on the drawings.

All helical pile components including the shaft and bracket shall be isolated from making a direct electrical contact with any concrete reinforcing bars or other non-galvanized metal objects since these contacts may alter corrosion rates.

Abandon and cut off rejected piles as directed by Architect. Leave rejected piles in place, and install new piles in locations as directed by Architect.

Certified Piles Survey: Engage a land surveyor to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.

1. Notify Architect when deviations from locations exceed allowable tolerances.

The Contractor shall provide the Engineer and Owner copies of installation records within 48 hours after each installation is completed. These installation records shall include, but are not limited to, the following information:

2. Name of project and Contractor
3. Name of Contractor's supervisor during installation
4. Date and time of installation
5. Name and model of installation equipment
6. Type of torque indicator used
7. Location of helical pile or helical anchor by grid location, diagram, or assigned identification number
8. Type and configuration of lead section with length of shaft and number and size of helical bearing plates
9. Type and configuration of Extension Sections with length and number and size of helical bearing plates, if any
10. Installation duration and observations
11. Total length installed
12. Final elevation of top of shaft and cut-off length, if any
13. Final plumbness or inclination of shaft
14. Installation torque at minimum three-foot depth intervals
15. Final installation torque
16. Comments pertaining to interruptions, obstructions, or other relevant information
17. Verified axial load capacity

3.4 ALLOWABLE TOLERANCES

Helical piles shall be installed as close to the specified installation and orientation angles as possible. Tolerance for departure from installation and vertical orientation angles shall be +/- 2 degrees.

Centerline of helical piles shall be installed not more than 3 inches from indicated plan location.

Helical piles and bracket assemblies shall be installed at the locations and to the elevations shown on the plans. Tolerances for bracket assembly placement shall be +/- 1 inch in both directions perpendicular to the shaft and +/- 1/4 inch in a direction parallel with the shaft unless otherwise specified.

3.5 FIELD QUALITY CONTROL

Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Pile foundations.

Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

Tests and Inspections:

2. Helical Pile Compression Tests:
    a. Contractor shall perform the number of compression tests shown on the Drawings, if any.

b. Compression tests shall be performed following the “quick test” procedure described in ASTM D1143 specifications.
c. Load tests shall be observed and documented by an Engineer.
d. Unless otherwise shown on the drawings, the maximum test load shall be 200% of the allowable load shown on the drawings.
e. The locations of helical piles to be tested shall be determined by the Contractor, unless noted on the drawings.
f. Installation methods, procedures, equipment, products, and final installation torque shall be identical to the production helical piles to the extent practical except where otherwise approved by the Owner or Engineer.
g. A load test shall be deemed acceptable provided the maximum test load is applied without helical pile failure and the deflection of the pile head at the design load is less than 1-inch unless noted otherwise on the drawings. Failure is defined when continuous jacking is required to maintain the load.

3. Helical Pile Lateral Load Tests (if required):
   a. Contractor shall perform the number of lateral load tests shown on the drawings, if any.
   b. Lateral load tests shall be performed following the “free head” procedure described in ASTM D3966 specifications.
   c. Lateral load tests shall be observed and documented by an Engineer.
   d. Unless otherwise shown on the drawings, the maximum test load shall be 200% of the allowable lateral load shown on the drawings.
   e. The locations of test helical piles shall be determined by the Contractor, unless shown on the drawings.
   f. Installation methods, procedures, equipment, products, and final installation torque shall be identical to the production piles to the extent practical except where otherwise approved by the Owner or Engineer.
   g. A lateral load test shall be deemed acceptable provided the lateral deflection of the pile head measured at the ground surface at the maximum test load is equal to or less than 1-inch.
4. Weld Testing: In addition to visual inspection, welds shall be tested and inspected according to AWS D1.1/D1.1M and inspection procedures listed below, at testing agency's option. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   c. Radiographic Inspection: ASTM E 94, minimum quality level "2-2T."
   d. Ultrasonic Inspection: ASTM E 164.

Helical piles will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports.

3.6 DISPOSAL AND CLEANUP:

Remove withdrawn piles and cutoff sections of piles from site, and legally dispose of them off Owner's property.

Remove all debris and refuse caused by the construction process and fine grade the areas disturbed back to as close to natural appearance as possible.

END OF SECTION 05663

SECTION 06100

ROUGH CARPENTRY

1.1 GENERAL

A. Submittals: Submit the following:
   1. Contractor shall remove a treatment tag from each lumber delivery and provide to the Landscape Architect and Owner with a copy of the tag, manifest and delivery date. Include in daily reports and provide copies at the regular on-site project meetings.
   2. Contractor shall provide material certificates for dimension lumber specified to comply with minimum allowable unit stresses.
   3. Wood treatment data, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials.
   4. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence code compliance of engineered wood products, foam-plastic sheathing, air-infiltration barriers, metal framing anchors, power-driven fasteners, and fire-retardant-treated wood.
   5. **All lumber for bridge decks and wing walls shall be below ground contact LP-22 treatment or equal.**
   6. For temporary framing and form boards see Section 06105.

1.2 PRODUCTS

A. Lumber, General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review. Provide dressed lumber, S4S, with each piece factory marked with grade stamp of inspection agency.
   1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
   2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
   3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Wood-Preservative-Treated Materials: Comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

   1. Above Ground Lumber: Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19

~~and 15 percent, respectively. Treat indicated items and the following:~~

a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
c. Wood framing members less than 18 inches (460 mm) above grade.
d. Wood floor plates installed over concrete slabs directly in contact with earth.

2. Ground Contact Lumber: Pressure treat ground contact wood members or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m) or approved equal.
3. Water Contact: Lumber or posts in constant contact with fresh or saltwater shall be Marine Grade treatment.
4. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
5. Exterior Type: Use for exterior locations and where indicated.
6. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

C. Dimension Lumber: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
1. Non-Load-Bearing Interior Partitions: Provide Standard, Stud, or No. 3 grade and any of the following species:
a. Species: Mixed southern pine; SPIB.

2. Framing Other than Non-Load-Bearing Partitions: Provide Construction or No. 2 grade and any of the following species:
a. Species: Southern pine; SPIB.

3. Exposed Framing: Provide material hand-selected from lumber of species and grade indicated below for uniformity of appearance and freedom from characteristics and would impair finish appearance.
a. Species and Grade: Southern pine, Select Structural; SPIB.

D. Concealed Boards: Provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.
2. Species and Grade: Northern species, No. 3 Common or Standard per NLGA rules.
3. Species and Grade: Mixed southern pine, No. 2 per SPIB rules.
4. Species and Grade: Western woods, Standard per WCLIB rules or No. 3 Common per WWPA rules.

E. Miscellaneous Lumber: Provide No. 3 or Standard grade lumber of any species for support or attachment of other construction, including rooftop equipment curbs and support bases, can’t strips, bucks, nailers, blocking, and similar members.

F. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project. Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

1. Laminated-Veneer Lumber: Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D 2559 to produce members with grain of veneers parallel to their lengths and complying with the following requirements
   a. Extreme Fiber Stress in Bending: 2500 psi (17 MPa) for 12-inch nominal- (286-mm actual-) depth members.
   b. Modulus of Elasticity: 2,000,000 psi (13 800 MPa).

2. Parallel-Strand Lumber: Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with ASTM D 2559, and cured under pressure to produce members with grain of strands parallel to their lengths and complying with the following requirements:
   a. Extreme Fiber Stress in Bending: 2900 psi (20 MPa) for 12-inch nominal- (286-mm actual-) depth members.
   b. Modulus of Elasticity: 2,000,000 psi (13 800 MPa).

3. Prefabricated Wood I-Joists: Units manufactured by bonding stress- graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I- shaped joists complying with the following requirements:
   a. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.

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P. Hardware: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
   1. Power-Driven Fasteners: CABO NER-272.
   2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

1.3 EXECUTION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted in accordance with good carpentry standards.

B. All deck boards shall be placed '*Bark Side Up'*.

B. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

END OF SECTION 06100

SECTION 06105

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber for abutment and other concrete forming

B. Related Requirements:

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Power-driven fasteners.
3. Post-installed anchors.
4. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

A. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Southern Yellow Pine.

B. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Screws for Fastening to Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.

2.5 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Simpson Strong-Tie Co., Inc or comparable equal.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

B. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

C. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 06105

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 02060 Demolition" for disposition of waste resulting from partial demolition of, structures, and site improvements, and for disposition of hazardous waste.
2. Section 02100 "Site Preparation" for disposition of waste resulting from site clearing and removal of above and below grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including but not limited to the following:

1. Demolition Waste:

a. Metal roof.
b. Concrete paving.
c. Concrete reinforcing steel..
d. Concrete masonry units.
e. Chain link fence.
f. Wood joists.

g. Rough hardware.
h. Supports and hangers.
i. Valves.
j. Sprinklers.
k. Electrical conduit.
l. Copper wiring.
m. Lighting fixtures.
n. Lamps.
o. Ballasts.
p. Electrical devices.
q. Switchgear and panelboards.
r. Transformers.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Metals.
e. Piping.
f. Electrical conduit.
g. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator and refrigerant recovery technician.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch size.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

K. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

L. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

Matrix Engineering Group, Inc.
engineers | special inspectors | construction consultants

December 2, 2019

Mr. Lee Croy, Program Manager
City of Brookhaven
4362 Peachtree Road
Brookhaven, GA, 30319

Re: Subsurface Exploration and Geotechnical Engineering Evaluation
Murphey Candler Park Bridge abutments–Brookhaven, Georgia
Matrix Engineering Group Project Number MEG-302331

Dear Mr. Croy:

Matrix Engineering Group, Inc. has completed the authorized Subsurface Exploration for Murphey Candler Park Bridges abutments. The scope of this work included performing Dynamic Cone Penetrometer Test (DCP) at a total of four (4) soil test borings within the areas planned for development and providing the findings and recommendations regarding the geotechnical aspects of the proposed development. This work was performed in accordance with Matrix Proposal Numbers 102819-1, dated October 28, 2019.

The purpose of this report was to determine the site's subsurface conditions, to analyze and evaluate the data obtained, and to provide recommendations regarding the geotechnical aspects of the proposed development. This report describes our investigative procedures and presents our findings, conclusions and engineering recommendations.

Project Description:

It is our understanding that the new development will consist of two pedestrian bridges.

Test Borings B1 and B2 were located at the proposed bridge at the Northwest Area. Test Borings B3 and B4 were located at the proposed bridge at the South Area. All boring locations were designated by the City of Brookhaven and were located in the field by Matrix staff relying on existing features, existing structures, and topographical features. The approximate locations of the soil borings are shown on Figure 1, presented in the Appendix of this report. For exact locations, the owner may elect to survey the boring locations. Matrix should be informed of any deviations in order to evaluate and modify our recommendations.

Procedure:

Since access to the test borings with a truck mounted drill rig was not possible, the soil consistency and bearing capacity were evaluated in general accordance with ASTM STP-399 using a portable hand auger and Dynamic Cone Penetrometer device. The DCP device consists of a cone tip which drives into the soil, and a 15-lb ring-weight hammer falling freely 20 inches at the top. The number of hammer blows required to drive the sampler 1.75 inches is recorded and is designated as the Blow Count. The blow counts, when properly evaluated and correlated to the Standard Penetration Test Resistance (SPT), is an index of the soil strength, consistency and ability to support foundations. The number of blow counts per increment (bpi) was counted and recorded. The depth of the borings were drilled to a minimum of 5 feet, residual firm soils, or to auger- refusal to obtain the necessary information for the bearing capacity evaluation.

The test borings were backfilled with the soil cuttings at the conclusion of DCP testing. Some consolidation of the backfilled soil column should be expected.

Findings:

The subsurface conditions were characterized by visual-manual classification of the soils obtained from the hand auger in general accordance with ASTM D2488. The soil boring logs, designated as B1 to B4, are provided in the appendix of this report. The subsurface conditions are characterized as follows:

Proposed Bridge at the Northwest Area (Test Borings B1):

The surface cover consisted of approximately 8 inches of topsoil underlain by fill soil consisting of very loose, silty sand, with roots up to three feet Below Ground Surface (BGS). The soil changes to wet, firm, gray, silty clay with roots up to a depth of 6 feet BGS. The soil then changes to firm to stiff gray, silty clay and sandy silt up to the termination depth of ten feet BGS. The soil consistency ranged from 2 blows per increment (bpi) at the surface to 15 bpi and generally increases with depth. Groundwater was encountered at a depth of 8.5 feet BGS at the time of drilling.

Proposed Bridge at the Northwest Area (Test Borings B2):

The surface cover consisted of 8 inches of topsoil underlain by fill soil consisting of loose, brown, silty sand with roots. The soil changes at approximately 3 feet to medium dense, yellow/orange silty sand up to six feet BGS. The soil then changes to firm, gray, clayey silt with roots at up to the termination depth of ten feet. The

soil consistency ranged from 5 bpi to 15 bpi. Groundwater was encountered at a depth of 8 feet BGS at the time of drilling.

Proposed Bridge at the Southern Area (Test Borings B3 & B4):

Hand-auger refusal was encountered at depths ranging from 1 to 2 ft BGS at both Test Boring locations B3, and B4 due to the presence of obstructions as well as rock fragments. Several offset test borings were attempted on each side of the creek and encountered shallow auger refusal. Digging tools, (i.e. shovel, pickaxe, and hand-auger) were used to visually identify the cause of obstruction. Rock fragments and boulders up to 12 inches in nominal size were encountered throughout up to a depth of 2.5 ft at location B3, and 2 ft at location B4.

Recommendations:

The following recommendations are based on the information furnished to us, the data obtained from the subsurface exploration, and our past experience with similar projects. They were prepared in general accordance with established and accepted professional geotechnical engineering practice in this region. Our recommendations are based on findings from the dates referenced within this report and do not reflect any variations that would likely exist at later dates or between the pre-designated borings or unexplored areas.

If information becomes available which may impact our recommendations, Matrix Engineering Group shall be afforded the opportunity to review this information and re-evaluate the recommendations contained within this report and make any alterations deemed necessary by a Georgia Registered professional engineer. This report is intended for the use of the City of Brookhaven and its current design team. No other warranty is expressed or implied. Matrix Engineering Group, Inc. is not responsible for conclusions, opinions, or recommendations made by others based on this report.

Bridge Foundations:

Based on the findings at test borings B1 to B4, it is our opinion that the existing soils are not suitable for support of the proposed bridges on shallow foundations. The soils at test borings B1 and B2 were very loose man-made fill containing roots to a minimum of 5 feet below the existing grades. The soils at test borings B3 and B4 were man-made fill containing rock fragments and boulders varying in size up to 12 inches in nominal size. Therefore, construction of the foundations at the proposed bridges utilizing shallow foundations will require corrective measures to improve the bearing capacity and reduce for the potential of excessive settlements.

Alternatively, to eliminate or minimize settlements, intermediate foundation system may be used to provide adequate support for the proposed bridges. We recommend that the following options be considered for the foundations:

1. Shallow Foundations

Shallow foundations can be used to support the bridge foundations provided that the soft soils up to a minimum of 5 feet be excavated and the bottom of the excavation stabilized with a combination of geotextile fabric and crushed stone. The following steps should be used for the preparation of the shallow foundations:

- Excavate existing man-made fill up to five (5) feet below the existing surface. The excavation should be a minimum of 1.5 feet wider than the width of the footing dimensions.
- Allow the geotechnical engineer to inspect the bottom of the excavation and determine if additional excavation is required to reach satisfactory bearing elevation.
- Compact the bottom of the excavation with a vibratory tamper to consolidate any loose soils.
- Place geotextile fabric (i.e. TerraTex HD or equivalent) at the bottom and sides of the excavation. Allow sufficient length and width to wrap the crushed stone with the fabric.
- Install 2 feet of baby surge stone at the bottom of the excavation (on top of the fabric)..
- Install crushed stone No. 57 up to the bottom of the bridge foundation (assuming concrete footing to be on the order of 1.5 to 2 feet thick).
- Wrap the crushed stone with the geotextile fabric with a minimum of 2 feet overlap.
- Form the foundations to design dimensions and install per the design requirements.
- Backfill around the foundations with suitable materials in accordance with the Structural Fill Recommendations provided in this report.
- A soil bearing capacity of 1,500 should be used for the design of the foundations.

Settlement of existing fill may occur as a result of the new loading conditions. The total settlement will depend on the loading conditions and the consistency of the fill materials. It is our understanding that the bridges will be used for pedestrian traffic and occasional landscaping equipment. It is our opinion that the stabilization measures provided above should reduce the potential for excessive settlements. We anticipate that differential and total settlement to be on the order of 1 and 2 inches respectively.

2. Intermediate Foundation System

We recommend that deep foundations be considered to support the bridge foundations in order to prevent the potential for excessive settlements. We recommend that helical pier system be used. Helical Piers are an extendable intermediate foundation system that has helical bearing plates welded to a central steel shaft. Load is transferred from the shaft to the soil through these bearing plates. Segments or sections are joined with bolted couplings. Installation depth is limited only by soil density and practicality based on economics. Helical piers do not auger into the soil but rather screw into it producing minimal spoils. Helical piers general develop their capacities within dense residual soils and/or partially weathered rock.

We recommend that the piers be designed for a minimum of 20 kip working load (40 kips ultimate load) for the support of the bridge loads. We recommend that the design length be specified as 40 feet length and a unit cost is provided if the depth of the piers extend to deeper elevations to achieve the required capacity. The design and installation of the helical piers can be accomplished as a design/build by the installer. The design should be prepared by a professional engineer licensed in the State of Georgia. The following helical pier installation companies are recommended:

We recommend that one of the following qualified contractors be engaged to design and install the helical piers and determine suitability of their foundations system relative to the site's subsurface conditions:

- **Atlas Piers of Atlanta**
  Mr. Chad Costello, Project Manager
  Office: 770-7405-0400
  www.atlaspiers.com
- **Foundation Worx (Helical Piers)**
  Jonathan Maguire, Owner
  Office: 404-662-2454
  www.foundation-worx.com
- **Gibson Pressure Grouting Service**
  Don Gibson
  Office 404-427-3910
  www.gibsonsgrouting.com

Due to the presence of rock boulders at test borings B3 and B4 penetration of the piles may be difficult and may require the use of air rotary drilling to pre-drill at the foundation location or require removal and replacement with structural fill prior to drilling.

Settlements of the foundations supported on helical piers should be limited to less than 0.5 inches differential and 1 inch total settlements.

Structural Fill Recommendations

Staged, methodical and well-planned grading is key to avoiding unnecessary costs and time delays. Areas should not be stripped or disturbed if the grading contractor is unable to properly seal the subgrade prior to departure each day. Exposure of soils to moisture from direct rainfall or runoff usually renders these soils un-usable for several days. This usually gets mischaracterized as an unsuitable soils condition which is inaccurate. Unsuitable soils are defined as those containing deleterious matter (such as organics, alluvium, debris and/or trash). Moisture related problems should be avoided by employing best management practices that involve maintaining positive drainage, installation of berms, diversion channels, and/or sealing the subgrade to avoid water infiltration. Other measures involve covering all stockpiled soils with heavy tarps or plastic to avoid saturating the soils in the event of rainfall. Means and methods of construction are certainly the contractor's jurisdiction; however, exposing otherwise suitable soils to excessive moisture or softening of existing subgrades as a result of unscrupulous construction traffic should be avoided and planned for.

We recommend that the following criteria be used for structural fill:

1. Adequate laboratory proctor density tests should be performed on representative samples of the proposed fill materials to provide data necessary for the quality control. The moisture content at the time of compaction should be within 3 percentage points of the optimum moisture content. In addition, we recommend that the fill soils be free of organics and rock boulder/cobbles larger than 2 inches in nominal size and relatively non-plastic with plasticity indices less than 20.

2. Suitable fill material should be placed in thin lifts (lift thickness depends on type of equipment used, but generally lifts of 8 inches loose measurements are recommended). The soils should be compacted by mechanical means such as sheepsfoot rollers.

3. Slopes that are limited to 2:1 (horizontal: vertical), or flatter, will have adequate long term slope stability, if limited in height to 15 feet, based on our experience with the type of soils encountered onsite. The slope's crest should be protected against water ponding. Proposed slopes should incorporate only suitable fill, clean of organics or any other vegetative content. Topsoil should only be used to provide cover over the completed slope's free face so as to promote vegetative growth which in turn protects the slope's surface against scour and erosion. Slopes should be overbuilt and cut back to the proposed grades, exposing the firm compacted inner core. The amount of overbuilding would vary depending on the site conditions at the time of construction, types of soils used and degree of compaction achieved.

