Project Manual
For

Pennies for Progress 3
Clearing and Grubbing
of US 21 Bypass and SC 51
From Springfield Parkway to the North Carolina Line

March 2024

County Management
David Hudspeth, County Manager
Michael Moore, Assistant County Manager
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County Council
District 1: Tom Audette
District 2: Allison Love
District 3: Tommy Adkins
District 4: William “Bump” Roddey
District 5: Christi Cox, Chairwoman
District 6: Watts Huckabee
District 7: Debi Cloninger

York County Engineering Reference No. 11149-004
SCDOT Project ID. 0042332

Prepared for:
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TABLE OF CONTENTS

END OF TABLE OF CONTENTS

BID BOND

STATE OF SOUTH CAROLINA
COUNTY OF YORK

KNOW ALL MEN BY THESE PRESENTS, that ____

as Principal, and ____, as Surety, a Corporation chartered and existing under the laws of the State of _________________________, with its principal offices in the City of___________________, and authorized to do business in the State of South Carolina are held and firmly bound unto the OWNER, __________________________________ _________________________ in the penal Sum of _______________________________________ _________________________Dollars ($_________________) lawful money of the United States, for the payment of which sum will and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted to the OWNER the accompanying bid, dated _____________***, 202***__, for:

York County No 11149-004 SCDOT Proj ID 0042332
Widening of US 21 Bypass and SC 51
Clearing and Grubbing

NOW, THEREFORE,

A. If said Bid shall be rejected, or

B. If the principal shall not withdraw said Bid within twenty-four (24) hours after date of opening of the same, and shall within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the OWNER in accordance with the Bid as accepted, and give bonds with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract, then the above obligations shall be void and of no effect, otherwise to remain in full force and effect.

C. In the event of the withdrawal of said Bid within the period specified, or the failure to enter into such contract and give such bonds within the time specified, if the principal shall pay the OWNER the difference between the amount specified in said bid and the amount for which the OWNER may procure the required work and supplies, if the latter amount be in excess of the former, then the above obligations shall be void and of no effect, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals, this ____ day of ____________________, A.D., *202__,* the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

WITNESSES:	PRINCIPAL:
______________________________	______________________________ Name of Firm
______________________________	______________________________ Signature of Authorized Officer (Affix Seal)
	______________________________ Title
	______________________________ Business Address
	______________________________ City State

WITNESS:	SURETY:
______________________________	______________________________ Corporate Surety
______________________________ (Affix Attorney-in-Fact Seal)	
______________________________ Business Address	
	______________________________ City State
	______________________________ Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _________________________, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____________________________who signed the said bond on behalf of the principal, was then ________________________ of said corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said corporation by authority of its governing body.

____
(Corporate Secretary Seal)

STATE OF SOUTH CAROLINA
COUNTY OF YORK

Before me, a Notary Public duly commissioned, qualified and acting, personally appeared _________________________________to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the _______________________________ and that he has been authorized by ___________________________________ to execute the foregoing bond on behalf of the Contractor named therein in favor of the OWNER, the ______________________.

Subscribed and sworn to before me this ____ day of_________________, *202*__, A.D.

(Attach Power of Attorney
to original Bid Bond)

____
Notary Public
State of South Carolina-at-Large

My Commission Expires:____________________

END OF SECTION

AGREEMENT

THIS AGREEMENT, made and entered into this ______ day of _______, *202*__ A.D., by and between the York County Government, party of the first part (hereinafter sometimes called the "OWNER"), and ____________________, party of the second part (hereinafter sometimes called the "CONTRACTOR").

WITNESSETH: That the parties hereto, for the consideration hereinafter set forth, mutually agree as follows:

1. SCOPE OF THE WORK

1.1. The CONTRACTOR shall furnish all labor, materials, equipment, machinery, tools, apparatus, and transportation and perform all of the Work shown on the Drawings and described in the Specifications entitled:

Pennies for Progress Project 3
Widening of US 21 Bypass and SC 51
Clearing and Grubbing
York County No 11149-004 SCDOT Proj ID 0042332

as prepared by York County Engineering Department acting as, and in the Contract Documents entitled the ENGINEER, and shall do everything required by this Contract and the other Contract Documents.

2. THE CONTRACT SUM

2.1. The OWNER shall pay to the CONTRACTOR for the faithful performance of the Contract, in lawful money of the United States, and subject to addition and deductions as provided in the Contract Documents, a total sum as follows:

Based upon the prices shown in the Bid heretofore submitted to the OWNER by the CONTRACTOR, a copy of said Proposal being a part of these Contract Documents, the aggregate amount of this Contract (obtained from either the lump sum price, the application of unit prices to the quantities shown in the Bid, or the combination of both) being the sum of

____

($________________).

3. COMMENCEMENT AND COMPLETION OF WORK

3.1. The CONTRACTOR shall commence Work and the Contract Time will commence to run on the date fixed in the Notice to Proceed.

3.2. The CONTRACTOR shall prosecute the Work with faithfulness and diligence and shall be completed and ready for final payment within ***510 calendar* days** after commencement date fixed in the Notice to Proceed.

3.3 The CONTRACTOR shall prosecute the Work with faithfulness and diligence and shall be substantially completed with **Clearing and Grubbing** by the interim completion time of ***180 calendar days***.

4. CONTRACTOR'S ACCEPTANCE OF CONDITIONS

4.1. The CONTRACTOR hereby agrees that, by virtue of submitting a completed Bid including his declarations therein of full satisfaction, knowledge and understanding of the Contract Documents, site conditions (surface and subsurface) and all other conditions affecting the Work, he assumes full responsibility for performance of the Work as required under this Contract. It is expressly agreed that under no circumstances, conditions or situations shall this Contract be more strongly construed against the OWNER than against the CONTRACTOR and his Surety.

4.2. It is understood and agreed that the passing, approval and/or acceptance of any part of the Work or material by the OWNER, ENGINEER, or by any agent or representative, as being in compliance with the terms of this Contract and/or of the Contract Documents, shall not operate as a waiver by the OWNER of strict compliance with the terms of this Contract, and/or the Contract Documents covering said Work; and the OWNER may require the CONTRACTOR and/or his surety to repair, replace, restore and/or make to comply strictly and in all things with this Contract and the Contract Documents any and all of said Work and/or materials which within a period of two years from and after the date of the acceptance of any such Work or material, are found to be defective or to fail in any way to comply with this Contract or with the Contract Documents. This provision shall not apply to materials or equipment normally expected to deteriorate or wear out and become subject to normal repair and replacement before their condition is discovered. Failure on the part of the CONTRACTOR and/or his Surety, immediately after notice to either, to repair or replace any such defective materials and workmanship shall entitle the OWNER, if it sees fit, to replace or repair the same and recover the reasonable cost of such replacement and/or repair from the CONTRACTOR and/or his surety, who shall in any event be jointly and severally liable to the OWNER for all damage, loss and expense caused to the OWNER by reason of the CONTRACTOR's breach of this Contract and/or his failure to comply strictly and in all things with this Contract.

5. LIQUIDATED DAMAGES

5.1. It is mutually agreed that time is of the essence of this Contract and should the CONTRACTOR fail to complete the work within the specified time, or any authorized extension thereof, there shall be deducted from the compensation otherwise to be paid to the CONTRACTOR, and the OWNER will retain the amount of ***Two Thousand, Two Hundred Dollars ($2,200.00)*** per calendar day as fixed, agreed, and liquidated damages for each calendar day elapsing beyond the specified time for **interim substantial completion of the clearing and grubbing** or any authorized extension thereof, which sum shall represent the actual damages which the OWNER will have sustained by failure of the CONTRACTOR to complete the work within the specified time. After substantial completion, if the CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, Contractor shall pay OWNER ***Two Thousand, Two Hundred Dollars ($2,200.00)*** per for each calendar day that expires after the date specified for Final Completion and readiness for final payment until the work is complete and ready for final payment. It being further agreed that said sum is not a penalty, but is the stipulated amount of damages sustained by the OWNER in the event of such default by the CONTRACTOR.

5.2. For the purposes of this Article, the day of final acceptance of the Work shall be considered a day of delay, and the scheduled day of completion of the work shall be considered a day scheduled for production.

6. PARTIAL AND FINAL PAYMENTS

6.1. In accordance with the provisions fully set forth in the General Conditions, and subject to additions and deductions as provided, the OWNER shall pay the CONTRACTOR as follows:

6.1.1. Within 30 days after receipt by the OWNER of the CONTRACTOR's request for partial payment, the OWNER shall make partial payments to the CONTRACTOR, on the basis of the estimate of Work as approved by the ENGINEER, for work performed during the preceding calendar month, less five percent (5%) of the amount of such estimate which is to be retained by the OWNER until all Work has been performed strictly in accordance with this Agreement and until such Work has been accepted by the OWNER.

6.1.2. Upon submission by the CONTRACTOR of evidence satisfactory to the OWNER that all payrolls, material bills and other costs incurred by the CONTRACTOR in connection with the construction of the Work have been paid in full, including all retainage to subcontractors on the project, and also after all guarantees that may be required in the specifications have been furnished and are found acceptable by the OWNER, final payment on account of this Agreement shall be made within sixty (60) days after completion by the CONTRACTOR of all Work covered by this Agreement and acceptance of such Work by the OWNER.

6.1.3. Retainage will be released in full at Final Completion.

7. ADDITIONAL BOND

7.1. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the Performance and Payment Bonds hereto attached for its faithful performance, the OWNER shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bond(s) ceases to be adequate to cover the performance of the Work, the CONTRACTOR shall, at his expense, and within three days after the receipt of notice from the OWNER to do so, furnish an additional bond or bonds, in such form and amount, and with such sureties as shall be satisfactory to the OWNER. In such event, no further payment to the CONTRACTOR shall be deemed due under this Agreement until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the OWNER.

8. CONTRACT DOCUMENTS

8.1. The Contract Documents, as stated in the Instructions to Bidders, including this Project Manual and General Conditions, and the accompanying Contract Drawings, shall form the Contract and are as fully a part of this Contract as if herein repeated.

IN WITNESS WHEREOF the parties hereto have executed this Agreement on the day and date first above written in three (3) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original Contract.*

______________________	______________________
Owner	Contractor
By:____________________	By:____________________
______________________	______________________
[Corporate Seal]	[Corporate Seal]
Attest:________________	Attest:________________
Address for giving notices:	Address for giving notices:
______________________	______________________
______________________	______________________
	License No.____________
	Agent for service of process:__________
	______________________
	______________________

(*) In the event that the CONTRACTOR is a Corporation, a certificate of resolution of the Board of Directors of the Corporation, authorizing the officer who signs the Contract to do so in its behalf shall be completed and submitted with this form.

END OF SECTION

GENERAL CONDITIONS

1. DEFINITIONS

1.1. Whenever used in any of the Contract Documents, the following meanings shall be given to the terms herein defined:

1.1.1. *Addendum* or *Addenda* - Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.1.2. *Agreement* - The written contract between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.1.3. *Application for Payment* - The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.1.4. *Bid* - The offer or proposal of the bidder on the prescribed Bid Form setting forth the prices for the Work to be performed.

1.1.5. *Bidder* - One who submits a Bid directly to OWNER, as distinct from sub-bidder, who submits a Bid to a Bidder.

1.1.6. *Bidding Documents* - The Invitation for Bids, Instruction to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.1.7. *Bonds* - Performance and Indemnity and Payment Bonds and other instruments of security.

1.1.8. *Change Order* - A document recommended by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

1.1.9. *Contract Documents* - Executed Agreement, Addenda (if any), Invitation for Bids, Instructions to Bidders, Signed Copy of Bid, Bid Guarantee, Statement of Bidder's Qualifications, Performance and Indemnity Bond, Payment Bond, Certification of Insurance, General Conditions, Supplemental Conditions (if any), Special Conditions (if any), Technical Specifications, and Drawings (as listed in the Index of Drawings).

1.1.10. *Contract Price* - The moneys payable by OWNER for completion of the Work in accordance with the Contract Documents.

1.1.11. *Contract Times* - The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the work so that it is ready for final payment as evidenced by ENGINEER's written records.

1.1.12. *CONTRACTOR* - The person, firm, or corporation entering into Contract with the OWNER to construct and install the improvements embraced in this Contract.

1.1.13. *Defective* - An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or had been damaged prior to ENGINEER's recommendation or final payment.

1.1.14. *Drawings* - The construction drawings which graphically show the scope, extent, and character of the Work to be furnished and performed by the CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents. These Drawings are listed in the Index of Drawings.

1.1.15. *ENGINEER* – The person, firm or corporation serving the OWNER with Engineering services, his successors, or any other person or persons, employed by said OWNER for the purpose of directing or having charge of the work embraced in this Contract.

1.1.16. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.1.17. *Liens* - Liens, charges, security interests or encumbrances upon project funds, real property or personal property.

1.1.18. *Local Government* - York County, South Carolina, within which the Project Areas are situated.

1.1.19. *Milestone* - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.1.20. *Notice of Award* - The written notice by OWNER to the apparent successful Bidder stating that upon compliance by the apparent successful Bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the agreement.

1.1.21. *Notice to Proceed* - A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform, CONTRACTOR's obligations under the Contract Documents.

1.1.22. O*WNER* - The York County Government, which is authorized to undertake this Contract.

1.1.23. *Partial Utilization* - Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.1.24. *Project* - The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.1.25. *Project Area* - The area within which are the specified limits of the improvements to be constructed in whole or in part under this Contract.

1.1.26. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

1.1.27. *Resident Project Representative* – The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

1.1.28. *Samples* - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.1.29. *Site* – Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of the CONTRACTOR.

1.1.30. *Shop Drawings* - All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

1.1.31. S*pecial Conditions -* The part of the Contract Documents that amends or supplements the Technical Specifications.

1.1.32. *Subcontractor* - An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.1.33. *Substantial Completion* - The Work (or specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certification of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.1.34. *Successful Bidder* - The lowest, qualified, responsible and responsive Bidder to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

1.1.35. *Supplier* – A manufacturer, fabricator, supplier, distributor, material man or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

1.1.36. *Supplemental Conditions* - The part of the Contract Documents that amends or supplements these General Conditions.

1.1.37. *Technical Specifications* - The part of the Contract Documents that describes, outlines, and stipulates: the quality of materials, equipment and systems to be furnished; the quality of workmanship required; and the methods to be used in carrying out the construction work to be performed under this Contract.

1.1.38. *Underground Facilities -* All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, or water.

1.1.39*. Unit Price Work* - Work to be paid for on the basis of unit prices.

1.1.40. *Work* - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing and incorporating materials and equipment into the construction, and furnishing, installing and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

1.2 Other technical terms not specifically defined within the Contract Documents shall have the meanings given in AIA Document "Glossary of Construction Industry Terms," current edition. Technical terms not defined as above and used to describe items of the Work, and which so applied have a well-known technical or trade meaning, shall be deemed to have such recognized meaning.

2. CONTRACTOR'S OBLIGATIONS

2.1. All work shall be done in strict accordance with the Contract Documents. Observations, construction reviews, tests, recommendations or approvals by the ENGINEER or persons other than the CONTRACTOR, shall in no way relieve the CONTRACTOR of his obligations to complete all work in accordance with the Contract Documents. All work shall be done under the direct supervision of the CONTRACTOR. The CONTRACTOR shall be responsible for construction means, methods, techniques, and procedures, and for providing a safe place for the performance of the work by the CONTRACTOR, Subcontractors, suppliers, and their employees and for access, use, work, or occupancy by all authorized persons.

3. LANDS BY CONTRACTOR

3.1. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application, but specifically related to the use of the Site with which the CONTRACTOR must comply in performing work.

3.2. Any land and access thereto not specifically shown to be furnished by the OWNER that may be required for temporary construction facilities or for storage of materials and equipment shall be provided by the CONTRACTOR with no liability to the OWNER. The CONTRACTOR shall confine his apparatus and storage to such additional areas as he may provide at his expense.

3.3. The CONTRACTOR shall not enter upon private property for any purpose without obtaining permission, and he shall be responsible for the preservation of all public property, trees, monuments, structures and improvements, along and adjacent to the street and/or right-of-way, and shall use every precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed.

4. SURVEYS BY CONTRACTOR

4.1. Based upon the Construction Documents and any additional information provided by the OWNER, the CONTRACTOR shall develop and make all detailed surveys necessary for construction, including working points, lines and elevations.

5. PUBLIC UTILITIES

5.1. The elevation and location of all public utilities shown on the Drawings were taken from existing public records. It shall be the duty of the CONTRACTOR to make final and exact determination of the location and extent of all utilities and he will be liable for any expense resulting from damage to them.

6. SUPERINTENDENT

6.1. A qualified superintendent, who is acceptable to the OWNER, shall be maintained on the Work and shall give efficient supervision to the Work until its completion. The superintendent shall have full authority to act in behalf of the CONTRACTOR, and all instruction given to the superintendent shall be considered as given to the CONTRACTOR. It shall be the responsibility of this CONTRACTOR's superintendent to coordinate the Work of all the Subcontractors. The superintendent shall be present on the site at all times required to perform adequate supervision and coordination.

7. SUBCONTRACTORS

7.1. At the time set forth in the Contract Documents or when requested by the OWNER, the CONTRACTOR shall submit in writing for review of the OWNER the names of the Subcontractors proposed for the work. Subcontractors may not be changed except at the request or with the approval of the OWNER. The CONTRACTOR is responsible to the OWNER for the acts and deficiencies of his Subcontractors, and of their direct and indirect employees, to the same extent as he is responsible for the acts and deficiencies of his employees. The Contract Documents shall not be construed as creating any contractual relation between any Subcontractor and the OWNER. The CONTRACTOR shall bind every Subcontractor by the terms of the Contract Documents.

8. ASSIGNMENTS

8.1. The CONTRACTOR shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder without written consent of the OWNER. In case the CONTRACTOR assigns all or any part of any moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the CONTRACTOR shall be subject to prior claims of all persons, firms, and corporations for services rendered or materials supplied for the performance of the work called for in this Contract.

9. MUTUAL RESPONSIBILITY OF CONTRACTORS

9.1. If through acts of neglect on the part of the CONTRACTOR, any other CONTRACTOR or any Subcontractor shall suffer loss or damage on the work, the CONTRACTOR agrees to settle with such other CONTRACTOR or Subcontractor by agreement or arbitration if such other CONTRACTOR or Subcontractor will so settle. If such other CONTRACTOR or Subcontractor shall assert any claim against the OWNER on account of any damage alleged to have been sustained, the OWNER shall notify the CONTRACTOR, who shall indemnify and save harmless the OWNER against any such claim.

10. ORAL AGREEMENTS

10.1. No oral order, objection, claim or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents, and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver or modification thereof in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

11. MATERIALS, SERVICE AND FACILITIES

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

11.2. Any work necessary to be performed after regular working hours, on Sundays or Legal Holidays, shall be performed without additional expense to the OWNER.

12. MATERIALS AND EQUIPMENT

The materials and equipment installed in the work shall meet the requirements of the Contract Documents and no materials or equipment shall be ordered until reviewed by the ENGINEER. The CONTRACTOR shall furnish all materials and equipment not otherwise specifically indicated or provided by the OWNER.

The CONTRACTOR shall guarantee all materials and equipment he provides in accordance with Section 16 of these GENERAL CONDITIONS.

12.1. Substitutions: In order to establish standards of Quality, the ENGINEER has, in the detailed Specifications, referred to certain products by name and catalog number without consideration of possible substitute or “or equal” items. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design.

12.1.1. Whenever it is indicated in the Drawings or specified in the specifications that a substitute or “or-equal” item of material or equipment may be furnished or used by the CONTRACTOR, application for such acceptance will not be considered by the ENGINEER until after the Effective Date of the agreement. The CONTRACTOR shall furnish the complete list of proposed desired substitutions, together with such engineering and catalog data as the ENGINEER may require. All proposals for substitutions shall be submitted in writing by the General Contractor and not by individual trades or material suppliers. The ENGINEER will review proposed substitutions and make his recommendations in writing within reasonable time.

12.1.2. The CONTRACTOR shall abide by the ENGINEER's recommendation when proposed substitute materials or items of equipment are not recommended for installation and shall furnish the specified material or item of equipment in such case.

12.2. Space Requirements: It shall be the responsibility of the CONTRACTOR to insure that materials and equipment to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall order such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the Contract Documents.

12.3. Arrangement: Where equipment requiring different arrangement of connections from those shown is approved, it shall be the responsibility of the CONTRACTOR to install the equipment to operate properly, and in harmony with the intent of the work required by such arrangement.

12.4. Unacceptable Materials and Equipment: Materials and equipment which do not conform to the requirements of the Contract Documents, or are not equal to samples reviewed by the ENGINEER, or are in any way unsatisfactory or unsuited to the purpose for which they are intended, shall not be furnished nor installed.

12.5. Storage: Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground and/or they shall be placed under cover. Stored materials and equipment shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the property owner or leasee. Materials, equipment, construction machinery, fuel, and oils shall not be stored or parked within the drip-line of any trees in or adjacent to the project site or additional off-site easements and right-of-ways.

12.6. Manufacturer's Directions: Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer.

13. INSPECTION AND TESTING OF MATERIALS

13.1. Unless otherwise specifically provided for in the specifications, the inspection and testing of material and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies approved by the OWNER. The cost of such inspection and testing shall be paid by the CONTRACTOR. The CONTRACTOR shall furnish evidence satisfactory to the OWNER that the material and finished articles have passed the required tests prior to the incorporation of such materials and finished articles in the work. The CONTRACTOR shall promptly segregate and remove rejected material and finished articles from the site of the work.

14. SAMPLES

14.1. All samples called for in the Specifications or required by the ENGINEER shall be furnished by the CONTRACTOR and shall be submitted to the ENGINEER for his review. Samples shall be furnished so as not to delay fabrication, allowing the ENGINEER reasonable time for the consideration of the samples submitted.

14.1.1. Samples for Tests: CONTRACTOR shall furnish such samples of material as may be required for examination and test. All samples of materials for tests shall be taken according to standard methods or as provided in the Contract Documents.

14.1.2. CONTRACTOR's Guaranty: All samples shall be submitted by the CONTRACTOR with a covering letter indicating that such samples are recommended by the CONTRACTOR for the service intended and that the CONTRACTOR's Guaranty will fully apply.

14.1.3. All materials, equipment and workmanship shall be in accordance with samples guaranteed by the CONTRACTOR and reviewed by the ENGINEER.

15. SHOP DRAWINGS

15.1. The CONTRACTOR shall provide shop drawings, setting schedules and such other drawings as may be necessary for the prosecution of the work in the shop and in the field as required by the Drawings, Specifications or the ENGINEER's instructions. Deviations from the Drawings and Specifications shall be called to the attention of the ENGINEER at the time of the first submission of shop drawings and other drawings for consideration. The ENGINEER's review of any drawings shall not release the CONTRACTOR from responsibility for such deviations. Shop drawings shall be submitted according to a schedule prepared jointly by the CONTRACTOR and the ENGINEER.

15.1.1. CONTRACTOR's Certification: When submitted for the ENGINEER's review, shop drawings shall bear the CONTRACTOR's certification that he has reviewed, checked and approved the shop drawings, that they are in harmony with the requirements of the Project and with the provisions of the Contract Documents, and that he has verified all field measurements and construction criteria, materials, catalog numbers and similar data. CONTRACTOR shall also certify that the work represented by the shop drawings is recommended by the CONTRACTOR and the CONTRACTOR's Guaranty will fully apply.

16. GUARANTY

16.1. The CONTRACTOR shall guarantee all materials and equipment furnished and work performed for a period of one years from the date of final payment of the work.

16.1.1. The Performance and Indemnity Bond shall remain in full force and effect during the guaranty period.

16.1.2. Correction of faulty work after final payment shall be as provided in Paragraph 41.

17. INSURANCE

17.1. The CONTRACTOR shall not commence any work until he obtains, at his own expense, all required insurance. Such insurance must have the approval of the OWNER as to the limit, form, and amount. The CONTRACTOR will not permit any Subcontractor to commence work on this project until such Subcontractor has complied with the same insurance requirements.

Types: The types of insurance the CONTRACTOR is required to obtain
and maintain for the full period of the Contract will be: Workmen's Compensation Insurance, Automobile and Comprehensive General Liability Insurance as detailed in the following portions of this specification.

17.1.2. Evidence: As evidence of specified insurance coverage, the OWNER may, in lieu of actual policies, accept certificates issued by the insurance carrier showing such policies in force for the specified period. Each policy or certificate will bear an endorsement or statement waiving right of cancellation or reduction in coverage within ten days' notice in writing to be delivered by registered mail to the OWNER. Should any policy be cancelled before final payment by the OWNER to the CONTRACTOR and the CONTRACTOR fails immediately to procure other insurance as specified, the OWNER reserves the right to procure such insurance and to deduct the cost thereof from any sum due the CONTRACTOR under this Contract.

17.1.3. Adequacy of Performance: Any insurance bearing on adequacy of performance shall be maintained after completion of the project for the full guaranty period. Should such insurance be cancelled before the end of the guaranty period and the CONTRACTOR fails immediately to procure other insurance as specified, the OWNER reserves the right to procure such insurance and to charge the cost thereof to the CONTRACTOR.

17.1.4. Payment of Damages: Nothing contained in these insurance requirements is to be construed as limiting the extent of the CONTRACTOR's responsibility for payment of damages resulting from his operations under this Contract.

18. WORKMEN'S COMPENSATION INSURANCE

18.1. Before the Agreement between the OWNER and the CONTRACTOR is entered into, the CONTRACTOR shall submit written evidence that he and all Subcontractors have obtained, for the period of the Contract, full Workman's Compensation Insurance coverage for all persons whom they employ or may employ in carrying out the work under this Contract. This insurance shall be in strict accordance with the requirements and statutory limits of the most current and applicable South Carolina Workman's Compensation Insurance Laws.

19. COMPREHENSIVE GENERAL LIABILITY AND AUTOMOBILE INSURANCE

19.1. Before commencement of the work, the CONTRACTOR shall submit written evidence that he and all his Subcontractors have obtained for the period of the Contract, full Comprehensive General Liability Insurance and automobile coverage. This coverage shall provide for both bodily injury and property damage.

19.1.1. Comprehensive General Liability Insurance shall include coverage for bodily injury, sickness or disease, death, or property damage arising directly or indirectly out of or in connection with the performance of work under this Contract, and shall provide for a combined single limit of not less than one million ($1,000,000) dollars for all damages arising out of bodily injury, sickness or disease, death, or property damage for each occurrence.

19.1.2. Automobile insurance shall include coverage for bodily injury and property damage arising directly or indirectly out of or in connection with the performance of work under this Contract, and shall provide for a combined single limit of not less than one million ($1,000,000) dollars for all damages arising out of bodily injury or property damage for each occurrence.

19.1.3. Indemnity: Included in such insurance will be contractual coverage sufficiently broad to insure the provisions of Paragraph 20.

20. INDEMNITY

20.1. The CONTRACTOR shall hold harmless, indemnify and defend the OWNER, it's successors and assigns, the ENGINEER, their consultants, and each of their officers and employees and agents, from any and all liability claims, losses or damage arising or alleged to arise from the performance of the work described herein, but not including the sole negligence of the OWNER or the ENGINEER.

21. PATENTS AND ROYALTIES

21.1. If any design, device, material or process covered by letters, patent or copyright is used by the CONTRACTOR, he shall provide for such use by legal agreement with the OWNER of the patent or a duly authorized licensee of such OWNER, and shall save harmless the OWNER, and the ENGINEER, from any and all loss or expense on account thereof, including its use by the OWNER.

22. PERMITS

22.1. All permits and licenses necessary for the prosecution of the work shall be secured and paid for by the CONTRACTOR. This shall include all Business Licenses required by the Local Government.

23. LAWS TO BE OBSERVED

23.1. The CONTRACTOR shall give all notices and comply with all Federal, State and local laws, ordinances and regulations in any manner affecting the conduct of the work, and all such orders and decrees as exist, or may be enacted by bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the OWNER its successors and assigns, the ENGINEER, their consultants, and each of their officers and employees and agents against any claim or liability arising from, or based on, the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees.

24. WARNING SIGNS AND BARRICADES

24.1. The CONTRACTOR shall provide adequate signs, barricades, red lights and watchmen and take all necessary precautions for the protection of the work and the safety of the public. All barricades and obstructions shall be kept burning from sunset to sunrise. Barricades shall be of substantial construction and shall be placed and illuminated at night as to show in advance where construction, barricades, or detours exist.

25. PUBLIC CONVENIENCE

25.1. The CONTRACTOR shall at all times so conduct his work as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the work, and to insure the protection of persons and property. No road or street shall be closed to the public except with permission of the proper authorities. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to insure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed.

26. SAFETY

26.1. The CONTRACTOR shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property affected directly or indirectly by his operation during the performance of the work. This requirement will not be limited to normal working hours but will only apply continuously 24 hours per day until written acceptance of the work by the OWNER and shall not be limited to normal working hours.

26.2. The ENGINEER's construction reviews of the CONTRACTOR’s performance is not intended to include review of the adequacy of the CONTRACTOR's safety measures in, on, or near the construction site.

27. NOTICE TO PROCEED

27.1. Following the execution of the Contract by the OWNER and the CONTRACTOR, written Notice to Proceed with the work shall be given by the OWNER to the CONTRACTOR. The CONTRACTOR shall begin and shall prosecute the work regularly and uninterruptedly thereafter (except as provided for herein) with such force as to secure the completion of the work within the Contract Time.

28. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

28.1. It is hereby understood and mutually agreed, by and between the CONTRACTOR and the OWNER, that the date of beginning and the time for completion as specified in the Contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on a date to be specified in the Notice to Proceed.

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

28.3. If said CONTRACTOR shall neglect, fail, or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the OWNER, then the CONTRACTOR does hereby agree, as a part consideration for the awarding of this Contract, to pay to the OWNER the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the CONTRACTOR shall be in default after the time stipulated in the Contract for completing the work.

28.4. The said amount is fixed and agreed upon by and between the CONTRACTOR and the OWNER because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER would in such event sustain, and said amount is agreed to be the amount of damages which the OWNER would sustain and said amount shall be retained from time to time by the OWNER from current periodical estimates.

28.5. It is further agreed that time is of the essence of each and every portion of this Contract and of the Specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. PROVIDED, that the CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to the following:

28.5.1. Any preference, priority or allocation order duly issued by the Federal or State Government.

28.5.2. Unforeseeable cause beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, flood, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather; and

28.5.3. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsection 28.5.1. and 28.5.2. of this article:

PROVIDED, FURTHER, that the CONTRACTOR shall, within 10 days from the beginning of such delay, unless the OWNER shall grant a further period of time prior to the date of final settlement of the contract, notify the OWNER, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the CONTRACTOR within a reasonable time of its decision in the matter, and grant such extension of time as the OWNER shall deem equitable and just.

29. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

29.1. Immediately after execution and delivery of the contract, and before the first partial payment is made, the CONTRACTOR shall deliver to the OWNER an estimated construction progress schedule in a form satisfactory to the OWNER, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents.

30. EXTENSION OF CONTRACT TIME

30.1. A delay beyond the CONTRACTOR's control occasioned by an Act of God, by act or omission on the part of the OWNER or by strikes, lockouts, fire, etc., may entitle the CONTRACTOR to any extension of time in which to complete the work as agreed by the OWNER, provided, however, that the CONTRACTOR shall immediately give written notice to the OWNER of the cause of such delay.

30.2. Act of God shall mean an earthquake, flood, cyclone, or other cataclysmic phenomenon. Storms of normal intensity for the locality shall not be construed as an Act of God and no reparation shall be made to the CONTRACTOR for damages to the work resulting there from.

31. EXTRA WORK

31.1. New and unforeseen items of work found to be necessary, and which cannot be covered by any item or combination of items for which there is a Contract price, shall be classed as Extra Work. It shall be the responsibility of the CONTRACTOR to identify necessary work items classed as Extra Work and for which no previous contract price has been arranged and advise the ENGINEER and the OWNER of the need for the aforesaid necessary Extra Work. The CONTRACTOR shall do such Extra Work and furnish such materials as may be required for the proper completion or construction of the whole work contemplated, upon written order from the OWNER as approved by the ENGINEER. In the absence of such written order, no claim for Extra Work shall be considered.

31.2. Extra Work shall be performed in accordance with these Contract Documents where applicable and work not covered by such shall be done in accordance with the best construction practice and in a workmanlike manner.

31.3. Extra Work required in an emergency to protect life and property shall be performed by the CONTRACTOR as required.

32. CLEANING UP

32.1. The CONTRACTOR shall at all times, keep the premises clean and shall remove from the OWNER's property, and from all public and private property, temporary structures, rubbish, waste materials resulting from his operation or caused by his employees, and all surplus materials, leaving the site smooth, clean and true to line and grade and in the same condition as existed prior to the work performed by the CONTRACTOR or his Subcontractors and as approved by the OWNER. Failure to maintain a clean project site or to complete clean-up of the project site at the completion of the work shall be cause for the OWNER to perform the necessary clean-up and the costs thereof shall be charged to the CONTRACTOR.

33. REQUEST FOR PAYMENT

33.1. The CONTRACTOR may submit to the OWNER periodically, but not more than once each month, a Request for Payment for work done and materials delivered to and stored on the site. The CONTRACTOR shall furnish the OWNER all reasonable information required for obtaining the necessary data relative to the progress and execution of the work. Payment for materials stored on the site will be conditioned upon evidence submitted to establish the OWNER's title to such materials. Each Request for Payment shall be computed on the basis of work completed on all items listed in the Detailed Breakdown of Contract (or on unit prices, as the case may be), less retainage as stated in Special Provisions until final completion and acceptance of the work and less previous payments.

34. ENGINEER'S ACTION ON REQUEST FOR PAYMENT

34.1. All CONTRACTOR's Requests for Payment shall be referred to the ENGINEER for his review and, within a reasonable period, the ENGINEER shall:

34.1.1. Recommend payment by the OWNER of the Request for Payment as submitted.

34.1.2. Recommend payment by the OWNER of such other amount as the ENGINEER shall consider as due the CONTRACTOR, informing the OWNER and the CONTRACTOR in writing of his reasons for recommending the amended amount.

34.1.3. Recommend to the OWNER that payment of the Request for Payment be withheld, informing the CONTRACTOR and the OWNER in writing of his reasons, for so recommending.

35. OWNER'S ACTION ON REQUEST FOR PAYMENT

35.1. Within thirty days after receipt of a Request for Payment from the CONTRACTOR, the OWNER shall:

35.1.1. Pay the Request for Payment as recommended by the ENGINEER.

35.1.2. Pay such other amount, in accordance with Paragraph 36, as he shall decide is due the CONTRACTOR, informing the CONTRACTOR and the ENGINEER in writing of this reasons for paying the amended amount.

35.1.3. Withhold payment in accordance with Paragraph 36, informing the CONTRACTOR and the ENGINEER of his reasons for withholding payment.

36. OWNER'S RIGHT TO WITHHOLD PAYMENT OF A REQUEST FOR PAYMENT

36.1. The OWNER may withhold payment, in whole or in part, of a Request for Payment to the extent necessary to protect himself from loss on account of any of the following:

36.1.1. Defective work.

36.1.2. Evidence indicating the probable filing of claims by other parties against the CONTRACTOR that may adversely affect the OWNER.

36.1.3. Failure of the CONTRACTOR to make payments due to Subcontractors, material suppliers, or employees.

36.1.4. Damage to another CONTRACTOR.

37. PAYMENT FOR EXTRA WORK

37.1. Written notice of claims for payment for Extra Work shall be given by the CONTRACTOR within ten days after receipt of instructions from the OWNER to proceed with the Extra Work and also before any work is commenced, except in emergency endangering life or property. No claim shall be valid unless so made. In all cases, the CONTRACTOR's itemized estimate sheets showing all labor and material shall be submitted to the OWNER. The OWNER's order for Extra Work shall specify any extension of the Contract Time and one of the following methods of payment:

37.1.1. Unit prices or combination of unit prices which formed the basis of the original Contract.

37.1.2. A lump sum based on the CONTRACTOR's estimate and accepted by the OWNER.

37.1.3. Actual cost plus 15 percent for overhead and profit. Actual costs are defined as follows:

37.1.3.1. Labor costs, including time of foreman while engaged directly upon extra work.

37.1.3.2. Labor insurance and taxes.

37.1.3.3. Materials and supplies actually used on the work.

37.1.3.4. Associated General Contractors of America standard rental rates on each piece of equipment having a value in excess of $50.00. Equipment and tools of lesser value are considered "small tools" and, as such, are considered to be part of overhead.

38. ACCEPTANCE AND FINAL PAYMENT

38.1. When the CONTRACTOR has completed the work in accordance with the terms of the Contract Documents, he shall certify completion of the work to the OWNER and submit a final Request for Payment, which shall be the Contract Amount plus all approved additions, less all approved deductions and less previous payments made. The CONTRACTOR shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the work, and upon acceptance by the OWNER, the OWNER will release the CONTRACTOR except as to the conditions of the Performance and Indemnity Bond and the Labor and Material Payment Bond, any legal rights of the OWNER, required guaranties, and Correction of Faulty Work after Final Payment, and will pay the CONTRACTOR's final Request of Payment. The CONTRACTOR shall allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the ENGINEER to assemble and check the necessary data.

38.1.1. Release of Liens: The CONTRACTOR shall deliver to the OWNER a complete release of all liens arising out of this Contract before the retained percentage or before the final Request for Payment is paid. If any liens remains unsatisfied after all payments are made, the CONTRACTOR shall refund to the OWNER such amounts as the OWNER may have been compelled to pay in discharging such liens including all costs and a reasonable attorney's fees.

39. OWNER'S RIGHT TO TERMINATE AGREEMENT

39.1. The OWNER shall have the right to terminate his agreement with the CONTRACTOR after giving ten days' written notice of termination to the CONTRACTOR in the event of any default by the CONTRACTOR.

39.1.1 Default by CONTRACTOR: It shall be considered a default by the CONTRACTOR whenever he shall:

39.1.1.1. Declare bankruptcy, become insolvent, or assign his assets for the benefit of his creditors.

39.1.1.2. Disregard or violate provisions of the Contract Documents or fail to prosecute the work according to the agreed Schedule of Completion, including extensions thereof.

39.1.1.3. Fail to provide a qualified superintendent, competent workmen or Subcontractors, or proper materials, or fail to make prompt payment thereof.

39.1.2. Completion by the OWNER: In the event of termination of the Agreement by the OWNER because of default by the CONTRACTOR, the OWNER may take possession of the work and of all materials and equipment thereon and may finish the work by whatever method and means he may select.

40. TERMINATION OF CONTRACTOR'S RESPONSIBILITY

40.1. The Contract will be considered complete when all work has been finished and the project accepted in writing by the OWNER. The CONTRACTOR's responsibility shall then cease, except as set forth in his Performance and Indemnity Bond, as provided in Paragraph 16, Guaranty, and as provided in Paragraph 41, Correction of Faulty Work After Final Payment.

41 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT

41.1. The making of the final payment by the OWNER to the CONTRACTOR shall not relieve the CONTRACTOR of responsibility for faulty materials or workmanship. The CONTRACTOR shall promptly replace any such defects, as determined by the ENGINEER, discovered within two years from the date of final payment of the work.

42. INSPECTION

42.1. The authorized representatives of the ENGINEER and OWNER shall be permitted to inspect all materials, workmanship, and other relevant project records and data. Materials and workmanship will be subject to the approval of the OWNER and/or his representative.

43. CORRECTION OF WORK

43.1. All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be, at all times and places, subject to the inspection of the ENGINEER who shall be the final judge of the quality and suitability of the work, materials, process of manufacturer, and methods of construction for the purposes for which they are used. Should they fail to meet his approval, they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the CONTRACTOR at his own expense. Rejected material shall immediately be removed from the site. If, in the opinion of the ENGINEER, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract hereunder shall be reduced by such amount as in the judgment of the ENGINEER shall be equitable.

44. SUBSURFACE CONDITIONS FOUND DIFFERENT

44.1. Should the CONTRACTOR encounter subsurface and/or latent conditions at the site materially differing from those shown on the Plans or indicated in the Specifications, he shall immediately give notice to the ENGINEER of such conditions before they are disturbed. The ENGINEER will thereupon promptly investigate the conditions, and if he finds and so determines that they materially differ from those shown on the Plans or indicated in the Specifications, he will at once make such changes in the Plans and/or Specifications, as he may find necessary. Any increase or decrease of cost resulting from such changes are to be adjusted in the manner provided in Paragraph 37 of the General Conditions.

45. CONTRACT SECURITY

45.1. The CONTRACTOR shall furnish a Performance Indemnity Bond and Payment Bond (forms attached) in an amount at least equal to 100% of the contract prices as security for the faithful performance of this Contract, as the security for the payment of all persons performing labor on the project under this Contract, and furnishing materials in connection with this Contract. The Performance and Indemnity Bond and the Payment Bond may be in one or in separate instruments in accordance with local law. Before final acceptance, each bond must be approved by the OWNER.

46. DISPUTE RESOLUTION

46.1 OWNER and CONTRACTOR agree to negotiate all disputes between them in good faith prior to exercising their rights under law.

46.2 Any claim, dispute or other matter in question arising from or related to this Agreement or the performance or breach thereof, which cannot be resolved through direct discussions between parties shall be subject to mediation as a condition precedent to the institution of legal or equitable proceedings by either party, and only after both parties have completed the mediation process.

46.3 Through mediation, CONTRACTOR and OWNER shall endeavor to resolve claims, disputes, or other matters in question between them by mediation in an informal process in which a third-party mediator facilitates discussion between the parties. The parties may designate a mediator mutually agreeable to both CONTRACTOR and OWNER to conduct the mediation. If the parties are unable to agree upon a mediator, mediation shall be conducted in accordance with the mediation provision of the South Carolina Circuit Court Alternative Dispute Resolution Rules. The mediation shall be conducted in York County, South Carolina. A request for mediation shall be filed in writing with the other party to this Agreement, and legal or equitable proceedings shall be stayed pending mediation for a period of sixty (60) days from the date of the request for mediation is filed, unless stayed for a longer period of time by agreement of the parties or court order. The cost of a third-party mediator will be shared equally by the parties.

46.4 If the parties reach an agreement during the mediation process, they shall reduce the agreement to writing and sign it with their attorneys, if any. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

46.5 In any action or proceedings to enforce or interpret any provision of this Agreement, or where any provision herein is validity asserted as a defense, each Party shall bear its own attorney fees, costs, and expenses.

47. CONTRACTOR'S/SUBCONTRACTOR'S PERSONNEL

47.1 Contractor warrants that all Contractor/Subcontractor personnel engaged in the performance of Work under this Contract shall possess sufficient experience and/education to perform the services requested by the County. County expressly retains the right to have any of the Contractor/Subcontractor personnel removed from performing services under this Contract. Contractor shall effectuate the removal of the specified Contractor/Subcontractor personnel from providing any services to the County under this Contract within one business day of notification by County. County shall submit the request in writing to the Contractor's Project Manager. The County is not required to provide any reason, rationale or additional factual information if it elects to request any specific Contractor personnel be removed from performing services under this Contract.

END OF SECTION

SPECIAL CONDITIONS

1. All work performed by the Contractor must be in accordance with the South Carolina Department of Transportation (SCDOT) 2007 Standard Specification for Highway Construction and SCDOT Traffic Signals Material Specifications (latest edition), unless directed otherwise in the plans or by the Engineer. A full version of the 2007 Edition SCDOT Standard Specifications For Highway Construction may be viewed or downloaded on SCDOT's website at www.scdot.org.

2. All work performed by the Contractor shall be constructed using the SCDOT'S Current Standard Drawings with all updates effective at the time of the letting, unless directed otherwise in the plans or by the Engineer. The Standard Drawings are available for download on SCDOT's website www.scdot.org. All drawings that are updated are labeled with their effective letting date in red.

3. There are no known underground storage tanks (UST) within the (present/new) right-of-way. Phase I and Phase II Environmental Site Assessments were conducted for the project and are attached in the Appendix. Seven (7) LUST sites are located adjacent to the subject project. It is the Contractor's responsibility to investigate the project site prior to bidding to determine all structures and obstructions requiring removal. In accordance with Section 202 of SCDOT Specifications, payment for the removal and satisfactory disposal of all underground storage tanks shall be included in the lump sum bid item of 2021000 "Removal of Structures and Obstructions" and includes all materials, labor, equipment, tools, supplies, transportation, removal & disposal of soil and all other incidentals necessary to complete the work. For bidding purposes, it is to be assumed there is one (1) UST in the Lum Sum pay item 2021000. The Contractor shall be paid based on the Lum Sum cost per UST found and removed, or the bid unit price submitted by the contractor multiplied the number of UST actual found and removed within the construction limits. The contractor shall notify the RCE and County of any discovered UST prior to removal and obtain written approval.

   All work shall be performed in accordance with the Department of Health and Environmental Control (DHEC) requirements by contracting personnel certified by DHEC. The Contractor will be required to obtain all permits and provide the required closure reports for all tank removals.

4. The Contractor shall be liable and responsible for payment of fines assessed by any regulatory agency due to non-compliance with applicable permit requirements and/or regulations by the Contractor. In the event that Owner is fined due to non-compliance with permit requirements, the Owner will charge the Contractor the cost of the fine by deducting an equal amount from the next progress pay estimate.

5. In the Bid Proposal Form and Schedule, Division I-Section 3, contract items given a unique seven (7) digit Item Number shall be constructed in accordance with SCDOT Standard Specifications. The first three (3) digits correspond to sections of the SCDOT Standard Specifications. The remaining four (4) digits are for individual identification of each contract item. Contract items that are identified with Item Numbers beginning with W, S, F, and SP shall be constructed in accordance with specifications contained within this document.

6. Construction conditions requiring minor vertical adjustments (0-2 ft.) to existing water line valve boxes, sanitary sewer manholes, and other minor appurtenances shall be the responsibility of the Contractor. The costs for the adjustments shall be the Contractor's responsibility and shall be included in Bid Item, Mobilization. Other utilities requiring relocation or adjustment for construction activities will be the responsibility of the utility owner.

7. Reconstruction of driveways and other special provisions on properties, included in the right-of-way acquisition, shall be coordinated with the Engineer. Contractor shall notify Engineer prior to construction of driveways.

8. The Owner will obtain the South Carolina Department of Health and Environmental Control (DHEC) Notice of Intent (NOI) for the project. The Contractor's signature is required on several documents necessary for obtaining the permit including, but not limited to, the NOI application, weekly inspection reports and Co-Permittee Agreements. The Contractor shall cooperate with the Owner in providing the required signatures. The Contractor shall be responsible for posting at the project site and keeping on file, permit approvals and other notices as required by permits for the project. The NOI also requires that on-site preconstruction conferences be held for the Prime Contractor and all subcontractors. The Contractor shall participate in these meetings as required by the NOI.

9. Testing shall be conducted by the Owner/Engineer in accordance with the procedures defined in the SCDOT Standard Specifications, and applicable Supplemental Specifications.

10. The Contractor shall provide all record drawing information to the Engineer prior to final approval.

11. Commercial advertising signs (realtor signs) within the construction limits should be removed and left on adjacent property - Do not reinstall. No direct payment will be made for removing these signs as the work is considered incidental to the item of clearing and grubbing.

12. Mailboxes are to be relocated at the direction of the Engineer. No direct payment will be made for the relocation of mailboxes.

13. The removal or relocation of billboards is not the Contractor's responsibility.

14. Non-conforming signs that are not to be relocated shall be removed and placed on the property beyond the construction limits.

15. Temporary lane closure shall be conducted in accordance with SCDOT standard details and as directed by the Engineer. The Contractor shall submit a lane closure plan to the Engineer seven (7) calendar days prior to a lane closure. The Contractor shall notify all agencies responsible for emergency services of the lane closure schedule seven (7) calendar days prior to closure.

16. Partial Payments – The following retainage will be withheld pending final completion and final payment. A percentage based on the amount of the contract completed, shall be retained on each estimate until payment of the final estimate. The retainage shall be 5 percent until the project is 75 percent complete, at which time the retainage will be reduced to 2.5 percent. However, when the Contractor has completed at least 99 percent of the work, the Owner may, at his discretion, further reduce the retainage to an amount which will be adequate to complete the remaining work plus any anticipated liquidated damage. The Contractor may be required to furnish consent of surety before the retained amount is reduced to less than 2.5 percent.

17. The Contractor shall develop and submit prior to beginning construction, a schedule of work which will allow construction of the project while maintaining vehicular access to all adjacent parcels during the construction period.

18. The Contractor shall be responsible for abandoning wells, septic tanks and drain fields in accordance with DHEC and other applicable requirements. Payment for all work associated with the abandonment removal and capping of wells and septic tanks and drain fields shall be included in the clearing and grubbing pay item.

19. The Contractor shall be aware of the following special conditions related to right-of-way settlements with property owners adjacent to the project limits. The Contractor shall be responsible for coordinating with property owners to meet the conditions stipulated below:

2021 YORK COUNTY CAPITAL PROJECTS SALES AND USE TAX PROGRAM
11149-004: WIDENING OF US 21 BYPASS AND SC 51 PROJECT
RIGHT-OF-WAY SPECIAL CONDITIONS

Tract	OWNER/CONTACT INFO	CONDITIONS
34	Coalition of Prison Evangelist POC: Keith Blackwell | 864.505.0847	See R/W Form 803 (06-11) Special Provision
81	H & A Associates LLC POC: Metrolina Collision Center | 803.548.4239	See R/W Form 803 (06-11) Special Provision
85	GTA Properties LLC POC: Tina Pappas | 704.552.8580	See R/W Form 803 (06-11) Special Provision

Tract	OWNER/CONTACT INFO	CONDITIONS
162	HOF LLC POC: Brandy Mcbee | 864.761.6980	Existing Fence on Tract 162 along relocated SC 51 to be relocated by property owner. Give 30 Day notice.
163	McDonalds Real Estate Company POC: Sumita Patel | 919.740.8436	See R/W Form 803 (06-11) Special Provision
185	Ross Dress for Less POC: Micheal Jewett | 803.396.2479 | 803.833.7796 | Michael.jewett@ros.com POC: Jonathan Hartman | 803.448.3345 | Jonathan.hartman@ros/com	See R/W Form 803 (06-11) Special Provision

20. A summary of the known utilities within the project limits of the project is included in Section 4D: Utilities Special Conditions. While the Owner has coordinated utility relocation work with the utilities prior to the letting of this contract, it will be the successful low bidder's responsibility to coordinate the construction work with the utilities work during construction. The contractor shall provide Utility Staking for all utilities within the project limits to eliminate conflict between the utility and construction activities which will be paid for as pay item 1052001 Utility Staking.

21. For this project, the following will be eligible for adjustments:

    - Not Applicable

    Base date for adjustment will be determined at the Preconstruction meeting dependent on the bid date for this project.

22. Contractor shall comply with all general and regional conditions identified in the nationwide permit.

23. The Contractor shall be liable and responsible for payment of fines assessed by any regulatory agency due to non-compliance with applicable permit requirements and/or regulations by the Contractor. In the event the Owner is fined due to non-compliance with permit requirements, the Owner will charge the Contractor the cost of the fine by deducting the fine amount from the next month's progress pay estimate.

24. Moving Items – Certain items will need to be moved from within the project limits to allow for the construction of the project. It is the Contractor's responsibility to investigate the various project sites prior to bidding to determine the items requiring removal.

25. Mobilization shall be paid in accordance with Section 103.11 of the SCDOT 2007 Standard Specifications For Highway Construction.

26. The Contractor shall be responsible for abandoning wells, septic tanks and drain fields in accordance with DHEC and other applicable requirements. Payment for all work associated with the abandonment, removal and capping of wells, septic tanks and drain fields shall be included in the Clearing and Grubbing pay item, unless it is provided by other pay items included in this contract.

27. The contractor shall read the Section 404 General Permit included in this Project Manual and comply with all appropriate conditions during construction.

28. PAYMENT FOR MATERIAL TO BE USED IN THE WORK

Material Delivered on the Project
When so authorized by York County/SCDOT, partial payments will be made up to 95% of the delivered cost of materials on hand that are to be incorporated in the work, provided that such materials have been delivered on or in close proximity to the project and stored in an acceptable manner. Material payments will be allowed when 95% of the accumulated costs of unpaid invoices are equal to or greater than $10,000, materials have been inspected and approved by York County/SCDOT

Material Stored at Fabricator's Facilities or Contractor's Facilities
When so authorized by York County/SCDOT, partial payments will be made up to 95% of the invoiced cost, exclusive of delivery cost, for bulky materials requiring fabrication at an offsite location that are durable in nature and represent a significant portion of the project cost, if it has been determined by York County/SCDOT, that the material cannot be reasonably stockpiled in the vicinity of the work. Material payments will be allowed when the materials have been inspected and approved by York County/SCDOT

Materials with Delayed Delivery to the Project
When so authorized by York County/SCDOT, partial payments will be made up to 95% of the invoiced cost of materials that have been ordered by the contractor but will be more than 45 days before being delivered to the project.

Required Documents
(1) Written consent of surety to make such partial payments,
(2) Bill of Sale from the Contractor to the Department, and
(3) Copy of invoice from material supplier verifying the cost of the material.

General Requirements
The partial payments will be made on the conditional basis that the material meets the requirements of the contract and will be incorporated into the project. The Contractor shall reimburse the Department for all partial payments for material paid, but not incorporated into the project.

Partial payments for materials on hand or already ordered but not yet delivered to the project will not constitute acceptance, and any faulty material will be rejected even though previous payment may have been made for same in the estimates.

Partial payment will not be made for fuel, supplies, form lumber, falsework, or used materials.

Partial payments will not be made on seed or any living or perishable plant materials except that when such materials have been planted or otherwise incorporated in the work, payment may be made, not as materials, but as work done as part of a contract item for which a contract unit or lump sum price has been established.

Partial payments will not exceed 95% of the contract unit or lump sum prices for the work.

29. R/W Form 803 (06-11)

THE STATE OF SOUTH CAROLINA

COUNTY OF YORK

PERMISSION FOR:

Slope
Silt fence & Sediment Tubes
Right to Enter
Drop Inlet

York County PID No.	**11149-004**
Project Name:	**US Route 21/SC 51**
Tract No.	**34**
PID No.	**0042332**

KNOW ALL MEN BY THESE PRESENTS, That I (or we) **COPE/Freedom Ministry F/K/A Coalition of Prison Evangelists, PO Box 1461, Fort Mill, SC 29716,** in consideration of the sum of One Dollar ($1.00), to me (or us) in hand paid, and other valuable consideration at and before the sealing and delivering hereof, do hereby grant to the County of York permission to do the work as outlined below, with the understanding that this work is to be done on property of the Grantor outside of the right of way, it being fully understood and agreed that no right of way is being granted to the County for the purpose of this construction.

SPECIAL PROVISIONS:

Herein granted is permission for construction slopes to extend beyond the right of way on the right of US Route 21 between approximate survey stations 37+90 and 38+80 with the understanding that no additional property is granted for construction slopes, during this construction.

Also, herein granted is permission to use heavy equipment for clearing, placement, maintenance, and access for the purpose of construction of a silt fence for NPDES (National Pollutant Discharge Elimination System) to extend beyond the right of way right of US Route 21, between approximate survey stations 37+90 and 38+80, and right of Fern Forest Court between approximate survey stations 10+80 and 11+00, and the construction of sediment tubes to extend beyond the right of way right of US Route 21, at approximate survey stations 38+04 and 38+52, as shown on the plans for this project with the understanding no additional property is granted for the permission, in accordance with County standards.

Also, herein granted is permission for the County, its contractors, or assigns to use heavy equipment beyond the right of way to demolish or remove the Pine Trees right of approximate survey stations 38+20 and 38+36 US 21 and to remove all materials and debris, during this construction.

Also herein granted is permission for the County to install a drop inlet on the property of the grantor and adjacent to the right of way right of US Route 21 at approximate survey station 38+80, as shown on the plans for this project, during this construction.