4. When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Materials generated by the benching operation should be moved sufficiently away from the bench area to allow the geotechnical engineer (testing agency) to properly inspect the area and ascertain that the benching is performed properly.

5. We recommend that the fill be compacted to a minimum of 98% of the Standard Proctor Maximum Dry Density (ASTM Specifications D 698). We recommend that an allowable soil bearing capacity of **1,500 psf** be assumed for design purposes for foundations constructed on structural fill placed in accordance with the recommendations provided in this report.

6. An experienced soil engineering inspector should take adequate density tests throughout the fill placement operation to ensure that the specified compaction is being achieved.

Construction Inspection and Testing

During construction, it is advisable that Matrix Engineering Group inspect the site preparation and construction work in order to ensure that our recommended procedures are followed. The placement of any compacted fill should be inspected and tested. The utilization of acceptable on-site borrow materials, as well as adequate off-site selected fill must be verified.

We understand that the construction will be governed by an IBC 2018 Special Inspections Schedule. Such a schedule should include at a minimum the following earthwork related items:

- Verify materials below shallow foundations are adequate to achieve the design bearing capacity.

- Verify excavations are extended to proper depths and have reached proper material.
- Perform classification and testing of controlled fill materials.
- Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.
- Prior to placement of controlled fill, observe subgrade and verify that the site has been properly prepared.

Matrix Engineering Group, Inc. appreciates the opportunity to have worked with the City of Brookhaven, and looks forward to our continued association. If you have any questions or need further assistance, please do not hesitate to call.

Ashraf I. Abukhalaf, E.I.T.
Project Manager
ashraf@matrixengineeringgroup.com

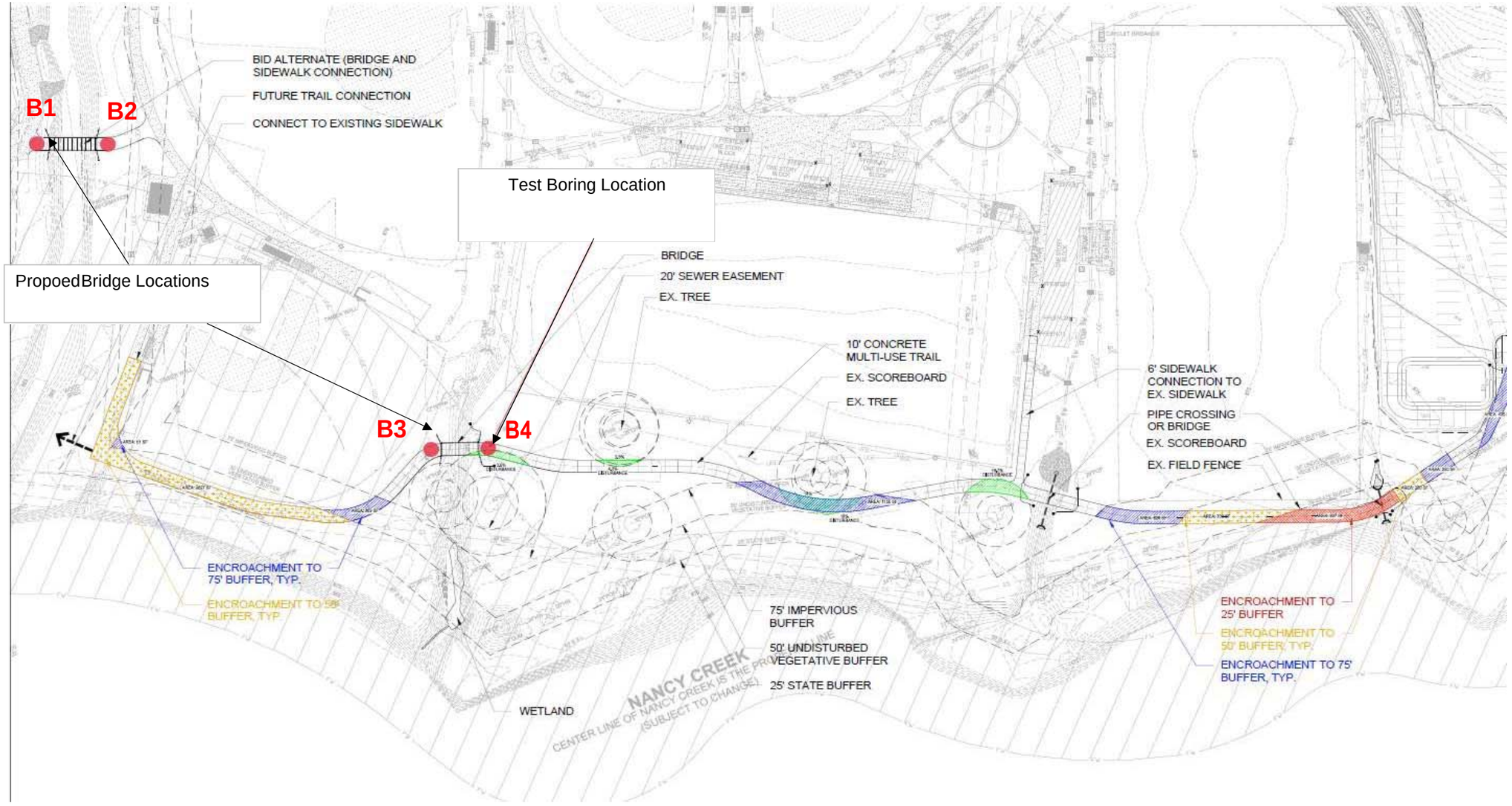
Sam Alyateem, PE
Senior Geotechnical Engineer
Principal
sam@matrixengineeringgroup.com

M:\1.0 MATRIX PROJECTS FOLDER\1.4 CITY OF BROOKHAVEN\Murphey Candler Park Bridge Abutments\1.0 GEOTECHNICAL - MEG 302331\Report\Murphey Candler Park Bridge abutments

APPENDIX

Test Boring Locations Plan

Soil Boring Logs


B1
B2
B3
B4
Test Boring Location
Propoed Bridge Locations
BID ALTERNATE (BRIDGE AND SIDEWALK CONNECTION)
FUTURE TRAIL CONNECTION
CONNECT TO EXISTING SIDEWALK
BRIDGE
20' SEWER EASEMENT
EX. TREE
10' CONCRETE MULTI-USE TRAIL
EX. SCOREBOARD
EX. TREE
6' SIDEWALK CONNECTION TO EX. SIDEWALK
PIPE CROSSING OR BRIDGE
EX. SCOREBOARD
EX. FIELD FENCE
ENCROACHMENT TO 75' BUFFER, TYP.
ENCROACHMENT TO 50' BUFFER, TYP.
75' IMPERVIOUS BUFFER
50' UNDISTURBED VEGETATIVE BUFFER
25' STATE BUFFER
WETLAND
NANCY CREEK
CENTER LINE OF NANCY CREEK (IS THE PROPERTY LINE (SUBJECT TO CHANGE))
ENCROACHMENT TO 25' BUFFER
ENCROACHMENT TO 50' BUFFER, TYP.
ENCROACHMENT TO 75' BUFFER, TYP.

MATRIX ENGINEERING GROUP, INC.
Geotechnical, Environmental & Construction Materials Consultants

DRILL HOLE LOG

BORING NO. B1

File: Murphey Candler Park Date Printed: 12/4/2019

PROJECT: Murphey Candler Park Bridge Abutments **PROJECT NO.:** 302331
CLIENT: City of Brookhaven **DATE:** 11/22/2019
LOCATION: Western Bank of Northwestern Bridge **ELEVATION:**
DRILLER: Matrix Engineering Group **LOGGED BY:** Ashraf Abukhalaf, EIT
DRILLING METHOD: ASTM STP 399 **STATION:**
DEPTH TO - WATER> INITIAL: ▽ 8.5 **After 48+ Hours:** ▽ **CAVING>** C

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS: Natural Moisture Content (%). Penetration - 10 20 30 40 50	STP 399
	0						
	0.5	**Approximately 7 inches of topsoil.**					2
	1	**FILL - Very Loose, Brown, Silty Sand.**	FILL				
	1.5	**Loose, Brown, Silty Sand, with roots.**					5
	2						
	2.5	**Loose, Light Brown, Silty Sand, with rock fragments.**					6
	3						
	3.5	**Loose, Light Brown, Silty Sand.**					6
	4	**Wet, Firm, Gray, Sandy Silt, with Clay, and roots.**					
	4.5	**Firm, Gray, Silty Clay, with roots.**					7
	5						
	5.5	**Dry, Gray, Silty Clay, with hairline roots.**					5
	6						
	6.5	**Firm, Light Brown, Silty Clay.**					8
	7						
	7.5						
	8	**Stiff, Gray, Sandy Silt.**					15
	8.5 ▽						
	9						
	9.5						
	10	**Boring was terminated at 10.0 ft BGS.**					14
	10.5						
	11						
	11.5						
	12						
	12.5						
	13						

Boring was backfilled with the soil cuttings at the conclusion of drilling.

MATRIX ENGINEERING GROUP, INC.
Geotechnical, Environmental & Construction Materials Consultants

DRILL HOLE LOG

BORING NO. B2

File: Murphey Candler Park Date Printed: 12/4/2019

PROJECT: Murphey Candler Park Bridge Abutments **PROJECT NO.:** 302331
CLIENT: City of Brookhaven **DATE:** 11/22/2019
LOCATION: Eastern Bank of Northwestern Bridge **ELEVATION:**
DRILLER: Matrix Engineering Group **LOGGED BY:** Ashraf Abukhalaf, EIT
DRILLING METHOD: ASTM STP 399 **STATION:**
DEPTH TO - WATER> INITIAL: 8.0 **After 48+ Hours:** **CAVING>** C

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS: Natural Moisture Content (%). Penetration - 10 20 30 40 50	STP 399
	0						
	0.5	**Approximately 7 inches of topsoil.**					5
	1	**FILL - Loose, Brown, Silty Sand.**	FILL				
	1.5	**Loose, Brown, Silty Sand, with occasional roots.**					6
	2						
	2.5						
	3	**Medium Dense, Clean, Yellowish Orange, Silty Sand.**					15+
	3.5						
	4						
	4.5						
	5						
	5.5						9
	6						
	6.5	**Firm, Gray, Clayey Silt, with roots.**					6
	7						
	7.5						
	8						8
	8.5						
	9						
	9.5						
	10						15+
	10.5	**Boring was terminated at 10.0 ft BGS.**					
	11						
	11.5						
	12						
	12.5						

Boring was backfilled with the soil cuttings at the conclusion of drilling.

Boring was backfilled with the soil cuttings at the conclusion of drilling.

MATRIX ENGINEERING GROUP, INC.
Geotechnical, Environmental & Construction Materials Consultants

DRILL HOLE LOG

BORING NO. B3

File: Murphey Candler Park Date Printed: 12/4/2019

PROJECT: Murphey Candler Park Bridge Abutments **PROJECT NO.:** 302331
CLIENT: City of Brookhaven **DATE:** 11/22/2019
LOCATION: Western Bank of Southern Bridge **ELEVATION:**
DRILLER: Matrix Engineering Group **LOGGED BY:** Ashraf Abukhalaf, EIT
DRILLING METHOD: ASTM STP 399 **STATION:**
DEPTH TO - WATER> INITIAL: **After 48+ Hours:** **CAVING>** C

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS: Natural Moisture Content (%). Penetration - 10 20 30 40 50	STP 399
	0						
	0.5	**Approximately 7-inches of Topsoil.**					4
	1	**Very Loose, Brown, Silty Sand, with roots.**	FILL				10
	1.5						
	2	**Auger Refusal was encountered at 21 inches BGS, possibly due to rock fragments or boulders.**					
	2.5						
	3						
	3.5						
	4						
	4.5						
	5						
	5.5						
	6						
	6.5						
	7						
	7.5						
	8						
	8.5						
	9						
	9.5						
	10						
	10.5						
	11						
	11.5						
	12						
	12.5						
	13						

Groundwater was not encountered within the drilled depths. A total of 6 attempts were made at offset locations, all attempts encountered auger refusal at depths varying from 1 to 2 ft BGS. Boring was backfilled with the soil cuttings at the conclusion of drilling.

MATRIX ENGINEERING GROUP, INC.
Geotechnical, Environmental & Construction Materials Consultants

DRILL HOLE LOG

BORING NO. B4

File: Murphey Candler Park Date Printed: 12/4/2019

PROJECT: Murphey Candler Park Bridge Abutments **PROJECT NO.:** 302331
CLIENT: City of Brookhaven **DATE:** 11/22/2019
LOCATION: Eastern Bank of Southern Bridge **ELEVATION:**
DRILLER: Matrix Engineering Group **LOGGED BY:** Ashraf Abukhalaf, EIT
DRILLING METHOD: ASTM STP 399 **STATION:**
DEPTH TO - WATER> INITIAL: **After 48+ Hours:** **CAVING>** C

ELEVATION (feet)	DEPTH (feet)	Description	SOIL TYPE	SOIL SYMBOL	SAMPLERS	TEST RESULTS: Natural Moisture Content (%). Penetration - 10 20 30 40 50	STP 399
	0						
	0.5	**Approximately 7-inches of Topsoil.**					
	1	**Brown, Silty Sand, with roots.**	FILL				
	1.5	**Auger refusal was encountered at 12 inches BGS, possibly due to rock fragments or boulders.**					
	2						
	2.5						
	3						
	3.5						
	4						
	4.5						
	5						
	5.5						
	6						
	6.5						
	7						
	7.5						
	8						
	8.5						
	9						
	9.5						
	10						
	10.5						
	11						
	11.5						
	12						
	12.5						
	13						

Groundwater was not encountered within the drilled depths. A total of 4 attempts were made at offset locations, all attempts encountered auger refusal at approximately 1 ft BGS. Boring was backfilled with the soil cuttings at the conclusion of drilling.

GEORGIA
DEPARTMENT OF NATURAL RESOURCES

ENYIRONMENTALPROTECTION OMSION

Richard E. Dunn, Director

EPD Director's Office
2 Martin Luther King, Jr. Drive
Suite 1456, East Tower
Atlanta, Georgia 30334
404-656-4713

JUN 1 6 2020

Mr. Mark Cain
Clark Patterson Lee (CPL)
3011 Sutton Gate Drive, Suite 130
Suwannee, GA 30024

RE: Request for Variance under Provisions O.C.G.A. 12-7-6(b)(l5)
City of Brookhaven - Murphey Candler Park - South Trail
(1551 West Nancy Creek Drive NE, Brookhaven, GA 30319)
Brookhaven, DeKalb County
File: BV-044-20-06

Dear Mr. Cain:

The Georgia Environmental Protection Division's Watershed Protection Branch has reviewed your stream buffer variance application for the subject project. The review was conducted to consider the potential impacts of the proposed project's encroachment on State waters within the context of the Georgia Erosion and Sedimentation Act. This review, and the variance granted herein, is limited to only the request(s) in the stream buffer variance application for permission to conduct land-disturbing activities within 25-foot areas located immediately adjacent to the banks of State waters where vegetation has been wrested by normal stream flow or wave action. To the extent there is a request in the buffer variance application to conduct land-disturbing activities within 25-foot areas located immediately adjacent to State waters where there is no vegetation that has been wrested by normal stream flow or wave action, such request has not been considered, and is not included as a part of the variance granted herein.

Pursuant to DNR Rule 391-3-7-.05(2)(£), authorization is hereby granted to encroach within the 25-foot buffer adjacent to State waters as delineated in your application dated April 1, 2020 and the revised Erosion, Sedimentation and Pollution Control Plans dated May 8, 2020. ***Buffer impacts autltorized*** *by* ***tit is variance must be completed wit/tin five years of the date of tit is approval letter.*** *If* ***tlte approved buffer impacts cannot be completed prior to tlte expiration date, a time extension must be requested*** *ill* ***writing at least 90 calendar days prior to tlte expiration date with justifiable cause demonstrated.***

Authorization for the above referenced project is subject to the following conditions:

1) All graded slopes 3:1 or greater must be hydroseeded and covered with Georgia DOT approved wood fiber matting or coconut fiber matting. If not hydroseeded, Georgia DOT approved matting that has been incorporated with seed and fertilizer must be used. All slopes must be properly protected until a permanent vegetative stand is established;

2) The amount of land cleared during construction must be kept to a minimum;

3) All disturbed areas must be seeded, fertilized and mulched as soon as the final grade is achieved. Also, these disturbed areas must be protected until permanent vegetation is established;

4) A double row of Georgia DOT type "C" silt fence or an approved high performance silt fence must be installed between the land disturbing activities and State waters where appropriate;

5) Buffer variance conditions must be incorporated into any Land Disturbing Activity Permit issued by the City of Brookhaven for this project;

6) This project must be conducted in strict adherence to the approved erosion and sedimentation control plan and any Land Disturbing Activity Permit issued by the City of Brookhaven; and

7) In accordance with the EPD Buffer Mitigation Guidance document, the City of Brookhaven will purchase 268 stream mitigation credits from an approved mitigation bank located within the primary service area of the proposed project. Stream mitigation credits must be purchased at least 14 days prior to any land disturbance on site and the sale receipts verifying the transactions must be forwarded to the EPD by return receipt certified mail or similarservice.

The granting of this approval does not relieve you of any obligation or responsibility for complying with the provisions of any other law or regulations of any federal, local or additional State authority, nor does it obligate any of the aforementioned to permit this project if they do not concur with its concept of development/control. As a delegated "Issuing Authority," the City of Brookhaven is expected to ensure that the stream buffer variance requirements are met for this project and is empowered to be more restrictive in this regard.

If you have questions concerning this letter, please contact Frank M. Carubba, Erosion and Sedimentation Control Unit, NonPoint Source Program, at (404) 651-8550.