Checked ____________________ By ____________________

Recorded ____________________ By ____________________

Project ____________________ File ____________________ **Tract 34**

TO HAVE AND TO HOLD, all and singular, the said Permission hereinbefore granted, unto the said County of York. E. Keith Blackwell - Executive Director

IN WITNESS WHEREOF, I (or we) have hereunto set my (or our) hand(s) and seal(s) this 21 day of August, in the year of our Lord, Two Thousand and Nineteen.

Signed, sealed and delivered in the presence of:

COPE/Freedom Ministry
F/K/A Coalition of Prison Evangelists

Alexandria McFadden
1st Witness *(can not be Notary)*

Richard L. Hyatt
2nd Witness *(can be Notary)*

By: E. Keith Blackwell (L.S.)

Its: Executive Director

NOTE: All right-of-way agreements or easements must be in writing and are subject to rejection by the County of York.

THE STATE OF South Carolina)
) Acknowledgement
COUNTY OF York)

The foregoing instrument was acknowledged before me this 21 day of August, 20 19, by E. Keith Blackwell ~~Alexandria McFadden~~ of COPE/Freedom Ministry a executive director of corporation, on behalf of the corporation.

Witness my hand and official seal this the 21 day of August, 2019.

Richard L. Hyatt
Signature of Notary Public

RICHARD L. HYATT COMM. EXP. NOTARY PUBLIC 01-16-2028 SOUTH CAROLINA

Richard L. Hyatt
Printed Name of Notary Public

NOTARY PUBLIC FOR THE STATE OF South Carolina

My Commission Expires: 01/16/2028

(Affix seal if outside SC)

Checked ______ By ______

Recorded ______ By ______

Project ______ File ______ **Tract 34**

R/W Form 803 (06-11)

THE STATE OF SOUTH CAROLINA

COUNTY OF YORK

PERMISSION FOR:

Drive

York County PID No. 11149-004
Project Name: US Route 21/SC 51
Tract No. 81
PID No. 0042332

KNOW ALL MEN BY THESE PRESENTS, That I (or we) **H&A Associates, LLC, 3031 Highway 21, Fort Mill, SC, 29715,** in consideration of the sum of One Dollar ($1.00), to me (or us) in hand paid, and other valuable consideration at and before the sealing and delivering hereof, do hereby grant to the County of York permission to do the work as outlined below, with the understanding that this work is to be done on property of the Grantor outside of the right of way, it being fully understood and agreed that no right of way is being granted to the County for the purpose of this construction.

SPECIAL PROVISIONS:

It is understood and agreed that a drive entrance will be constructed left of US Route 21 at approximate survey station 79+50 during this construction.

It is also understood that the County will relocate the existing business sign currently located within the existing road right at its expense to a place outside of the existing right-of-way.

SAME DRIVEWAY ENTRANCE + WIDTH –

Checked ______________ By ______________

Recorded ______________ By ______________

Project ______________ File ______________ **Tract 81**

TO HAVE AND TO HOLD, all and singular, the said Permission hereinbefore granted, unto the said County of York.

IN WITNESS WHEREOF, I (or we) have hereunto set my (or our) hand(s) and seal(s) this 25th day of January, in the year of our Lord, Two Thousand and ~~Eighteen~~ Twenty two
Signed, sealed and delivered in the presence of: **H&A Associates, LLC**

Elizabeth F. Barrett
1st Witness *(can not be Notary)*

By: [signature] (L.S.)

Cynthia L. Whetsel
2nd Witness *(can be Notary)*

Its: Manager

NOTE: All right-of-way agreements or easements must be in writing and are subject to rejection by the County of York.

THE STATE OF South Carolina)
) Acknowledgement
COUNTY OF York)

The foregoing instrument was acknowledged before me this 25 day of January, 2022, by Harold A. Sumner of H&A Associates, LLC, a ______ corporation, on behalf of the corporation.

Witness my hand and official seal this the 25 day of January, 2022.

CYNTHIA L. WHETSEL
MY COMM EXP.
NOTARY PUBLIC
09/26/2028
SOUTH CAROLINA

Cynthia L. Whetsel
Signature of Notary Public

Cynthia L. Whetsel
Printed Name of Notary Public

NOTARY PUBLIC FOR THE STATE OF
South Carolina

My Commission Expires: Sept. 26, 2028
(Affix seal if outside SC)

Checked ______ By ______
Recorded ______ By ______
Project ______ File ______ **Tract 81**

THE STATE OF SOUTH CAROLINA

COUNTY OF YORK

PERMISSION FOR:

Slope
Drive

York County PID No. 11149-004
Project Name: US Route 21/SC 51
Tract No. 85
PID No. 0042332

KNOW ALL MEN BY THESE PRESENTS, That I (or we) **GTA Properties, LLC, 2707 Huntingtowne Farms Lane, Charlotte, NC 28210** ("Grantor") in consideration of the sum of One Dollar ($1.00), to me (or us) in hand paid, and other valuable consideration at and before the sealing and delivering hereof, do hereby grant to the County of York ("Grantee")permission to do the work as outlined below, with the understanding that this work is to be done on property of the Grantor outside of the right of way, it being fully understood and agreed that no right of way is being granted to the County for the purpose of this construction.

SPECIAL PROVISIONS:

Herein granted is permission for 4 to 1 construction slopes to extend beyond the right of way on the left of US 21 between approximate survey stations 83+80 and 85+96 with the understanding that no additional property is granted for construction slopes, during this construction. The contractor will work the slope around the sign located left of station 84+38 so that it remains in its current location and undisturbed.

Also, it is understood and agreed that a drive entrance to Grantor's property will be constructed left of US 21 at approximate survey station 85+90 during this construction.

The Grantee will restore all areas that are disturbed during or as a result of construction or maintenance activities to a manageable condition. Disturbed areas will be graded to a smooth surface free of ruts, with a uniform slope to prevent ponding, and disturbed areas will be seeded

The Grantee will require the use of protective measures during construction to prevent silting of adjacent creeks and streams. In addition, the Grantee will require the use of traffic control measures including flaggers, as appropriate, when working in the road or driveway. Grantee will require contractor to keep one lane of traffic open during construction at all times.

The Grantee will use at a minimum the following driveway specifications: 150 lbs./SY of asphalt concrete surface course, over 400 lbs./SY of asphalt concrete base course to repair any area of the driveway that is disturbed by this work.

The Grantor shall be responsible for the replacement of all landscaping other than the seeding that the Grantee will perform upon completion of construction.

The Grantor will be allowed to place, at their expense, temporary business signs stating that tenants on the property are Open for Business. Such signs shall not interfere with the Grantee's Contractor's work. The County waives any County permitting fees that would normally apply to these temporary signs (See Attachment "A").

The Grantee will coordinate with its contractors during the pre-construction conference to have minimum impact to the Grantor's tenants' business during business hours throughout construction.

Checked ____________________ By ______________________

Recorded ____________________ By ______________________

Project ______________________ File _____________________ **Tract 85**

TO HAVE AND TO HOLD, all and singular, the said Permission hereinbefore granted, unto the said County of York.

IN WITNESS WHEREOF, I (or we) have hereunto set my (or our) hand(s) and seal(s) this 20 day of November, in the year of our Lord, Two Thousand and Nineteen

Signed, sealed and delivered in the presence of: **GTA Properties, LLC**

Irini Pappas
1st Witness *(can not be Notary)*

By: Angelo Pappas (L.S.)

Georgia Pappas
2nd Witness *(can be Notary)*

Its: Manager

NOTE: All right-of-way agreements or easements must be in writing and are subject to rejection by the County of York.

THE STATE OF South Carolina)
) Acknowledgement
COUNTY OF York)

The foregoing instrument was acknowledged before me this 20 day of November, 20 19, by Angelo Pappas of GTA Properties, LLC a South Carolina corporation, on behalf of the corporation.

Witness my hand and official seal this the 20 day of November 2019.

T. Michael Smith
Signature of Notary Public

T. Michael Smith
Printed Name of Notary Public

NOTARY PUBLIC FOR THE STATE OF
South Carolina

My Commission Expires: September 24, 2028

(Affix seal if outside SC)

Checked ______ By ______

Recorded ______ By ______

Project ______ File ______ **Tract 85**

THE STATE OF SOUTH CAROLINA

COUNTY OF YORK

PERMISSION FOR:

Drive

York County PID No.	**11149-004**
Project Name:	**US Route 21/SC 51**
Tract No.	**163**
PID No.	**0042332**

KNOW ALL MEN BY THESE PRESENTS, That I (or we) **McDonalds Real Estate Company, 110 N. Carpenter Street, Chicago, IL 60607-2101 Attn. US Legal Department L/C 039-0773 ("McDonald's")** in consideration of the sum of One Dollar ($1.00), to me (or us) in hand paid, and other valuable consideration at and before the sealing and delivering hereof, do hereby grant to the County of York ("County") permission to do the work as outlined below, with the understanding that this work is to be done on property of the McDonald's outside of the right of way, it being fully understood and agreed that no right of way is being granted to the County for the purpose of this construction.

SPECIAL PROVISIONS:

The proposed work is to tie the new curb and gutter being installed on US Route 21 into the curb and gutter on McDonald's property at its existing curb cut onto US Route 21. If the exiting fire hydrant at the curb cut needs to be relocated to facilitate this work it will be done by and at the expense of County.

It is understood and agreed that a drive entrance will be constructed right of US Route 21 at approximate survey station 132+60 during this construction.

Immediately after County completes the work, County will restore the work area to the same or better condition as it was in before County began the work and to a safe condition, and will remove all of its equipment, tools, trash and debris from the work area.

Unless otherwise agreed in writing, County will not move, remove or demolish any of McDonald's signs, access drives curbing or other improvements located within the work area.

County will separate by cones or other appropriate construction safety barriers ("cone off") the work area while County performs any work in the work area.

County will perform all work in such a manner so as to not unduly disrupt the operation of the McDonald's restaurant on McDonald's property. County will "cone off" no more than 4 parking stalls at any one time, and will not "cone off" or block in any manner more than half of any access drive at any time, allowing at least one lane open at all times in each access drive for vehicular traffic.

County will not park on or store any construction vehicles, equipment or materials within the work area or on McDonald's other property.

If any damage occurs to McDonald's property or any improvements thereon arising out of, related to, or as a consequence of any of County's work in the work area, McDonald's promptly will notify County in writing of the damage. Unless otherwise agreed by the parties, County will repair the damage (or commence and diligently pursue repairing the damage) within 30 days after receipt of McDonald's notice.

Checked ____________________ By ______________________

Recorded ____________________ By ______________________

Project ______________________ File _____________________ **Tract 163**

TO HAVE AND TO HOLD, all and singular, the said Permission hereinbefore granted, unto the said County of York.

IN WITNESS WHEREOF, I (or we) have hereunto set my (or our) hand(s) and seal(s) this 14th day of October, in the year of our Lord, Two Thousand and 19.

Signed, sealed and delivered in the presence of:

McDonalds Real Estate Company

____
1st Witness *(can not be Notary)*

____
2nd Witness *(can be Notary)*

By: ______________________ (L.S.)

Its: Senior Counsel of McDonald's Corporation, Authorized Signatory for McDonald's Real Estate Company

NOTE: All right-of-way agreements or easements must be in writing and are subject to rejection by the County of York.

THE STATE OF Illinois)
) Acknowledgement
COUNTY OF Cook)

The foregoing instrument was acknowledged before me this 14th day of October, 2019, by Padraic G. Molley of McDonald's Real Estate Company a Delaware corporation, on behalf of the corporation.

Witness my hand and official seal this the 14th day of October, 2019.

OFFICIAL SEAL
PATRICIA HENSLER
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:07/28/20

____
Signature of Notary Public

Patricia Hensler
Printed Name of Notary Public

NOTARY PUBLIC FOR THE STATE OF
Illinois

My Commission Expires: 7-28-20

(Affix seal if outside SC)

Checked ______________ By ______________

Recorded ______________ By ______________

Project ______________ File ______________ **Tract 163**

Memorandum

To: Patrick Hamilton

From: Jerry Bernie

Date: 11/9//2020

Re: SEDC Easement for Highway 21 Widening

The attached has been executed by Ross and included for your records. Please note that all work should be coordinated through ~~James Blevins (james.blevins@ros.com / 805-396-2479)~~ to ensure no disruption to vehicular traffic entering or exiting Retail Drive at Highway 21.

Jerry

10-12-21:

The new contact is Michael Jewett: michael.jewett@ros.com | 803-396-2479 (O) | 803-833-7796 (Cell)

His backup is Jonathan Hartman: jonathan.hartman@ros.com | 803-909-277 (O) | 803-448-3345 (Cell)

THE STATE OF SOUTH CAROLINA

COUNTY OF YORK

York County PID No. 11149-004
Project Name: US Route 21/SC 51
Tract No. 185
PID No. 0042332

PERMISSION FOR:

Slope tie-in

Driveway tie-in

KNOW ALL MEN BY THESE PRESENTS, That I (or we) **Ross Dress for Less, Inc., 5130 Hacienda Drive, Dublin, CA 94568-7579,** in consideration of the sum of One Dollar ($1.00), to me (or us) in hand paid, and other valuable consideration at and before the sealing and delivering hereof, do hereby grant to the County of York. in the State of South Carolina ("York County") permission to do the work as outlined below, with the understanding that this work is to be done on property of the Grantor outside of the right of way, it being fully understood and agreed that no right of way is being granted to York County for the purpose of this construction.

SPECIAL PROVISIONS:

Herein granted is permission for construction slopes to extend beyond the right of way on the left of US 21 between approximate survey stations 107+70 and 109+00 with the understanding that no additional property is transferred for construction slopes, during this construction. This grant of permission is conditioned on York County relocating the existing "NO TRUCKS ALLOWED, ROSS EMPLOYEE/VISITOR ENTRANCE ONLY" sign ("No Trucks Sign"), located at Retail Drive, at its expense during construction of the subject project to its final location as shown on the plans attached hereto at Exhibit A.

1. Also, it is understood and agreed that a driveway tie-in (Retail Drive) will be constructed left of US 21 at approximate survey station 108+40 during this construction. The Contractor shall develop and submit prior to beginning construction, a schedule of work which will allow construction of the project while maintaining vehicular access to all adjacent parcels during the construction period.

TO HAVE AND TO HOLD, all and singular, the said Permission hereinbefore granted, unto York County.

IN WITNESS WHEREOF, I ~~(or we)~~ have hereunto set my ~~(or our)~~ hand~~(s)~~ and seal~~(s)~~ this 6 day of NOVEMBER, in the year of our Lord, Two Thousand and Twenty.

ROSS DRESS FOR LESS, INC.,
a Virginia corporation

By: [signature]
Gregg McGillis
Its: Group Executive Vice President, Property Development

FINAL

6061.1719/1566860.1

TENANT ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
)
County of Alameda)

On 11-6-20 before me, KAREN FOSTER, a Notary Public, personally appeared Gregg McGillis, who proved to me on the basis of satisfactory evidence to be the person~~(s)~~ whose name~~(s)~~ is~~/are~~ subscribed to the within instrument and acknowledged to me that he~~/she/they~~ executed the same in his~~/her/their~~ authorized capacity~~(ies)~~, and that by his~~/her/their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

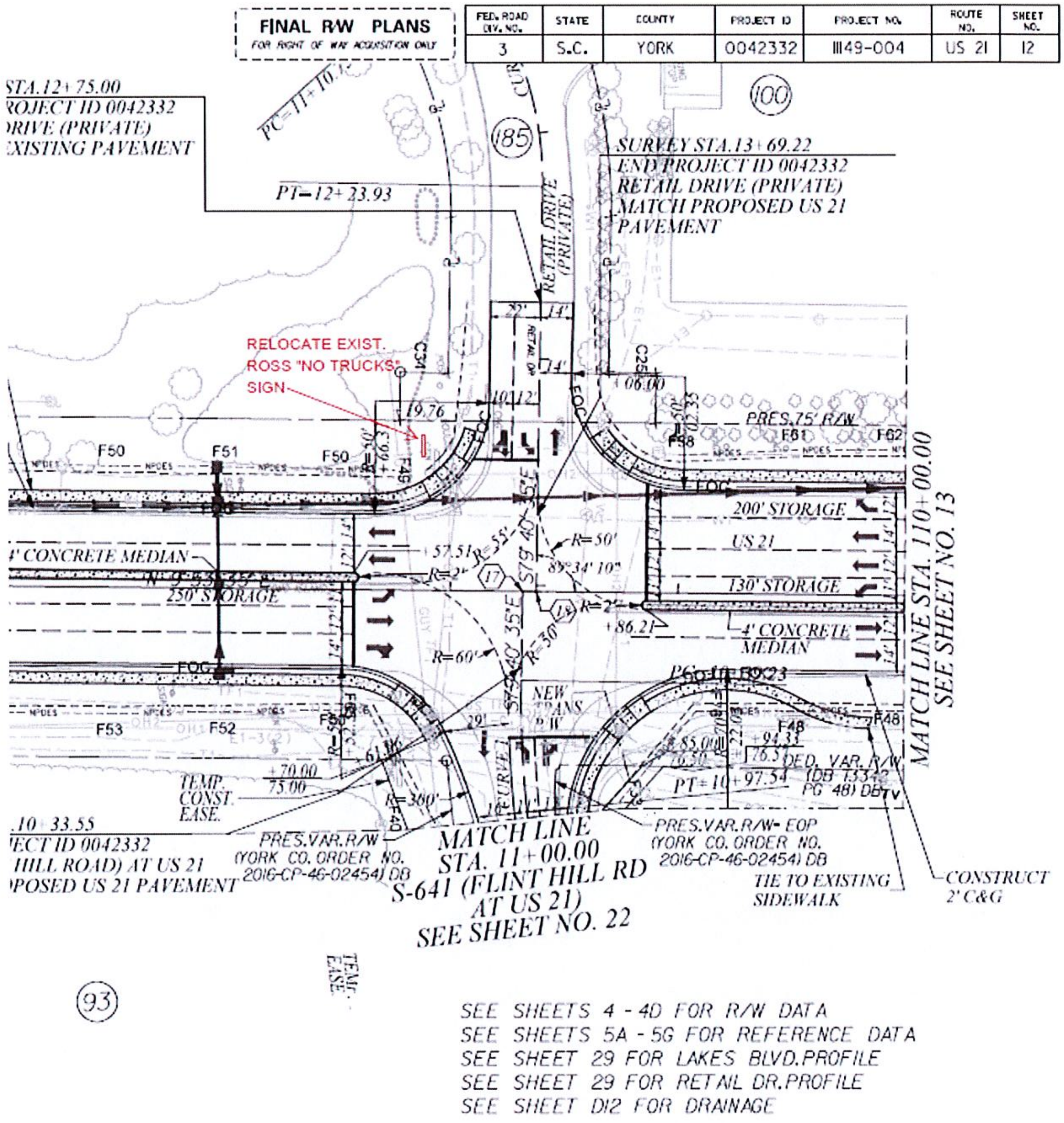
WITNESS my hand and official seal.

Karen Foster
Notary Public

KAREN FOSTER
COMM. #2269902
Notary Public - California
Alameda County
My Comm. Expires Jan. 1, 2023
NRO1

EXHIBIT A

Location of Relocated No Trucks Sign



FINAL

6061.1719/1566860.1

UTILITY SPECIAL PROVISIONS/CONDITIONS
COORDINATION OF RELOCATION WORK WITH HIGHWAY CONSTRUCTION

Widening of US 21 Bypass and SC 51 YORK COUNTY, SC
YORK COUNTY PROJECT – 11149-004 SCDOT PROJECT ID 0042332
Clearing and Grubbing

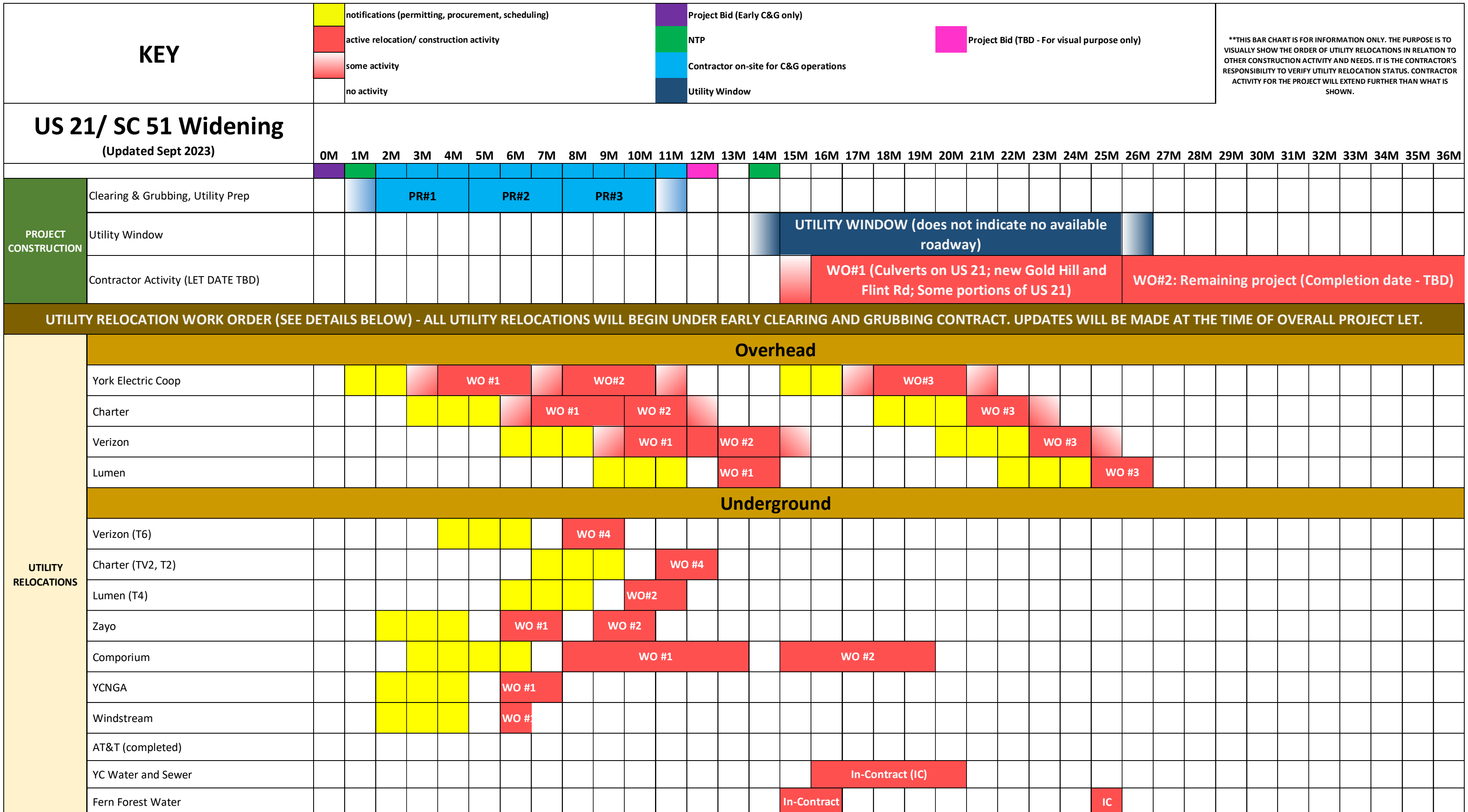
Utility Staking:

Contractor shall be aware on as needed basis; utilities may request staking of construction items and right-of-way to help facilitate relocations and to avoid potential conflict with roadway construction and other utilities.

Utility Relocation Clearing Sequence:

Utility Relocation Approach:

It is the intention of the utilities to relocate according to the following construction sequence. The clearing contractor shall clear and grub according to the priority shown in chart.



WORK AREAS, CONTRACTOR ACTIVITY, AND PRECEDING RELOCATION REQUIRED FOR UTILITY RELOCATION

York Electric Cooperative (E1):
WO #1: SC 51 (need clearing and new alignment graded)
WO #2: Old Nations to SC 51
WO#3: Remaining US 21 (require fill efforts from prime)

Charter (TV2, T2):
WO #1: SC 51 (need clearing/grading & YEC OH)
WO #2: Old Nations to SC 48 (need clearing/grading & YEC OH)
WO #3: Remaining US 21 (need YEC OH)
WO #4: US 21 - UG from Sta 45+00 to 72+00

Verizon (T6):
WO #1: SC 51 (need clearing/grading & YEC OH)
WO #2: Old Nations to SC 48 (need clearing/grading & YEC OH)
WO #3: Remaining US 21 (need YEC OH)
WO #4: US 21 - UG from Sta 45+00 to 61+00

Zayo (T5):
WO #1: Gold Hill to SC 51 & SC 51 (need clearing/grading)
WO #2: SC 460 to Gold Hill (need clearing/grading)

Comporium (T1):
WO #1: Gold Hill to SC 51 & SC 51 (need clearing/grading)
WO #2: SC 460 to Gold Hill (need clearing/grading)

AT&T (T3):
Work is complete for Encrochment #A029Y30

Windstream:
WO #1: Adjust as needed; 1 month notification

Lumen (T4):
WO #1: Old Nations to end of SC 51 (OH) (need YEC & Tele OH
WO #2: Gold Hill to Old Nations (UG only) (need C&G)
WO #3: All remaining OH (need YEC OH & Other OH Telecoms

YCNGA (G1):
WO #1: SC 51 (need clearing & grubbing)
WO#2: All remaining relocations

York County Water/Sewer (W1/SS1):
In-contract

Fern Forest Water (T2):
In-contract (2 parts)

Clearing Priorities:
PR#1:
C&G SC51 and Flint Hill Road (new and existing); Includes rough grading new alignments of existing ground
PR#2:
C&G RT/LT Side from Gold Hill to SC 43 and cut from Sta 44+00 to 54+00 LT on US 21; Includes rough grading for new alignment for Gold Hill of existing ground

PR#3:
Remaining project

PERFORMANCE AND INDEMNITY BOND

STATE OF SOUTH CAROLINA
COUNTY OF YORK

KNOW ALL MEN BY THESE PRESENTS that ____ __________________________ as Principal, hereinafter called Contractor, and ____________________ ____as Surety, hereinafter called Surety, are held and firmly bound unto the York County Government, as Obligee, hereinafter called owner, in the amount of ____ _____________Dollars ($__________________) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated____________________, *202__,* entered into a Contract with Owner for:

Pennies for Progress Project 3

Widening of US 21 Bypass and SC 51
Clearing and Grubbing

in accordance with Drawings and Specifications prepared by York County Engineering Department, ENGINEER, which Contract is by reference made a part hereof and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that, if the Principal shall in all respects promptly and faithfully perform and comply with the terms and conditions of said Contract and his obligations thereunder and shall indemnify the OWNER and the ENGINEER and save either or all of them harmless against and from all costs, expenses and damages arising from the performance of said Contract or the repair of any work thereunder, then this obligation shall be void; otherwise, this Bond shall remain in full force and effect, in accordance with the following terms and conditions:

A. The Principal and Surety jointly and severally agree to pay the OWNER any difference between the sum to which the said Principal would be entitled on the completion of the Contract, and that sum which the OWNER may be obliged to pay for the completion of said work by Contract or otherwise, and any damages, direct or indirect or consequential, which the said OWNER may sustain on account of such work, or on account of the failure of said CONTRACTOR to properly and in all things, keep and execute all of the provisions of said Contract.

B. And this Bond shall remain in full force and effect for a period of two (2) years from the date of final payment of the project by the OWNER and shall provide that the CONTRACTOR guarantees to repair or replace for said period of one (1) years all work performed and materials and equipment furnished that were not performed or furnished according to the terms of the Contract, and shall make good, defects thereof which have become apparent before the expiration of said period of two (2) years. If any part of the project, in the judgment of the OWNER, for the reasons above stated needs to be replaced, repaired or made good during that time, the OWNER shall so notify the CONTRACTOR in writing. If the CONTRACTOR refuses or neglects to do such work within five (5) days from the date of service of such Notice, the OWNER shall have the work done by others and the cost thereof shall be paid by the CONTRACTOR or his Surety. After the one year warranty period and after all warranty work has been completed satisfactorily to the Owner, the Contractor may request that this Bond be terminated.

C. And the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive Notice of any change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

D. The surety represents and warrants to the OWNER that they have a minimum Best's Key Rating Guide General Policyholder's Rating of "A –" and Financial Category of "Class VIII".