Sincerely,

Richard E. Dunn
Director

RED:fmc

cc: John Arthur Ernst, Jr., Mayor, City of Brookhaven
Jim Hakala, Wildlife Resources Division, Region 1 Fisheries Management
Torren Hoyord, CE, WPIT, Corblu Ecology Group, LLC
Ben Ruzowicz, Georgia Soil and Water Conservation Commission
Christian Sigman, City Manager, City of Brookhaven
Mick Smith, EPD Mountain District - Atlanta
Richard W. Whiteside, PhD, CWB, CSE, Corblu Ecology

File: BV-044-20-06

Special Flood Hazard Area Report: Floodway Encroachment Analysis

For

MURPHEY CANDLER PARK PROJECTS
CITY OF BROOKHAVEN
4051 CANDLER LAKE W
Brookhaven, GA 30319
Dekalb County, GA

August 12, 2020

Prepared by:

ARCHITECTURE
ENGINEERING
PLANNING
CPLteam.com

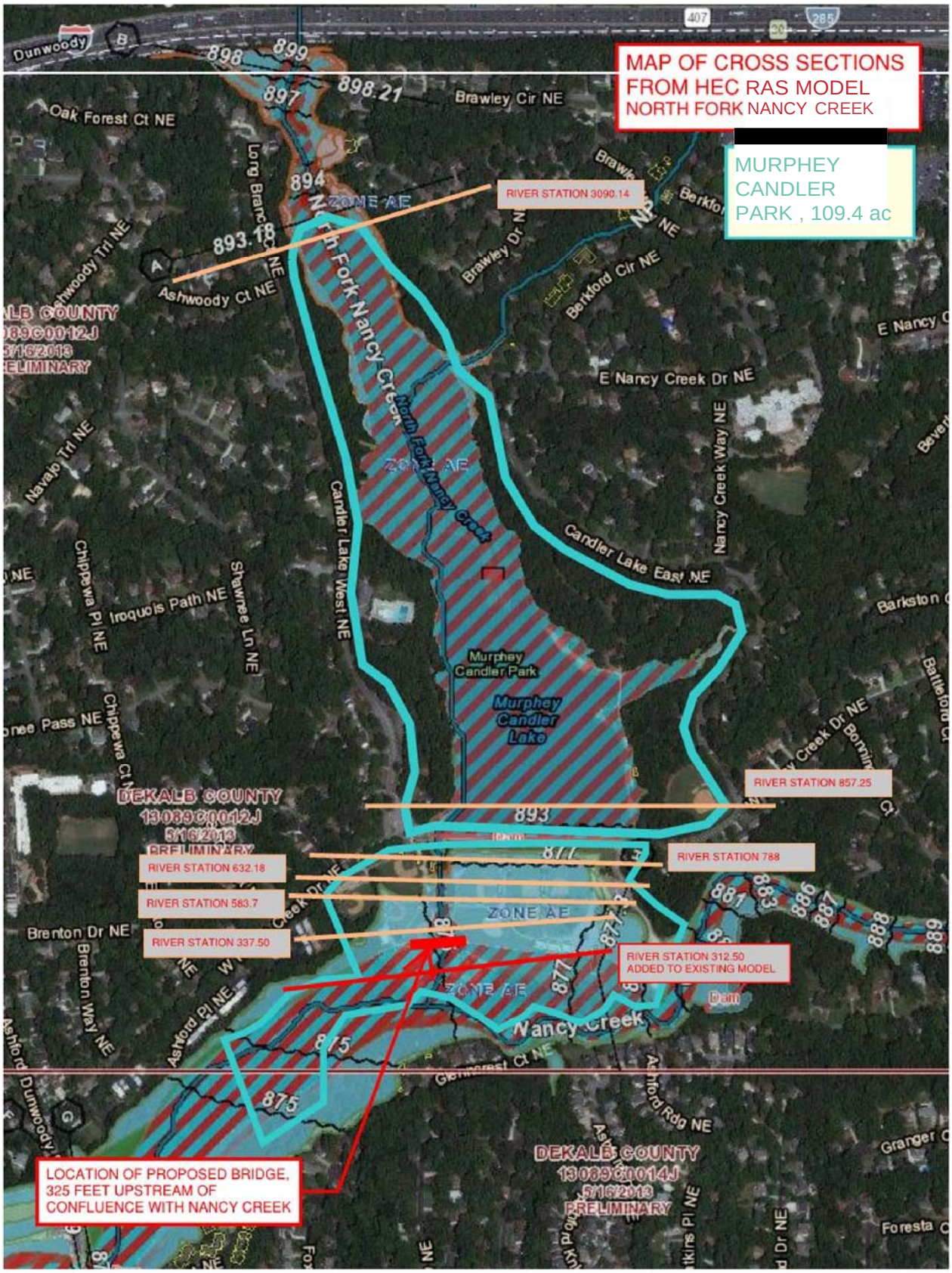
3011 Sutton Gate Drive
Suite 130
Suwanee, Georgia 30024
800.274.9000
770.831-9243 (Fax)
CPL Project Number 15092.00

OVERVIEW

The City of Brookhaven proposes to construct a series of projects on the existing Murphey Candler Park owned by the City of Brookhaven. They consist of seven projects throughout the two parcels which total 109.4 acres. Within the two parcels are two significant stream channels that are designated as Special Hazard Flood Areas (SFHAs), Nancy Creek and the North Fork of Nancy Creek.

A component of the seven projects is the proposal to build a utility bridge over the North Fork of Nancy Creek, downstream of Murphey Candler Lake. In accord with Sec 14-794(2) of the city code, encroachments for bridges in the floodway may be permitted provided it is demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the encroachment shall not result in any increase to the pre-project base flood elevations, floodway elevations, or floodway widths during the base flood (the one percent chance, or "100 year flood", per Sec 14-733) discharge. This report is prepared in order to demonstrate that compliance, also called a "No-Rise" certification.

The location of the proposed bridge crossing is on the North Fork of Nancy Creek, about 325 feet upstream from its confluence with Nancy Creek.


MAP OF CROSS SECTIONS
FROM HEC RAS MODEL
NORTH FORK NANCY CREEK
MURPHEY
CANDLER
PARK , 109.4 ac
RIVER STATION 3090.14
RIVER STATION 857.25
RIVER STATION 788
RIVER STATION 632.18
RIVER STATION 583.7
RIVER STATION 337.50
RIVER STATION 312.50
ADDED TO EXISTING MODEL
LOCATION OF PROPOSED BRIDGE,
325 FEET UPSTREAM OF
CONFLUENCE WITH NANCY CREEK
DEKALB COUNTY
13089C0012J
5/16/2013
PRELIMINARY
DEKALB COUNTY
13089C0014J
5/16/2013
PRELIMINARY
ZONE AE
North Fork Nancy Creek
Murphey Candler Park
Murphey Candler Lake
Nancy Creek
Dam
Dunwoody
Oak Forest Ct NE
Brawley Cir NE
Long Branch Dr NE
Ashwoody Ct NE
Ashwoody Trl NE
Brawley Dr NE
Berkford Cir NE
E Nancy Creek Dr NE
Nancy Creek Way NE
Navajo Trl NE
Chippewa Pl NE
Iroquois Path NE
Shawnee Ln NE
Candler Lake West NE
Candler Lake East NE
Brenton Dr NE
Brenton Way NE
Ashford Pl NE
Ashford Rdg NE
Glenforest Ct NE
Granger
Foresta
898
899
898.21
897
894
893.18
893
877
875
881
883
886
887
888

APPROACH

Both Nancy Creek and the North Fork of Nancy Creek are designated as Zone AE. This means that hydrologic and hydraulic studies have been performed. In this case, the data emanates from HEC-RAC models prepared by FEMA vendors. These models were made available for the purpose of this report.

Three models are necessary to be employed to be able to make the proper determination:

1. The existing model as provided by the FEMA vendor.
2. A 'corrected existing' model which adds the necessary cross section where the bridge will be located, as the first river station on the North Fork of Nancy Creek where there is a modeled cross section is upstream of the proposed location for the bridge, and would otherwise generate an error message in the simulation run.
3. A proposed model with cross sections that model the proposed bridge.

As mentioned in describing the corrective effective model, the first river station on the North Fork of Nancy Creek is located 337 feet upstream from the stream's mouth, which is its confluence with Nancy Creek. Because of this, a cross section would need to be added downstream of this river station and the proposed location of the bridge. This cross section was located at a point 312 feet upstream from the mouth of the stream. The water surface elevations generated by this corrected effective model would be the elevations by which the no rise determination would be made.

For the steady flow data in the existing model of the North Fork of Nancy Creek (NFNC), the reach boundary condition used was normal depth at a slope of 0.00057. Given that the water surface elevations of the Nancy Creek Main Channel (NCM) model are much higher than the water surface elevations generated in the NFNC model, the corrected effective model uses a reach boundary condition of the water surface elevations from the NCM model at the river station (cross section) where the confluence with NFNC is located.

River Station 11098.7 of Nancy Creek Main Channel -confluence with North Fork Nancy Creek

Storm Frequency	Water Surface Elevation
Base Flood –one percent annual chance "100 year"	874.04
Future Conditions 100 year	874.10

The HEC – RAS model had both the base flows plan, without encroachments, which modeled the future conditions flows, and the floodway plan, which established the floodway width and water surface elevations of the floodway. Both of these plans were applied to the corrected existing model and the proposed model created as part of this analysis to calculate the SFHA characteristics necessary to determine compliance.

RESULTS

The following table summarizes the results of the three HEC RAS model simulations and the two plans, the base flows plan and the floodway flows plan.

River Station (cross section)	SFHA Characteristics	Existing Model	Corrective Effective Model	Proposed Model	Notes
312.5	Base Flood (100 yr) Water surface elevation	Not in model	874.04	874.04	Downstream of proposed bridge location
	Floodway Width		200	200	
	Floodway WS elev.		874.04	874.04	
	Future Cond. 100 yr Water surface elevation		874.10	874.10	
337.5	Base Flood (100 yr)	872.11	874.04	874.04	Upstream of proposed bridge location
	Floodway Width	200	200	200	
	Floodway WS elev.	872.77	874.04	874.05	
	Future Conds. 100 yr	872.11	874.10	874.10	
583.7	Base Flood (100 yr)	872.09	874.03	874.04	Downstream of existing ped bridge location
	Floodway Width	48	48	48	
	Floodway WS elev.	872.79	874.03	874.00	
	Future Conds. 100 yr	872.09	874.10	874.10	
632.18	Base Flood (100 yr)	872.82	874.25	874.25	Upstream of existing ped bridge location
	Floodway Width	36	36	36	
	Floodway WS elev.	873.34	874.34	874.35	
	Future Conds. 100 yr	872.82	874.30	874.30	
788	Base Flood (100 yr)	889.20	889.20	889.20	Downstream of W Nancy Creek Dr / Murphey Candler Lake Dam
	Floodway Width	50	50	50	
	Floodway WS elev.	889.19	889.19	889.19	
	Future Conds. 100 yr	889.20	889.20	889.20	
857.25	Base Flood (100 yr)	892.53	892.53	892.53	Upstream of W Nancy Creek Dr / Murphey Candler Lake Dam At spillway of lake
	Floodway Width	66	66	66	
	Floodway WS elev.	892.52	892.52	892.52	
	Future Conds. 100 yr	892.53	892.53	892.53	
3090.14	Base Flood (100 yr)	893.17	893.17	893.17	Upstream point of Parcel Boundary
	Floodway Width	484	484	484	
	Floodway WS elev.	893.17	893.17	893.17	
	Future Conds. 100 yr	893.17	893.17	893.17	

These results show that the proposed bridge installation does not result in an increase in the base flood and floodway water surface elevations of more than 0.01 feet, in accord with the general standards of Sec 14-792(b)(4). Also, the floodway widths remain unchanged.

APPENDIX

BRIDGE DETAILS AND PROFILE

CALCULATION PRINTOUTS

Existing Model
- Water Surface Elevation
- Floodway Encroachments Results
- River Station Cross Sections

Corrective Existing Model
- Water Surface Elevation
- Floodway Encroachments Results
- River Station Cross Sections

Proposed Condition Model
- Water Surface Elevation
- Floodway Encroachments Results
- River Station Cross Sections

NOTE: REFER TO SHEET C8.5C1 FOR ABUTMENT DETAILS.

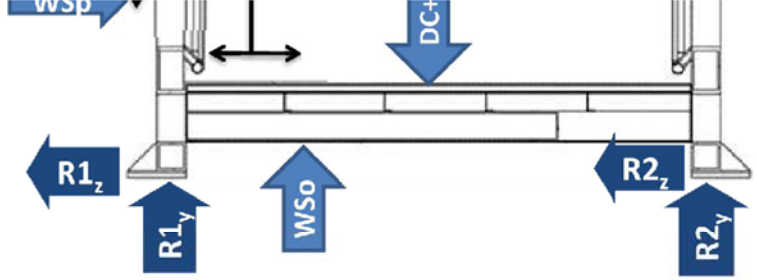
DRAWINGS SCHEDULE		
No.	Date	Description
1	04/20	LDP - South Trail
2	05/05	State Buffer Comments - South Trail
3	05/05	LDP - Natural Play Area
4	05/07	LDP - South Trail - Rev #1
5	05/28	LDP - Natural Play Area - Rev #1
6	06/18	Wetland Boardwalk Design-Build
7	06/28	LDP - Natural Play Area - Rev #2
8	06/30	LDP - Horseshoe Road
9	07/07	LDP - Community Green
10	07/10	LDP - Pool Parking
11	07/23	SDP - MULTIUSE TRAIL ON DAM

CITY OF BROOKHAVEN

MURPHEY CANDLER PARK

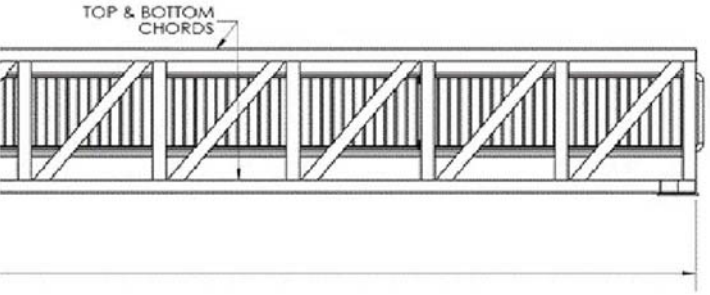
1551 W. NANCY CREEK DRIVE NE

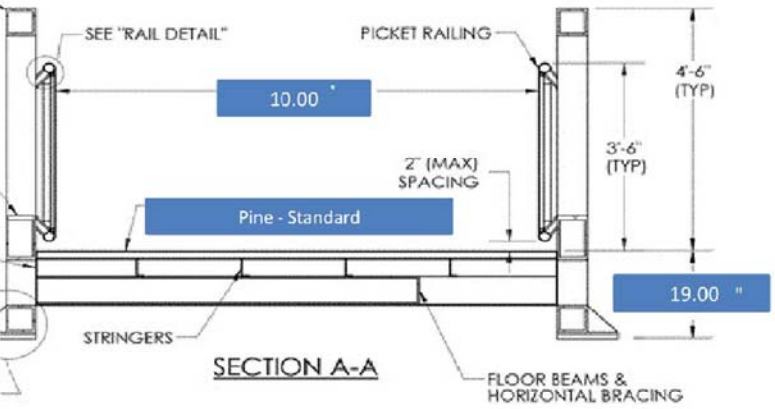
BROOKHAVEN, GEORGIA 30319



* ALL DIMENSIONS, CONFIGURATIONS, AND MEMBERS SHOWN ARE STANDARD AND MAY VARY. CUSTOM OPTIONS ARE AVAILABLE.

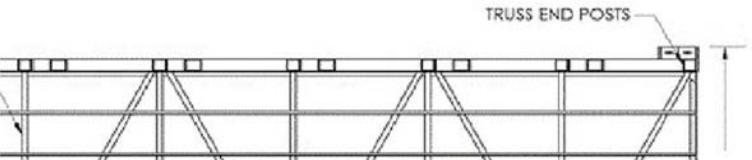
Options Not Shown:	
Guard Rail	42" Combination
Color/Texture	Mill Finish Aluminum
Grab Rail	NO
Toe Rail	NO
Top Chord Cladding	NO
Rub Rails	NO
Accent Lighting	NO
Enclosures & Fencing	NO
Additional Camber	NO
Skew & Incline	NO
Mid-span Splice (qty)	0





SECTION A-A

NOTE:
CONTRACTOR SHALL CONTACT GATOR BRIDGE TO DEVELOP THE FINAL SHOP DRAWINGS FOR PROPOSED BRIDGE. DRAWINGS SHALL BE STAMPED BY PROFESSIONAL ENGINEER IN GEORGIA. SHOP DRAWINGS SUBMITTED FOR APPROVAL PRIOR TO ORDERING THE BRIDGE.



GATOR Bridge
2880 MELLONVILLE AVE. SANFORD, FL 32773
800/256-8857 407/323-0190

ESTIMATED LOADS AND GEOMETRY ARE PRELIMINARY, AND ARE NOT FOR CONSTRUCTION. FINAL LOADS AND GEOMETRY MAY VARY.

DRAWINGS SCHEDULE

No.	Date	Description
1	04/20	LDP - South Trail
2	05/05	State Buffer Comments - South Trail
3	05/05	LDP - Natural Play Area
4	05/07	LDP - South Trail - Rev #1
5	05/28	LDP - Natural Play Area - Rev #1
6	06/18	Wetland Boardwalk Design-Build
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9	07/07	LDP - Community Green
10	07/10	LDP - Pool Parking
11	07/23	SDP - MULTIUSE TRAIL ON DAM

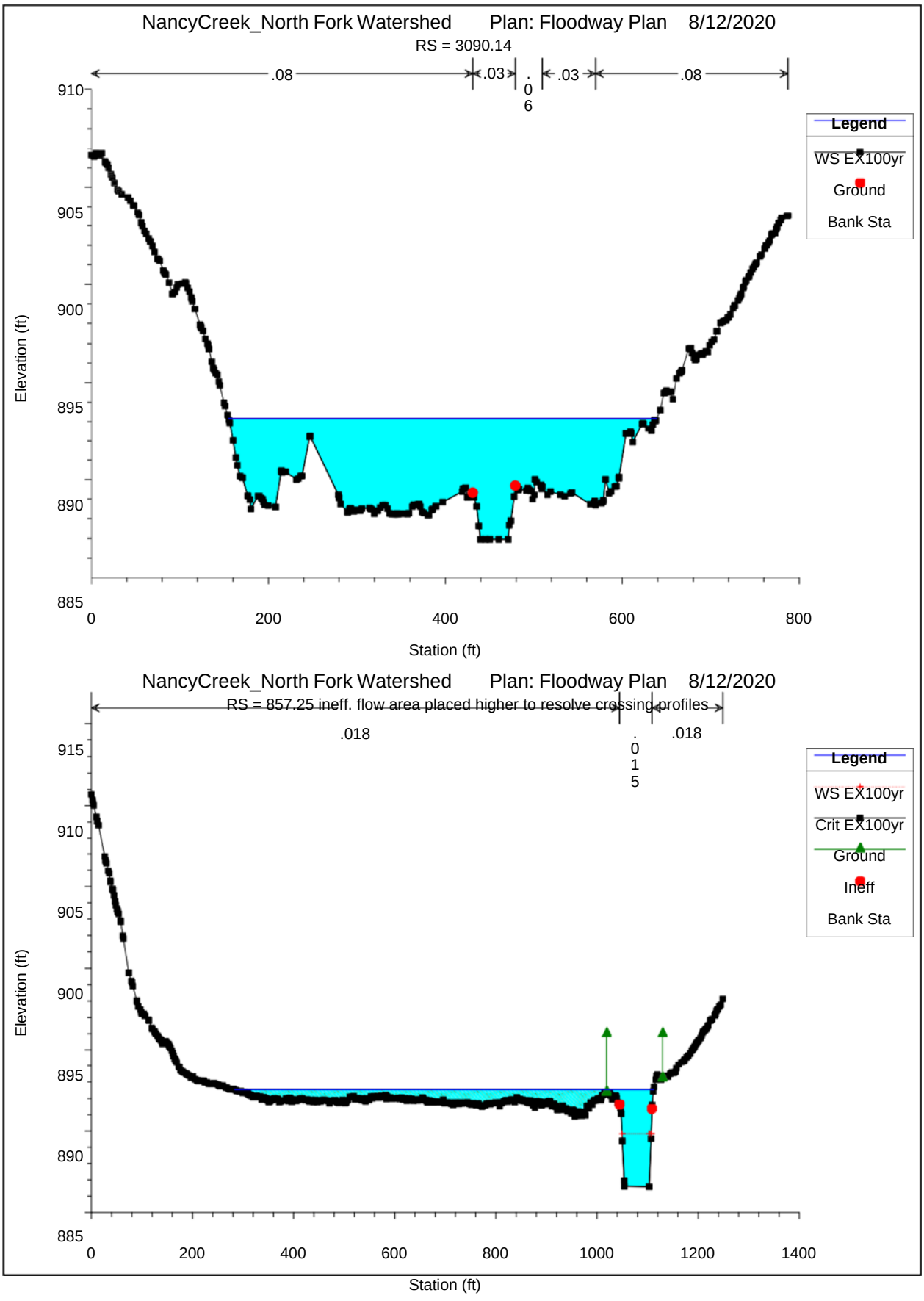
CITY OF BROOKHAVEN
MURPHEY CANDLER PARK
1551 W. NANCY CREEK DRIVE NE
BROOKHAVEN, GEORGIA 30319

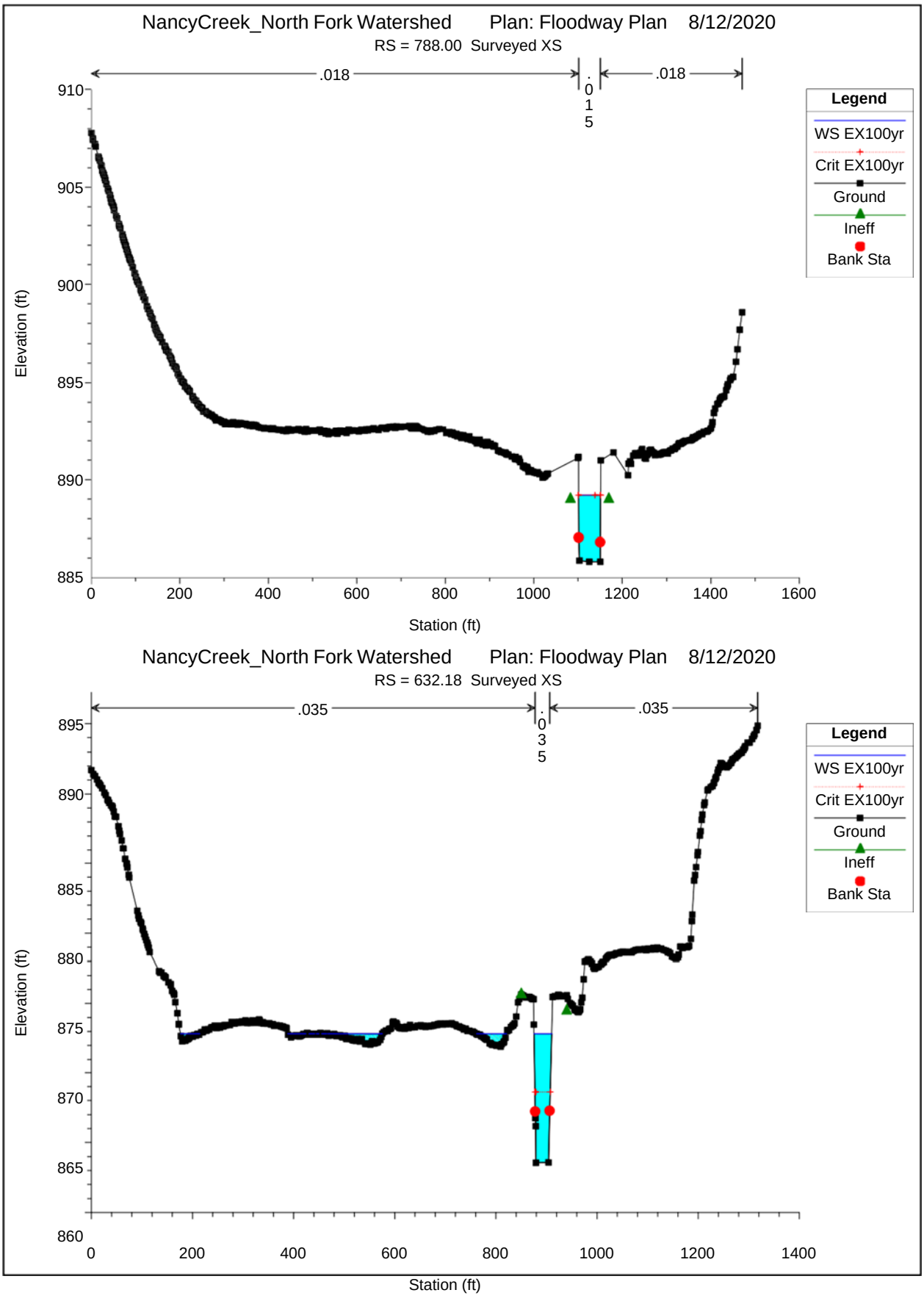
HEC-RAS Plan: EX River: NForkNancyCk Reach: NForkNancyCk

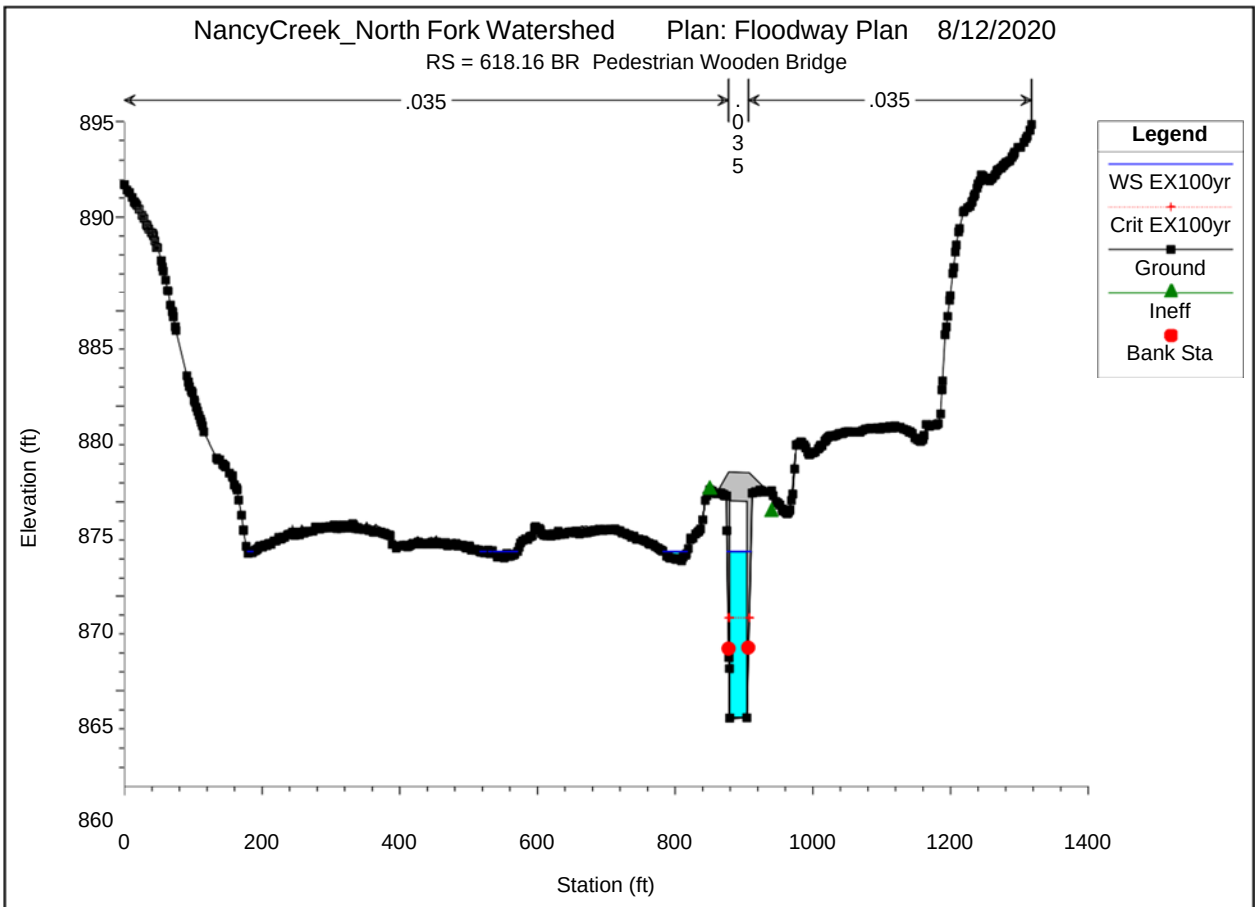
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NForkNancyCk	3090.14 1019	EX100yr	3672.90	886.95	893.17		893.30	0.000768	4.35	1832.25	483.73	0.32
NForkNancyCk	3090.14 1019	FU100yr	3672.90	886.95	893.17		893.30	0.000768	4.35	1832.25	483.73	0.32
NForkNancyCk	2533.68 148	EX100yr	3982.50	886.15	893.06		893.11	0.000165	2.18	2384.94	420.37	0.15
NForkNancyCk	2533.68 148	FU100yr	3982.50	886.15	893.06		893.11	0.000165	2.18	2384.94	420.37	0.15
NForkNancyCk	1583.69 1020	EX100yr	3982.50	886.74	893.03		893.04	0.000030	0.92	4484.29	822.16	0.06
NForkNancyCk	1583.69 1020	FU100yr	3982.50	886.74	893.03		893.04	0.000030	0.92	4484.29	822.16	0.06
NForkNancyCk	1055.13 1185	EX100yr	3982.50	886.76	893.02		893.03	0.000020	0.76	5366.29	910.20	0.05
NForkNancyCk	1055.13 1185	FU100yr	3982.50	886.76	893.02		893.03	0.000020	0.76	5366.29	910.20	0.05
NForkNancyCk	868.96 1026	EX100yr	3982.50	886.61	892.99		893.02	0.000203	2.35	3861.20	939.49	0.17
NForkNancyCk	868.96 1026	FU100yr	3982.50	886.61	892.99		893.02	0.000203	2.35	3861.20	939.49	0.17
NForkNancyCk	857.25 1027	EX100yr	1705.90	886.58	892.53	889.83	892.91	0.000292	4.97	354.02	828.04	0.38
NForkNancyCk	857.25 1027	FU100yr	1705.90	886.58	892.53	889.83	892.91	0.000292	4.97	354.02	828.04	0.38
NForkNancyCk	847.18 1276		Bridge									
NForkNancyCk	838.76 1023	EX100yr	1705.90	885.83	892.49	889.23	892.90	0.000236	5.18	341.41	216.92	0.35
NForkNancyCk	838.76 1023	FU100yr	1705.90	885.83	892.49	889.23	892.90	0.000236	5.18	341.41	216.92	0.35
NForkNancyCk	822.29 1022		Bridge									
NForkNancyCk	788.00 1024	EX100yr	1705.90	885.81	889.20	889.20	890.86	0.002244	10.34	165.66	49.85	1.00
NForkNancyCk	788.00 1024	FU100yr	1705.90	885.81	889.20	889.20	890.86	0.002244	10.34	165.66	49.85	1.00
NForkNancyCk	656.39 1031	EX100yr	1705.90	872.19	878.32	878.32	879.71	0.001009	10.04	290.65	881.09	0.72
NForkNancyCk	656.39 1031	FU100yr	1705.90	872.19	878.32	878.32	879.71	0.001009	10.04	290.65	881.09	0.72
NForkNancyCk	632.18 1029	EX100yr	1705.90	863.55	872.82	868.62	873.46	0.001495	6.44	276.91	304.07	0.38
NForkNancyCk	632.18 1029	FU100yr	1705.90	863.55	872.82	868.62	873.46	0.001495	6.44	276.91	304.19	0.38
NForkNancyCk	618.16 1028		Bridge									
NForkNancyCk	583.70 1030	EX100yr	1705.90	864.12	872.09		872.71	0.002223	6.78	292.30	99.22	0.43
NForkNancyCk	583.70 1030	FU100yr	1705.90	864.12	872.09		872.71	0.002223	6.78	292.34	99.28	0.43
NForkNancyCk	337.49 1033	EX100yr	1705.90	861.96	872.11	868.91	872.19	0.000570	3.18	870.80	743.89	0.20
NForkNancyCk	337.49 1033	FU100yr	1705.90	861.96	872.11	868.91	872.19	0.000570	3.18	870.80	743.89	0.20

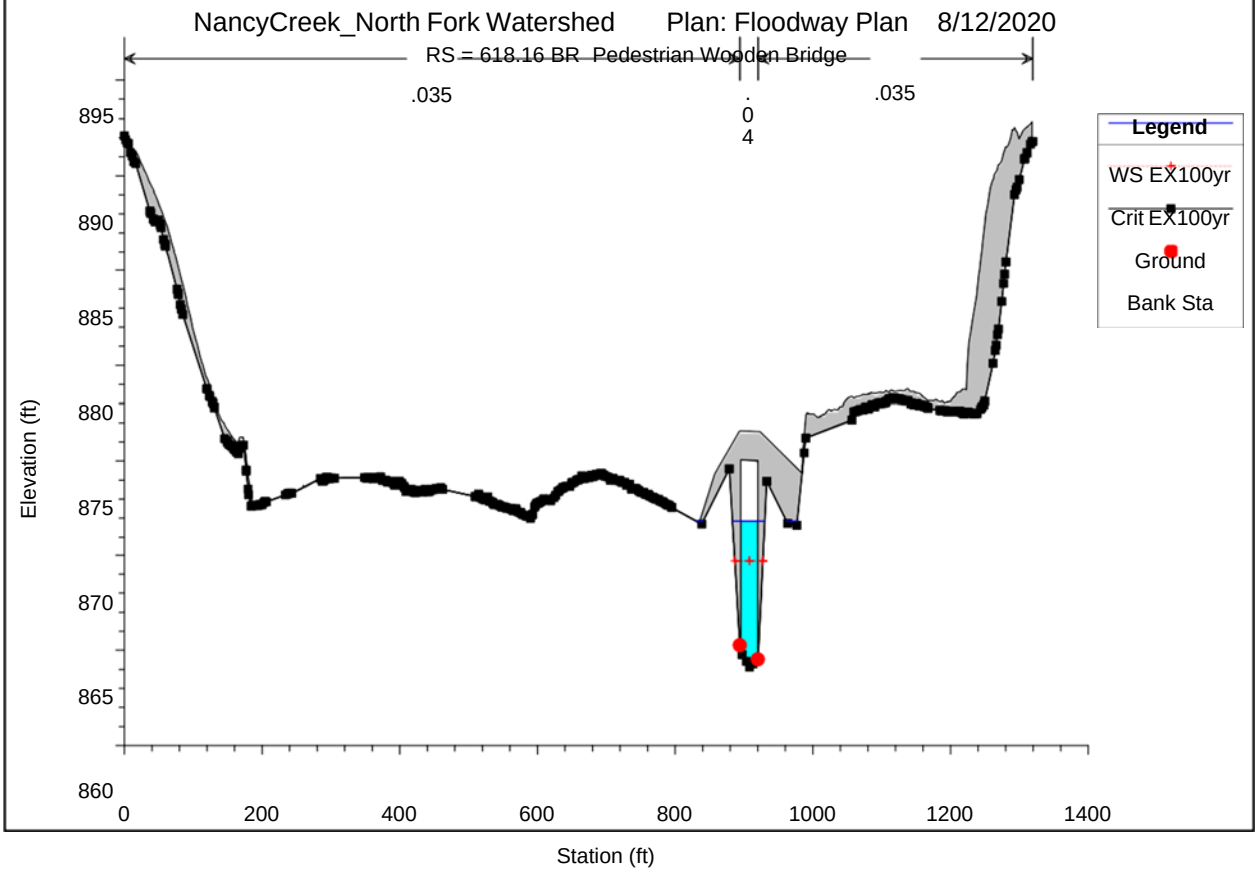
HEC-RAS Plan: FW River: NForkNancyCk Reach: NForkNancyCk

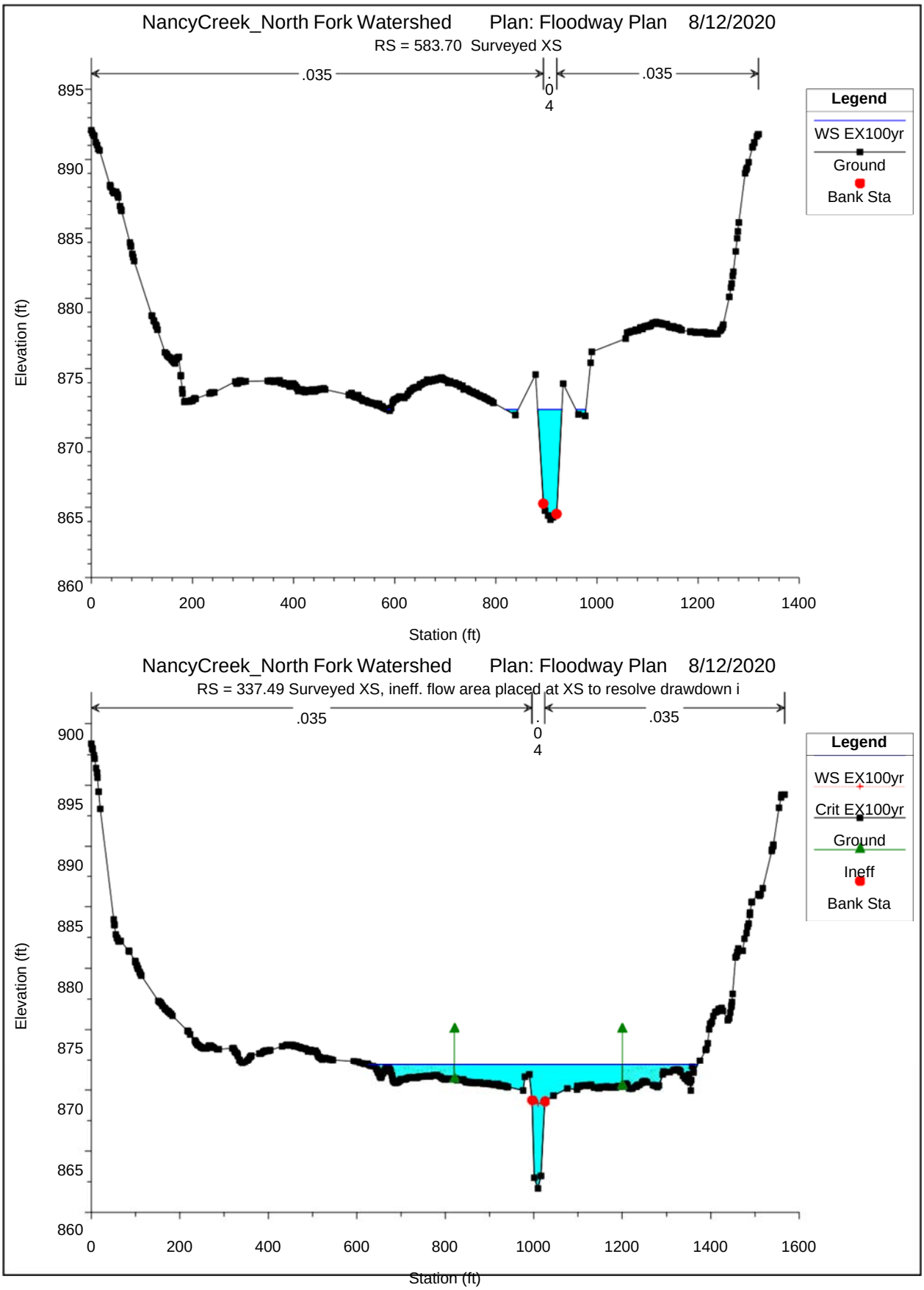
Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
			(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
NForkNancyCk	3090.14 1019	EX100yr	893.17		893.30	483.73	1344.84	1200.52	1127.54		431.09	479.17	
NForkNancyCk	3090.14 1019	FW	893.17	0.00	893.30	483.79	1345.00	1200.09	1127.82	154.99	431.09	479.17	638.78
NForkNancyCk	2533.68 148	EX100yr	893.06		893.11	420.37	682.15	584.83	2715.52		236.45	278.50	
NForkNancyCk	2533.68 148	FW	893.06	0.00	893.11	420.40	682.15	584.80	2715.55	114.71	236.45	278.50	535.11
NForkNancyCk	1583.69 1020	EX100yr	893.03		893.04	822.16	45.81	3929.25	7.45		506.98	1189.35	
NForkNancyCk	1583.69 1020	FW	893.04	0.00	893.05	822.25	45.97	3929.08	7.45	382.05	506.98	1189.35	1204.31
NForkNancyCk	1055.13 1185	EX100yr	893.02		893.03	910.20	34.24	3941.10	7.16		184.52	1014.56	
NForkNancyCk	1055.13 1185	FW	893.03	0.00	893.03	910.32	34.30	3941.03	7.17	122.18	184.52	1014.56	1032.50
NForkNancyCk	868.96 1026	EX100yr	892.99		893.02	939.49	3079.82	896.46	6.22		1042.00	1104.09	
NForkNancyCk	868.96 1026	FW	892.99	0.00	893.02	936.82	3080.41	895.73	6.37	177.88	1042.00	1104.09	1114.70
NForkNancyCk	857.25 1027	EX100yr	892.53		892.91	92.93	10.24	1694.66	0.99		1044.53	1109.03	
NForkNancyCk	857.25 1027	FW	892.52	-0.01	892.91	66.35		1704.82	1.08	1044.53	1044.53	1109.03	1110.88
NForkNancyCk	847.18 1276 BR U	EX100yr	892.51		892.90	72.64	0.06	1705.33	0.51		1044.53	1109.03	
NForkNancyCk	847.18 1276 BR U	FW	892.52	0.00	892.91	64.29		1705.38	0.52	1044.53	1044.53	1109.03	1110.88
NForkNancyCk	847.18 1276 BR D	EX100yr	892.49		892.90	57.02	31.90	1672.61	1.39		1099.08	1148.00	
NForkNancyCk	847.18 1276 BR D	FW	892.49	0.00	892.90	57.14	31.99	1672.52	1.39	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	838.76 1023	EX100yr	892.49		892.90	56.97	31.90	1672.62	1.39		1099.08	1148.00	
NForkNancyCk	838.76 1023	FW	892.49	0.00	892.90	57.10	31.90	1672.61	1.39	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	822.29 1022 BR U	EX100yr	892.49		892.90		37.17	1667.55	1.20		1099.08	1148.00	
NForkNancyCk	822.29 1022 BR U	FW	890.71	-1.78	892.90		37.11	1667.59	1.20	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	822.29 1022 BR D	EX100yr	892.48		892.49	5.64	0.30	1702.28	3.34		1101.16	1150.35	
NForkNancyCk	822.29 1022 BR D	FW	889.57	-2.91	891.33	46.25	0.09	1703.88	1.93	1100.98	1101.16	1150.35	1151.34
NForkNancyCk	788.00 1024	EX100yr	889.20		890.86	49.85	0.05	1704.73	1.12		1101.16	1150.35	
NForkNancyCk	788.00 1024	FW	889.19	-0.01	890.86	49.85	0.05	1704.74	1.11	1100.98	1101.16	1150.35	1151.34
NForkNancyCk	656.39 1031	EX100yr	878.32		879.71	154.97	87.62	1502.48	115.80		1004.61	1029.64	
NForkNancyCk	656.39 1031	FW	878.35	0.03	879.71	154.99	85.92	1499.00	120.98	978.34	1004.61	1029.64	1133.33
NForkNancyCk	632.18 1029	EX100yr	872.82		873.46	35.17	13.24	1669.02	23.65		877.89	906.64	
NForkNancyCk	632.18 1029	FW	873.34	0.51	873.90	35.71	15.21	1663.47	27.22	875.09	877.89	906.64	910.80
NForkNancyCk	618.16 1028 BR U	EX100yr	872.40		873.34	24.83		1705.90			877.89	906.64	
NForkNancyCk	618.16 1028 BR U	FW	872.97	0.57	873.80	24.83		1705.90		875.09	877.89	906.64	910.80
NForkNancyCk	618.16 1028 BR D	EX100yr	871.84		873.17	29.95	0.10	1705.80			893.92	920.60	
NForkNancyCk	618.16 1028 BR D	FW	872.57	0.73	873.67	24.83		1705.90		882.74	893.92	920.60	930.87
NForkNancyCk	583.70 1030	EX100yr	872.09		872.71	99.19	157.55	1380.17	168.18		893.92	920.60	
NForkNancyCk	583.70 1030	FW	872.79	0.70	873.30	48.13	172.21	1358.08	175.62	882.74	893.92	920.60	930.87
NForkNancyCk	337.49 1033	EX100yr	872.11		872.19	380.00	393.85	724.94	587.11		996.06	1024.61	
NForkNancyCk	337.49 1033	FW	872.77	0.66	872.88	200.00	412.65	827.53	465.72	900.00	996.06	1024.61	1100.00


NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 3090.14
.08
.03
.06
.03
.08
Legend
WS EX100yr
Ground
Bank Sta
Elevation (ft)
910
905
900
895
890
885
0
200
400
600
800
Station (ft)
NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 857.25 ineff. flow area placed higher to resolve crossing profiles
.018
.018
.015
Legend
WS EX100yr
Crit EX100yr
Ground
Ineff
Bank Sta
Elevation (ft)
915
910
905
900
895
890
885
0
200
400
600
800
1000
1200
1400
Station (ft)


NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 788.00 Surveyed XS
.018
.015
.018
Legend
WS EX100yr
Crit EX100yr
Ground
Ineff
Bank Sta
Elevation (ft)
910
905
900
895
890
885
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 632.18 Surveyed XS
.035
.035
.035
Legend
WS EX100yr
Crit EX100yr
Ground
Ineff
Bank Sta
Elevation (ft)
895
890
885
880
875
870
865
860
0
200
400
600
800
1000
1200
1400
Station (ft)


NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 618.16 BR Pedestrian Wooden Bridge
.035
.035
.035
Legend
WS EX100yr
Crit EX100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
895
890
885
880
875
870
865
860
0
200
400
600
800
1000
1200
1400


NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 618.16 BR Pedestrian Wooden Bridge
.035
.035
.035
Legend
WS EX100yr
Crit EX100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
895
890
885
880
875
870
865
860
0
200
400
600
800
1000
1200
1400

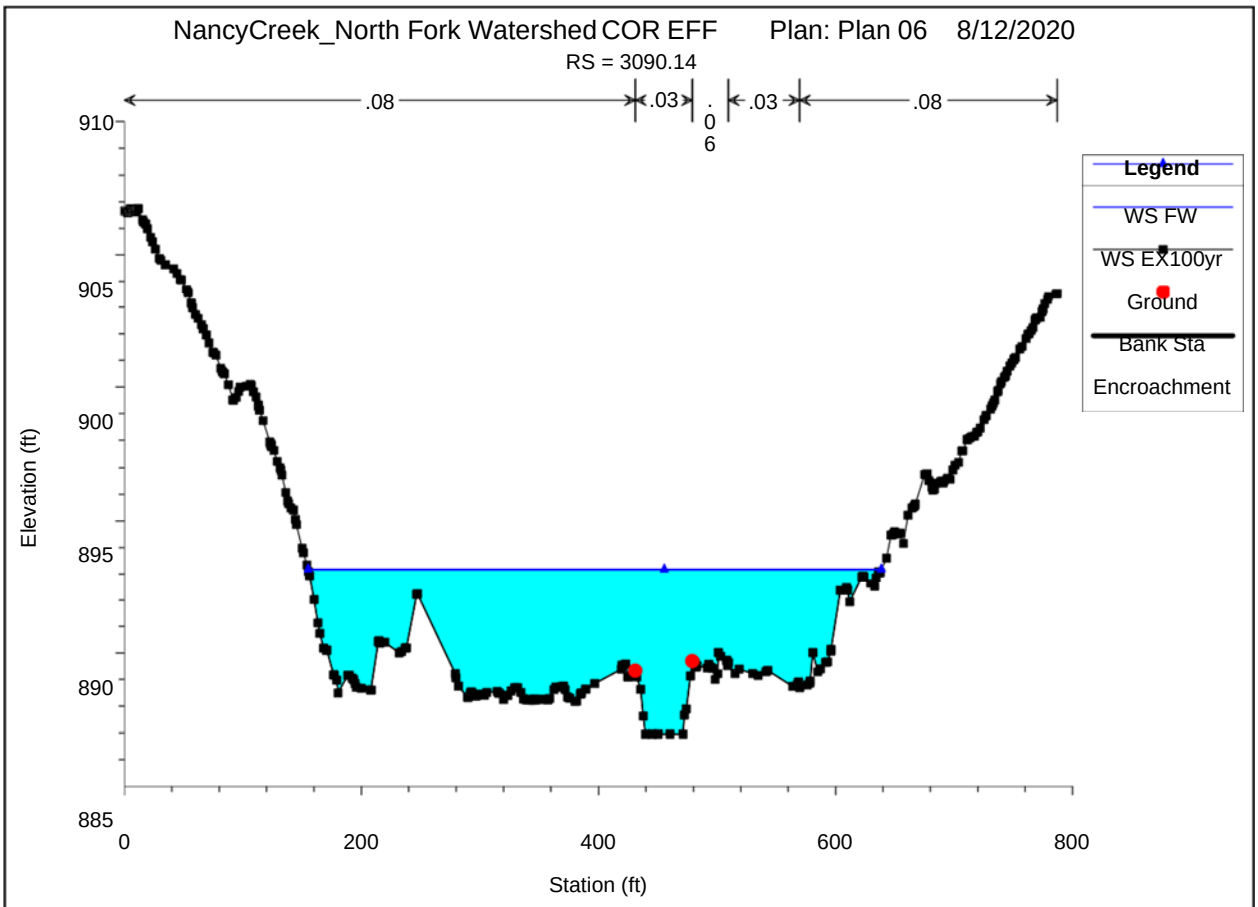

NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 583.70 Surveyed XS
.035
.035
.04
Legend
WS EX100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
NancyCreek_North Fork Watershed Plan: Floodway Plan 8/12/2020
RS = 337.49 Surveyed XS, ineff. flow area placed at XS to resolve drawdown i
.035
.035
.04
Legend
WS EX100yr
Crit EX100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

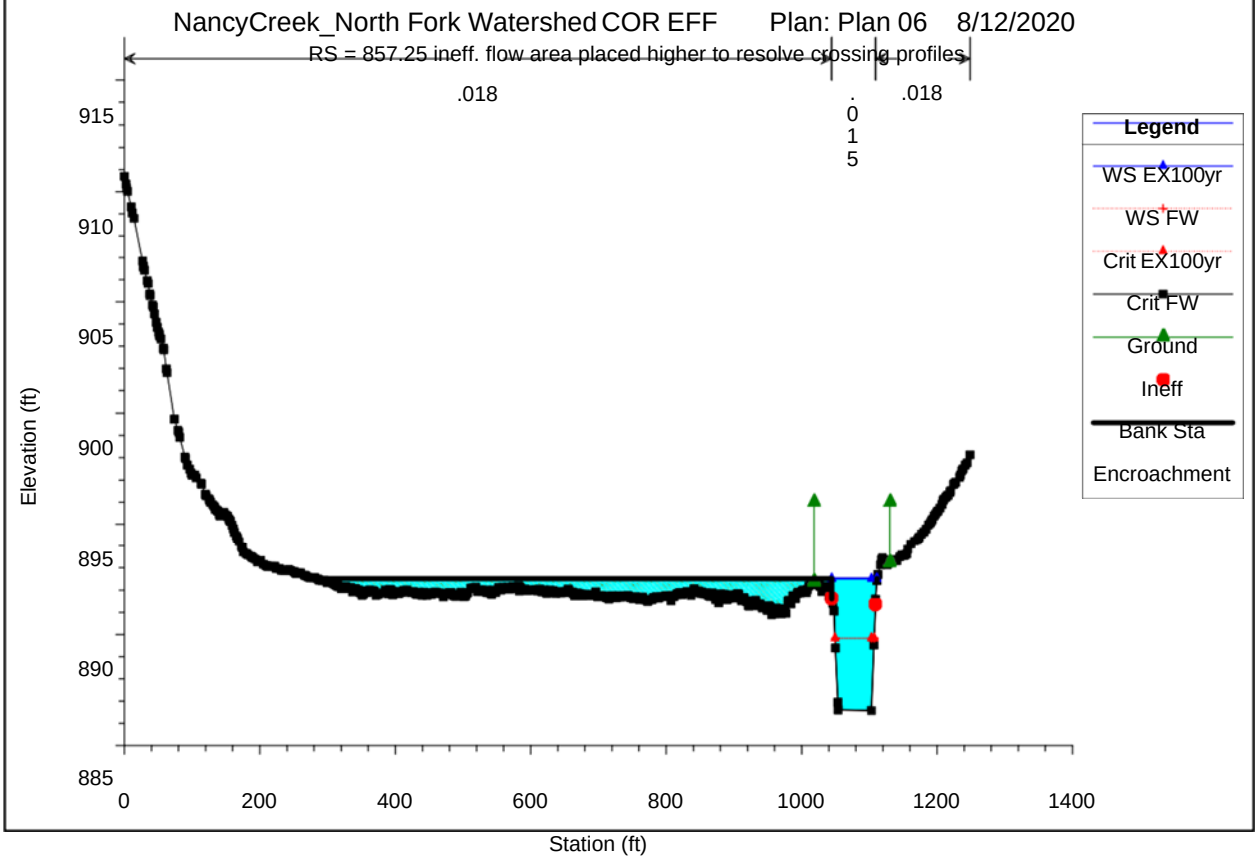
HEC-RAS Plan: FW River: NForkNancyCk Reach: NForkNancyCk

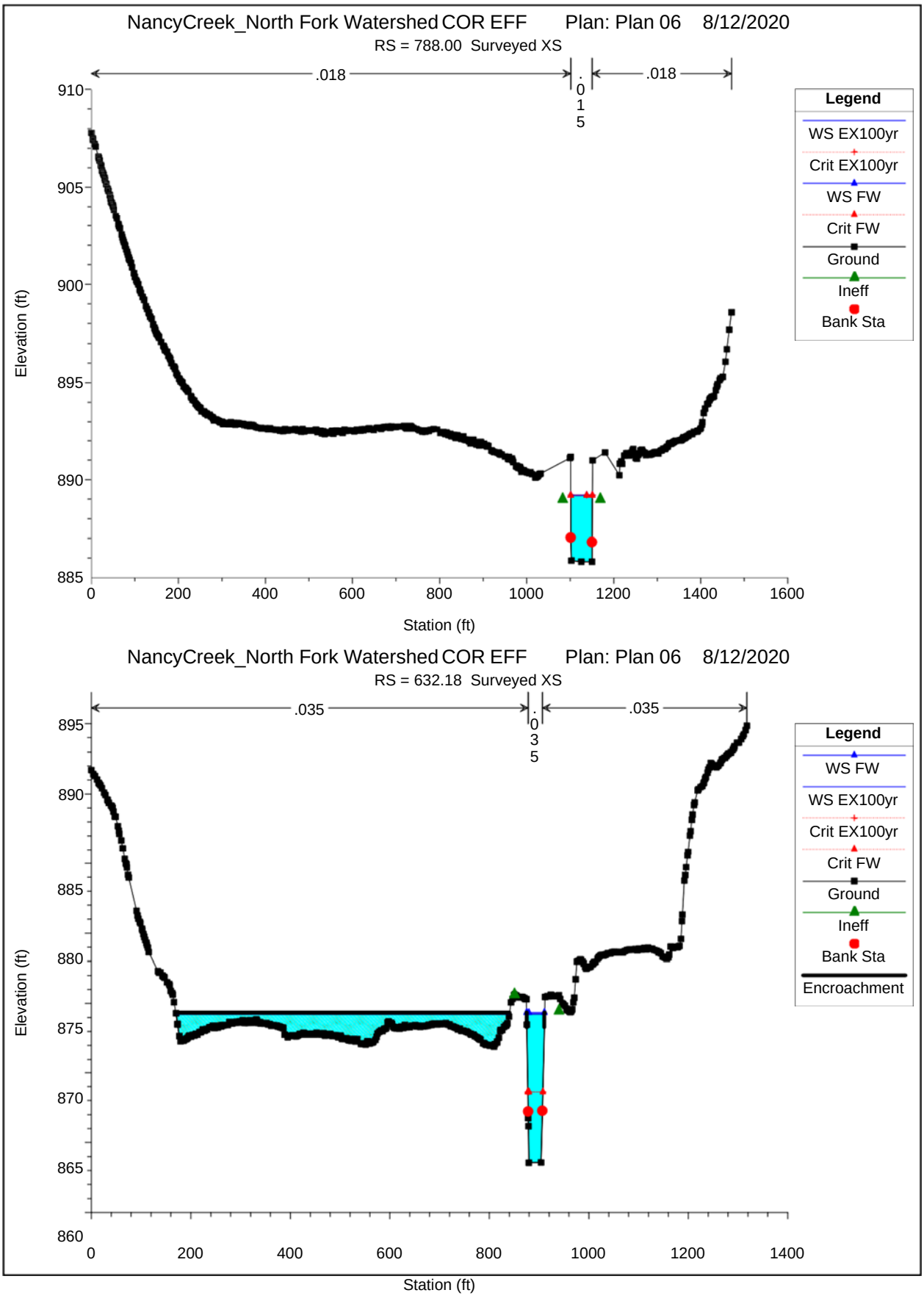
Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
			(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
NForkNancyCk	3090.14 1019	EX100yr	893.17		893.30	483.73	1344.84	1200.52	1127.54		431.09	479.17	
NForkNancyCk	3090.14 1019	FW	893.17	0.00	893.30	483.79	1345.00	1200.09	1127.82	154.99	431.09	479.17	638.78
NForkNancyCk	2533.68 148	EX100yr	893.06		893.11	420.37	682.15	584.83	2715.52		236.45	278.50	
NForkNancyCk	2533.68 148	FW	893.06	0.00	893.11	420.40	682.15	584.80	2715.55	114.71	236.45	278.50	535.11
NForkNancyCk	1583.69 1020	EX100yr	893.03		893.04	822.16	45.81	3929.25	7.45		506.98	1189.35	
NForkNancyCk	1583.69 1020	FW	893.04	0.00	893.05	822.25	45.97	3929.08	7.45	382.05	506.98	1189.35	1204.31
NForkNancyCk	1055.13 1185	EX100yr	893.02		893.03	910.20	34.24	3941.10	7.16		184.52	1014.56	
NForkNancyCk	1055.13 1185	FW	893.03	0.00	893.03	910.32	34.30	3941.03	7.17	122.18	184.52	1014.56	1032.50
NForkNancyCk	868.96 1026	EX100yr	892.99		893.02	939.49	3079.82	896.46	6.22		1042.00	1104.09	
NForkNancyCk	868.96 1026	FW	892.99	0.00	893.02	936.82	3080.41	895.73	6.37	177.88	1042.00	1104.09	1114.70
NForkNancyCk	857.25 1027	EX100yr	892.53		892.91	92.93	10.24	1694.66	0.99		1044.53	1109.03	
NForkNancyCk	857.25 1027	FW	892.52	-0.01	892.91	66.35		1704.82	1.08	1044.53	1044.53	1109.03	1110.88
NForkNancyCk	847.18 1276 BR U	EX100yr	892.51		892.90	72.64	0.06	1705.33	0.51		1044.53	1109.03	
NForkNancyCk	847.18 1276 BR U	FW	892.52	0.00	892.91	64.29		1705.38	0.52	1044.53	1044.53	1109.03	1110.88
NForkNancyCk	847.18 1276 BR D	EX100yr	892.49		892.90	57.02	31.90	1672.61	1.39		1099.08	1148.00	
NForkNancyCk	847.18 1276 BR D	FW	892.49	0.00	892.90	57.14	31.99	1672.52	1.39	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	838.76 1023	EX100yr	892.49		892.90	56.97	31.90	1672.62	1.39		1099.08	1148.00	
NForkNancyCk	838.76 1023	FW	892.49	0.00	892.90	57.10	31.90	1672.61	1.39	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	822.29 1022 BR U	EX100yr	892.49		892.90		37.17	1667.55	1.20		1099.08	1148.00	
NForkNancyCk	822.29 1022 BR U	FW	890.71	-1.78	892.90		37.11	1667.59	1.20	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	822.29 1022 BR D	EX100yr	892.48		892.49	5.64	0.30	1702.28	3.34		1101.16	1150.35	
NForkNancyCk	822.29 1022 BR D	FW	889.57	-2.91	891.33	46.25	0.09	1703.88	1.93	1100.98	1101.16	1150.35	1151.34
NForkNancyCk	788.00 1024	EX100yr	889.20		890.86	49.85	0.05	1704.73	1.12		1101.16	1150.35	
NForkNancyCk	788.00 1024	FW	889.19	-0.01	890.86	49.85	0.05	1704.74	1.11	1100.98	1101.16	1150.35	1151.34
NForkNancyCk	656.39 1031	EX100yr	878.32		879.71	154.97	87.62	1502.48	115.80		1004.61	1029.64	
NForkNancyCk	656.39 1031	FW	878.35	0.03	879.71	154.99	85.92	1499.00	120.98	978.34	1004.61	1029.64	1133.33
NForkNancyCk	632.18 1029	EX100yr	874.25		874.71	36.75	18.78	1653.37	33.75		877.89	906.64	
NForkNancyCk	632.18 1029	FW	874.34	0.09	874.80	35.71	18.66	1653.43	33.81	875.09	877.89	906.64	910.80
NForkNancyCk	618.16 1028 BR U	EX100yr	873.95		874.63	24.83		1704.88			877.89	906.64	
NForkNancyCk	618.16 1028 BR U	FW	874.05	0.10	874.72	24.83		1705.90		875.09	877.89	906.64	910.80
NForkNancyCk	618.16 1028 BR D	EX100yr	873.70		874.55	24.83		1704.88			893.92	920.60	
NForkNancyCk	618.16 1028 BR D	FW	873.81	0.11	874.64	24.83		1705.90		882.74	893.92	920.60	930.87
NForkNancyCk	583.70 1030	EX100yr	874.03		874.15	663.63	580.31	921.67	203.93		893.92	920.60	
NForkNancyCk	583.70 1030	FW	873.99	-0.04	874.35	48.13	194.48	1319.56	191.86	882.74	893.92	920.60	930.87
NForkNancyCk	337.49 1033	EX100yr	874.04		874.06	380.00	584.09	413.96	707.85		996.06	1024.61	
NForkNancyCk	337.49 1033	FW	874.04	0.00	874.10	200.00	524.70	656.22	524.98	900.00	996.06	1024.61	1100.00
NForkNancyCk	312	EX100yr	874.04		874.06	380.00	589.43	405.70	710.77		996.06	1024.61	
NForkNancyCk	312	FW	874.04	0.00	874.09	200.00	530.98	646.86	528.06	900.00	996.06	1024.61	1100.00