IN WITNESS WHEREOF, the above bounded parties executed this instrument under their several seals, this ____ day of _______________ *202*__, A.D., the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

PRINCIPAL:

____

____
Signature of Authorized Officer
(Affix Seal)

WITNESSES:

____

____

____
Title

____
Business Address

____
City State

SURETY:

WITNESS:

____
Corporate Surety

____

____
Attorney-in-Fact (Affix Seal)

____
Business Address

____
City State

____
Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _________________________, certify that I am the Secretary of the Corporation named as Principal in the within bond; that ___________________________ who signed the said bond on behalf of the Principal, was then ____________________________ of said Corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

____
Secretary

Corporate
Seal

STATE OF SOUTH CAROLINA

COUNTY OF YORK

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared __________________________________ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the ____ ____ and that he has been authorized by ____ to execute the foregoing bond on behalf of the Contractor named therein in favor of the___________________________.

Subscribed and sworn to before me this _ day of _____________________, *202*__ A.D.

(Attach Power of Attorney)

____
Notary Public
State of South Carolina-at-Large

My Commission Expires:

END OF SECTION

PAYMENT BOND

STATE OF SOUTH CAROLINA
COUNTY OF YORK

KNOW ALL MEN BY THESE PRESENTS that ________________________________ ____ as Principal, hereinafter called CONTRACTOR, and ____ as Surety, hereinafter called Surety, are held and firmly bound unto the York County Government, as Obligee, hereinafter called OWNER, in the amount of ____ ____Dollars($__________________________) for the payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated_____________, *202*__, entered into a Contract with OWNER for:

Pennies for Progress Project 3
Widening of US 21 Bypass and SC 51
Clearing and Grubbing

in accordance with Drawings and Specifications prepared by York County Engineering Department, ENGINEER, which Contract is by reference made a part hereof and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that, if the Principal shall promptly make payments to all claimants, as herein below defined, then this obligation shall be void; otherwise, this Bond shall remain in full force and effect, subject to the following terms and conditions:

A. A claimant is defined as any person supplying the Principal with labor, material and supplies, used directly or indirectly by the said Principal or any subcontractor in the prosecution of the work provided for in said Contract.

B. The above named Principal and Surety hereby jointly and severally agree with the OWNER that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after performance of the labor or after complete delivery of materials and supplies by such claimant, may sue on this Bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.

C. No suit or action shall be commenced hereunder by any claimant:

    1. Unless claimant, other than one having a direct contract with the Principal, shall within forty-five (45) days after beginning to furnish labor, materials or supplies for the prosecution of the work, furnish the Principal with a notice that he intends to look to this bond for protection.

2. Unless claimant, other than one having a direct contract with the Principal, shall within ninety (90) days after such claimant's performance of the labor or complete delivery of materials and supplies, deliver to the Principal written notice of the performance of such labor or delivery of such material and supplies and the nonpayment therefore.

3. After the expiration of one (1) year from the performance of the labor or completion of delivery of the materials and supplies; it being understood, however, that if any limitation embodied in this Bond is prohibited by any law controlling the construction hereof such limitations shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

4. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

D. The Principal and the Surety jointly and severally, shall repay the OWNER any sum which the OWNER may be compelled to pay because of any lien for labor or materials furnished for any work included in or provided by said Contract.

E. The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration of or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications applicable thereto shall in any way affect its obligations on this Bond, and the Surety hereby waives notice of any such change, extension of time, alterations of or addition to the terms of the Contract, or to the work or to the Specifications.

F. The Surety represents and warrants to the Owner that they have a minimum Best's Key Rating Guide General Policyholder's rating of "___A -___" and Financial Category of "Class __VIII___".

IN WITNESS WHEREOF, the above bounded parties executed this instrument under their several seals, this _____ day of _____________________ *202__*, A.D., the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

PRINCIPAL:

____

____
Signature of Authorized Officer
(Affix Seal)

WITNESSES:

____

____

____
Title

____
Business Address

____
City State

SURETY:

WITNESS:

____

____
Corporate Surety

____
Attorney-in-Fact
(Affix Seal)

____
Business Address

____
City State

____
Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _________________________, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _______________________________ who signed the said bond on behalf of the Principal, was then ______________________ of said Corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

____

Secretary

Corporate

Seal

STATE OF SOUTH CAROLINA

COUNTY OF YORK

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared _______________________________ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the ______________________________ ____ and that he has been authorized by __________________________________ to execute the foregoing bond on behalf of the CONTRACTOR named therein in favor of the_______________________________.

Subscribed and sworn to before me this ____ day of ____________________, *202*__, A.D.

(Attach Power of Attorney)

____

Notary Public
State of South Carolina-at-Large

My Commission Expires: ____________

END OF SECTION

NOTICE OF AWARD

TO: ______________________________

____

____

FROM: York County Engineering

P.O. Box 148

York, SC 29745

PROJECT TITLE: Pennies for Progress Project 3 - Widening of US 21 Bypass and SC 51 Clearing and Grubbing

PROJECT DESCRIPTION: Clearing and Grubbing for the Widening of US 21 Bypass and SC 51 from US 21 at SC 460 (Springfield Pkwy) to 700' South of S-48 (Springhill Farm Rd) and SC 51 from US 21 to the NC State Line. The total estimated length of roadway is 5.051 miles.

The Owner has considered the Bid submitted by you for the above described work in response to its Advertisement for Bids dated ______________________ and Information for Bidders.

You are hereby notified that your Bid has been accepted for items in the amount of

$ ____

($ ________________________).

You are required by the Information for Bidders to execute the Agreement and furnish the required Contractor's Performance Bond, Payment Bond and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as abandoned and as forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Dated this _____ day of ________, *202*__.

On behalf of the York County Council

By:______________________________________

Title:____________________________________

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged

By:______________________________________

Title:____________________________________

This __________day of _____________________,*202*__

NOTICE TO PROCEED

Date: ______________________________

To: ______________________________

____

____

Project:

Pennies for Progress Project 3
Widening of US 21 Bypass and SC 51
Clearing and Grubbing

You are hereby notified to commence work in accordance with the Agreement dated ________________________ on or before __________________________, and you are to complete the work within **510** consecutive calendar days thereafter. The date of completion of all work is therefore ______________________.

On behalf of the

YORK COUNTY GOVERNMENT

By: __________________________________

Title: York County Engineer

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged by ______________________, this the __________day of ___________________, ***202__***.

By: __________________________________

Title: ________________________________

NON-COLLUSION AFFIDAVIT

State of ______________________________________

County of _____________________________________

___________________________________, being first duly sworn, deposes and says that:

(1) He is _____________________ of _____________________________, the Bidder
Title Company Name
that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm, or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, conveyance or unlawful agreement any advantage against the OWNER or any person interested in the proposed contract;

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affidavit.

(Signed)_________________________

____
(Title)

Subscribed and sworn to before me

this ____ day of ______________, 202__

____
(Title)

My commission expires ___________________

CERTIFICATE OF INSURANCE
(May also use applicable Accord form)

THIS IS TO CERTIFY THAT THE ____

Insurance Company

Address ____

Of ____

has issued policies of insurance, as described below and identified by a policy number, to the insured named below; and to certify that such policies are in full force and effect at this time. It is agreed that none of these policies will be cancelled or changed so as to affect the interest(s) of the York County Government (hereinafter sometimes called the OWNER) until thirty (30) days after written notice of such cancellation or change has been delivered to the ENGINEER.

Insured: ____

Address: ____

Status of Insured

_____________ Corporation _______________ Partnership _______________ Individual

Insured: ____

Description of Work: ____

____

____

INSURANCE POLICIES IN FORCE

Forms of Coverage	Policy Number	Expiration Date
*Worker's Comp./Employers' Liability	_____________	_____________
**Comprehensive Auto Liability	_____________	_____________
***Excess Liability	_____________	_____________
Other (Please specify type)	_____________	_____________

POLICY INCLUDES COVERAGE FOR:		YES	NO
1.	Additional Insured: OWNER and ENGINEER	_______	_______
2.	*Liability under the United States Longshore-men's and Harbor Workers' Compensation Act.	_______	_______
3.	**All owned, hired, or non-owned automotive equipment used in connection with work done for the Owner.	_______	_______
4.	Contractual Liability	_______	_______
5.	Damage caused by explosion, collapse or structural injury, and damage to underground utilities.	_______	_______
6.	Products/Completed Operations	_______	_______
7.	Owners and Contractors Protective Liability	_______	_______
8.	Personal Injury Liability	_______	_______
9.	***Excess Liability applies excess of:		
	(a) Employers' Liability	_______	_______
	(b) Comprehensive General Liability	_______	_______
	(c) Comprehensive Automobile Liability	_______	_______

Types of Coverage	Forms of Coverage	Minimum Limits of Liability	
Workers' Compensation	Bodily Injury	$ 1,000,000	Statutory
Employers' Liability	Bodily Injury	$ 500,000	Each Accident
	Disease	$ 500,000	Each Person
	Disease	$ 500,000	Policy Limit
Comprehensive Auto Liability	Combined Single Limit BI/PD	$ 1,000,000	Each Accident
Comprehensive General Liability	Bodily Injury	$ 1,000,000	Each Occurrence
		$ 5,000,000	Aggregate

The Insurance Company hereby agrees to deliver, within ten (10) days, two (2) copies of the above policies to the Engineer when so requested.

NOTE: Entries on this certificate are limited to the Authorized Agent or Insurance Company Representative.

Date______________________ (SEAL) __________________________
Insurance Company

Issued at____
Authorized Representative

Insurance Agent or Company

- Send original and one copy to:

York County Engineering
Post Office Box 148
6 South Congress Street
York, South Carolina 29745

END OF SECTION

APPLICATION FOR PAYMENT No. _____

Date: ____________ Contractor: ____

Project: ____

Project Number: ___________________ For Period _________________ To ___________________

Total value of work completed to date (see attached sheet) $__________________

Total value of materials stored for project (see attached sheet) $__________________

SUB TOTAL $__________________

LESS ______ %RETAINED $__________________

TOTAL $__________________

LESS PREVIOUS PAYMENTS $__________________

Other Changes, additions, or deductions (see attached sheet) $__________________

TOTAL AMOUNT DUE THIS PAYMENT $__________________

Previous Payments

1.__________________	**4.**__________________	**7.**__________________	**10.**__________________
2.__________________	**5.**__________________	**8.**__________________	**11.**__________________
3.__________________	**6.**__________________	**9.**__________________	**12.**__________________

Submitted By:
I hereby certify to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, and that all amounts have been paid by the Contractor for Work which previous Applications for Payment were issued and payments received from the Owner, that current payment shown herein is now due.

Contractor:_______________________________

Signed By:_______________________________

Date: _______________________________

Notarized:_______________________________
(affix seal)
My Commission Expires:___________________

Recommended By:
Architect/Engineer:________________________ Date: ___________________

Certified Amount: $________________________

The Certified amount is payable only to the Contractor named herein. Issuance, payment, and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

Accepted By:
Owner:________________________________ Date: ___________________

CONTRACT CHANGE ORDER

CHANGE ORDER NO:_________

PROJECT: ____

DATE OF ISSUANCE: ____

DESCRIPTION OF CHANGE: ____

____

____

____

CONTRACT AMOUNT		CONTRACT TIME (Calendar Days)	
Original	$ ___________	Original Durations	_________ Days
Previous Change Orders (Add/Deduct)	$ ___________	Previous Change Order (Add/Deduct)	_________ Days
This Change Order (Add/Deduct)	$ ___________	This Change Order (Add/Deduct)	_________ Days
Revised Contract Amount	$ ___________	Revised Contract Time	_________ Days
REVISED CONTRACT COMPLETION DATE IS: ___________, *20*___			

	OWNER	CONTRACTOR	ENGINEER
SIGNATURE			
PRINT NAME			
COMPANY			
DATE			

RELEASE AND WAIVER OF CLAIM
BY PRIME CONTRACTOR

Know all men by these presents that the undersigned, _____of ___________202__ first being duly sworn, states that all payrolls, materials bills, sales tax, privilege tax or license, old age benefits tax, state and federal unemployment insurance, and other liabilities incurred for use in the performance of the contract for the ***Pennies for Progress Project 3: Widening of US 21 Bypass and SC 51 Clearing and Grubbing*** located in York County, South Carolina have been paid in full and waives any and all claims and releases York County Government (York County, South Carolina) from any rights or claims for debts due and owing by virtue of the furnishing of any material or supplies or any lien thereon.

____
(Name of Company)

By: ________________________________

Its: ________________________________

Sworn to before me
this _________day of ______________________, 20 _______________ .

____

Notary Public for ____

My Commission expires:______________________________________

VALUE ENGINEERING INCENTIVE

INTENT AND OBJECTIVE

(1) This Subarticle applies to any cost reduction proposal (hereinafter referred to as a Value Engineering Change Proposal or VECP) initiated and developed by the Contractor for the purpose of refining the contract documents so as to contribute to design cost effectiveness or significantly improve the quality of the end result. This Subarticle does not, however, apply to any such proposal unless it is identified by the Contractor, at the time of its submission to the County, as a proposal submitted pursuant to this Subarticle.

(2) VECPs contemplated are those that would result in net savings to the County by providing either: (A) a decrease in the cost of performance of the Contract, or; (B) a reduction in cost of ownership (hereinafter referred to as collateral costs) of the work provided by this Contract, regardless of acquisition costs. VECPs must result in savings without impairing essential functions and characteristics such as safety, service, life, reliability, economy of operation, ease of maintenance, aesthetics and necessary standard design features. However, nothing herein prohibits the submittal of VECPs where the required functions and characteristics could be combined, reduced or eliminated as being nonessential or excessive. Plan errors which are identified by the Contractor and which result in a cost reduction, will not qualify for submittal as a VECP.

(3) The County reserves the right to reject at its discretion any VECP submitted which proposes a change in the design of the pavement system or which would require additional right-of- way. Substitution of another design alternate, which is detailed in the plans, for the one on which the Contractor bid, will not be allowed under this Subarticle. Pending execution of a formal supplemental agreement, implementing an approved VECP, the Contractor shall remain obligated to perform in accordance with the terms of the existing contract. No time extensions will be granted due to the time required to review a VECP.

SUBCONTRACTORS

(1) The Contractor is encouraged to include the provisions of this Subarticle in contracts with subcontractors. The Contractor shall encourage submission of VECPs from subcontractors, however, it is not mandatory that VECPs be submitted nor is it mandatory that the Contractor accept or transmit to the County VECPs proposed by his subcontractors.

DATA REQUIREMENTS

(1) A description of the difference between the existing contract requirement and the proposed change, and the comparative advantages and disadvantages.

(2) Separate detailed cost estimates for both the existing contract requirement and the proposed change. The cost estimates shall be broken down by contract item numbers indicating quantity increases or decreases and deleted pay items. Additional proposed work, not covered by contract items, shall be identified by current County pay item numbers. In preparing the estimate, the Contractor shall include overhead, profit, and bond. No separate

pay item(s) for these costs will be allowed.

(3) An itemization of plan details, plan sheets, design standards and Specifications that must be changed or added if the VECP is adopted. Preliminary plan drawings must be sufficient to describe the proposed changes.

(4) An estimate of the effects the VECP would have on collateral costs to the County.

(5) Engineering or other analysis in sufficient detail to identify and describe specific features of the contract which must be changed if the VECP is accepted, with a proposal as to how these changes can be accomplished and an assessment of their effect on other project elements. The County may require that engineering analyses be performed by a prequalified consultant in the applicable class of work. Any design changes which result from the VECP must be supported by computations sealed by a Professional Engineer registered in the State of South Carolina.

(6) A statement of the time by which approval of the VECP must be issued by the County to obtain the total estimated cost reduction during the remainder of this Contract, noting any effect on the contract completion time or delivery schedule.

PROCESSING PROCEDURES

(1) Two copies of each VECP shall be submitted, one to the Engineer, or his duly authorized representative, and one to the County's Value Engineering Office. VECPs will be processed expeditiously; however, the County will not be liable for any delay in acting upon a VECP submitted pursuant to this Subarticle. The Contractor may withdraw, in whole or in part, a VECP not accepted by the County within the period specified in the VECP. The County shall not be liable for any VECP development cost in the case where a VECP is rejected or withdrawn.

The Engineer shall be the sole judge of the acceptability of a VECP and of the estimated net savings in construction and/or collateral costs from the adoption of all or any part of such proposal. In determining the estimated net savings, the right is reserved to disregard the contract bid prices if, in the judgment of the Engineer, such prices do not represent a fair measure of the value of work to be performed or to be deleted.

Prior to approval, the Engineer may modify a VECP, with the concurrence of the Contractor, to make it acceptable. If any modification increases or decreases the net savings resulting from the VECP as modified and upon determination of final quantities, the new savings shall be computed by subtracting the revised total cost of all bid items affected by the VECP design from the total cost of the same bid items as represented in the original contract.

Prior to approval of the VECP, which initiates the supplemental agreement, the Contractor shall provide acceptable contract quality plan sheets revised to show all details consistent with the VECP design.

COMPUTATIONS FOR CHANGE IN CONTRACT COST OF PERFORMANCE

Contractor development and implementation costs for the VECP will not be recoverable. If the VECP is adopted, the Contractor's share of the net savings as defined hereinafter shall be considered full compensation to the Contractor for the VECP.

County costs of processing or implementation of a VECP will not normally be considered in the estimate. However, the County reserves the right, where it deems such action appropriate, to require the Contractor to pay the County's cost of investigating and implementing a VECP submitted by the Contractor as a condition of considering such proposal. Where such a condition is imposed, the Contractor shall indicate his acceptance thereof in writing, and such acceptance shall constitute full authority for the County to deduct amounts payable to the County from any monies due or that may become due to the Contractor under the contract.

COMPUTATIONS FOR COLLATERAL COSTS

When collateral cost savings are sought by the Contractor, separate estimates must be prepared for collateral costs of both the existing contract requirement and the proposed change. Each estimate shall consist of an itemized breakdown of all costs and the basis for the data used in the estimate. Cost benefits to the County include, but are not limited to: reduced costs of operation, maintenance or repair, and extended useful service life. Increased collateral costs include the converse of such factors.

Computations shall be as follows:

(1) Costs shall be calculated over a 20-year period on a uniform basis for each estimate.

(2) If the difference in the estimates as approved by the County indicates a savings, the Contractor shall divide the resultant amount by 20 to arrive at the average annual net collateral savings. The resultant savings shall be shared as stipulated in Sharing Arrangements.

SHARING ARRANGEMENTS

If a VECP is approved by the County, the Contractor may be entitled to share in both construction savings and collateral savings to the full extent provided for in this Subarticle.

Except for innovative ideas, the Contractor and County shall each receive 50 percent of net reduction in the cost of performance of this Contract. For innovative ideas, the reduction in the cost of performance shall be shared as follows:

Accrued Net Savings	Contractor's Share %	County's Share %
Less than $25,000	100	0
$25,000 to $50,000	75	25
Over $50,000	50	50

If an approved change is identical or similar to a previously submitted VECP or an idea previously utilized by the County it will not be considered an innovative idea, thus will only qualify for a 50 percent sharing of savings.

When collateral savings occur, the Contractor shall receive 20 percent of the average one year's net collateral savings.

The Contractor shall not receive construction savings or collateral savings on optional work listed in this Contract, until the County exercises its option to obtain that work.

TRAFFIC CONTROL:
The Contractor shall execute the item of Traffic Control as required by the Standard Specifications, the plans, the Standard Drawings For Road Construction, these special provisions, all supplemental specifications, the MUTCD, and the Engineer. This is an amendment to the Standard Specifications to require the following:

GENERAL REGULATIONS -

These special provisions shall have priority to the plans and comply with the requirements of the MUTCD and the standard specifications. Revisions to the traffic control plan through modifications of the special provisions and the plans shall require approval by the department. **Final approval of any revisions to the traffic control plan shall be pending upon review by the Director of Traffic Engineering.**

All signs mounted on portable sign supports shall have a minimum mounting height of 5' from the bottom of the sign to the ground. All signs mounted on ground mounted u-channel posts or square steel tube posts shall have a minimum mounting height of 7' from the bottom of the sign to the grade elevation of the near edge of the adjacent travel lane or sidewalk when a sidewalk is present.

On multilane primary routes, avoid placement of signs mounted on portable sign supports within paved median areas utilized for two-way left turns unless otherwise directed by the RCE.

When mounting signs on multiple ground mounted sign supports, ensure that each post is of the same type. Combining and installing both ground mounted u-section and square steel tube posts within the same sign assembly is prohibited.

When mounting signs on ground mounted u-section or square steel tube posts, utilize either a sign support / ground support post combination with an approved breakaway assembly or a single direct driven post for each individual sign support of a sign assembly installation. Do not combine a sign support / ground support post combination and a direct driven post on the same sign assembly installation that contains two or more sign supports. Regarding sign support / ground support post combination installations, ensure that post lengths, stub heights and breakaway assemblies comply with the manufacturer's requirements and specifications. Use approved breakaway assemblies found on the *Approved Products List For Traffic Control Devices in Work Zones*.

When covering signs with opaque materials, the Department prohibits attaching a covering material to the face of the sign with tape or a similar product or any method that will leave a residue on the retroreflective sheeting. Residue from tape or similar products, as well as many methods utilized to remove such residue, damages the effective reflectivity of the sign. Therefore, contact of tape or a similar product with the retroreflective sheeting will require replacement of the sign. Cost for replacement of a sign damaged by improper covering methods will be considered incidental to providing and maintaining the sign; no additional payment will be made.

Signs not illustrated on the typical traffic control standard drawings designated for permanent construction signs shall be considered temporary and shall be included in the lump sum price bid item for "Traffic Control" unless otherwise specified.

Install and maintain any necessary detour signing as specified by the typical traffic control standard drawings designated for detour signing, Part VI of the MUTCD, these Special Provisions, and the Engineer. The lump sum price bid item for "Traffic Control" includes payment for installation and maintenance of the detour signing.

The Contractor shall maintain the travel patterns as directed by the traffic control plans and shall execute construction schedules expeditiously. The Contractor shall provide the Resident Engineer with no less than a two-week prior notification of changes in traffic patterns.

Supplement and delineate the shoulder edges of travel lanes through work zones with traffic control devices to provide motorists with a clear and positive travel path. Utilize portable plastic drums unless otherwise directed by the Department. Vertical panels may be used where specified by the plans and directed by the RCE. The installation of traffic control devices are required in all areas where those areas immediately adjacent to a travel lane open to traffic have been altered in any manner by work activities, including but not limited to activities such as grading, milling, etc. Install

the traffic control devices immediately upon initiating any alterations to the areas immediately adjacent to or within 15 feet of the near edge line of the adjacent travel lane. When sufficient space is available, place the traffic control devices no closer than 3 feet from the near edge of the traffic control device to the near edge line on the adjacent travel lane. When sufficient space is unavailable, place the traffic control device at the maximum distance from the near edge of the adjacent travel lane available.

LANE CLOSURE RESTRICTIONS -

The lane closure restrictions stated below are project specific. For all other restrictions see supplemental specification "Closure Restrictions" dated July 1, 2019.

- **Lane Closure Restriction**
  https://www.scdot.org/business/technicalPDFs/supSpecs/Lane-Closure-Restriction-2019July.pdf
- **Primary Hour Restrictions**
  http://www.scdot.org/business/pdf/accessMgt/trafficEngineering/PrimaryHourRestrictions.pdf
- **Interstate Hour Restrictions**
  https://www.scdot.org/business/pdf/accessMgt/trafficEngineering/InterstateHourRestrictions.pdf

The Contractor shall install all lane closures as directed by the Standard Specifications For Highway Construction (latest edition), the Standard Drawings For Road Construction, these special provisions, the MUTCD, and the Engineer. The Contractor shall close the travel lanes of two-lane two-way roadways by installing flagging operations. The Contractor shall close the travel lanes of multilane primary and secondary routes as directed by the typical traffic control standard drawings designated for lane closures on primary routes.

The Department prohibits lane closures on primary and secondary routes during any time of the day that traffic volumes in the travel lanes remaining open to traffic exceed 800 vehicles per hour per lane per direction. In addition to this restriction the Department specifically restricts lane closures on US 21 & SC 51 & SC 460 & I-77 NB Offramp during the hours listed in the table below. These restrictions also apply to all road closures and pacing operations. The Department reserves the right to suspend a lane closure if any resulting traffic backups are deemed excessive by the Engineer. Maintain all lane closure restrictions as directed by the plans, these special provisions, and the Engineer.

HOURLY LANE CLOSURE PROHIBITIONS (US 21 & SC 51 & SC 460)	HOURLY LANE CLOSURE PROHIBITIONS (I-77 NB Off Ramp)
MON-FRI: 7A-9A and 4P-6P SAT-SUN: N/A	MON-THU: 5A-8P FRI: 5A-9P SAT: 7A-9P SUN: 9A-9P

The contractor is advised that the Lane Closure Restrictions outline in this Traffic Control Special Provision will be strictly enforced. Should lane closures remain in place or not be completely removed by the time specified, a penalty will be assessed at the rate of $500.00 (FIVE HUNDRED DOLLARS) for each hour interval (or any portion thereof).

Flagging operations are considered to be lane closures for two-lane two-way operations and shall be subject to all restrictions for lane closures as specified by this contract.

Lane closures, including flagging operations, are restricted to maximum distances of 2 miles. Install all lane closures according to the typical traffic control standard drawings. On occasions when daytime lane closures must be extended into the nighttime hours, substitute the nighttime lane closure standards for the daytime lane closure standards.

Installation and maintenance of a lane closure is PROHIBITED when the Contractor is not actively engaged in work activities specific to the location of the lane closure unless otherwise specified and approved by the Engineer. The length of the lane closure shall not exceed the length of

roadway anticipated to be subjected to the proposed work activities within the work shift time frame or the maximum lane closure length specified unless otherwise approved by the Engineer. Also, the maximum lane closure length specified does not warrant installation of the specified lane closure length when the length of the lane closure necessary for conducting the work activity is less. The length and duration of each lane closure, within the specified parameters, shall require approval by the Engineer prior to installation. The length and duration of each lane closure may be reduced by the Engineer if the work zone impacts generated by a lane closure are deemed excessive or unnecessary.

The presence of temporary signs, portable sign supports, traffic control devices, trailer mounted equipment, truck mounted equipment, vehicles and vehicles with trailers relative to the installation or removal of a closure and personnel are prohibited within the 15 to 30 foot clear zone based upon the roadway speed limit during the prohibitive hours for lane closures specified by these special provisions.

SHOULDER CLOSURE RESTRICTIONS -

The hourly restrictions for lane closures shall also apply to work activities conducted under a shoulder closure within 15' of the near edge of an adjacent travel lane or a median area. The Department reserves the right to suspend work conducted under a shoulder closure if any traffic backups develop and are deemed excessive by the Engineer. Maintain all shoulder closure restrictions as directed by the plans, these special provisions, and the Engineer.

On primary and secondary roadways, the Department prohibits the Contractor from conducting work within 1' or less of the near edge of an adjacent travel lane under a shoulder closure. All work that may require the presence of personnel, tools, equipment, materials, vehicles, etc., within 1' of the near edge of an adjacent travel lane shall be conducted under a lane closure.

The Contractor shall install all shoulder closures as directed by the typical traffic control standard drawings designated for shoulder closures, and the Engineer. Substitution of the portable plastic drums with oversized cones during nighttime shoulder closures is PROHIBITED.

MOBILE OPERATIONS -

A mobile operation moves continuously at all times at speeds 3 mph or greater without any stops. The minimal traffic flow impacts generated by these operations involve brief traffic flow speed reductions and travel path diversions. Conduct work operations that cannot be performed at speeds of 3 mph or greater under standard stationary lane closures.

The distance intervals between the vehicles, as indicated in the *Standard Drawings For Road Construction*, may require adjustments to compensate for sight distance obstructions created by hills and curves and any other conditions that may obstruct the sight distance between the vehicles. However, adjustments to the distance intervals between the vehicles should be maintained within the range of variable distance intervals indicated in the standard drawings unless otherwise directed by the Engineer.

Maintain two-way radio communication between all vehicles in the vehicle train operating in a mobile operation.