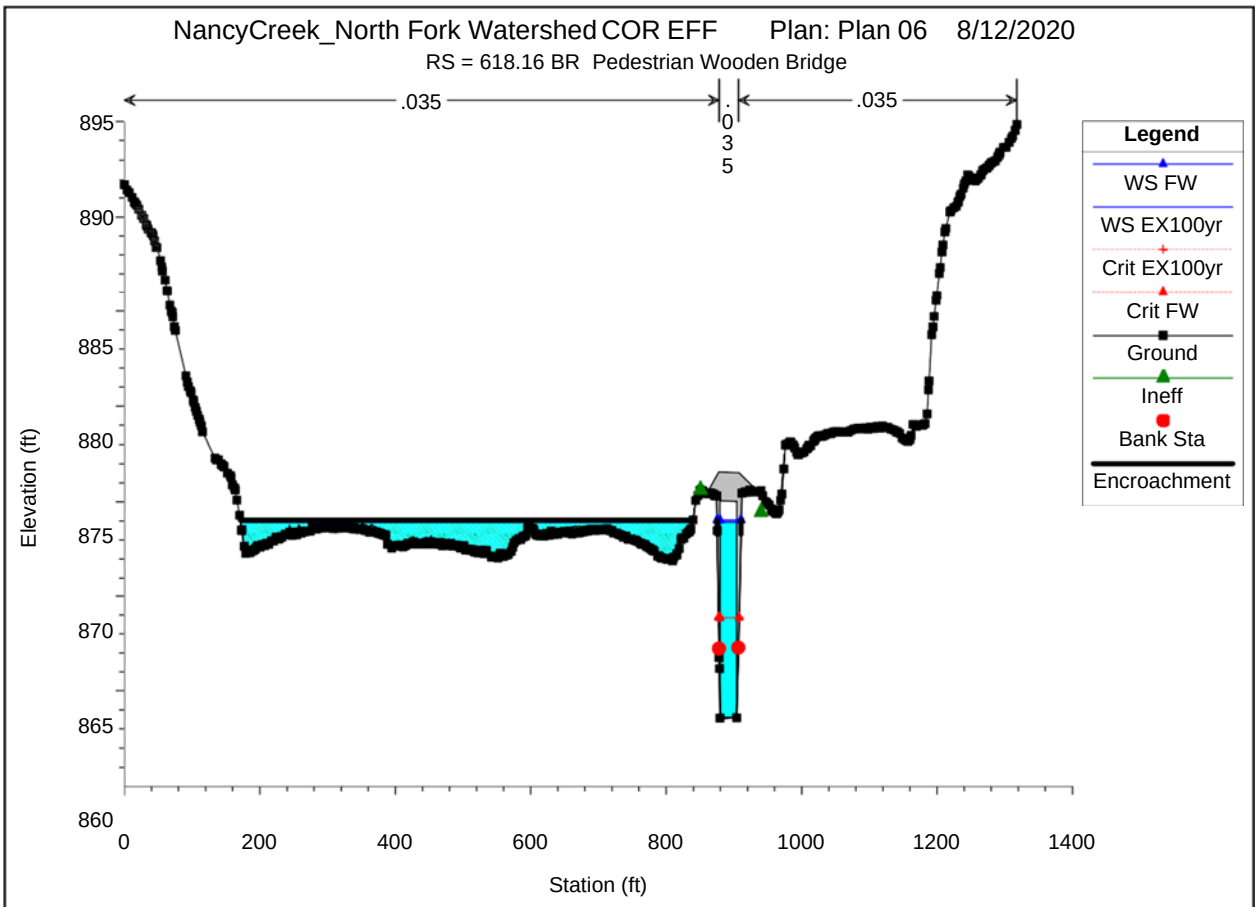
HEC-RAS Plan: Plan 05 River: NForkNancyCk Reach: NForkNancyCk

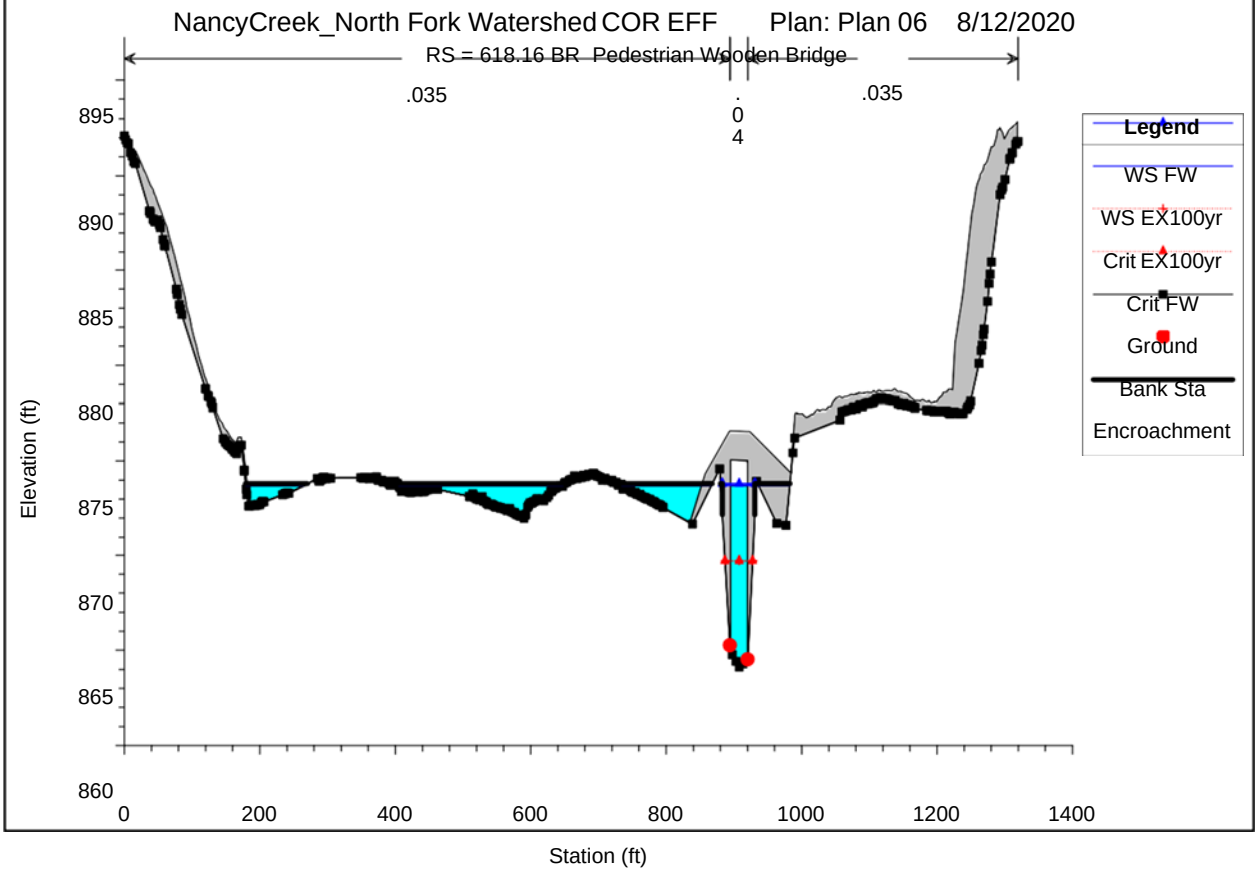
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NForkNancyCk	3090.14 1019	EX100yr	3672.90	886.95	893.17		893.30	0.000768	4.35	1832.25	483.73	0.32
NForkNancyCk	3090.14 1019	FU100yr	3672.90	886.95	893.17		893.30	0.000768	4.35	1832.25	483.73	0.32
NForkNancyCk	2533.68 148	EX100yr	3982.50	886.15	893.06		893.11	0.000165	2.18	2384.94	420.37	0.15
NForkNancyCk	2533.68 148	FU100yr	3982.50	886.15	893.06		893.11	0.000165	2.18	2384.94	420.37	0.15
NForkNancyCk	1583.69 1020	EX100yr	3982.50	886.74	893.03		893.04	0.000030	0.92	4484.29	822.16	0.06
NForkNancyCk	1583.69 1020	FU100yr	3982.50	886.74	893.03		893.04	0.000030	0.92	4484.29	822.16	0.06
NForkNancyCk	1055.13 1185	EX100yr	3982.50	886.76	893.02		893.03	0.000020	0.76	5366.29	910.20	0.05
NForkNancyCk	1055.13 1185	FU100yr	3982.50	886.76	893.02		893.03	0.000020	0.76	5366.29	910.20	0.05
NForkNancyCk	868.96 1026	EX100yr	3982.50	886.61	892.99		893.02	0.000203	2.35	3861.20	939.49	0.17
NForkNancyCk	868.96 1026	FU100yr	3982.50	886.61	892.99		893.02	0.000203	2.35	3861.20	939.49	0.17
NForkNancyCk	857.25 1027	EX100yr	1705.90	886.58	892.53	889.83	892.91	0.000292	4.97	354.02	828.04	0.38
NForkNancyCk	857.25 1027	FU100yr	1705.90	886.58	892.53	889.83	892.91	0.000292	4.97	354.02	828.04	0.38
NForkNancyCk	847.18 1276		Bridge									
NForkNancyCk	838.76 1023	EX100yr	1705.90	885.83	892.49	889.23	892.90	0.000236	5.18	341.41	216.92	0.35
NForkNancyCk	838.76 1023	FU100yr	1705.90	885.83	892.49	889.23	892.90	0.000236	5.18	341.41	216.92	0.35
NForkNancyCk	822.29 1022		Bridge									
NForkNancyCk	788.00 1024	EX100yr	1705.90	885.81	889.20	889.20	890.86	0.002244	10.34	165.66	49.85	1.00
NForkNancyCk	788.00 1024	FU100yr	1705.90	885.81	889.20	889.20	890.86	0.002244	10.34	165.66	49.85	1.00
NForkNancyCk	656.39 1031	EX100yr	1705.90	872.19	878.32	878.32	879.71	0.001009	10.04	290.65	881.09	0.72
NForkNancyCk	656.39 1031	FU100yr	1705.90	872.19	878.32	878.32	879.71	0.001009	10.04	290.65	881.09	0.72
NForkNancyCk	632.18 1029	EX100yr	1705.90	863.55	874.25	868.62	874.71	0.000898	5.51	328.30	706.94	0.30
NForkNancyCk	632.18 1029	FU100yr	1705.90	863.55	874.30	868.62	874.76	0.000883	5.48	330.21	707.38	0.30
NForkNancyCk	618.16 1028		Bridge									
NForkNancyCk	583.70 1030	EX100yr	1705.90	864.12	874.03		874.15	0.000465	3.61	961.71	663.63	0.21
NForkNancyCk	583.70 1030	FU100yr	1705.90	864.12	874.10		874.21	0.000431	3.49	1003.85	703.58	0.20
NForkNancyCk	337.49 1033	EX100yr	1705.90	861.96	874.04	868.91	874.06	0.000090	1.46	1606.21	1158.83	0.08
NForkNancyCk	337.49 1033	FU100yr	1705.90	861.96	874.10	868.91	874.12	0.000086	1.43	1629.01	1160.05	0.08
NForkNancyCk	312	EX100yr	1705.90	861.86	874.04	868.80	874.06	0.000084	1.42	1643.68	1160.95	0.08
NForkNancyCk	312	FU100yr	1705.90	861.86	874.10	868.80	874.12	0.000080	1.39	1666.48	1162.39	0.08

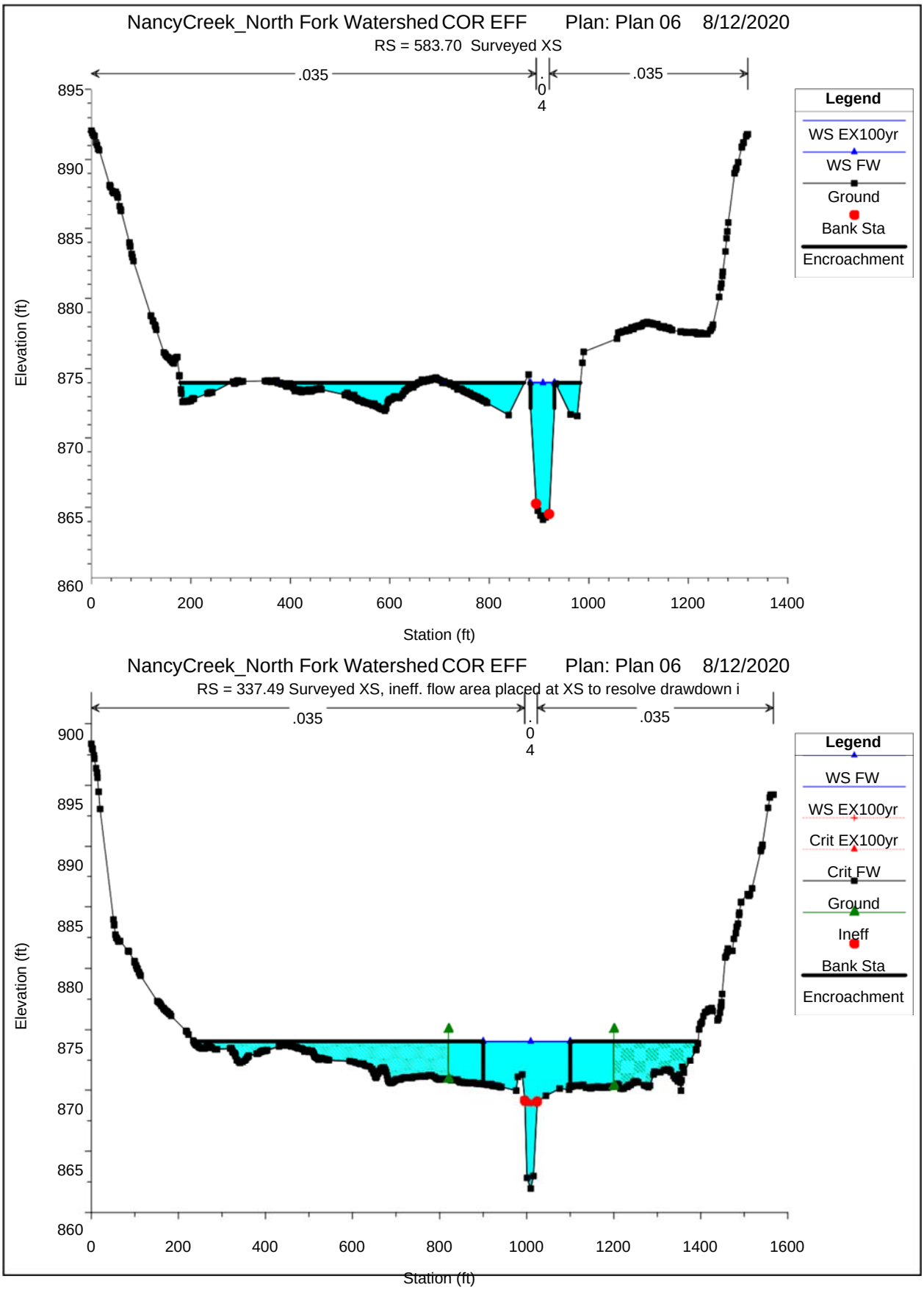

NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 3090.14
.08
.03
.06
.03
.08
Legend
WS FW
WS EX100yr
Ground
Bank Sta
Encroachment
Elevation (ft)
910
905
900
895
890
885
0
200
400
600
800
Station (ft)

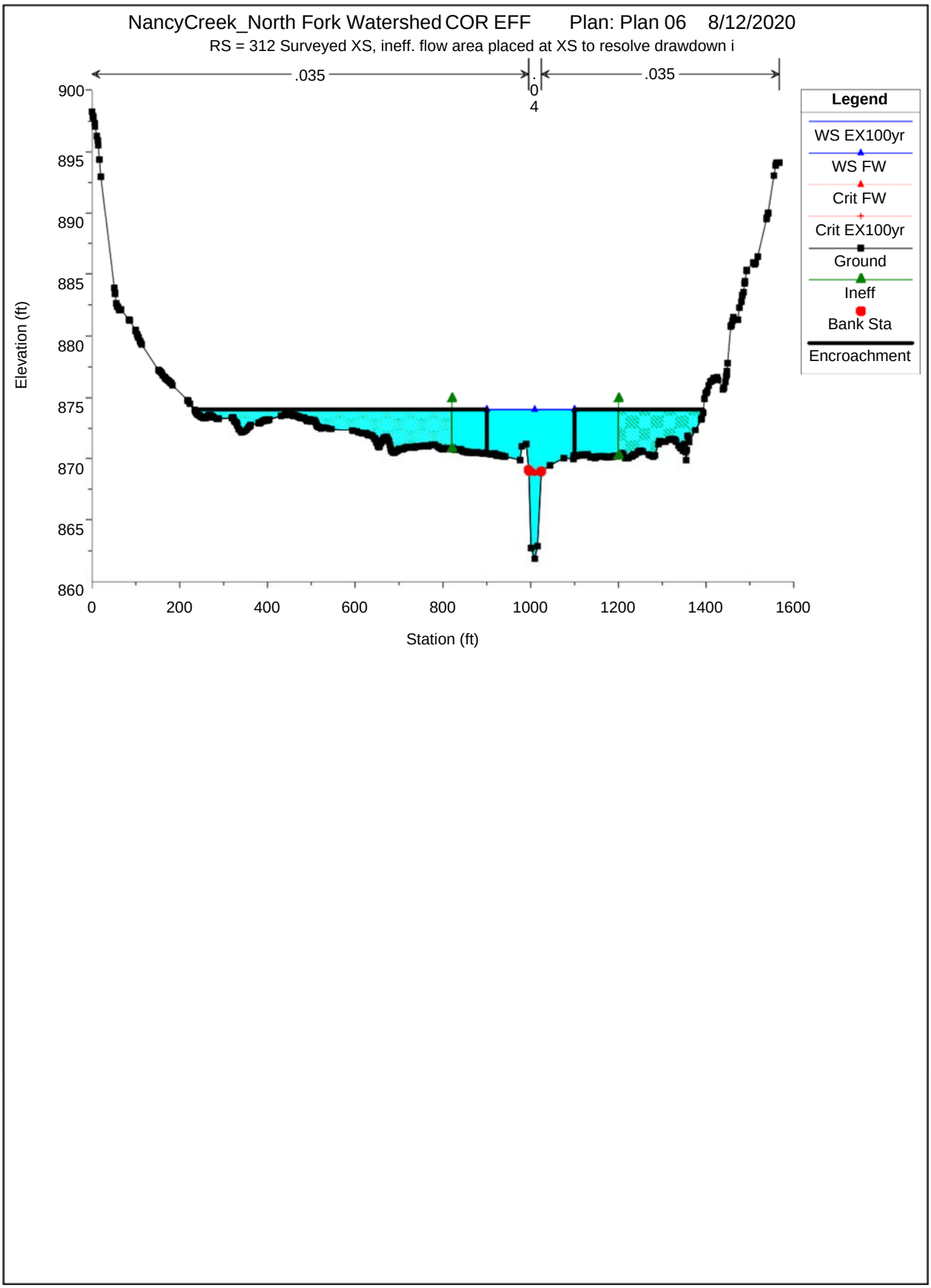

NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 857.25 ineff. flow area placed higher to resolve crossing profiles
.018
.015
.018
Legend
WS EX100yr
WS FW
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
915
910
905
900
895
890
885
0
200
400
600
800
1000
1200
1400
Station (ft)


NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 788.00 Surveyed XS
.018
.015
.018
Legend
WS EX100yr
Crit EX100yr
WS FW
Crit FW
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 632.18 Surveyed XS
.035
.035
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 618.16 BR Pedestrian Wooden Bridge
.035
.035
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 618.16 BR Pedestrian Wooden Bridge
.035
.035
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 583.70 Surveyed XS
.035
.04
.035
Legend
WS EX100yr
WS FW
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 337.49 Surveyed XS, ineff. flow area placed at XS to resolve drawdown i
.035
.04
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

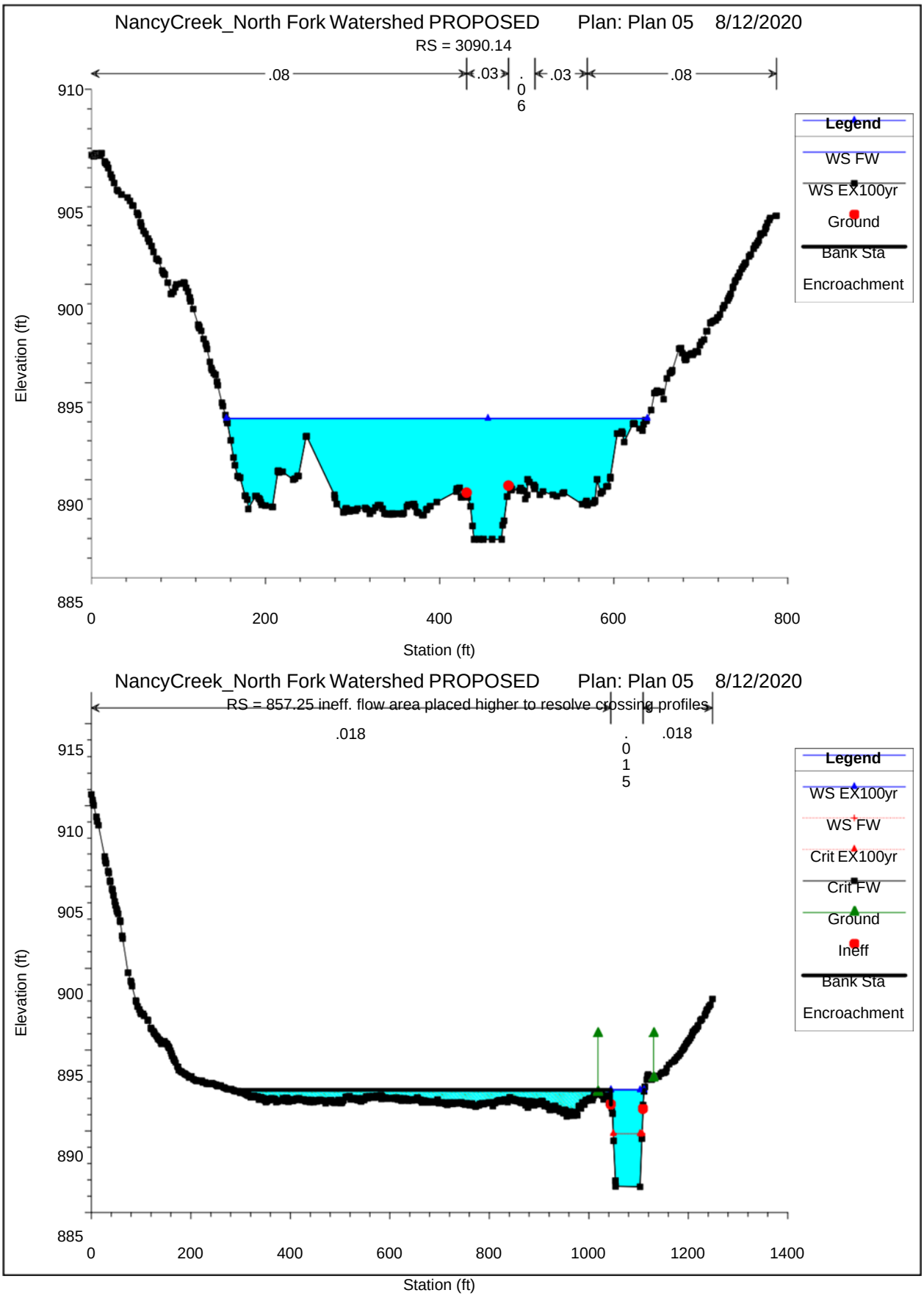

NancyCreek_North Fork Watershed COR EFF Plan: Plan 06 8/12/2020
RS = 312 Surveyed XS, ineff. flow area placed at XS to resolve drawdown i
.035
.035
.04
Legend
WS EX100yr
WS FW
Crit FW
Crit EX100yr
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
900
895
890
885
880
875
870
865
860
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

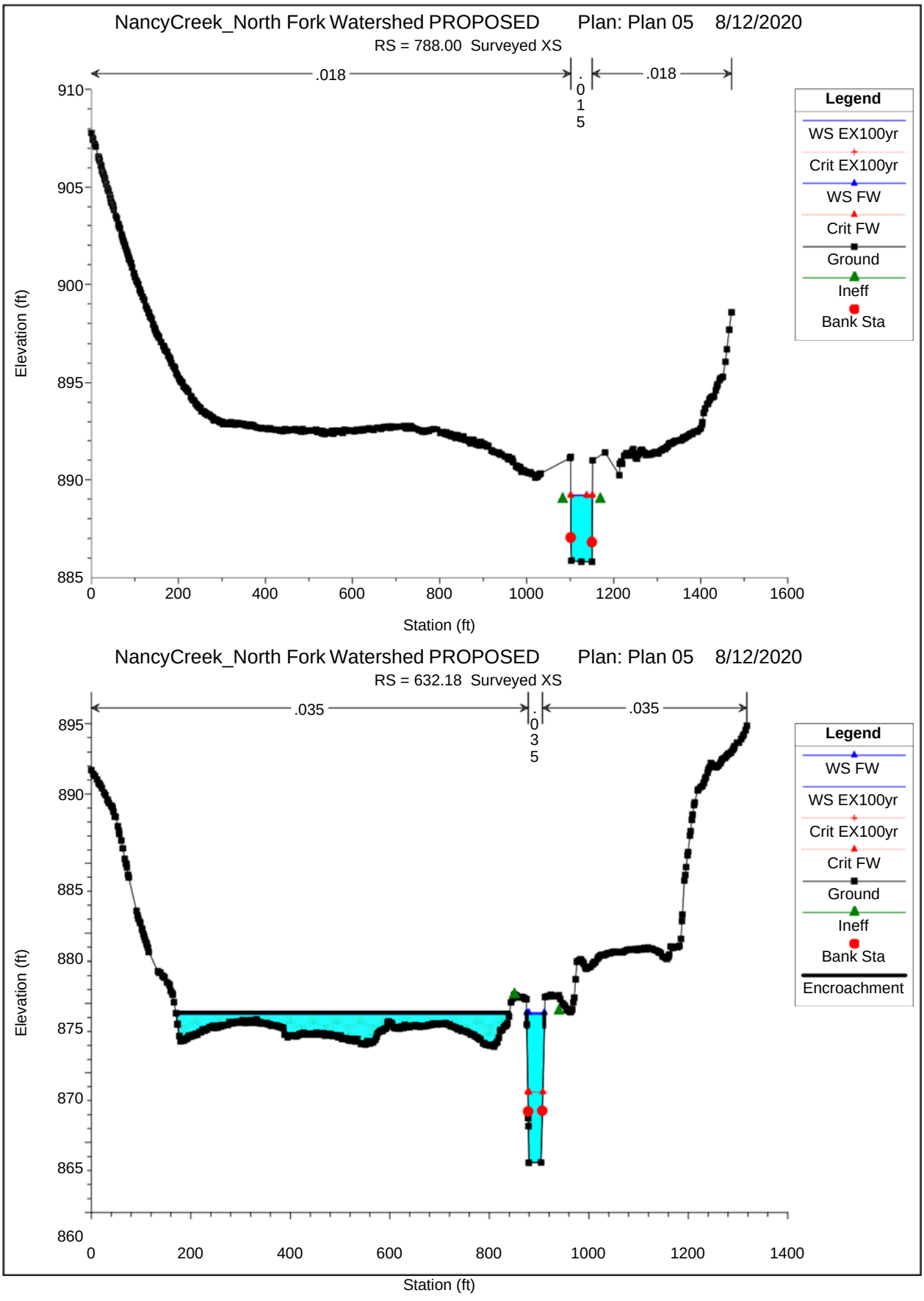
HEC-RAS Plan: FW River: NForkNancyCk Reach: NForkNancyCk

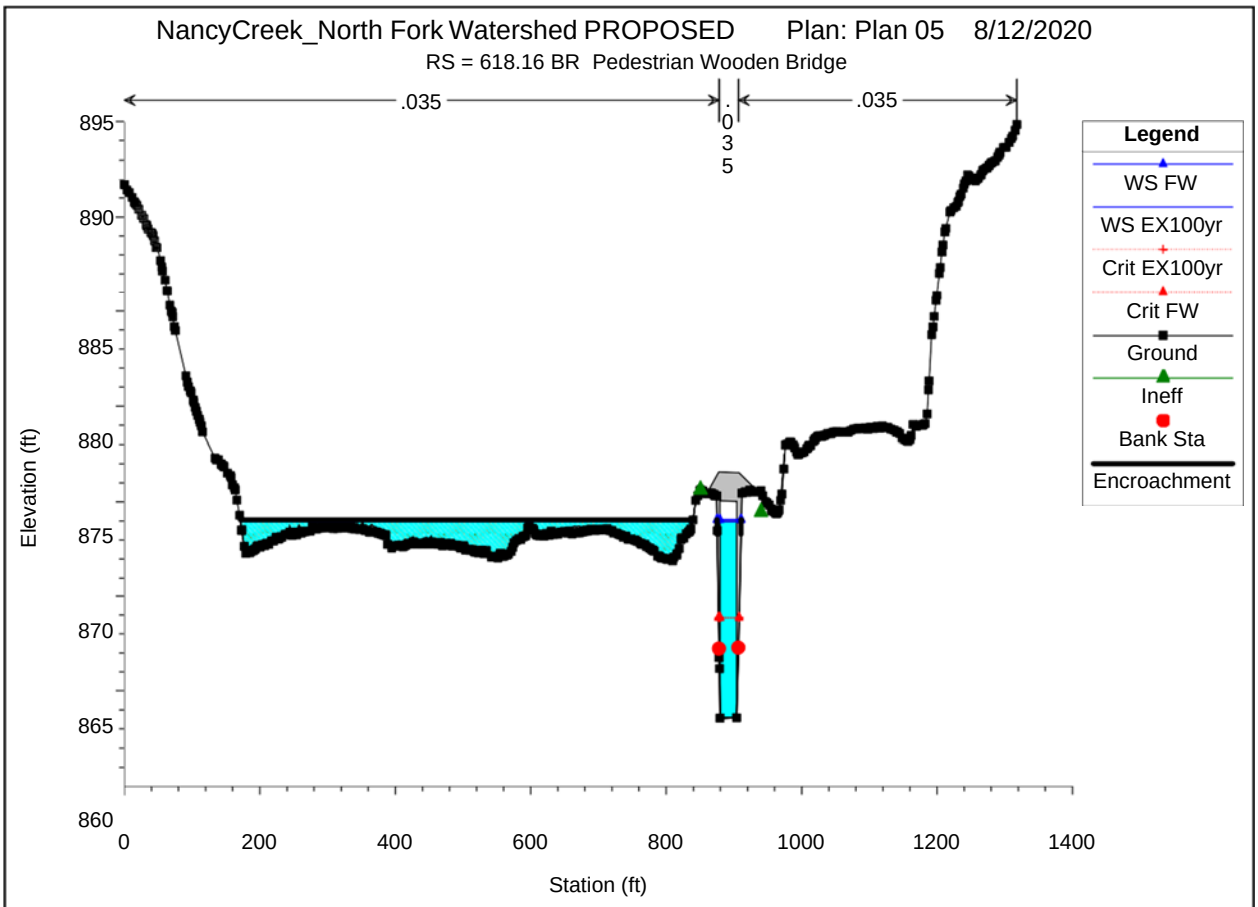
Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
			(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
NForkNancyCk	3090.14 1019	EX100yr	893.17		893.30	483.73	1344.84	1200.52	1127.54		431.09	479.17	
NForkNancyCk	3090.14 1019	FW	893.17	0.00	893.30	483.79	1345.00	1200.09	1127.82	154.99	431.09	479.17	638.78
NForkNancyCk	2533.68 148	EX100yr	893.06		893.11	420.37	682.15	584.83	2715.52		236.45	278.50	
NForkNancyCk	2533.68 148	FW	893.06	0.00	893.11	420.40	682.15	584.80	2715.55	114.71	236.45	278.50	535.11
NForkNancyCk	1583.69 1020	EX100yr	893.03		893.04	822.16	45.81	3929.25	7.45		506.98	1189.35	
NForkNancyCk	1583.69 1020	FW	893.04	0.00	893.05	822.25	45.97	3929.08	7.45	382.05	506.98	1189.35	1204.31
NForkNancyCk	1055.13 1185	EX100yr	893.02		893.03	910.20	34.24	3941.10	7.16		184.52	1014.56	
NForkNancyCk	1055.13 1185	FW	893.03	0.00	893.03	910.32	34.30	3941.03	7.17	122.18	184.52	1014.56	1032.50
NForkNancyCk	868.96 1026	EX100yr	892.99		893.02	939.49	3079.82	896.46	6.22		1042.00	1104.09	
NForkNancyCk	868.96 1026	FW	892.99	0.00	893.02	936.82	3080.41	895.73	6.37	177.88	1042.00	1104.09	1114.70
NForkNancyCk	857.25 1027	EX100yr	892.53		892.91	92.93	10.24	1694.66	0.99		1044.53	1109.03	
NForkNancyCk	857.25 1027	FW	892.52	-0.01	892.91	66.35		1704.82	1.08	1044.53	1044.53	1109.03	1110.88
NForkNancyCk	847.18 1276 BR U	EX100yr	892.51		892.90	72.64	0.06	1705.33	0.51		1044.53	1109.03	
NForkNancyCk	847.18 1276 BR U	FW	892.52	0.00	892.91	64.29		1705.38	0.52	1044.53	1044.53	1109.03	1110.88
NForkNancyCk	847.18 1276 BR D	EX100yr	892.49		892.90	57.02	31.90	1672.61	1.39		1099.08	1148.00	
NForkNancyCk	847.18 1276 BR D	FW	892.49	0.00	892.90	57.14	31.99	1672.52	1.39	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	838.76 1023	EX100yr	892.49		892.90	56.97	31.90	1672.62	1.39		1099.08	1148.00	
NForkNancyCk	838.76 1023	FW	892.49	0.00	892.90	57.10	31.90	1672.61	1.39	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	822.29 1022 BR U	EX100yr	892.49		892.90		37.17	1667.55	1.20		1099.08	1148.00	
NForkNancyCk	822.29 1022 BR U	FW	890.71	-1.78	892.90		37.11	1667.59	1.20	1095.50	1099.08	1148.00	1152.64
NForkNancyCk	822.29 1022 BR D	EX100yr	892.48		892.49	5.64	0.30	1702.28	3.34		1101.16	1150.35	
NForkNancyCk	822.29 1022 BR D	FW	889.57	-2.91	891.33	46.25	0.09	1703.88	1.93	1100.98	1101.16	1150.35	1151.34
NForkNancyCk	788.00 1024	EX100yr	889.20		890.86	49.85	0.05	1704.73	1.12		1101.16	1150.35	
NForkNancyCk	788.00 1024	FW	889.19	-0.01	890.86	49.85	0.05	1704.74	1.11	1100.98	1101.16	1150.35	1151.34
NForkNancyCk	656.39 1031	EX100yr	878.32		879.71	154.97	87.62	1502.48	115.80		1004.61	1029.64	
NForkNancyCk	656.39 1031	FW	878.35	0.03	879.71	154.99	85.92	1499.00	120.98	978.34	1004.61	1029.64	1133.33
NForkNancyCk	632.18 1029	EX100yr	874.25		874.71	36.75	18.78	1653.36	33.76		877.89	906.64	
NForkNancyCk	632.18 1029	FW	874.35	0.10	874.80	35.71	18.68	1653.39	33.84	875.09	877.89	906.64	910.80
NForkNancyCk	618.16 1028 BR U	EX100yr	873.95		874.63	24.83		1704.87			877.89	906.64	
NForkNancyCk	618.16 1028 BR U	FW	874.06	0.10	874.72	24.83		1705.90		875.09	877.89	906.64	910.80
NForkNancyCk	618.16 1028 BR D	EX100yr	873.70		874.55	24.83		1704.87			893.92	920.60	
NForkNancyCk	618.16 1028 BR D	FW	873.81	0.11	874.64	24.83		1705.90		882.74	893.92	920.60	930.87
NForkNancyCk	583.70 1030	EX100yr	874.04		874.15	663.89	580.77	921.18	203.95		893.92	920.60	
NForkNancyCk	583.70 1030	FW	874.00	-0.04	874.36	48.13	194.58	1319.40	191.92	882.74	893.92	920.60	930.87
NForkNancyCk	337.49 1033	EX100yr	874.04		874.06	380.00	584.15	413.86	707.89		996.06	1024.61	
NForkNancyCk	337.49 1033	FW	874.05	0.01	874.11	200.00	525.12	655.58	525.19	900.00	996.06	1024.61	1100.00
NForkNancyCk	325 BR U	EX100yr	874.04		874.06	380.00	698.28	211.30	796.33		996.06	1024.61	
NForkNancyCk	325 BR U	FW	874.04	0.00	874.10	200.00	708.07	388.11	609.72	900.00	996.06	1024.61	1100.00
NForkNancyCk	325 BR D	EX100yr	874.04		874.06	380.00	702.78	206.33	796.78		996.06	1024.61	
NForkNancyCk	325 BR D	FW	874.04	0.00	874.10	200.00	715.04	386.42	604.44	900.00	996.06	1024.61	1100.00
NForkNancyCk	312.5	EX100yr	874.04		874.06	380.00	589.43	405.70	710.77		996.06	1024.61	
NForkNancyCk	312.5	FW	874.04	0.00	874.09	200.00	530.98	646.86	528.06	900.00	996.06	1024.61	1100.00

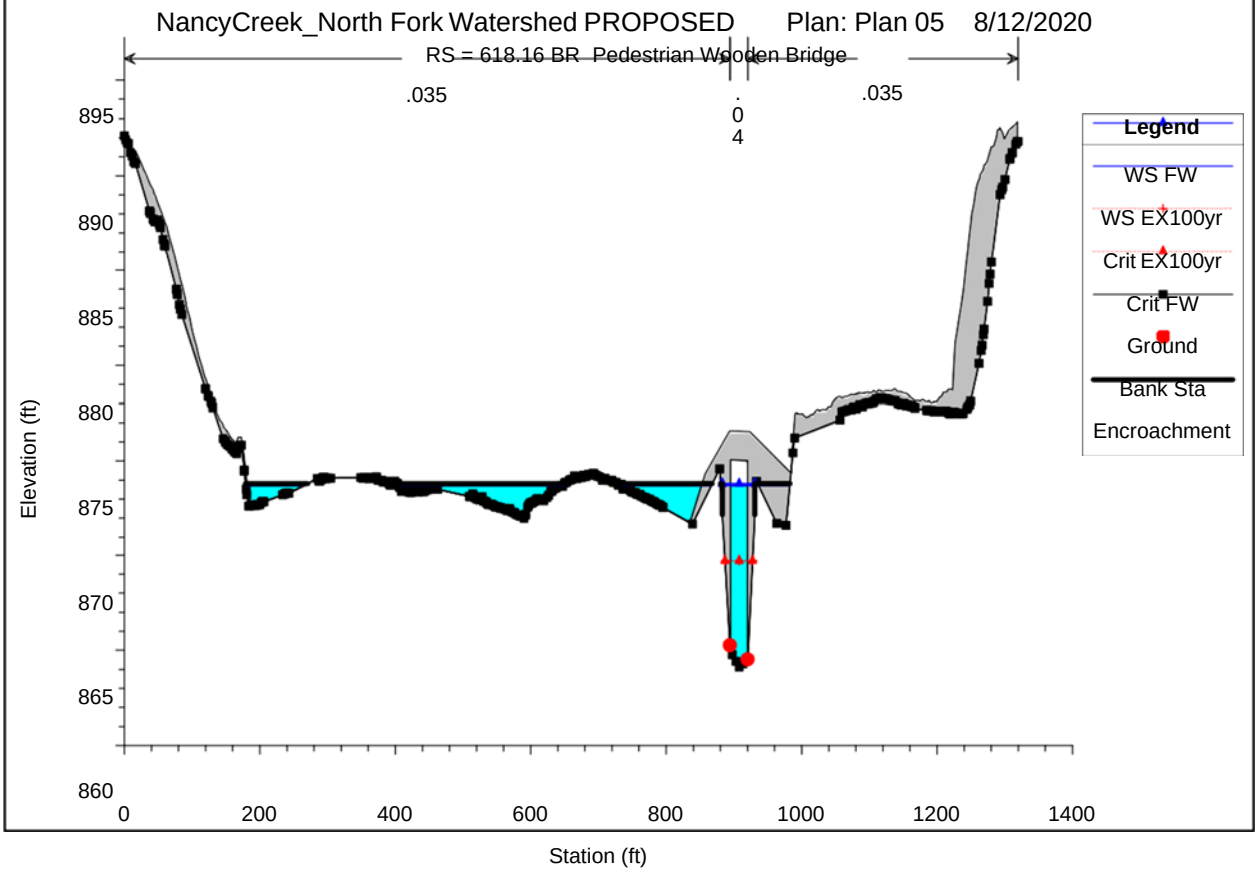
HEC-RAS Plan: PROPOSED BRIDGE IMPACT River: NForkNancyCk Reach: NForkNancyCk