Supplement the work vehicles and the shadow vehicles with amber colored flashing dome lights. The vehicles may also be supplemented with advance warning arrow panels and truck mounted attenuators as directed in the *Standard Drawings For Road Construction* and the Standard Specifications.

The Contractor shall install, operate and maintain all advance warning arrow panels, truck mounted attenuators and truck mounted changeable message signs as required by these special provisions, the manufacturer's specifications, the *Standard Drawings For Road Construction*, the Standard Specifications, the plans and the Engineer.

TRAFFIC CONTROL PROCEDURES SPECIFIC TO TRAFFIC SIGNAL WORK OPERATIONS –

Utilize a vehicle train consisting of a primary work vehicle and no less than 1 shadow vehicle. The shadow vehicle is required for all Traffic Signal Work Operations except on a two-lane roadway for a time duration of 15 minutes or less when no pedestrian workers are present, excluding the flagger. A second shadow vehicle is necessary in some applications on multilane roadways as depicted on the Standard Drawings. Install and maintain the vehicle train as directed by these special provisions, the Standard Drawings For Road Construction, and the Engineer.

Two-Lane Two-Way Roadways

A. Utilize flagging operations to control the traffic flow around the work site where the vehicle train is operating.

B. Utilize flaggers to control the traffic flow on an intersecting two-lane two-way roadway. The advance warning signs for the flagging operations shall include the following:

W20-7a-48	Flagger symbol
W20-4-48-A	One Lane Road Ahead
W20-1-48-A	Road Work Ahead

C. Maintain two-way radio communications between all flaggers.

Multilane Roadways

A. During work operations that require the vehicle train to encroach upon or operate within the limits of a travel lane for a time duration of 15 minutes or less, advance warning signs may be omitted.

B. During work operations that require the vehicle train to encroach upon or operate within the limits of a travel lane for a time duration in excess of 15 minutes but less than 60 minutes, advance warning signs are required. Typical advance warning signs required for a temporary closure of a travel lane shall include the following:

W4-2R(L)-48	Lane Ends symbol
W20-5R(L)-48-A	Right (Left) Lane Closed Ahead
W20-1-48-A	Road Work Ahead

C. Utilization of flaggers to control the traffic flow in the travel lanes adjacent to the travel lane the vehicle train is operating in is PROHIBITED except as allowed in the Standard Drawings Requirements for a Temporary Cessation of Traffic Flow for a time duration of 3 minutes or less.

D. Utilize flaggers to control the traffic flow on an intersecting two-lane two-way roadway. Only flaggers and advance warning signs are required on the approaches intersecting the travel lane the vehicle train is operating in. The advance warning signs for the flagging operations shall include the following:

W20-7a-48	Flagger symbol
W3-4-48	Be Prepared to Stop
W20-1-48-A	Road Work Ahead

E. **During work operations that require the vehicle train to encroach upon or operate within the limits of a travel lane for a time duration in excess of 60 minutes, install a standard lane closure as directed by these special provisions, the Standard Drawings For Road Construction, and the Engineer.**

Conduct all equipment and material preparations prior to entering the roadway.

Conducting traffic signal work or conducting any activities that interfere with or create disruptions to normal traffic operations during morning, mid-day, and afternoon-evening high traffic volume peak periods is PROHIBITED. The contractor shall observe all lane closure restrictions.

Conduct all work activities within the boundaries of a travel lane closed to vehicular traffic or a pedestrian thoroughfare closed to pedestrian traffic. Conducting work activities over a travel lane open to traffic is PROHIBITED. Conducting work activities over a pedestrian thoroughfare open to pedestrian traffic is PROHIBITED. Do not conduct any work activities in any manner over a thoroughfare open to vehicular or pedestrian traffic.

When advance warning signs are required to supplement the vehicle train, install the advance warning signs at spacing intervals based on the regulatory speed limit of the roadway prior to beginning any work. When a work zone traffic control plan or a work zone traffic control standard drawing is not provided to indicate the spacing intervals for a typical 3 advance warning sign array installation, utilize the sign placement intervals below. **These sign intervals do not apply to the sign intervals of the advance sign intervals for standard lane closures.**

ADVANCE WARNING SIGN PLACEMENT INTERVALS	
URBAN / RURAL (LOW SPEED) ≤ 35 MPH	200 / 200 / 200 Feet
URBAN / RURAL (INTERMEDIATE SPEED) 40 - 50 MPH	350 / 350 / 350 Feet
RURAL (HIGH SPEED) ≥ 55 MPH	500 / 500 / 500 Feet
INTERSTATE	1000 / 1500 / 2600 Feet

TYPICAL TRAFFIC CONTROL STANDARD DRAWINGS -

The typical traffic control standard drawings of the "Standard Drawings For Road Construction", although compliant with the MUTCD, shall take precedence over the MUTCD. The typical traffic control standard drawings of the "Standard Drawings For Road Construction" shall apply to all projects let to contract.

Install the permanent construction signs as shown on the typical traffic control standard drawings designated for permanent construction signing.

605-010-01

Scheme C	**US 21 (Hwy 21 Byp) x2** **S-1426 (Gold Hill Rd)** **US 21 Bus (Old Nation Rd)** **SC 51 (Hwy 51)**	**92 Square Feet**
Scheme E	**SC 460 (Springfield Pkwy) x2** **Mercantile Place** **Crescent Moon Drive** **S-1134 (Lakeview Dr)** **S-1467 (Amelia Dr)** **S-1469 (Fern Forest Ct)** **S-1133 (Lakeshore Dr)** **S-1470 (Forest Way Dr)** **S-1109 (Forest Way Dr)** **Embassy Dr** **Drewsky Ln** **Ed Thompson Rd** **Heritage Blvd** **S-676 (Garrison Farm Rd)** **Regent Driveway** **Lakes Blvd** **S-641 (Flint Hill Rd) x2** **Retail Dr** **Terrys Rd** **S-48 (Springhill Farm Rd) x2** **I-77 Exit 90 NB Off Ramp** **Centre Cir x2** **S-328 (Andrew L Tucker Rd)**	**24 Square Feet**
Total		**1,156 Square Feet**

ADDENDUMS

(Addendums to the "2007 Standard Specifications for Highway Construction")

(A) Construction (Sub-section 601.4) –

Sub-section 601.4.2 Construction Vehicles (paragraph 2) -

When working within the rights-of-way of access-controlled roadways such as Interstate highways, the Contractor's vehicles may only change direction of travel at interchanges. These vehicles are prohibited from crossing the roadway from right side to the median or vice versa. Use a flagger to control the Contractor's vehicles when these vehicles attempt to enter the roadway from a closed lane or the median area. Ensure the flagger does not stop roadway traffic, cause roadway traffic to change lanes, or affect roadway traffic in any manner. The Contractor's vehicles may not disrupt the normal flow of roadway traffic or enter the travel lane of the roadway until a sufficient gap is present.

The Contractor shall have flaggers available to control all construction vehicles entering or crossing the travel lanes of secondary and primary routes. The RCE shall determine the necessity of these flaggers for control of these construction vehicles. The RCE shall consider sight distance, vertical and horizontal curves of the roadway, prevailing speeds of roadway traffic, frequency of construction vehicles entering or crossing the roadway and other site conditions that may impact the safety of the workers and motorists when determining the necessity of these flaggers. Ensure these flaggers do not stop roadway traffic, cause roadway traffic to change lanes or affect roadway traffic in any manner. The Contractor's vehicles may not disrupt the normal flow of roadway traffic or enter the travel lane of the roadway until a sufficient gap is present.

When working within the rights-of-way of access-controlled roadways with posted regulatory speed limits of 55 MPH or greater and average daily traffic volumes {ADT} of 10,000 vehicles per day or greater, i.e. Interstate highways, all construction and work vehicles possessing any one or more of the vehicular characteristics listed below are only permitted to enter and exit a right or left shoulder work area during the presence of active lane closures unless otherwise directed by the RCE. These vehicles are not permitted to enter or exit these work areas without the presence of active lane closures unless otherwise directed by the RCE. Shoulder closures are unacceptable and insufficient methods for control of traffic at ingress / egress areas for these vehicles. The restrictive vehicular characteristics include the following:

- Over six (6) tires
- Tandem rear axles
- A base curb weight greater than 8000 lbs.
- A gross vehicular weight greater than 12000 lbs. unless performing duties as a shadow vehicle while supporting a truck mounted attenuator
- A trailer in tow except under the following conditions:
  - Trailers transporting traffic control devices (including but not limited to standard and 42" oversized traffic cones, portable plastic drums, signs, portable sign supports, u-channel and square steel tube sign posts) relative to the installation of lane closures, shoulder closures or other traffic control operations approved by the RCE
  - Trailer mounted traffic control devices (including but not limited to advance warning arrow panels, changeable message signs, temporary traffic signals, highway advisory radios, work zone intelligent transportation systems and trailer towed truck mounted attenuators)

(B) <u>Construction</u> (Sub-section 601.4) –

<u>Sub-section 601.4.2 Construction Vehicles</u> -

<u>Auxiliary Warning Lights for Vehicles and Equipment</u> -

Supplement all construction and/or construction-related vehicles and equipment that operate in a stationary or mobile work zone within or adjacent to a roadway within the highway rights-of-way with AMBER or YELLOW colored high intensity rotating or strobe type flashing auxiliary warning light devices. Utilize, install, operate and maintain a single or multiple lighting devices as necessary to provide visibility to approaching motorists.

All auxiliary warning light models shall meet *Society of Automotive Engineers* (SAE) Class I standards and SAE Standard J575 relative to *Tests for Motor Vehicle Lighting Devices and Components* and these specifications.

The amber/yellow color of the dome/lens of an auxiliary warning light device shall meet SAE Standard J578 for amber/yellow color specifications.

Auxiliary warning lights with parabolic reflectors that rotate shall rotate around a halogen lamp at a rate to produce approximately 175 flashes per minute. The parabolic reflector shall produce a minimum 80,000 candle power and a minimum 54,000 candela through an SAE Standard J846 approved amber dome.

Equip strobe type flashing auxiliary warning light devices with photosensitive circuit controls to adjust the lighting intensity in response to changes in ambient light conditions such as from day to night. These lights shall have a double-flash capability rated at approximately 80 double flashes per minute and produce a minimum 24 joules of flash energy at the highest power level setting.

Acceptable auxiliary warning light models shall provide sufficient light output to be clearly recognizable at a minimum distance of 1750 feet.

Mount all auxiliary warning light devices intended to function as the auxiliary warning light system or as an element thereof on vehicles and equipment at locations no less than 3 feet above the ground and in conspicuous locations to provide visibility to approaching motorists.

Auxiliary warning light devices and/or models that mount in the locations of the standard vehicle lighting system are unacceptable as the specified auxiliary warning light system due to restrictive simultaneous visibility capabilities from multiple sight angles. However, auxiliary warning light devices that mount in the standard vehicle lighting system locations are acceptable as supplements to the specified lighting devices mounted in locations that do meet the minimum height requirements and provide simultaneous visibility capabilities from multiple sight angles.

Standard vehicle hazard warning lights are only permitted as supplements to the specified auxiliary warning light devices.

(C) <u>General Requirements for Providing and Maintaining Traffic Control Devices in the Work Zone</u> (Section 602) –

<u>Sub-section 602.4 Construction (paragraph 8)</u> -

Mount flat sheet signs straight and level and with the face of the signs perpendicular to the surface of the roadway. This requirement applies to flat sheet signs whether they are portable or have the embedded supports. Mount advance construction signs 2 feet from the edge of a paved shoulder or the face of a curb, or if no paved shoulder exists, 6 feet to 12 feet from the edge of an adjacent travel lane to the nearest edge of the signs. The mounting height of single signs mounted on ground embedded sign supports is no less than 7 feet or no greater than 8 feet from the bottom edge of the sign to the grade elevation of the near edge of the adjacent travel lane or sidewalk when a sidewalk is present. Any secondary sign on the same assembly has a minimum mounting height of 6 feet from the ground to the bottom edge of the secondary sign. Ensure that signs mounted on portable sign supports, including advance construction signs, regulatory signs, warning signs, etc., have a minimum mounting height of 5 feet from the ground to the bottom edge of the sign. Provide special sign mounting assemblies, when necessary, in areas of double-layered guardrail, concrete median barrier, or bridge parapet walls.

(D) <u>Category I Traffic Control Devices</u> (Section 603) –

<u>Sub-section 603.2.2 Oversized Traffic Cones (paragraph 6)</u> -

Reflectorize each oversized traffic cone with 4 retroreflective bands: 2 orange and 2 white retroreflective bands. Alternate the orange and white retroreflective bands, with the top band always being orange. Make each retroreflective band not less than 6 inches wide. Utilize Type III – Microprismatic retroreflective sheeting for retroreflectorization on all projects let to contract after May 1, 2010 unless otherwise specified. Separate each retroreflective band with not more than a 2-inch non-reflectorized area. Do not splice the retroreflective sheeting to create the 6-inch retroreflective bands. Apply the retroreflective sheeting directly to the cone surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting.

<u>Sub-section 603.2.3 Portable Plastic Drums (paragraph 3)</u> -

Reflectorize each drum with Type III – Microprismatic retroreflective sheeting: 2 orange and 2 white retroreflective bands, 6 inches wide on all projects let to contract after May 1, 2010 unless otherwise specified. Alternate the orange and white retroreflective bands with the top band always being orange. Ensure that any non-reflectorized area between the orange and white retroreflective bands does not exceed 2 inches. Do not splice the retroreflective sheeting to create the 6-inch retroreflective bands. Apply the retroreflective sheeting directly to the drum surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting.

(E) Category II Traffic Control Devices (Section 604) –

Sub-section 604.2.1 Type I and Type II Barricades (paragraph 3) -

Reflectorize these barricades with Type VIII or IX Prismatic retroreflective sheeting on all projects let to contract after May 1, 2012 unless otherwise specified. Ensure that the retroreflective sheeting has alternate orange and white stripes sloping downward at a 45-degree angle in the direction of passing traffic. The stripes shall be 6 inches wide.

Sub-section 604.2.2 Type III Barricades (paragraph 3) -

Reflectorize these barricades with Type VIII or IX Prismatic retroreflective sheeting on all projects let to contract after May 1, 2012 unless otherwise specified. Ensure that the retroreflective sheeting has alternate orange and white stripes sloping downward at a 45-degree angle. Apply the sloping orange and white stripes in accordance with the requirements of the Plans, SCDOT Standard Drawings and the MUTCD. The stripes shall be 6 inches wide.

(F) Construction Signs (Sub-section 605.4.1.1) –

On all projects relative to **interstate highways** let to contract after January 1, 2016, all signs attached to portable sign supports on and/or adjacent to **interstate highways** shall be rigid. Fabricate each of these rigid signs from an approved aluminum laminate composite rigid sign substrate approved by the Department. Utilization of signs fabricated from roll-up fabric substrates attached to portable sign supports installed on and/or adjacent to **interstate highways** will no longer be acceptable on projects let to contract after January 1, 2016.

ONLY those portable sign supports specified and approved for support of rigid signs fabricated from approved aluminum laminated composite rigid sign substrates and included on the *Approved Products List for Traffic Control Devices in Work Zones*, latest edition, are acceptable. To facilitate location of acceptable portable sign supports, the listing of portable sign supports is now separated into two (2) sections; “Portable Sign Supports for Use with Roll-Up Signs ONLY” and “Portable Sign Supports for Use with Roll-Up Sign Substrates and Rigid Sign Substrates”.

The trade names of the approved aluminum laminate composite rigid sign substrates are “Acopan”, “Alpolic”, “Dibond” and “Reynolite”. These rigid sign substrates are restricted to thicknesses no greater than 2 millimeters.

Rigid signs fabricated from standard aluminum sign blanks or any other rigid material other than Acopan, Alpolic, Dibond or Reynolite are PROHIBITED for attachment to portable sign supports. However, rigid signs fabricated from standard 0.080 and 0.100 inches thick aluminum sign blanks will continue to be acceptable for mounting on ground mounted sign supports.

Signs fabricated from roll-up fabric substrates approved by the Department will continue to be acceptable for use on and/or adjacent to secondary and primary roadways unless otherwise directed by the Department.

The minimum mounting height of signs mounted on these portable sign supports shall continue to be 5 feet from the ground to the bottom edge of the sign except where a minimum 7 foot mounting height is required in accordance with the standard specifications, the standard drawings, these special provisions and the MUTCD, latest edition.

GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL CONFORM WITH THE SCDOT STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION, SCDOT STANDARD DRAWINGS, SCDOT PROCEDURES & GUIDELINES FOR WORK AND HIGHWAYS, AND OTHER APPLICABLE SCDOT DOCUMENTS, LATEST EDITIONS.

2. APPROPRIATE CHANNELIZING DEVICES SHALL BE MAINTAINED DURING CONSTRUCTION TO SEPARATE WORK FROM TRAFFIC.

3. ALL EXISTING SIGNS IN CONFLICT WITH CONSTRUCTION SIGNING SHALL BE REMOVED, COVERED, OR RELOCATED.

4. CONTRACTOR SHALL MAINTAIN SIGNAL OPERATION AT ALL SIGNALIZED INTERSECTIONS AS DIRECTED BY THE RCE.

5. CONTRACTOR SHALL MAINTAIN POSITIVE SURFACE DRAINAGE DURING CLEARING AND GRUBBING OPERATIONS.

6. CONTRACTOR TO NOTIFY IN WRITING ALL BUSINESSES AND PROPERTY OWNERS OF CONSTRUCTION ACTIVITIES, DRIVEWAY MODIFICATIONS, AND OTHER ACCESS RESTRICTIONS 7 DAYS IN ADVANCE OF ANY CONSTRUCTION ACTIVITIES ADJACENT TO THEIR PROPERTY.

7. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL COMMERCIAL AND PRIVATE DRIVEWAYS IN ACCORDANCE WITH THE FOLLOWING:
   A. SITE WITH TWO OR MORE DRIVEWAYS - ONE DRIVEWAY TO BE MAINTAINED CONTINUOUSLY OPENED. NO DRIVEWAY TO BE CLOSED LONGER THAN 1 DAY.
   B. SITE WITH ONE DRIVEWAY - DRIVEWAY NOT TO BE CLOSED FOR A PERIOD LONGER THAN 1 HOUR.

8. CONTRACTOR SHALL INSTALL PERMANENT CONSTRUCTION SIGNING PER SCDOT STANDARD DRAWINGS 605-010-01 AS NOTED IN THE PLANS AND/OR AS DIRECTED BY THE RCE. SIGNING SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.

9. THE CONTRACTOR SHALL BE ON SITE AT ALL TIMES TO MAINTAIN TRAFFIC CONTROL ONCE CONSTRUCTION OPERATIONS BEGIN, UNTIL COMPLETE AND APPROVED BY THE RCE.

10. PORTABLE PLASTIC DRUMS SHALL BE PLACED IN ACCORDANCE WITH SCDOT STANDARDS AND AS DIRECTED BY THE RCE. TYPICAL DRUM SPACING IS AS FOLLOWS UNLESS NOTED:
    A. 50 FEET SPACING FOR EXISTING POSTED SPEED 40 MPH OR LESS
    B. 100 FEET SPACING FOR EXISTING POSTED SPEED 45 MPH OR GREATER
    C. 20 FEET SPACING & NO LESS THAN 4 EA FOR RADIUS RETURN

11. TEMPORARY LANE CLOSURES SHALL CONFORM TO SCDOT STANDARD DRAWINGS SECTION 610-000.

12. SHOULDER CLOSURES SHALL CONFORM TO SCDOT STANDARD DRAWINGS SECTION 610-200.

13. CONTRACTOR SHALL INSTALL ADVANCE LANE CLOSURE SIGNING PER SCDOT STANDARD DRAWINGS 610-010-00 THRU 610-040-00.

14. CONTRACTOR SHALL FOLLOW LANE CLOSURE RESTRICTIONS PER SCDOT SUPPLEMENTAL SPECIFICATIONS "LANE CLOSURE RESTRICTION" LATEST EDITION, SCDOT "HOURLY RESTRICTION FOR LANE CLOSURES ON MULTILANE PRIMARY AND SECONDARY ROUTES" LATEST EDITION AND AS NOTED IN THE PROJECT TRAFFIC CONTROL SPECIAL PROVISION. THE CONTRACTOR IS ADVISED THAT THE LANE CLOSURE RESTRICTIONS WILL BE STRICTLY ENFORCED. SHOULD LANE CLOSURES REMAIN IN PLACE OR NOT BE COMPLETELY REMOVED BY THE TIME SPECIFIED, A PENALTY WILL BE ASSESSED AT THE RATE OF $500.00 PER HOUR.

SCDOT SUPPLEMENTAL SPECIFICATIONS REFERENCE

The following are SCDOT Supplemental Specifications and SCDOT Supplemental Technical Specifications that pertain specifically to the Widening of US 21 Bypass and SC 51 Clearing and Grubbing. Additional Supplemental Specifications and SCDOT Supplemental Technical Specifications, not included, but which may be required for the project, are on file with the SCDOT and are available on the SCDOT website https://www.scdot.org/business/road-supplemental-specs.aspx & https://www.scdot.org/business/road-technical-specs.aspx

The list of the Supplemental Specifications provided is as follows:

Section

Critical Path Construction Schedules (March 1, 2007)
Errata to 2007 Standard Specifications for Highway Construction (January 1, 2018)
Subsection 401.4.17, Transportation and Delivery of Mixes (July 1, 2010)
Fine Grading (January 4, 2012)
Prompt Payment Clause (July 1, 2017)
Construction Schedules (November 4, 2013)
Muck Excavation (July 1, 2017) – {Shall be paid as Unclassified Excavation}
627 Thermoplastic Pavement Marking (July 1, 2020)
Erosion Control Measures (January 1, 2021)
Temporary Barrier Fence (July 1, 2021)
Materials for Full Depth Patching (January 1, 2018)
Removal of Existing Asphalt Pavement before Patching (January 1, 2018)
Work Zone Traffic Control Local Law Enforcement (July 1, 2018)
Section 605 Temporary Concrete Barrier (July 1, 2020)
Work Zone Traffic Control Training Requirements for Contractors/Subcontractors (July 1, 2020)

SC-M-400 Asphalt Mixture Quality Acceptance (February 2020)
SC-M-810-4 Seeding (January 2021)
SC-M-815-2 Silt Fence Systems (July 2018)
SC-M-815-8 Inlet Structure Filters (July 2017)
SC-M-815-9 Rolled Erosion Control Product {RECP} (July 2017)
SC-M-815-10 Stabilized Construction Entrance (July 2018)
SC-M-815-11 Hydraulic Erosion Control Products (April 2011)

Limited Phase I Environmental Site Assessment

US Highway 21/SC Highway 51 Corridor Study
Fort Mill, South Carolina
Road Widening Project

Prepared For:

STV/Ralph Whitehead Associates

Rockhill, South Carolina

June 18, 2013

FUSS & O'NEILL

717 Lady Street, Suite E
Columbia, SC 29201

Project No. 20120285.A10

FUSS & O'NEILL

June 18, 2013

Ms. Sheri Williamson
STV/Ralph Whitehead Associates
Rock Hill Business Technology Center
454 S. Anderson Rd. BTC 517
Rock Hill, SC 29730

RE: Limited Phase I Environmental Site Assessment
US Highway 21/SC Highway 51 Road Widening Project
Fort Mill, South Carolina

Dear Ms. Williamson:

We are pleased to submit the enclosed report of the Phase I Environmental Site Assessment (Phase I ESA) for the above-referenced site. The assessment was conducted in conformance with Standard Practice E1527-05 for Environmental Site Assessments published by the ASTM International.

ASTM E1527-05 requires that certain elements of a Phase I ESA be updated if the data for the report is more than six months old. Therefore, if this report is to be relied on after September 2013, we recommend that you contact us to discuss options for an update.

We have identified **nine (9) recognized environmental conditions** (RECs) associated with the site. The findings, opinion and conclusions of this Phase I Environmental Site Assessment are discussed in *Section 9* and *Section 10* of this report.

In accordance with the requirements of the ASTM E1527-05 Standard, we declare that to the best of our professional knowledge and belief, we meet the definition of an environmental professional as defined in §312.10 of 40 CFR 312 and we have the specific qualifications based on education, training, and experience to assess the nature, history, and setting of the site. We have developed and performed all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Thank you for the opportunity to conduct this work. Please contact us at 803-376-6034 if we can be of further assistance.

Sincerely,

for

Reginald Butler
Environmental Technician III
Ext. 6109

Jeremy Grant, P.G.
Project Manager
Ext. 6107

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Project No. 20120285.A10

Table of Contents

Limited Phase I Environmental Site Assessment
STV/Ralph Whitehead Associates
US Highway 21/SC Highway 51, Fort Mill, SC

Figures

Appendices

1 Introduction

Fuss & O'Neill, Inc. (Fuss & O'Neill) conducted a Limited Phase I Environmental Site Assessment (Phase I ESA) at the request of Ms. Sheri Williamson of STV/Ralph Whitehead Associates, as due diligence for the acquisition of the right-of-way (ROW) property by the Pennies for Progress Program for road widening along US Highway 21/SC Highway 51 in Fort Mill, York County, South Carolina.

The section for improvement along US Highway 21/SC Highway 51 will extend approximately 2.5 miles from Springfield Parkway to the North Carolina State line (*Figure 1*). The existing highway is a two lane road with grass shoulders and drainage ditches. This project corridor will be known as the *property* throughout this report.

This assessment was conducted as a preliminary assessment that was restricted to non-invasive types of investigations. The conclusions reached and the representations contained herein, are based on the available data and on the contracted scope of work. Fuss & O'Neill makes no representations or conclusions or information beyond the scope of this assessment.

1.1 Objective

The objective of this Phase I ESA is to identify recognized environmental conditions (RECs) present at the *property*. As defined by Standard Practice for Environmental Site Assessments E1527 05 developed by the ASTM International (ASTM, 2005), REC means:

> *…the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.*

1.2 Scope of Services

Our Limited Phase I ESA was performed in general conformance with Standard Practice E1527-05 for Environmental Site Assessments by the ASTM International (ASTM, 2005). Since this Phase I ESA is was conducted for a corridor, some information for each individually owned parcel along the *property* was not reasonably ascertainable within the time and cost constraints of this investigation due to the large number of land parcels associated with individual property owners. Current and past uses of specific properties were identified through the review of the regulatory database search, site reconnaissance, and/or other publicly available sources of information. This information is discussed in detail in *Section 4* of this report.

This Limited Phase I ESA deviates from ASTM E1527-05 in the following ways:

- Past or current uses of the properties, adjoining properties, and/or the surrounding area were not identified through interviews with the past or present individual parcel owners and/or past or present occupants.
- Past uses prior to 1970 were not identified through the review of historic aerial photographs.
- Interior observations of the structures along the *property* were not identified.
- Recorded land title records, liens, and/or zoning/land use records on individual properties along the *property* were not assessed. This includes environmental liens or activity and use limitations (AULs).
- The *User* of the report, York County and its agents, was not given a "User Questionnaire" because it is unrealistic for a government entity to have specialized knowledge on small parcels of land along an extensive corridor. Therefore, the review of title and judicial records for environmental liens, AULs, or ascertainable recorded land title records were not supplied by the *User* of this report.

Assessments for asbestos-containing materials (ACM), lead-based paint or plumbing materials, radon gas, and mold were not conducted. Furthermore, we did not investigate the potential for the *property* to contain endangered species, ecological resources or historic/cultural resources. Additionally, environmental compliance or permitting issues were not considered during this investigation.

It is our understanding that this work is not being conducted under a United States Environmental Protection Agency (USEPA) Brownfield Assessment and Characterization Program grant awarded under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 9604(k)(2)(b); therefore, our investigation did not include an assessment of controlled substances. Refer to *Section 15* of this report for limitations on this work product.

2 *Property* Overview and Environmental Setting

2.1 *Property* Location

The US Highway 21/SC Highway 51 road widening project is located north of downtown Fort Mill between Springfield Parkway and the North Carolina/South Carolina state line (Figure 1). The project corridor has a linear roadway distance of approximately 13,200 feet. The proposed limits of construction for this project will require acquisition of additional right-of-way (ROW).