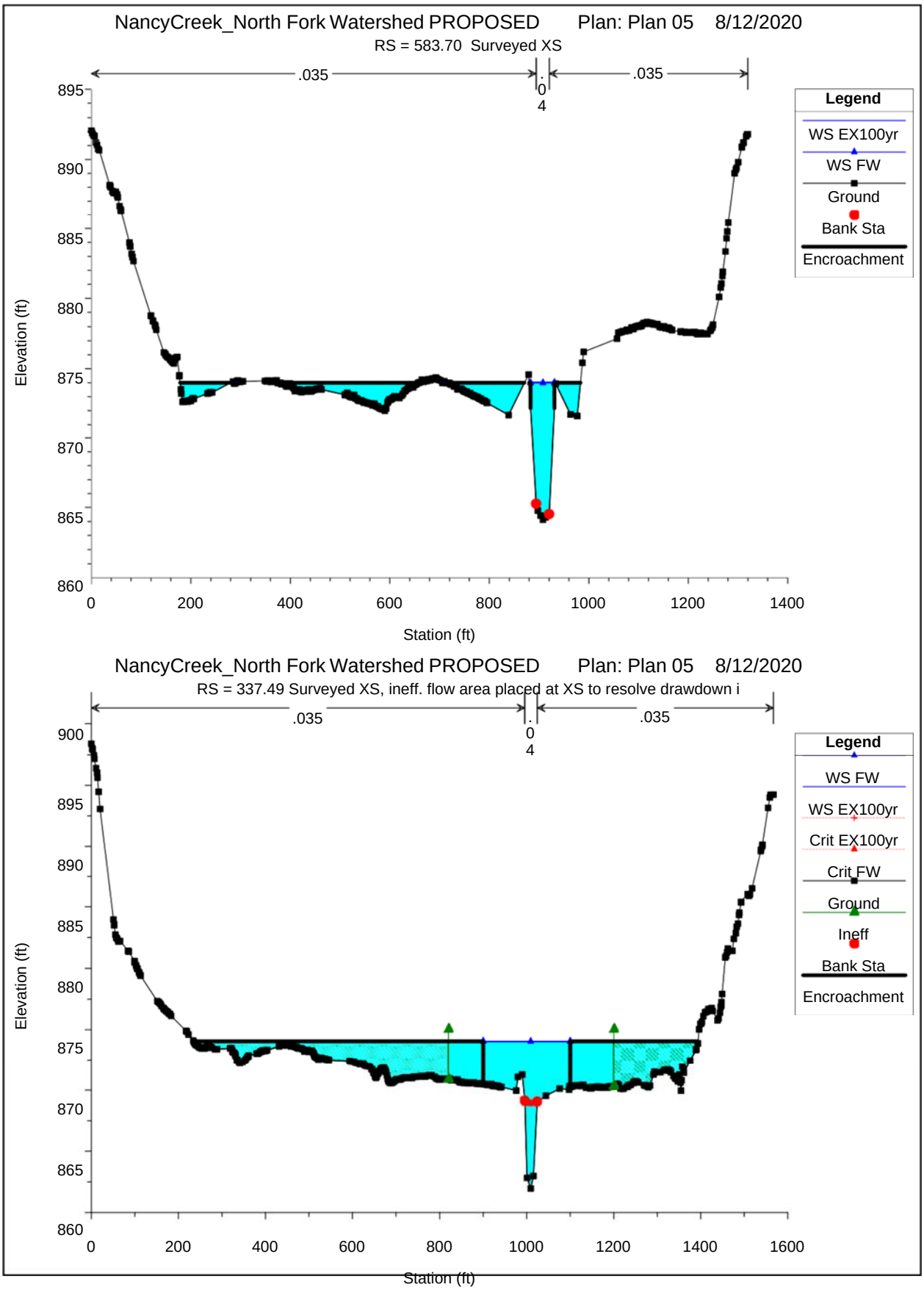
Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
			(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
NForkNancyCk	3090.14 1019	EX100yr	893.17	3.29	893.30	483.73	1344.84	1200.52	1127.54		431.09	479.17	
NForkNancyCk	3090.14 1019	FU100yr	893.17	3.29	893.30	483.73	1344.84	1200.52	1127.54		431.09	479.17	
NForkNancyCk	2533.68 148	EX100yr	893.06	3.29	893.11	420.37	682.15	584.83	2715.52		236.45	278.50	
NForkNancyCk	2533.68 148	FU100yr	893.06	3.29	893.11	420.37	682.15	584.83	2715.52		236.45	278.50	
NForkNancyCk	1583.69 1020	EX100yr	893.03	3.34	893.04	822.16	45.81	3929.25	7.45		506.98	1189.35	
NForkNancyCk	1583.69 1020	FU100yr	893.03	3.34	893.04	822.16	45.81	3929.25	7.45		506.98	1189.35	
NForkNancyCk	1055.13 1185	EX100yr	893.02	3.35	893.03	910.20	34.24	3941.10	7.16		184.52	1014.56	
NForkNancyCk	1055.13 1185	FU100yr	893.02	3.35	893.03	910.20	34.24	3941.10	7.16		184.52	1014.56	
NForkNancyCk	868.96 1026	EX100yr	892.99	3.82	893.02	939.49	3079.82	896.46	6.22		1042.00	1104.09	
NForkNancyCk	868.96 1026	FU100yr	892.99	3.82	893.02	939.49	3079.82	896.46	6.22		1042.00	1104.09	
NForkNancyCk	857.25 1027	EX100yr	892.53	3.97	892.91	92.93	10.24	1694.66	0.99		1044.53	1109.03	
NForkNancyCk	857.25 1027	FU100yr	892.53	3.97	892.91	92.93	10.24	1694.66	0.99		1044.53	1109.03	
NForkNancyCk	847.18 1276 BR U	EX100yr	892.51	4.19	892.90	72.64	0.06	1705.33	0.51		1044.53	1109.03	
NForkNancyCk	847.18 1276 BR U	FU100yr	892.51	4.19	892.90	72.64	0.06	1705.33	0.51		1044.53	1109.03	
NForkNancyCk	847.18 1276 BR D	EX100yr	892.49	3.99	892.90	57.02	31.90	1672.61	1.39		1099.08	1148.00	
NForkNancyCk	847.18 1276 BR D	FU100yr	892.49	3.99	892.90	57.02	31.90	1672.61	1.39		1099.08	1148.00	
NForkNancyCk	838.76 1023	EX100yr	892.49	3.99	892.90	56.97	31.90	1672.62	1.39		1099.08	1148.00	
NForkNancyCk	838.76 1023	FU100yr	892.49	3.99	892.90	56.97	31.90	1672.62	1.39		1099.08	1148.00	
NForkNancyCk	822.29 1022 BR U	EX100yr	892.49	4.31	892.90		37.17	1667.55	1.20		1099.08	1148.00	
NForkNancyCk	822.29 1022 BR U	FU100yr	892.49	4.31	892.90		37.17	1667.55	1.20		1099.08	1148.00	
NForkNancyCk	822.29 1022 BR D	EX100yr	892.48	4.66	892.49	5.64	0.30	1702.28	3.34		1101.16	1150.35	
NForkNancyCk	822.29 1022 BR D	FU100yr	892.48	4.66	892.49	5.64	0.30	1702.28	3.34		1101.16	1150.35	
NForkNancyCk	788.00 1024	EX100yr	889.20	1.67	890.86	49.85	0.05	1704.73	1.12		1101.16	1150.35	
NForkNancyCk	788.00 1024	FU100yr	889.20	1.67	890.86	49.85	0.05	1704.73	1.12		1101.16	1150.35	
NForkNancyCk	656.39 1031	EX100yr	878.32	3.33	879.71	154.97	87.62	1502.48	115.80		1004.61	1029.64	
NForkNancyCk	656.39 1031	FU100yr	878.32	3.33	879.71	154.97	87.62	1502.48	115.80		1004.61	1029.64	
NForkNancyCk	632.18 1029	EX100yr	874.25	3.89	874.71	36.75	18.78	1653.36	33.76		877.89	906.64	
NForkNancyCk	632.18 1029	FU100yr	874.30	3.94	874.76	36.80	18.98	1652.78	34.14		877.89	906.64	
NForkNancyCk	618.16 1028 BR U	EX100yr	873.95	3.66	874.63	24.83		1704.87			877.89	906.64	
NForkNancyCk	618.16 1028 BR U	FU100yr	874.01	3.71	874.68	24.83		1704.32			877.89	906.64	
NForkNancyCk	618.16 1028 BR D	EX100yr	873.70	3.52	874.55	24.83		1704.87			893.92	920.60	
NForkNancyCk	618.16 1028 BR D	FU100yr	873.76	3.58	874.60	24.83		1704.32			893.92	920.60	
NForkNancyCk	583.70 1030	EX100yr	874.04	3.83	874.15	663.89	580.77	921.18	203.95		893.92	920.60	
NForkNancyCk	583.70 1030	FU100yr	874.10	3.89	874.21	705.66	604.20	896.33	205.36		893.92	920.60	
NForkNancyCk	337.49 1033	EX100yr	874.04	4.11	874.06	380.00	584.15	413.86	707.89		996.06	1024.61	
NForkNancyCk	337.49 1033	FU100yr	874.10	4.17	874.12	380.00	587.42	408.80	709.68		996.06	1024.61	
NForkNancyCk	325 BR U	EX100yr	874.04	4.16	874.06	380.00	698.28	211.30	796.33		996.06	1024.61	
NForkNancyCk	325 BR U	FU100yr	874.10	4.22	874.12	380.00	700.46	208.34	797.09		996.06	1024.61	
NForkNancyCk	325 BR D	EX100yr	874.04	4.20	874.06	380.00	702.78	206.33	796.78		996.06	1024.61	
NForkNancyCk	325 BR D	FU100yr	874.10	4.26	874.12	380.00	704.87	203.51	797.52		996.06	1024.61	
NForkNancyCk	312.5	EX100yr	874.04	4.18	874.06	380.00	589.43	405.70	710.77		996.06	1024.61	
NForkNancyCk	312.5	FU100yr	874.10	4.24	874.12	380.00	592.56	400.87	712.48		996.06	1024.61	

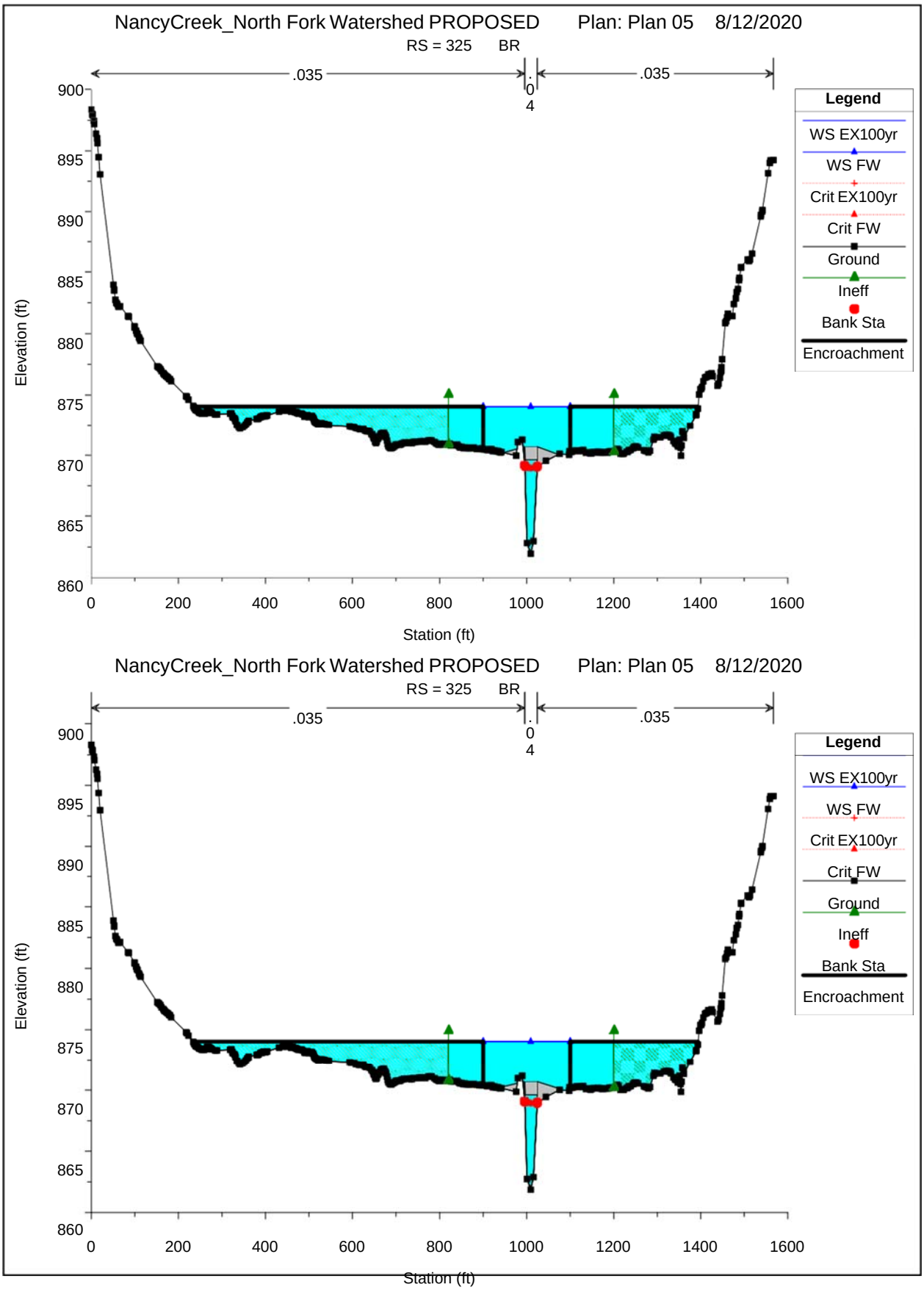

NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 3090.14
.08
.03
.06
.03
.08
Legend
WS FW
WS EX100yr
Ground
Bank Sta
Encroachment
Elevation (ft)
910
905
900
895
890
885
0
200
400
600
800
Station (ft)
NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 857.25 ineff. flow area placed higher to resolve crossing profiles
.018
.015
.018
Legend
WS EX100yr
WS FW
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
915
910
905
900
895
890
885
0
200
400
600
800
1000
1200
1400
Station (ft)

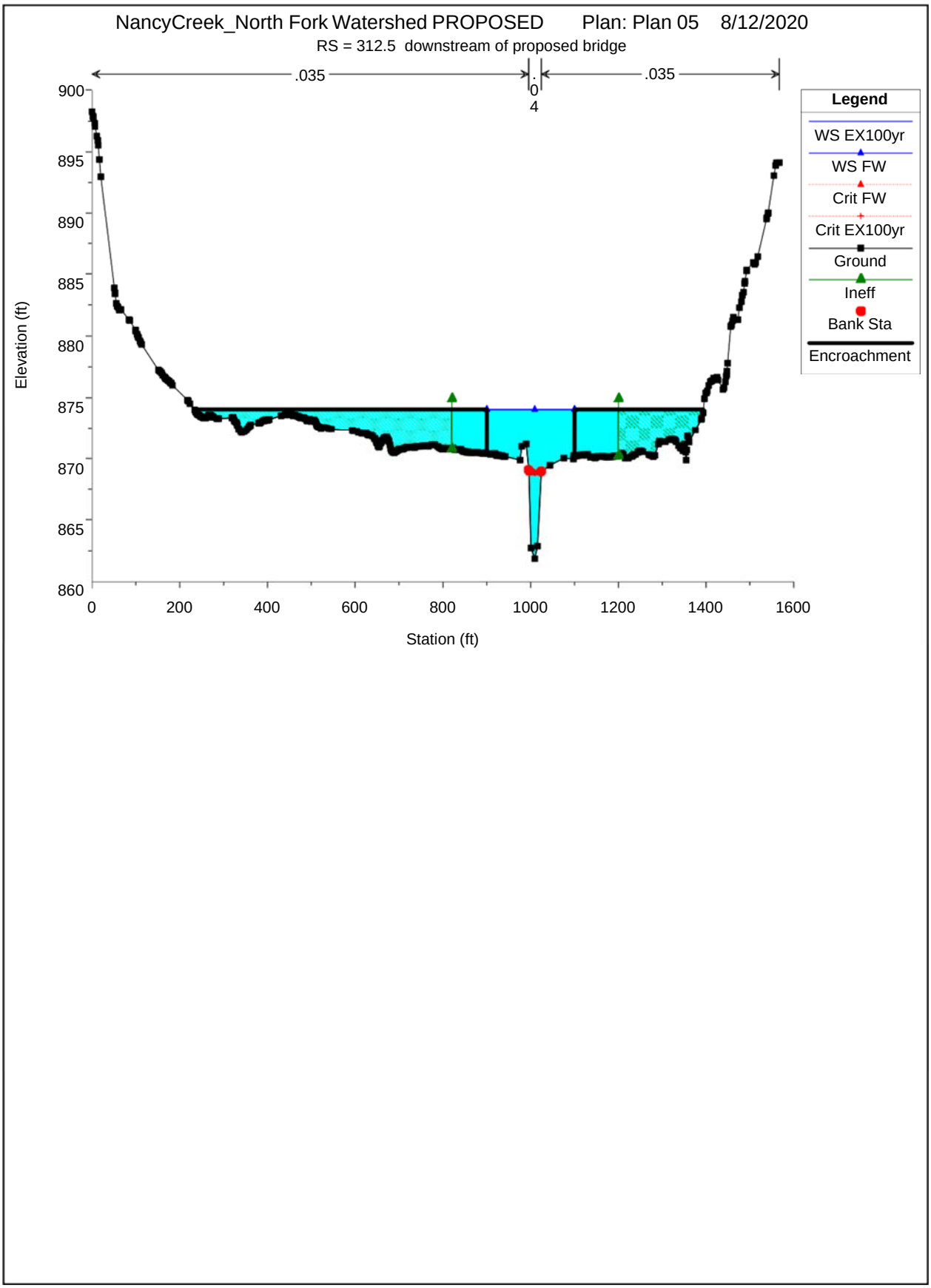

NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 788.00 Surveyed XS
.018
.015
.018
Legend
WS EX100yr
Crit EX100yr
WS FW
Crit FW
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 632.18 Surveyed XS
.035
.035
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 618.16 BR Pedestrian Wooden Bridge
.035
.035
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 618.16 BR Pedestrian Wooden Bridge
.035
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 583.70 Surveyed XS
.035
.04
.035
Legend
WS EX100yr
WS FW
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 337.49 Surveyed XS, ineff. flow area placed at XS to resolve drawdown i
.035
.04
.035
Legend
WS FW
WS EX100yr
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 325 BR
.035
.035
.04
Legend
WS EX100yr
WS FW
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
900
895
890
885
880
875
870
865
860
0
200
400
600
800
1000
1200
1400
1600
NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 325 BR
.035
.035
.04
Legend
WS EX100yr
WS FW
Crit EX100yr
Crit FW
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


NancyCreek_North Fork Watershed PROPOSED Plan: Plan 05 8/12/2020
RS = 312.5 downstream of proposed bridge
.035
.035
.04
Legend
WS EX100yr
WS FW
Crit FW
Crit EX100yr
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
900
895
890
885
880
875
870
865
860
0
200
400
600
800
1000
1200
1400
1600
Station (ft)