The *property* is located in an area of mixed residential, industrial, and commercial parcels. A site location map showing the approximate project corridor is provided as *Figure 1* and a site topographic map of the *property* is included as *Figure 2*.

2.2 Utilities

The City of Fort Mill and York County provides municipal water and sewer service in the area to the *property*. Electrical power is provided to the *property* by Duke Energy. Electric, cable, and telephone services to the *property* are provided via underground conduits and overhead transmission lines.

2.3 Adjoining Land Use

As with any Phase I ESA, nearby land usage is always a concern and investigating adjoining land uses that could potentially impact the surface and subsurface conditions of the *property* is a vital part of performing a complete Phase I ESA.

From observations made during the site reconnaissance and through review of historic and current aerial images, the *property* is located in an area of mixed residential, industrial, and commercial parcels. Specific uses of adjoining parcels are addressed in *Sections 4* and *Section 6*. A search of all public records for each individual parcel along the *property* was not reasonably ascertainable within the time and cost constraints of this project as outlined in *Section 1.2* of this report.

2.4 Environmental Setting

2.4.1 Geology

According to the Geologic Notes*, Volume 9, Number 2* (State Development Board, June 2010), York County is situated in the north-central Piedmont of South Carolina, adjacent to the North Carolina state line. Rocks of the Piedmont occur in belts that conform to the regional-northeasterly trend of major structural features. The belts are delineated by gross differences in rock types, grade of metamorphism, and structure. York County straddles the Charlotte Belt and extends into the Caro1ina Slate Belt to the east and into the Kings Mountain Belt to the northwest.

Rocks of the Carolina Slate Belt are mainly low rank metamorphic rocks of sedimentary and volcanic origin. The Charlotte Belt includes medium- to high-rank metamorphic rocks and a complicated sequence of igneous intrusions. Major rock types of the Kings Mountain Belt are phyllite, schist, gneiss, quartzite, conglomerate, and marble. The metamorphic grade of the Kings Mountain Belt ranges from medium to low.

2.4.2 Topography

According to the topographic maps reviewed for this assessment, the *property* and surrounding area ranges from approximately 590 feet to 650 feet above mean sea level (MSL). Topography of the *property* site generally slopes south to southeast towards tributaries of the Blackmanship Branch, Steele Creek, and the Sugar Creek. These creeks discharge into the Catawba River.

2.4.3 Hydrology & Hydrogeology

The soils encountered in this area are the residual product of in-place chemical weathering of rock presently underlying the site. In general, shallow unconfined groundwater movement within the overlying soils is controlled largely by topographic gradients. However, as the groundwater percolates downward to the bedrock, it becomes controlled by the orientation of the rock fracture systems. Thus the direction of groundwater movement may not be consistent with the reflection topography.

Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary with seasonal fluctuations in precipitation. Movement of groundwater under water table conditions is generally from higher to lower elevations. As such, shallow groundwater at the subject site appears to move to the north and northeast towards lower elevations and off-site water bodies.

Based on USGS mapping and field observations of the local topography regarding the physical setting, the groundwater flow direction of the *property* appears to vary throughout the corridor. The inferred dominant groundwater flow direction along the project corridor appears to be to the south/southeast toward tributaries of Sugar Creek and Sugar Creek. Groundwater along the project corridor is believed to vary from 5 feet to 60 feet below ground surface based on elevations of nearby water bodies.

The *property* is located west of Sugar Creek which discharges to the Catawba River. Surface runoff from the site would appear to flow to the south/southeast toward tributaries of Sugar Creek and Sugar Creek with components of flow to the southwest towards Blankmanship Branch which discharges to Steele Creek than eventually discharges to Sugar Creek.

2.4.4 Soils

According to the USDA Natural Resources Conservation Service Soil Survey, the soils along the corridor are classified as Cecil sandy clay loam (CeB2), Mecklenburg-Wynott complex (MeB2),and Pacolet clay loam (PcE3). Cecil sandy clay loam and Pacolet clay loam soils are well-drained members of Hydrologic Soil Group B. These soils have moderately high to high transmissivity in the most limiting layers of the soil unit along the project corridor. Mecklenburg-Wynott is not a well-drained soil and belongs to Hydrologic Soil Group C. A copy of the soil report is located in *Appendix C*.

2.4.5 Wetlands & Flood Zone Mapping

Based on the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI, 2012) and observations made during the site walkover, there are no mapped wetlands located on the *property*. The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map Database (FEMA, 2010) shows no mapped floodplains within the *property*. A copy of the FEMA map is included in *Appendix D*. As a wetlands survey is beyond the scope of this Phase I ESA, it is recommended that a wetlands survey be performed for the *property* if it is needed.

2.5 Previous Environmental Investigations

The following environmental investigations of adjacent properties of the *property* were identified and reviewed during the performance of this assessment.

1) Underground Storage Tank closure Report by Steffen, Robertson and Kirsten, Inc. (SRK) for Municipal Engineering for Container Corporation of Carolina, report dated September 26, 1996. SRK concluded that the chance of future environmental impact on the groundwater from USTs at this site is very low. Container Corporation of Carolina is located at 3358 Highway 51.

2) Soil Sampling Analysis Report by Environmental Management Solutions, Inc. (EMS) dated February 26, 1997 for Partex, Inc. / Eumeric Holdings. SCDHEC concluded that the areas of concern had been adequately addressed with regard to the spill area on the exterior of this facility. Partex, Inc. / Eumeric Holdings is located at 3551 Highway 51.

3) Post Remediation Sampling Report conducted by Consultech Environmental, Inc. for Lords Armory dated August 18, 2003. Consultech Environmental, Inc. concluded that concentrations of the contaminants of concern in all of the monitoring wells that have site-specific target levels (SSTLs) are below SSTLs at the site, recommended that all of the monitoring wells be properly abandoned, and that no further action be taken at the site. Lords Armory is located at 3660 Highway 51.

3 Site History

The following sources were used to develop the history of the *property*.

- Aerial imagery of the project corridor dating back to 1970 was viewed utilizing York County's GIS interactive mapping. Aerial imagery was reviewed by Mr. Reginald Butler of Fuss & O'Neill.

4 Federal, State, and Local File Review

Fuss & O'Neill reviewed database information compiled by Environmental Data Resources Inc., (EDR) to help identify RECs in connection with the project corridor. EDR is an environmental database search service that provides access to publicly available environmental databases maintained by various federal, state, and local agencies. The sources of information listed in the following table were researched to identify properties of concern within a specified search radius from the *property* as specified by ASTM Practice E1527-05. These records are identified by the ASTM International as "standard environmental record sources" requiring review. The listed information sources are defined and described in detail in the EDR database report and included in *Appendix A*.

The results of the review are shown in the table below. Databases with listings identified on the *property* or within the minimum search are discussed in a brief narrative following the table.

4.1 Federal Regulatory Agency Review

Database	ASTM Minimum Search Distance	Listings w/in 1,000 Foot Buffer
NPL	1.0 Mile	No
Delisted NPL	0.5 Mile	No
CERCLIS	0.5 Mile	No
CERCLIS-NFRAP	0.5 Mile	No
RCRA - CORRACTS	1.0 Mile	No
RCRA -TSD	0.5 Mile	No
RCRA - GEN	0.25 Mile	1
IC/EC Registry	*Property*	No
ERNS	*Property*	No

Potential environmental conditions were identified along the project corridor during review of "Standard Environmental Record Sources" of Federal Regulatory Agencies. 33 non-geocoded were included within the "Orphan Summary" supplied by EDR. Non-geocoded sites, or orphan sites, are facilities that could not be precisely located due to inadequate address information. The EDR report provides further details of the orphan sites identified in the databases. Fuss & O'Neill personnel make every effort within reasonable time and cost to locate non-geocoded listings that could influence the *property*.

- **(RCRA GEN) –** The RCRA GEN database includes information on sites that generate, store, treat, or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act. Facilities are considered large quantity generators (LQGs) if they generate more than 1,000 kg of hazardous waste per month or more than1 kg of acutely hazardous waste per month. Facilities are considered SQGs if they generate between 100 kg and 1,000 kg of hazardous waste per month or less than 1 kg of acutely hazardous waste, or meet other applicable requirements of RCRA. Facilities producing less than 100kg of hazardous waste per month are classified as CESQGs. A review of the most recent database indicated that there is **one (1)** reported RCRA GEN site within the search radius for the project corridor.

    1. Container Corporation of Carolina (CCC) (EPA I.D No.1000395755) located at 3358 Highway 51, Fort Mill, SC, is listed as a municipal solid waste (MSW) facility. This site is the one RCRA GEN site listed through our database search.

4.2 State Regulatory Review

Database	ASTM Minimum Search Distance	Listings w/in 1,000 Foot Buffer
STATE CERCLIS	1.0 Mile	No
SWL	0.5 Mile	**1**
LUST	0.5 Mile	**4**
UST/AST	0.5 Mile	**5**
IC/EC Registry	1.0 Mile	No
VCC	0.5 Mile	No
BROWNFIELDS	0.25 Mile	No

- **State Solid Waste Landfill (SWL/LF) -** The SWL/LF database is a listing of those facilities, involved with the handling of solid waste and includes locations of solid waste landfilling or associated activities involving the handling of solid waste. A review of the most recent database indicated **one (1)** reported SWL/LF property within the project corridor search radius.

    1. Container Corporation of Carolina (CCC) (EPA I.D No.1000395755) located at 3358 Highway 51, Fort Mill, South Carolina, is listed as a municipal solid waste (MSW) facility. MSW facilities accept combined residential, commercial/institutional waste generated. Though classified as a MSW facility in the database search report, CCC is better classified as a Class 3 MSW Transfer Station. Transfer stations are facilities where municipal solid waste is unloaded from collection vehicles and briefly held while it is reloaded onto larger long-distance transport vehicles for shipment to landfills or other treatment or disposal facilities. The database search shows the facility as a handler of tetrachloroethylene a chlorinated compound that has been the contaminant of concern at many soil and groundwater contaminated sites throughout the state.

- **Leaking Underground Storage Tank (LUST) -** The South Carolina LUST summary database contains information pertaining to all reported leaking storage tank cases. A review of the EDR report and the SCDHEC database indicates that there are **four (4)** LUST listings within the project corridor search radius.

    1. Summerville Grocery (SCDHEC Site I.D 14057) located at the parcel adjacent to 3660 Highway 51, Fort Mill, SC, is listed as a LUST site within SCDHECs database system. The site was granted a no further action (NFA) from SCDHEC on May 9, 1997.

    2. Lords Armory (SCDHEC Site I.D 14058) located at 3660 Highway 51, Fort Mill, SC, is listed as a LUST site within SCDHECs database system. The site was granted a conditional no further action (CNFA) from SCDHEC on May 9, 1997. The site was granted the CNFA status because groundwater is not currently being used, is reasonably anticipated not to be used in the future within the actual or predicted area of petroleum impact, petroleum chemicals of concern (CoCs) associated with the release are below site specific target levels (SSTL), groundwater will not be used for drinking or irrigation within the area of petroleum impact, and land use of the site will not change without notifying SCDHEC.

    3. Pantry 3969 doing business as (DBA) Petro Express (SCDHEC Site I.D 10515) located at 3473 Highway 21, Fort Mill, SC, is listed as a LUST site within SCDHECs database system. The site was granted a NFA from SCDHEC on January 6, 1999.

    4. Handy Pantry 28 Food Mart (SCDHEC Site I.D 09316) located at 3004 Highway 21 Bypass, Fort Mill, SC, is listed as a LUST site within SCDHECs database system. The site has not been granted a NFA from SCDHEC and is undergoing active corrective action (remediation).

The LUST sites found by the database search and included within the "orphan summary" are not considered to be RECs due to their physical or geographical location in reference to the *property*.

Potential historical RECs (HRECs) or RECs were identified for the *property* through review of Standard Environmental Record Sources of Federal Agencies. These RECs will be addressed in *Section 9*.

- **Underground Storage Tank (UST)/Aboveground Storage Tank (AST) Report -** The UST/AST report includes a listing of properties with USTs and ASTs that are registered with the SCDHEC. A review of the most recent listings reports there are **five (5)** sites within the project corridor search radius.

    1. Millers Produce & Farm Inc. (SCDHEC Site ID 12165) located at 3660 Highway 51, Fort Mill, SC, is listed as a UST site within SCDHECs database system. The site currently has five regulated USTs in use. A diesel fuel UST was previously used on this site but it has been properly abandoned.

    2. Summerville Grocery (SCDHEC Site ID 14057) located at the parcel adjacent to 3660 Highway 51, Fort Mill, SC is listed as a UST site within SCDHECs database system. The site formerly housed two regulated USTs but these tanks have been properly abandoned.

    3. Lords Armory (SCDHEC Site ID 14058) located at 3660 Highway 51, Fort Mill, SC, is listed as a UST site within SCDHECs database system. The site formerly housed two regulated USTs but these tanks have been properly abandoned.

    4. Pantry 3969 DBA Petro Express (SCDHEC Site ID 10515) located at 3473 Highway 21, Fort Mill, SC, is listed as a UST site within SCDHECs database system. The site currently houses four regulated USTs that are still in use.

    5. Handy Pantry 28 Food Mart (SCDHEC Site ID 09316) located at 3004 Highway 21 Bypass, Fort Mill, SC, is listed as a UST site within SCDHECs database system. The site formerly housed three regulated USTs but these tanks have been properly abandoned.

    6. The UST sites found by the database search and included within the "orphan summary" are not considered to be RECs due to their physical or geographical/topographical location in reference to the project corridor.

The EDR report in *Appendix A* provides further details of the "orphan sites" identified in the databases.

4.3 Additional Environmental Records Sources

Fuss & O'Neill reviewed additional environmental record sources as part of its due diligence in completing this Phase I ESA.

4.3.1 South Carolina Groundwater Contaminant Inventory

Fuss & O'Neill reviewed the South Carolina Groundwater Contaminant Inventory (GWCI) for sites along the project corridor and sites located within the project corridor search radius that may be of interest. The GWCI is a listing of known groundwater contaminant plumes throughout the state of South Carolina as maintained by the SCDHEC.

At the time of the compilation of this inventory in 2008 by SCDHEC, there were 171 sites in York County with known present or past groundwater contamination. Through review of the GWCI in combination with Fuss & O'Neill personnel identifying common groundwater contamination characteristics (including monitoring well and/or soil borings) along the project corridor, two additional sites were identified in the *property* that are UST/LUST sites. The following additional sites along the project corridor were discovered during the review of the GWCI:

Times Turn Around 10 – This site is located at 2488 US 21 Bypass, Fort Mill SC. The site currently operates as a gasoline retailer, and is listed in the GWCI, and has a monitoring well network associated with the site.

T & G's Country Store – This site is located at 2976 Highway 21, Fort Mill SC. The site currently appears to not be in operation, is listed in the GWCI, and has a monitoring well network associated with the site.

A copy of the York County GWCI is included in *Appendix E*.

4.3.2 Freedom of Information Act File Review

Fuss & O'Neill requested a Freedom of Information Act (FOIA) file review on January 29, 2013 for properties located at 3660 Highway 51, 3578 Highway 51, 3550 Highway 51, 3551 Highway 51, 3490 Highway 51, 3410 Highway 51, 3358 Highway 51, and the intersection of Highway US 21 & SC 51. Of the ten parcels listed, information was available for four of the properties.

The SCDHEC files on the selected properties along the *property* were reviewed by Fuss & O'Neill personnel on April 8-9, 2013. Environmental investigations at the Lord's Armory (3578 Highway 51), Container Corporation of Carolina (3358 Highway 51), Miller Produce and Farm (3660 Highway 51), Partex/Eumeric Holdings (3551 Highway 51), and at Paving Equipment of the Carolinas (3550 Highway 51) were reviewed and utilized during this Phase I ESA. The following was found during this FOIA file review:

- Container Corporation of Carolina – A UST closure report dated February 27, 1997 for the Carolina Corporation of Carolina by Steffen Robertson and Kirsten (SRK), was reviewed by Fuss & O'Neill personnel. The findings of the report documented four areas of concern (AOCs) at the site where closure activities took place. The four AOCs consisted of three UST storage areas and one concrete pad. Cumulatively thirteen USTs, two oil water separators, and one concrete pad along with underlying soils were removed during closure activities. Post removal soil samples were taken at all four locations. Benzene, toluene, ethylbenzene, xylenes, and naphthalene were present in post removal sampling.

- The Lord's Armory – SCDHECs response letter dated October 6. 2003 and a closure letter report by Consultech Environmental for the Lord's Armory dated September 23, 2003 was found and reviewed during our search of additional environmental record sources. The closure letter report stated that all wells associated with Lord's Armory were below applicable detection limits or below SSTLs during closure sampling events. A CNFA was granted at the site for a release that had previously occurred at the referenced site. The CNFA was granted with specific conditions in place for the site. These conditions are:

1) Groundwater is not currently being used and is reasonably anticipated not to be used in the future within the actual or predicted area of petroleum impact.
2) All petroleum CoCs associated with the referenced UST release are below the SSTLs in soil and groundwater. Based on these site specific conditions, the CoCs will not exceed RBSLs at any potential receptors and/or exposure points.
3) The groundwater should not be used as a source of drinking water of for irrigation within the area of petroleum impact.
4) Land use should not change without notifying the Bureau of the proposed use. Any site excavation activities may encounter petroleum impacted soil that must be disposed of in a method approved by the department.
5) If CoCs from the referenced release are detected at levels that present a risk to human health or the environment, this office, under authority established in the South Carolina UST Control Regulations (SCUSTCR) R.61-92 Part 280, may require additional site rehabilitation.
6) The Bureau will be notified within 30 days of any changes to any of the above assumptions and conditions until all petroleum constituents are at or below RBSL. If site conditions are changed without Department approval, the owner or operator will be in violation of a Department order enforceable pursuant to the 1976 Code Section 44-2-140.

- Partex, Inc. / Eumeric Holdings – Fuss & O'Neill personnel reviewed a SCDHEC memorandum regarding administrative order 97-11-HW. The administrative order was issued to Mr. Anthony R. Jans for violations of the South Carolina Hazardous Waste Management Regulations and the South Carolina Pollution Control Act. The findings of fact of this order stated that Partex did not have an EPA identification number, Partex had not made hazardous waste determinations for numerous wastes stored on-site, and a spill from an on-site air scrubber had impacted an area of soil approximately 144 square feet. Soil taken from the spill area detected the presence of Chromium. Additional information about the extent of this contamination was not in the SCDHEC files reviewed by Fuss & O'Neill personnel.

- Paving Equipment of the Carolinas – An air emissions report for the referenced facility was reviewed by Fuss & O'Neill personnel. The facility operated as an asphalt plant and stored #2 fuel oil on-site. These were the only files found for this site.

4.3.3 City Directories Summary

EDR provided city directories for years ranging from 1997 to 2013. Fuss & O'Neill reviewed address listings as applicable to individual sites in compiling properties of interest. No additional properties of interests were found during the review of city directories. City directories are provided in *Appendix A*.

5 User-Provided Information

ASTM Practice E1527-05 describes certain tasks to be performed by the *user* of this assessment that will help to identify RECs at the parcel if they exist. ASTM Practice E1527-05 defines the *user* as "the party seeking to use Practice E1527 to complete an environmental site assessment of the *property*". *User*s can include a potential purchaser or tenant of the *property*, a lender, a *property* manager, or a *property* owner. The users of this report will be York County and its agents.

As documented in *Section 1.2* of this report, the *User* of this report was not asked to complete the All Appropriate Inquiry Phase I User Questionnaire (AAI Questionnaire) during this scope of work. Due to the fact that this Limited Phase I ESA corridor study is linear in nature and not an individual property, a property record and liens review was not conducted during this scope of work.

6 Site Reconnaissance

A site reconnaissance of the *property* was conducted on January 21, 2013 by Mr. Reginald Butler of Fuss & O'Neill. The objective of the site reconnaissance for a Phase I ESA is to assess if there is evidence of hazardous substances or petroleum products that were disposed of or used on the site at any time in the past that may create potential liability for an owner of the *property*. This evidence can be circumstantial such as the observation of stressed vegetation, staining, unlabeled or suspicious containers or structures, unidentified oily substances, pooled liquids, odors and the like. If identified, these observations can be listed as RECs which may require additional investigation.

The site reconnaissance entailed driving the *property*, verifying the existence of sites that were identified by the environmental database search, searching for sites that may not have been identified on the database search, and by the visual observation of indicators of potential environmental concerns as outlined above. Photographs taken during the site reconnaissance are in *Appendix B*.

6.1 Site Access and Limitations

As this is a Limited Phase I ESA only public entry areas were accessible during this assessment.

The inaccessibility of structures within the proposed right of way expansion may be considered a data gap. However, it is believed that the thorough review of database searches, review of available aerial photography, and visual observations made during the site reconnaissance, sufficient information was gathered to assess those areas that Fuss & O'Neill personnel could not directly access.

6.1.1 Hazardous Substances in and not in Connection with Identified Uses

Several properties along the *property* are suspected of using and storing various chemical substances. Some of the suspected substances included degreasers, dry cleaner cleaning fluids, and unknowns. A full inventory of the types of chemicals and storage locations is beyond the scope of this investigation.

6.1.2 Petroleum Products in and not in Connection with Identified Uses

Several properties along the *property* are suspected of using and storing various petroleum products. Some of the petroleum products included gasoline, diesel fuel, used oil, fuel oil, and unknowns. A full inventory of the types of petroleum products and storage locations is beyond the scope of this investigation but properties that use or store these chemicals have been identified.

6.1.3 Storage Tanks

The EDR environmental database records indicated and Fuss & O'Neill reconnaissance confirmed the locations of underground storage tanks at the following locations:

- Millers Produce & Farm Inc., 3660 Highway 51
- Pantry 3969 DBA Petro Express, 3473 Highway 21
- Handy Pantry 28 Food Mart, 3004 US 21 Bypass
- Summerville Grocery, Highway 51

The following locations with USTs were found during the site reconnaissance but were not listed in the database search.

- Times Turn Around 10, 2448 US Highway 21
- T & G's Country Store, 2976 US Highway 21

Above ground storage tanks were not located during the corridor reconnaissance or on the database records search within the project corridor except at the following site.

- Container Corporation of the Carolinas – 2 ASTs

6.1.4 Polychlorinated Biphenyls (PCBs)

Electrical transformers manufactured prior to 1979 generally contained PCB-oils. PCBs are polychlorinated biphenyl's and have been determined to be a likely carcinogen. The production of PCB fluids were discontinued in the United States in 1977 and new PCB-oil containing equipment was banned on July 1, 1979. Pole-mounted and pad mounted transformers were observed during site reconnaissance. However, there was no indication that these transformers were leaking or had leaked in the past.

A power transmission station with numerous transformers was observed at 2014 Highway 21. The distance of the transmission station from the current road and proposed road widening area should limit the potential for PCB impact to the subsurface near the ROW.

6.1.5 Solid Waste Disposal

Container Corporation of Carolina (EPA I.D No.1000395755) located at 3358 Highway 51, Fort Mill, South Carolina was listed as a MSW facility within the database search and the facility was located and verified during the site reconnaissance.

6.1.6 Stormwater

Storm water runoff from the roadway along the project corridor flows by sheet drainage into roadside drainage swales, from the drainage swales, storm water flows into nearby surface water bodies.

6.1.7 Stained or Environmentally Stressed Areas

No major staining or stressed vegetation areas were observed along the project corridor during the site reconnaissance.

6.1.8 Wells

Several monitoring wells associated with petroleum releases were observed during the site reconnaissance at Millers Produce and Farm Inc., Southern Tree & Landscaping, T&G Country Store, and Time Turn Around 10.

6.1.9 Potable Water / Wastewater

Municipal water and sewer service is maintained and supplied to the majority of the project corridor by York County's public works department. There are still several private water supply wells on parcels throughout the corridor and suspected septic systems as well. A possible septic tank was seen at 2448 US Highway 21 during the site reconnaissance.

There was previously an oil water separator (OWS) at the Container Corporation of Carolina located at 3358 Highway 51, Fort Mill SC to handle wastewater from the facility according to the closure report for Carolina Corp of Carolina (*Section 4.3*). Though there is no knowledge of the discharge location of the OWS located at the referenced site, there is a high probability that this facility once did not have access to municipal water and sewer and could have utilized a leach field as a discharge point for effluent discharge from the OWS.

6.1.10 Additional Environmental Concerns

During the site reconnaissance evidence of a monitoring well network was found at the site of the former Southern Tree & Landscape Co. No information was found during FOI file review and Southern Tree & Landscape Co. was only mentioned as a small quantity generator during our database search.

6.2 Non-ASTM Scope Considerations

Unless otherwise specified, the following items were not considered in the course of completing this ASTM E1527-05 Phase I ESA:

- Asbestos, Lead (paint/plumbing), Radon, Mold, Fluorescent Light Ballasts
- Ecological Resources, Historical/Cultural Resources
- Regulatory and Health & Safety Compliance
- Endangered species

7 Interviews

7.1 Interview with Local Government Official

Fuss & O'Neill personnel contacted the Fort Mill Department (name of person spoken to, phone number) to obtain information regarding the *property*. Fuss & O'Neill personnel were informed that information could not be released without submitting an FOIA request. The fire department said these request normally take 6-8 weeks to process. The 6-8 week FOIA request and file review for sites listed in *Section 10* were not reasonably ascertainable within the time and cost constraints of this investigation.

8 Data Gaps and Deviations

8.1 Data Gaps & Failures

Standard Practice E 1527-05 requires the identification and evaluation of data gaps or data failures, which are defined as a lack of or inability to obtain information required by the practice despite good faith efforts by the environmental professional to gather such information.

Items that would normally be considered data gaps are addressed in *Section 8.2*..

The city directories and aerial photographs did not go back to 1940 or the time of first use. This would be considered a data failure.

8.2 Deviations

The report was conducted in general accordance with ASTM E1527-05 guidance for conducting Phase I ESAs. Since this Phase I ESA is being developed for a corridor, specific information for each individually owned parcel along the *property* was not reasonably ascertainable within the time and cost constraints of this investigation.

This Limited Phase I ESA deviates from ASTM E1527-05 in the following ways:

- Past or current uses of the properties, adjoining properties, and/or the surrounding area were not identified through interviews with the past or present individual parcel owners and/or past or present occupants.
- Past uses prior to 1970 were not identified through the review of historic aerial photographs.
- Interior observations of the structures along the *property* were not identified.
- Recorded land title records, liens, and/or zoning/land use records on individual properties along the *property* were not assessed. This includes environmental liens or activity and use limitations (AULs).
- The *User* of the report, York County and its agents was not given a "User Questionnaire" because it is unrealistic for a government entity to have specialized knowledge on small parcels of land along an extensive corridor. Therefore, the review of title and judicial records for environmental liens, AULs, or ascertainable recorded land title records were not supplied by the *User* of this report.

9 Findings

Findings of this Phase I ESA identify known or suspect RECs and HRECs. ASTM E 1527-05 states that an HREC is "an environmental condition in the past would have been considered a *recognized environmental condition*, but which may or may not be considered a *recognized environmental condition* currently. If a past release of any hazardous substances or petroleum products has occurred in connection with the *property* and has been remediated, with such remediation accepted by the responsible regulatory agency (for example, as evidenced by the issuance of a no further action letter or equivalent), this condition shall be considered an historical recognized environmental condition" The following suspect RECs and HRECs were observed during the Phase I ESA.

RECs

Container Corporation of Carolina: This site is located approximately 700 feet to the south of Highway 51 in a down to side-gradient location in proximity to the *property*.. The site is known to have had subsurface petroleum contamination in the past.

Handy Pantry 28 Food Mart: This site is located within the project corridor on the eastern side of Highway 21, is a known LUST site with limited information available, and no longer operates as a fuel retailer

Lords Armory: This site is located within the project corridor on the southern side of Highway 51 and is a known LUST site that has undergone active remediation Underground Injection Control (UIC). Direct push injection of Regenesis Corporation's oxygen release compound (ORC) was the remediation technology used to remediate the groundwater contaminant plume at the site.

Millers Produce & Farm Inc.: This site is located within the project corridor on the eastern side of Highway 21, is a known UST site with limited information available. An FOIA request was submitted to obtain any documented information regarding the site. A letter from SCDHEC dated September 8, 2002stating that SCDHEC requires no further site assessment or rehabilitation of the site was the only documentation obtained from the FOI request. The site currently operates as a fuel retailer.

Partex/Eumeric Holdings: This site is located within the project corridor on the northern side of Highway 51, is known to have had Chromium contaminated soilin the past, and has had violations of the South Carolina Hazardous Waste Management Regulations and the South Carolina Pollution Control Act. The violations at the site were for failure to comply with the following regulations:

1. R.61-79.262.11, a person who generates a solid waste, as defined in R.61-79.261.2 must accurately determine if that waste is a hazardous waste;
2. R.61-79.262.12(a), a generator must not treat, store, dispose of, or offer for transportation, hazardous waste without having received an EPA identification number from SCDHEC;
3. R.61-79.262, Subpart C, Pre-transport requirements for generators of hazardous waste
4. R.61-79.262, Subpart D, record keeping and reporting requirements for generators of hazardous waste;
5. R.61-79.262.80, a generator must clean up any hazardous waste discharge that occurs during generation of processing or storage and take such other action as may be required or approved by Federal, State, or local officials so that the hazardous waste discharge no longer presents a hazard to human health of the environment; and,
6. 48-1-90 of the South Carolina Pollution control Act in that it shall be unlawful for any person, directly or indirectly, top throw, drain, run, allow to seep or otherwise discharge into the environment of the state organic or inorganic matter, including sewage, industrial wastes and other wastes, except as in compliance with a permit issued by SCDHEC.

Paving Equipment of the Carolinas: This site is located within the project corridor on the southern side of Highway 51, is known to have stored #2 fuel oil in the past, and formerly operated as an asphalt manufacturing facility.

Pantry 3969 DBA Petro Express: This site (SCDHEC Site I.D 10515) is located at 3473 Highway 21, Fort Mill, SC (approximately 2000 feet north of the intersection of US 21 and SC 51) is listed as a LUST site within SCDHECs database system. The site was granted a no further action (NFA) from SCDHEC on January 6, 1999. A new leak was detected at the site in January 19, 2012. No additional information regarding the leak was able to be obtained during this scope of work.

Southern Tree & Landscaping: This parcel is located within the project corridor at the intersection of Highway 21 and Highway 51. A monitoring well network was observed on the parcel during the site reconnaissance.

Summerville Grocery: This parcel is located within the project corridor on the eastern side of Highway 21. This parcel is a known LUST site with limited information available. The site no longer operates as a fuel retailer

T&G Country Store: This parcel is located within the project corridor on the eastern side of Highway 21. This parcel is a known LUST site with limited information available.

Times Turn Around 10: This parcel is located within the project corridor on the eastern side of Highway 21. This parcel is a known LUST site with limited information available. The site currently operates as a fuel retailer.

Historical RECs

The first release at the Pantry 3969 site may be considered an HREC.

10 Opinions

We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527-05 for the *property*. Any exceptions to, or deletions from, this practice are described in *Section 8* of this report. This assessment has revealed no evidence of *recognized environmental conditions* in connection with the *property* except for the following:

- **Container Corporation of Carolina:** SCDHEC files reviewed by Fuss & O'Neill personnel did not to eliminate the possibility of contamination from this site moving off-site and potentially affecting adjoining parcels. The Container Corporation of Carolina site is located down to side-gradient of the project corridor and areas of the property with known or suspect hazardous chemical and/or petroleum usage are several hundred feet from the right-of-way. Therefore, previous or unreported releases would not affect the *property* and this site is not considered an REC.

- **Millers Produce & Farm Inc.:** This site is located within the project corridor on the eastern side of Highway 21, and is a known LUST site with limited information available. The site no longer operates as a fuel retailer. Due to the limited attainable information pertaining to this site and a known release of petroleum on the site, this site is considered an REC.

- **Summerville Grocery:** This site is located within the project corridor on the eastern side of Highway 21, is a known LUST site with limited information available, and no longer operates as a petroleum retailer. SCDHEC reported that information pertaining to the Summerville Grocery site has been purged from the SCDHEC file system. Due to the limited attainable information pertaining to this site, this site is considered an REC.

- **Lords Armory:** A former petroleum release at the site was granted a CNFA in 2003. The CNFA was granted with land use restrictions in place and varying amounts of petroleum contamination were allowed to remain in place at the site. Because of petroleum contamination remaining in place at the site and the potential for this contamination to be encountered during construction activities, this site is considered an REC.
- **Pantry 3969 DBA Petro Express**: Although this site was reported within our database search radius and a new leak was found at this site in 2012, due to this site's distance from the project corridor this site is not considered an REC.

- **Partex/Eumeric Holdings:** An administrative order (97-11-HW) was issued on the facility by SCDHEC in 1997 for violations of the South Carolina Hazardous Waste Management

Regulations and the South Carolina Pollution Control Act for failure to comply with regulations. Partex/Eumeric Holdings failed to comply with regulations listed in *Section 9*. Information regarding these violations and compliance or non-compliance of issues addressed in the administrative order were not found during FOI file review and have possibly been purged from SCHECs file system. Due to the lack of information on this facility and known past soil contamination the Environmental Professional conducting this Phase I ESA concludes this property is currently an REC.

- **Paving Equipment of the Carolinas:** This property formerly stored #2 fuel oil and was a manufacturer of petroleum-based asphalt. Because of the storage of #2 fuel oil and past use of the property, this site is considered an REC.

- **Southern Tree & Landscaping:** During the site reconnaissance, a monitoring well network was observed at the intersection of US 21 and SC 51 on a site which formerly operated as Southern Tree & Landscaping. Review of SCDHECs files did not return information pertaining to this site and it is believed that information on this site has been purged from SCDHECs file system. The presence of an on-site monitoring well network and limited attainable information pertaining to this site, this site is considered an REC.

- **Handy Pantry 28 Food Mart:** SCDHEC files did not contain information for the Handy Pantry 28 Food Mart. The facility is a former LUST site and was listed on the 2008 GWCI for York County. With the lack of available SCDHEC files and classification of the site as a LUST site, this site is considered an REC.

- **T&G Country Store:** This site is located within the project corridor on the eastern side of Highway 21 and is a known LUST site with limited information available. Because of the known release of petroleum at this site, the site is considered an REC.

- **Times Turn Around 10:** This site is located within the project corridor on the eastern side of Highway 21, Review of SCDHECs files did not return information pertaining to this site and it is believed that information on this site has been purged from SCDHECs file system. This site is a known LUST site with limited information available, and currently operates as a fuel retailer. Because of the known release of petroleum at this site, the site is considered an REC.

A map displaying the locations of these RECs is included as *Figure 3*.

11 Conclusions

We have performed a *Phase I Environmental Site Assessment* in conformance with the scope and limitations of ASTM Practice E1527 of the properties located along Highway 21/ Highway 51 in Fort Mill, York County, South Carolina, the *property* (project corridor). Any exceptions to, or deletions from, this practice are described in *Section8.2* of this *report*. This assessment has revealed no evidence of *recognized environmental conditions* in connection with the *property* except for the following:

- Millers Produce and Farm Inc.
- Summerville Grocery

- Lords Armory
- Partex/Eumeric Holdings
- Paving Equipment of the Carolinas
- Sothern Tree & Landscaping
- Handy Pantry 28 Food Mart
- T&G Country Store
- Times Turn Around 10

Although there were deviations from the ASTM E1527-05, this Limited Phase I ESA addressed the potential for environmental liabilities from the presence of soil or groundwater contamination and/or the presence of hazardous waste or hazardous materials within the reasonably ascertainable time and cost constraints.

12 Additional Investigation

In accordance with Section 12.6.1 of ASTM Standard Practice E1527-05, additional subsurface investigations are recommended due to RECs being present along the project corridor.

13 Qualifications

This Phase I Environmental Site Assessment was performed by Fuss & O'Neill staff members Mr. Reginald Butler and Mr. Jeremy Grant, P.G. Mr. Grant is a professional geologist in the state of South Carolina that served as the Project Manager for this project and senior reviewer of this report. He has 18 years of experience in the environmental industry and has a Bachelor of Arts degree and a Master of Science degree in Geology. Mr. Grant's resume is included in *Appendix F*.

13.1 Signature(s) of Environmental Professional(s)

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental Professionals* (EP) as defined in Part 312.10 of 40 CFR 312. I have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the subject *property*. We have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Jeremy Grant   6/18/13

Jeremy Grant, P.G.   Date
Project Manager

14 References

American Standard for Testing and Materials International, 2005;
Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process; Designation: E 1527-05.

South Carolina Department of Health and Environmental Control, Bureau of Water, October 2008;
South Carolina Groundwater Contaminant Inventory

State Development Board, Division of Geology, South Carolina Department of Transportation, June 2010;
Geologic Notes;
Designation: Volume 9, Number 2.

U.S. Fish & Wildlife Service, National Wetlands Inventory, Last updated: October 25, 2012;
Wetlands Mapper, Information retrieved online from http://www.fws.gov/wetlands;
Accessed on May 18, 2013.

York County Geographic Information Systems, York County, South Carolina, 2013;
Retrieved online from http://www.maps2.yorkcountygov.com;
Accessed on April 23, 2013.

15 Limitations of Work Product

This document was prepared for the sole use of **York County and its agents,** the only intended beneficiaries of our work. Those who may use or rely upon the report and the services (hereafter "work product") performed by Fuss & O'Neill, Inc. and/or its subsidiaries or independent professional associates, subconsultants and subcontractors (collectively the "Consultant") expressly accept the work product upon the following specific conditions.

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3. The observations described and upon which the work product was based were made under the conditions stated therein. Any conclusions presented in the work product were based solely upon the services described therein, and not on scientific or engineering tasks or procedures beyond the scope of described services.

4. In preparing its work product, Consultant may have relied on certain information provided by state and local officials and information and representations made by other parties referenced therein, and on information contained in the files of state and/or local agencies made available at the time of the project. To the extent that such files which may affect the conclusions of the work product are missing, incomplete, inaccurate or not provided, Consultant is not responsible. Although there may have been some degree of overlap in the information provided by these various sources, Consultant did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this project. Consultant assumes no responsibility or liability to discover or determine any defects in such information which could result in failure to identify contamination or other defect in, at or near the site. Unless specifically stated in the work product, Consultant assumes no responsibility or liability for the accuracy of drawings and reports obtained, received or reviewed.

5. If the purpose of this project was to assess the physical characteristics of the subject site with respect to the presence in the environment of hazardous substances, waste or petroleum and chemical products and wastes as defined in the work product, unless otherwise noted, no specific attempt was made to check the compliance of present or past owners or operators of the subject site with Federal, state, or local laws and regulations, environmental or otherwise.

6. If water level readings have been made, these observations were made at the times and under the conditions stated in the report. However, it must be noted that fluctuations in water levels

may occur due to variations in rainfall, passage of time and other factors and such fluctuations may affect the conclusions and recommendations presented herein.

7. Except as noted in the work product, no quantitative laboratory testing was performed as part of the project. Where such analyses have been conducted by an outside laboratory, Consultant has relied upon the data provided, and unless otherwise described in the work product has not conducted an independent evaluation of the reliability of these tests.

8. If the conclusions and recommendations contained in the work product are based, in part, upon various types of chemical data, then the conclusions and recommendations are contingent upon the validity of such data. These data (if obtained) have been reviewed and interpretations made by Consultant. If indicated in the work product, some of these data may be preliminary or screening-level data and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors.

9. Chemical analyses may have been performed for specific parameters during the course of this project, as described in the work product. However, it should be noted that additional chemical constituents not included in the analyses conducted for the project may be present in soil, groundwater, surface water, sediments or building materials at the subject site.

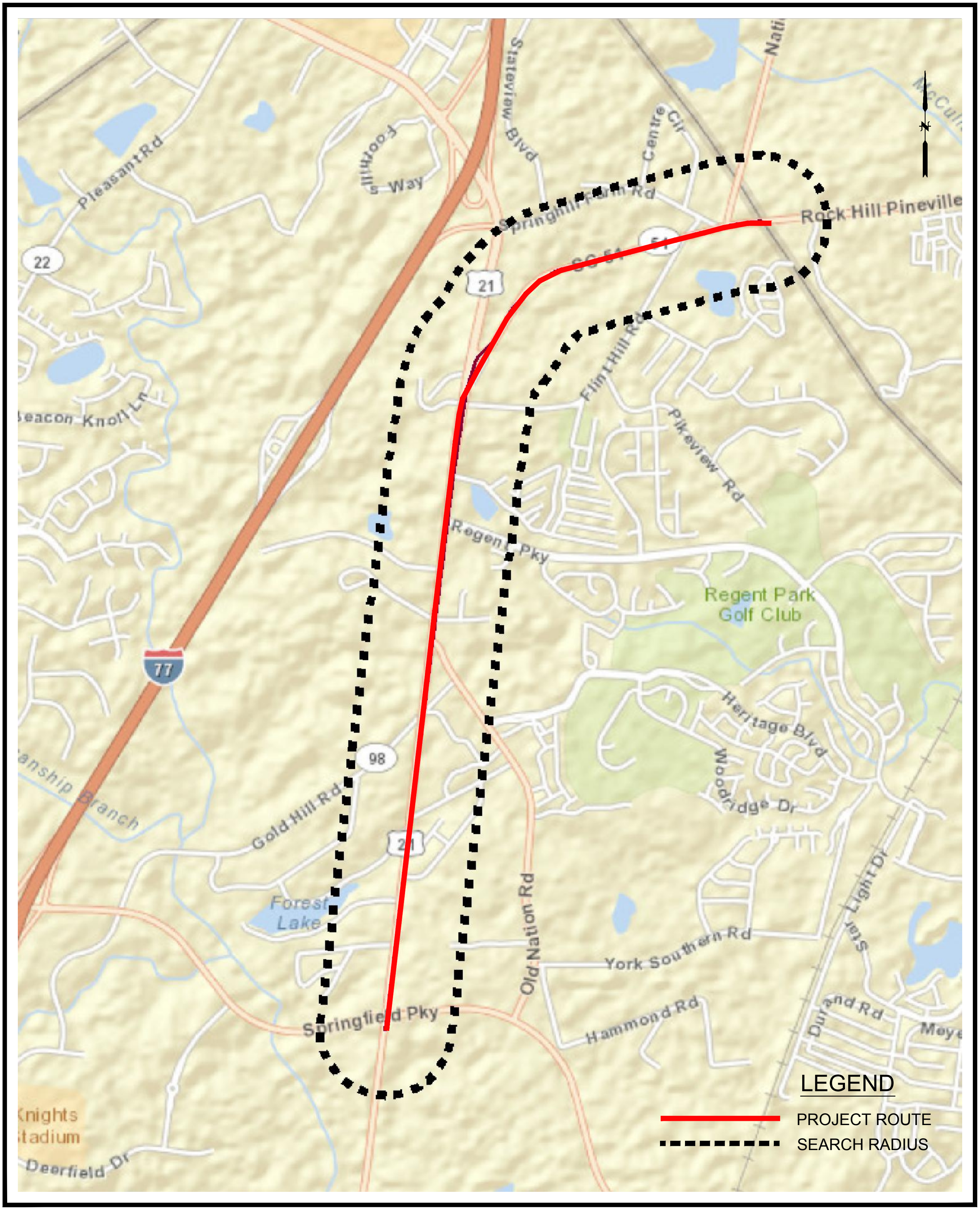
10. Ownership and property interests of all documents, including reports, electronic media, drawings and specifications, prepared or furnished by Consultant pursuant to this project are subject to the terms and conditions specified in the contract between the Consultant and Client, whether or not the project is completed.

11. Unless otherwise specifically noted in the work product or a requirement of the contract between the Consultant and Client, any reuse, modification or disbursement of documents to third parties will be at the sole risk of the third party and without liability or legal exposure to Consultant.

12. In the event that any questions arise with respect to the scope or meaning of Consultant's work product, immediately contact Consultant for clarification, explanation or to update the work product. In addition, Consultant has the right to verify, at the party's expense, the accuracy of the information contained in the work product, as deemed necessary by Consultant, based upon the passage of time or other material change in conditions since conducting the work.

13. Any use of or reliance on the work product shall constitute acceptance of the terms hereof.

Figures



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MS VIEW:

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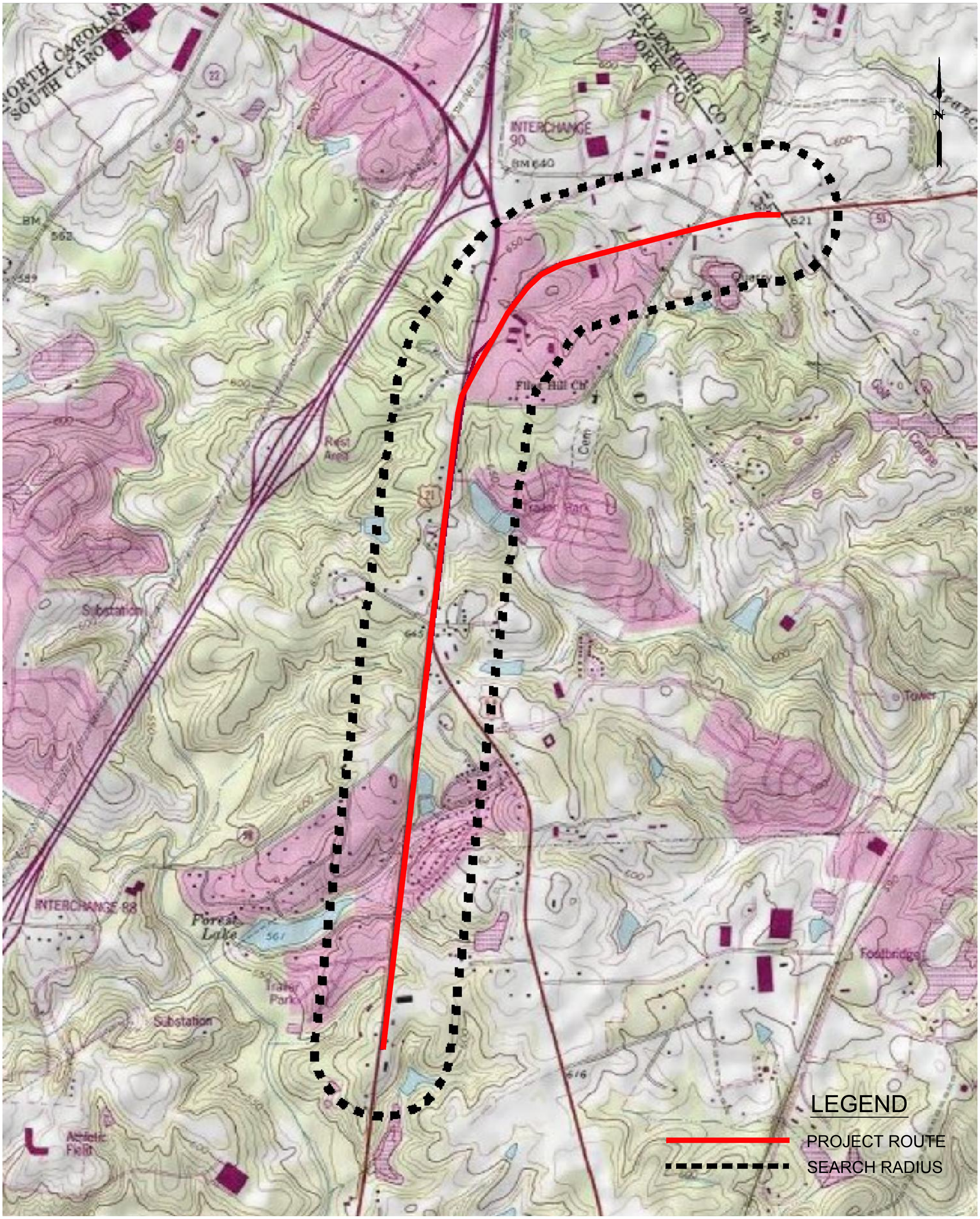

SCALE: HORZ.: 1" = 2000' VERT.: DATUM: HORZ.: VERT.: 0 1000 2000 GRAPHIC SCALE	FUSS & O'NEILL 717 LADY ST, SUITE E COLUMBIA, SOUTH CAROLINA 29201 803.376.6034 www.fando.com	STV/Ralph Whitehead Associates TOPOGRAPHIC SITE LOCATION MAP US Highway 21 / SC Highway 51 Road Widening Fort Mill South Carolina	PROJ. No.: 20120285.A10 DATE: MAY 2013 Figure 2

File Path: F:\P2012\0285 STV York County US 21 SC 51A10\DWG\20091408A11_STP01_TOPOMAP.dwg Layout: FIGURE 2 Plotted: Tue, April 30, 2013 - 10:31 AM User: rbutler
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LAYER STATE:

File Path: F:\P2012\0285 STV York County US 21 SC 51A10\DWG\20091408A11_STP01_TOPOMAP.dwg Layout: FIGURE 3 Plotted: Wed, May 01, 2013 - 9:05 AM User: rbutler

Plotter: DWG TO PDF.PC3 CTB File: FO 2008 MONO (HALF).CTB

LAYER STATE:

MS VIEW:

SCALE:
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VERT.:
DATUM:
HORZ.:
VERT.:

0 1000 2000

GRAPHIC SCALE

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STV/Ralph Whitehead Associates

REC LOCATION MAP

US Highway 21 / SC Highway 51 Road Widening

Fort Mill South Carolina

PROJ. No.: 20120285.A10
DATE: MAY 2013

Figure 3

Appendix A

Environmental Database Search (EDR)

US Hwy 21/SC Hwy 51 Phase I Env Site Assessment
Fort Mill, SC 29715

Inquiry Number: 3490767.1s
January 09, 2013

EDR DataMap™ Corridor Study

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

TARGET PROPERTY INFORMATION

ADDRESS

FORT MILL, SC 29715
FORT MILL, SC 29715

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records within the requested search area for the following databases:

FEDERAL RECORDS

NPL	National Priority List
Proposed NPL	Proposed National Priority List Sites
Delisted NPL	National Priority List Deletions
NPL LIENS	Federal Superfund Liens
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP	CERCLIS No Further Remedial Action Planned
LIENS 2	CERCLA Lien Information
CORRACTS	Corrective Action Report
RCRA-TSDF	RCRA - Treatment, Storage and Disposal
RCRA-LQG	RCRA - Large Quantity Generators
RCRA-SQG	RCRA - Small Quantity Generators
US ENG CONTROLS	Engineering Controls Sites List
US INST CONTROL	Sites with Institutional Controls
ERNS	Emergency Response Notification System
HMIRS	Hazardous Materials Information Reporting System
DOT OPS	Incident and Accident Data
US CDL	Clandestine Drug Labs
US BROWNFIELDS	A Listing of Brownfields Sites
DOD	Department of Defense Sites
FUDS	Formerly Used Defense Sites
LUCIS	Land Use Control Information System
CONSENT	Superfund (CERCLA) Consent Decrees
ROD	Records Of Decision
UMTRA	Uranium Mill Tailings Sites
DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations
ODI	Open Dump Inventory
MINES	Mines Master Index File
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
SSTS	Section 7 Tracking Systems
ICIS	Integrated Compliance Information System
PADS	PCB Activity Database System

EXECUTIVE SUMMARY

MLTS	Material Licensing Tracking System
RADINFO	Radiation Information Database
RAATS	RCRA Administrative Action Tracking System
RMP	Risk Management Plans
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing
US HIST CDL	National Clandestine Laboratory Register
PCB TRANSFORMER	PCB Transformer Registration Database
FEDERAL FACILITY	Federal Facility Site Information listing
US FIN ASSUR	Financial Assurance Information
EPA WATCH LIST	EPA WATCH LIST
PRP	Potentially Responsible Parties
2020 COR ACTION	2020 Corrective Action Program List
COAL ASH DOE	Steam-Electric Plant Operation Data
FEMA UST	Underground Storage Tank Listing
US AIRS	Aerometric Information Retrieval System Facility Subsystem

STATE AND LOCAL RECORDS

SC SHWS	Site Assessment Section Project List
NC SHWS	Inactive Hazardous Sites Inventory
SC ALLSITES	Site Assessment & Remediation Public Record Database
NC IMD	Incident Management Database
NC HSDS	Hazardous Substance Disposal Site
NC SWF/LF	List of Solid Waste Facilities
NC OLI	Old Landfill Inventory
NC UIC	Underground Injection Wells Listing
SC SWRCY	Solid Waste Recycling Facilities
NC SWRCY	Recycling Center Listing
NC HIST LF	Solid Waste Facility Listing
NC LUST	Regional UST Database
NC LUST TRUST	State Trust Fund Database
NC UST	Petroleum Underground Storage Tank Database
NC LAST	Leaking Aboveground Storage Tanks
SC AST	Aboveground Storage Tank List
NC AST	AST Database
SC SPILLS	Spills Database List
NC INST CONTROL	No Further Action Sites With Land Use Restrictions Monitoring
SC VCP	Voluntary Cleanup Sites
NC VCP	Responsible Party Voluntary Action Sites
SC DRYCLEANERS	Drycleaner Database
NC DRYCLEANERS	Drycleaning Sites
SC BROWNFIELDS	Brownfields Sites Listing
NC BROWNFIELDS	Brownfields Projects Inventory
SC CDL	Clandestine Drug Lab Sites
SC NPDES	Waste Water Treatment Facilities Listing
NC NPDES	NPDES Facility Location Listing
SC AIRS	Permitted Airs Facility Listing
SC Financial Assurance	Financial Assurance Information Listing
SC COAL ASH	Coal Ash Disposal Sites
NC COAL ASH	Coal Ash Disposal Sites
NC Financial Assurance	Financial Assurance Information Listing

TRIBAL RECORDS

INDIAN RESERV	Indian Reservations

INDIAN ODI	Report on the Status of Open Dumps on Indian Lands
INDIAN LUST	Leaking Underground Storage Tanks on Indian Land
INDIAN UST	Underground Storage Tanks on Indian Land
INDIAN VCP	Voluntary Cleanup Priority Listing

EDR PROPRIETARY RECORDS

EDR MGP	EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified.

Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

FEDERAL RECORDS

RCRA-CESQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

A review of the RCRA-CESQG list, as provided by EDR, and dated 09/11/2012 has revealed that there is 1 RCRA-CESQG site within the searched area.

Site	Address	Map ID	Page
CONTAINER CORPORATION OF CAROL	***3358 HWY 51***	***9***	***19***

RCRA-NonGen: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

A review of the RCRA-NonGen list, as provided by EDR, and dated 09/11/2012 has revealed that there are 3 RCRA-NonGen sites within the searched area.

Site	Address	Map ID	Page
EUMERIC HOLDINGS NV	***3551 HWY 51***	***4***	***10***
DIENES APPARATUS INC	***3410 HWY 51***	***7***	***16***
SOUTHERN TREE & LANDSCAPE CO	***INTERSECTION US21 & SC5***	***10***	***22***

EXECUTIVE SUMMARY

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 10/23/2011 has revealed that there are 16 FINDS sites within the searched area.

Site	Address	Map ID	Page
MILLERS PRODUCE & FARM INC	3660 HWY 51	2	6
LORDS ARMORY	3578 HWY 51	3	6
BYI LLC	3550 HWY 51	4	8
PAVING EQUIP CAROLINAS	3550 HWY 51	4	9
VIKING ENTERPRISES	3551 HWY 51	4	9
PARTEX INCORPORATED	3551 HWY 51	4	9
EUMERIC HOLDINGS NV	***3551 HWY 51***	***4***	***10***
DYNAMIC PROPERT	3490 HWY 51	5	15
DIENES APPARATUS INC	***3410 HWY 51***	***7***	***16***
CONTAINER CORPORATION OF CAROL	***3358 HWY 51***	***9***	***19***
SOUTHERN TREE & LANDSCAPE CO	***INTERSECTION US21 & SC5***	***10***	***22***
VANCEBURG READY MIX CONCRETE	3231 HIGHWAY 21	11	24
STATE STORE AND LOCK	3203 HWY 21	12	25
T & G S COUNTRY STORE	2976 HWY 21	13	25
HANDY PANTRY 28 FOOD MART	3004 US 21 BYPASS	13	27
DIAMONDS #1	3004 HWY 21	13	27

STATE AND LOCAL RECORDS

SC GWCI: Groundwater Contamination Inventory Cases. Any site that has groundwater contamination over a federal MCL.

A review of the SC GWCI list, as provided by EDR, and dated 07/01/2008 has revealed that there are 2 SC GWCI sites within the searched area.

Site	Address	Map ID	Page
LORDS ARMORY	***3578 HWY 51***	***3***	***6***
HANDY PANTRY 28 FOOD MART	***3004 US 21 BYPASS***	***13***	***25***

SC RCR: The Bureau of Land and Waste Management established this Registry to help monitor and maintain sites that have conditional remedies. A Conditional Remedy is an environmental remedy that includes certain qualifications. These qualifications are divided into two major categories: Remedies requiring Land Use Controls and Conditional No Further Actions.

A review of the SC RCR list, as provided by EDR, and dated 09/19/2012 has revealed that there is 1 SC RCR site within the searched area.

Site	Address	Map ID	Page
LORDS ARMORY	***3578 HWY 51***	***3***	***6***

EXECUTIVE SUMMARY

SC SWF/LF: The Solid Waste Facilities/Landfill Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from the Department of Health & Environmental Control's Permitted Landfills List/Inactive MSWLF List.

A review of the SC SWF/LF list, as provided by EDR, and dated 08/13/2012 has revealed that there is 1 SC SWF/LF site within the searched area.

Site	Address	Map ID	Page
CONTAINER COMPANY OF CAROLINA		8	18

SC UIC: A listing of underground injection wells locations.

A review of the SC UIC list, as provided by EDR, and dated 11/16/2012 has revealed that there is 1 SC UIC site within the searched area.

Site	Address	Map ID	Page
LORDS ARMORY	***3578 HWY 51***	***3***	***6***

SC LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Health & Environmental Control's Leaking UST list.

A review of the SC LUST list, as provided by EDR, and dated 05/23/2012 has revealed that there are 4 SC LUST sites within the searched area.

Site	Address	Map ID	Page
SUMMERVILLE GROCERY No Action Required: 05/09/97	***HWY 51***	***2***	***5***
LORDS ARMORY No Action Required: 10/03/03	***3578 HWY 51***	***3***	***6***
PANTRY 3969 DBA PETRO EXPRESS No Action Required: 01/06/99	***3473 HWY 21***	***6***	***15***
HANDY PANTRY 28 FOOD MART	***3004 US 21 BYPASS***	***13***	***25***

SC UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Health & Environmental Control's list: Comprehensive Underground Storage Tanks.

A review of the SC UST list, as provided by EDR, and dated 11/26/2012 has revealed that there are 5 SC UST sites within the searched area.

Site	Address	Map ID	Page
MILLERS PRODUCE & FARM INC	3660 HWY 51	1	4
SUMMERVILLE GROCERY	***HWY 51***	***2***	***5***
LORDS ARMORY	***3578 HWY 51***	***3***	***6***
PANTRY 3969 DBA PETRO EXPRESS	***3473 HWY 21***	***6***	***15***
HANDY PANTRY 28 FOOD MART	***3004 US 21 BYPASS***	***13***	***25***

EXECUTIVE SUMMARY

Please refer to the end of the findings report for unmapped orphan sites due to poor or inadequate address information.

MAP FINDINGS SUMMARY

Database	Total Plotted
FEDERAL RECORDS	
NPL	0
Proposed NPL	0
Delisted NPL	0
NPL LIENS	0
CERCLIS	0
CERC-NFRAP	0
LIENS 2	0
CORRACTS	0
RCRA-TSDF	0
RCRA-LQG	0
RCRA-SQG	0
RCRA-CESQG	1
RCRA-NonGen	3
US ENG CONTROLS	0
US INST CONTROL	0
ERNS	0
HMIRS	0
DOT OPS	0
US CDL	0
US BROWNFIELDS	0
DOD	0
FUDS	0
LUCIS	0
CONSENT	0
ROD	0
UMTRA	0
DEBRIS REGION 9	0
ODI	0
MINES	0
TRIS	0
TSCA	0
FTTS	0
HIST FTTS	0
SSTS	0
ICIS	0
PADS	0
MLTS	0
RADINFO	0
FINDS	16
RAATS	0
RMP	0
COAL ASH EPA	0
SCRD DRYCLEANERS	0
US HIST CDL	0
PCB TRANSFORMER	0
FEDERAL FACILITY	0
US FIN ASSUR	0
EPA WATCH LIST	0

Database	Total Plotted
PRP	0
2020 COR ACTION	0
COAL ASH DOE	0
FEMA UST	0
US AIRS	0

STATE AND LOCAL RECORDS

Database	Total Plotted
SC SHWS	0
NC SHWS	0
SC ALLSITES	0
SC GWCI	2
NC IMD	0
NC HSDS	0
SC RCR	1
SC SWF/LF	1
NC SWF/LF	0
NC OLI	0
SC UIC	1
NC UIC	0
SC SWRCY	0
NC SWRCY	0
NC HIST LF	0
SC LUST	4
NC LUST	0
NC LUST TRUST	0
SC UST	5
NC UST	0
NC LAST	0
SC AST	0
NC AST	0
SC SPILLS	0
NC INST CONTROL	0
SC VCP	0
NC VCP	0
SC DRYCLEANERS	0
NC DRYCLEANERS	0
SC BROWNFIELDS	0
NC BROWNFIELDS	0
SC CDL	0
SC NPDES	0
NC NPDES	0
SC AIRS	0
SC Financial Assurance	0
SC COAL ASH	0
NC COAL ASH	0
NC Financial Assurance	0

TRIBAL RECORDS

Database	Total Plotted
INDIAN RESERV	0

MAP FINDINGS SUMMARY

Database	Total Plotted
INDIAN ODI	0
INDIAN LUST	0
INDIAN UST	0
INDIAN VCP	0

EDR PROPRIETARY RECORDS

Database	Total Plotted
EDR MGP	0

NOTES:

Sites may be listed in more than one database

1 **MILLERS PRODUCE & FARM INC** **SC UST** **U003629500**
N/A
3660 HWY 51
FORT MILL, SC 29715

UST:

Facility ID:	12165
Owner:	MILLER
Owner Contact:	CHARLES MILLER
Owner Address:	3344 SCHOONER LN
Owner City,St,Zip:	CLOVER, SC 29710
Owner Phone:	000-000-0000
Contact:	PATRICIA PASTERNAK
Contact Tel:	803-548-1760

Tank ID:	1
Capacity:	8000
Product:	PREM
Calcage:	0
Status:	**Currently in use**

Tank ID:	2
Capacity:	8000
Product:	RUL
Calcage:	0
Status:	**Currently in use**

Tank ID:	3
Capacity:	10000
Product:	RUL
Calcage:	0
Status:	**Currently in use**

Tank ID:	4
Capacity:	8000
Product:	Diesel
Calcage:	0
Status:	**Abandoned**

Tank ID:	5
Capacity:	10000
Product:	Diesel
Calcage:	0
Status:	**Currently in use**

Tank ID:	6
Capacity:	30000
Product:	RUL
Calcage:	0
Status:	**Currently in use**

2 **SUMMERVILLE GROCERY**
HWY 51
FORT MILL, SC 29715

SC LUST **U003525696**
SC UST **N/A**

LUST:

Facility ID:	14057
Release Number:	1
Facility Status:	conduct invest/risk assessment
Substance:	PETRO
Owner:	MILDRED FERGUSON
NFA Date:	**05/09/97**
Date Confirmed:	05/17/94
Report Date:	03/22/93
Rank:	3BF

LUST DETAIL:

Release Date:	03/22/1993
Cleanup Complete Date:	05/09/1997
RP Name:	FERGUSON
RP Address:	9106 PROVIDENCE RD W
RP City:	CHARLOTTE
RP State:	NC
RP Zip:	28277-1641
SCRBCA Class Code:	CLASS3BF
Depth to Ground Water:	Not reported
Ground Water Flow Direction:	Not reported
Project Manager:	MINER, READ S
Release Fin Type Code:	DHEC SUPERB with State Lead

UST:

Facility ID:	14057
Owner:	FERGUSON
Owner Contact:	O'NEAL STARNES
Owner Address:	9106 PROVIDENCE RD W
Owner City,St,Zip:	CHARLOTTE, NC 28277-1641
Owner Phone:	704-542-2649
Contact:	O'NEAL STARNES
Contact Tel:	Not reported

Tank ID:	1
Capacity:	1000
Product:	Gasoline
Calcage:	25
Status:	**Abandoned**

Tank ID:	2
Capacity:	1000
Product:	Gasoline
Calcage:	25
Status:	**Abandoned**

2 **MILLERS PRODUCE & FARM INC** **FINDS** **1007240903**
3660 HWY 51 **N/A**
FORT MILL, SC 29715

FINDS:

Registry ID: 110017125617

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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3 **LORDS ARMORY** **FINDS** **1007227176**
3578 HWY 51 **N/A**
FORT MILL, SC 29715

FINDS:

Registry ID: 110016983264

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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3 **LORDS ARMORY** **SC GWCI** **U003525872**
3578 HWY 51 **SC RCR** **N/A**
FORT MILL, SC 29715 **SC UIC**
SC LUST
SC UST

SC GWIC:

Bureau:	BLWM
EAP ID:	Not reported
Solid Waste Permit #:	Not reported
Bureau of Land & Waste Management File #:	Not reported
Permit Number:	14058
WPC Permit:	Not reported
Program:	DUST
Contamination:	PETRO
Petroleum Products:	True
Volatile Organic Compounds:	False
Metals:	False
Nitrates or Potential to Nitrate:	False
Pesticides & Herbicides:	False
Polychlorinated Biphenyls:	False
Base, Neutral, & Acid Extractables:	False

LORDS ARMORY (Continued) **U003525872**

Phenols:	False
Radionuclides Over Max Contaminant Levels:	False
Sources Not In Other Categories:	False
Source:	UST
Underground Storage Tanks:	True
Pits, Ponds, & Lagoons:	False
Spills & Leaks:	False
Landfills:	False
Aboveground Storage Tank:	False
Spray Irrigation:	False
Single-Event Spill:	False
Unpermitted Disposal:	False
Septic Tank/Tile Field:	False
Substances Not In Other Categories:	False
Sources of Contamination Undetermined:	False
Assessment:	No
Monitoring:	No
Remediation:	Yes
Surface Impact:	No
Drinking Water Well Impact:	No

Remarks: Site ID # 14058. RBCA Classification 2AA9. CNFA.

RCR:

Entity Responsibility:	O'Neal S Starnes & William Vick
Region:	3
Tax Id:	Not reported
Latitude:	35.08857
Longitude:	-80.92332
Tracking Number:	14058
Regulatory Program:	UST
Unit Type:	UST
Unit Number/Letter:	1
Area/Acres:	Not reported
Affected Media:	Groundwater
Site/Unit:	Regulated Petroleum Underground Storage Tank Location
Condtions:	Public Noticed Corrective Action Plan
Associated Response/Corrective Action:	Not reported
Associated Chemicals Requiring:	Naphthalene

UIC:

Facility Status:	Permanently Abandoned
Permit Number:	450
Number Of Wells:	5

Facility Status:	Permanently Abandoned
Permit Number:	450M
Number Of Wells:	1

LUST:

Facility ID:	14058
Release Number:	1
Facility Status:	closed > RBSLs
Substance:	PETRO
Owner:	O'NEAL S STARNES & WILLIAM VICK
NFA Date:	**10/03/03**
Date Confirmed:	03/23/95

LORDS ARMORY (Continued) **U003525872**

Report Date: 03/22/93
Rank: 2AA

LUST DETAIL:

Release Date:	03/22/1993
Cleanup Complete Date:	Not reported
RP Name:	O'NEAL S STARNES & WILLIAM VICK
RP Address:	9014 FOURMILE CREEK RD
RP City:	CHARLOTTE
RP State:	NC
RP Zip:	28277-9068
SCRBCA Class Code:	CLASS2AA
Depth to Ground Water:	11
Ground Water Flow Direction:	W
Project Manager:	MINER, READ S
Release Fin Type Code:	DHEC SUPERB with State Lead

UST:

Facility ID:	14058
Owner:	O'NEAL S STARNES & WILLIAM VICK
Owner Contact:	O'NEAL STARNES
Owner Address:	9014 FOURMILE CREEK RD
Owner City,St,Zip:	CHARLOTTE, NC 28277-9068
Owner Phone:	704-542-7533
Contact:	O'NEAL STARNES
Contact Tel:	Not reported

Tank ID:	1
Capacity:	500
Product:	Gasoline
Calcage:	25
Status:	**Abandoned**

Tank ID:	2
Capacity:	500
Product:	Gasoline
Calcage:	25
Status:	**Abandoned**

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4 **BYI LLC**
3550 HWY 51
FORT MILL, SC 29715

FINDS **1007650914**
N/A

FINDS:

Registry ID: 110019917036

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

Map ID Direction Distance Distance (ft.)	Site	Database(s)	EDR ID Number EPA ID Number
4	**PAVING EQUIP CAROLINAS** **3550 HWY 51** **FORT MILL, SC 29715**	**FINDS**	**1007224350** **N/A**

FINDS:

Registry ID: 110016953956

Environmental Interest/Information System

AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

4	**VIKING ENTERPRISES** **3551 HWY 51** **FORT MILL, SC 29715**	**FINDS**	**1007835716** **N/A**

FINDS:

Registry ID: 110019997066

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

4	**PARTEX INCORPORATED** **3551 HWY 51** **FORT MILL, SC 29715**	**FINDS**	**1004593191** **N/A**

FINDS:

Registry ID: 110002329365

Environmental Interest/Information System

AFS (Aerometric Information Retrieval System (AIRS) Facility

PARTEX INCORPORATED (Continued) **1004593191**

Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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4 **EUMERIC HOLDINGS NV**
3551 HWY 51
FORT MILL, SC 29715

RCRA-NonGen **1001120786**
FINDS **SCR000003723**

RCRA-NonGen:

Date form received by agency:	05/03/1999
Facility name:	EUMERIC HOLDINGS NV
Facility address:	3551 HWY 51 FORT MILL, SC 29715
EPA ID:	SCR000003723
Mailing address:	HWY 51 FORT MILL, SC 29715
Contact:	HARRY DEHAAS
Contact address:	3551 HWY 51 FORT MILL, SC 29715
Contact country:	US
Contact telephone:	(999) 999-9999
Contact email:	Not reported
EPA Region:	04
Land type:	Private
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	EUMERIC HOLDINGS NV
Owner/operator address:	FRONT ST 7 ST MAARTEN, SC 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(999) 999-9999
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No

EUMERIC HOLDINGS NV (Continued) **1001120786**

Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Hazardous Waste Summary:
Waste code: D000
Waste name: Not Defined

Waste code: D007
Waste name: CHROMIUM

Facility Has Received Notices of Violations:
Regulation violated: SR - 262.11
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: 08/27/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.11
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: INITIAL 3008(A) COMPLIANCE
Enforcement action date: 05/14/1997
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 62000
Paid penalty amount: 0

Regulation violated: SR - 262.11
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL

EUMERIC HOLDINGS NV (Continued) **1001120786**

Enforcement action date: 03/18/1997
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.12(a)
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 03/18/1997
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.12(a)
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: 04/16/1997
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.12(a)
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: INITIAL 3008(A) COMPLIANCE
Enforcement action date: 05/14/1997
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 62000
Paid penalty amount: 0

Regulation violated: SR - 262.12(a)
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: FINAL 3008(A) COMPLIANCE ORDER
Enforcement action date: 12/19/1996

EUMERIC HOLDINGS NV (Continued) **1001120786**

Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.11
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: 04/16/1997
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.11
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 08/05/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.12(a)
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 08/05/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.12(a)
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: 08/27/1996
Enf. disposition status: Not reported

EUMERIC HOLDINGS NV (Continued) **1001120786**

Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Regulation violated: SR - 262.11
Area of violation: Generators - General
Date violation determined: 12/06/1994
Date achieved compliance: 12/19/1996
Violation lead agency: State
Enforcement action: FINAL 3008(A) COMPLIANCE ORDER
Enforcement action date: 12/19/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Evaluation Action Summary:
Evaluation date: 05/03/1999
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 12/19/1996
Evaluation: NOT A SIGNIFICANT NON-COMPLIER
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 10/01/1996
Evaluation: SIGNIFICANT NON-COMPLIER
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 12/06/1994
Evaluation: SIGNIFICANT NON-COMPLIER
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 12/06/1994
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - General
Date achieved compliance: 12/19/1996
Evaluation lead agency: State

FINDS:

Registry ID: 110008870515

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System)

EUMERIC HOLDINGS NV (Continued) **1001120786**

integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

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5 **DYNAMIC PROPERT** **FINDS** **1007244702**
3490 HWY 51 **N/A**
FORT MILL, SC 29715

FINDS:

Registry ID: 110017165235

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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6 **PANTRY 3969 DBA PETRO EXPRESS** **SC LUST** **U003629280**
3473 HWY 21 **SC UST** **N/A**
FORT MILL, SC 29715

LUST:

Facility ID:	10515
Release Number:	1
Facility Status:	conduct invest/risk assessment
Substance:	PETRO
Owner:	PANTRY INC
NFA Date:	**01/06/99**
Date Confirmed:	12/19/94
Report Date:	06/22/93
Rank:	5B

LUST DETAIL:

Release Date:	06/22/1993
Cleanup Complete Date:	01/06/1999
RP Name:	RHK GROUP INC
RP Address:	PO BOX 2359
RP City:	GASTONIA
RP State:	NC
RP Zip:	28053-2359
SCRBCA Class Code:	CLASS5B

PANTRY 3969 DBA PETRO EXPRESS (Continued) **U003629280**

Depth to Ground Water: Not reported
Ground Water Flow Direction: Not reported
Project Manager: ABERNATHY, JOHN D
Release Fin Type Code: DHEC SUPERB with State Lead

UST:
Facility ID: 10515
Owner: PANTRY INC
Owner Contact: MARY BATCHELOR
Owner Address: 1801 DOUGLAS DR
Owner City,St,Zip: SANFORD, NC 27330
Owner Phone: 919-774-6700
Contact: MARY BATCHELOR
Contact Tel: 803-548-6266

Tank ID: 1
Capacity: 10000
Product: Kerosene
Calcage: 0
Status: Currently in use

Tank ID: 2
Capacity: 10000
Product: RUL
Calcage: 0
Status: Currently in use

Tank ID: 3
Capacity: 10000
Product: PREM
Calcage: 0
Status: Currently in use

Tank ID: 4
Capacity: 10000
Product: Diesel
Calcage: 0
Status: Currently in use

---

7 **DIENES APPARATUS INC** **RCRA-NonGen** **1000914376**
3410 HWY 51 **FINDS** **SC0000322735**
FORT MILL, SC 29715

RCRA-NonGen:
Date form received by agency: 03/27/2002
Facility name: DIENES APPARATUS INC
Facility address: 3410 HWY 51
FORT MILL, SC 29715
EPA ID: SC0000322735
Mailing address: HWY 51
FORT MILL, SC 29715
Contact: CARL BOSSON
Contact address: 3410 HWY 51

DIENES APPARATUS INC (Continued) **1000914376**

	FORT MILL, SC 29715
Contact country:	US
Contact telephone:	(803) 548-4874
Contact email:	Not reported
EPA Region:	04
Land type:	Private
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	MARIE PAULE STONE
Owner/operator address:	3410 HWY 51
	FORT MILL, SC 29715
Owner/operator country:	Not reported
Owner/operator telephone:	(803) 548-4874
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	01/01/0001
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Historical Generators:

Date form received by agency:	04/01/1994
Facility name:	DIENES APPARATUS INC
Classification:	Conditionally Exempt Small Quantity Generator

Hazardous Waste Summary:

Waste code:	D001
Waste name:	IGNITABLE HAZARDOUS WASTES ARE THOSE WASTES WHICH HAVE A FLASHPOINT OF LESS THAN 140 DEGREES FAHRENHEIT AS DETERMINED BY A PENSKY-MARTENS CLOSED CUP FLASH POINT TESTER. ANOTHER METHOD OF DETERMINING THE FLASH POINT OF A WASTE IS TO REVIEW THE MATERIAL SAFETY DATA SHEET, WHICH CAN BE OBTAINED FROM THE MANUFACTURER OR DISTRIBUTOR OF THE MATERIAL. LACQUER THINNER IS AN EXAMPLE OF A COMMONLY USED SOLVENT WHICH WOULD BE CONSIDERED AS IGNITABLE HAZARDOUS WASTE.
Waste code:	F001
Waste name:	THE FOLLOWING SPENT HALOGENATED SOLVENTS USED IN DEGREASING: TETRACHLOROETHYLENE, TRICHLOROETHYLENE, METHYLENE CHLORIDE,

DIENES APPARATUS INC (Continued) **1000914376**

1,1,1-TRICHLOROETHANE, CARBON TETRACHLORIDE, AND CHLORINATED FLUOROCARBONS; ALL SPENT SOLVENT MIXTURES/BLENDS USED IN DEGREASING CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F002, F004, AND F005, AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Waste code: 7777
Waste name: 7777

Violation Status: No violations found

Evaluation Action Summary:
Evaluation date: 12/06/1994
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

FINDS:

Registry ID: 110006119501

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

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8 **CONTAINER COMPANY OF CAROLINA MSW TS (FORT MILL)** **SC SWF/LF** **S108237580**
N/A

YORK (County), SC

LF:
Mailing Address: PO Box 219
Mailing State: NC
Mailing City: Pineville
Mailing Zip: 28134
Facility ID: 463323-6001
Rate Restriction: 1200
Rate Units: tons per day
Cap Units: Not reported
Online Data: Transfer Station
EQC Region: 3
EQC Region Office: Lancaster
Total Capacity: Not reported
Status: Active

CONTAINER COMPANY OF CAROLINA MSW TS (FORT MILL) (Continued) **S108237580**

Class:	Not reported
UTM-E:	506468.3125
UTM-N:	3882540
Contact Name:	Jimmie Jones
Contact Phone:	(803) 547-3184

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9 **CONTAINER CORPORATION OF CAROLINA** **RCRA-CESQG** **1000395755**
3358 HWY 51 **FINDS** **SCD079053401**
FORT MILL, SC 29715

RCRA-CESQG:

Date form received by agency:	12/28/2000
Facility name:	CONTAINER CORPORATION OF CAROLINA
Facility address:	3358 HWY 51 FORT MILL, SC 29715
EPA ID:	SCD079053401
Mailing address:	PO BOX 219 PINEVILLE, NC 28134
Contact:	CHRIS JOBSON
Contact address:	3358 HWY 51 FORT MILL, NC 29715
Contact country:	US
Contact telephone:	(803) 547-3184
Contact email:	Not reported
EPA Region:	04
Land type:	Private
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	OPERNAME
Owner/operator address:	OPERSTREET OPERCITY, WY 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(404) 555-1212
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported
Owner/operator name:	ALLIED WASTE IND
Owner/operator address:	15880 N GREENWAY HEYDEN LOOP SCOTTSDALE, AZ 85260
Owner/operator country:	Not reported

CONTAINER CORPORATION OF CAROLINA (Continued) **1000395755**

Owner/operator telephone: (999) 999-9999
Legal status: Private
Owner/Operator Type: Owner
Owner/Op start date: 01/01/0001
Owner/Op end date: Not reported

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 12/10/1980
Facility name: CONTAINER CORPORATION OF CAROLINA
Classification: Not a generator, verified

Hazardous Waste Summary:
Waste code: D001
Waste name: IGNITABLE HAZARDOUS WASTES ARE THOSE WASTES WHICH HAVE A FLASHPOINT OF LESS THAN 140 DEGREES FAHRENHEIT AS DETERMINED BY A PENSKY-MARTENS CLOSED CUP FLASH POINT TESTER. ANOTHER METHOD OF DETERMINING THE FLASH POINT OF A WASTE IS TO REVIEW THE MATERIAL SAFETY DATA SHEET, WHICH CAN BE OBTAINED FROM THE MANUFACTURER OR DISTRIBUTOR OF THE MATERIAL. LACQUER THINNER IS AN EXAMPLE OF A COMMONLY USED SOLVENT WHICH WOULD BE CONSIDERED AS IGNITABLE HAZARDOUS WASTE.

Waste code: D039
Waste name: TETRACHLOROETHYLENE

Facility Has Received Notices of Violations:
Regulation violated: SR - 262.13(d)
Area of violation: Generators - Records/Reporting
Date violation determined: 12/14/2000
Date achieved compliance: 01/04/2001
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: 12/18/2000
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

CONTAINER CORPORATION OF CAROLINA (Continued) **1000395755**

Regulation violated: SR - 262.11
Area of violation: Generators - Records/Reporting
Date violation determined: 12/14/2000
Date achieved compliance: 01/04/2001
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: 12/18/2000
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: 0
Final penalty amount: 0
Paid penalty amount: 0

Evaluation Action Summary:
Evaluation date: 01/04/2001
Evaluation: COMPLIANCE SCHEDULE EVALUATION
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 12/14/2000
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - Records/Reporting
Date achieved compliance: 01/04/2001
Evaluation lead agency: State

FINDS:

Registry ID: 110002329597

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

PCS (Permit Compliance System) is a computerized management information system that contains data on National Pollutant Discharge Elimination System (NPDES) permit holding facilities. PCS tracks the permit, compliance, and enforcement status of NPDES facilities.

10 **SOUTHERN TREE & LANDSCAPE CO** **RCRA-NonGen 1000835590**
INTERSECTION US21 & SC51 **FINDS SCD987596707**
FORT MILL, SC 29715

RCRA-NonGen:

Date form received by agency:	05/06/2002
Facility name:	SOUTHERN TREE & LANDSCAPE CO
Facility address:	INTERSECTION US21 & SC51 FORT MILL, SC 29715
EPA ID:	SCD987596707
Mailing address:	PO BOX 7067 CHARLOTTE, NC 282417067
Contact:	KERRY KOMENDAT
Contact address:	INTERSECTION US21 & SC51 FORT MILL, SC 29715
Contact country:	US
Contact telephone:	(803) 548-4788
Contact email:	Not reported
EPA Region:	04
Land type:	Private
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	JOHN R. BRANTLEY JR
Owner/operator address:	9820 KERR RD WAXHAW, NC 28079
Owner/operator country:	Not reported
Owner/operator telephone:	(704) 843-4063
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	01/01/0001
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Historical Generators:

Date form received by agency:	03/27/2002
Facility name:	SOUTHERN TREE & LANDSCAPE CO
Classification:	Conditionally Exempt Small Quantity Generator
Date form received by agency:	03/31/1993
Facility name:	SOUTHERN TREE & LANDSCAPE CO

SOUTHERN TREE & LANDSCAPE CO (Continued) **1000835590**

Classification: Small Quantity Generator

Hazardous Waste Summary:

Waste code: D001
Waste name: IGNITABLE HAZARDOUS WASTES ARE THOSE WASTES WHICH HAVE A FLASHPOINT OF LESS THAN 140 DEGREES FAHRENHEIT AS DETERMINED BY A PENSKY-MARTENS CLOSED CUP FLASH POINT TESTER. ANOTHER METHOD OF DETERMINING THE FLASH POINT OF A WASTE IS TO REVIEW THE MATERIAL SAFETY DATA SHEET, WHICH CAN BE OBTAINED FROM THE MANUFACTURER OR DISTRIBUTOR OF THE MATERIAL. LACQUER THINNER IS AN EXAMPLE OF A COMMONLY USED SOLVENT WHICH WOULD BE CONSIDERED AS IGNITABLE HAZARDOUS WASTE.

Waste code: D002
Waste name: A WASTE WHICH HAS A PH OF LESS THAN 2 OR GREATER THAN 12.5 IS CONSIDERED TO BE A CORROSIVE HAZARDOUS WASTE. SODIUM HYDROXIDE, A CAUSTIC SOLUTION WITH A HIGH PH, IS OFTEN USED BY INDUSTRIES TO CLEAN OR DEGREASE PARTS. HYDROCHLORIC ACID, A SOLUTION WITH A LOW PH, IS USED BY MANY INDUSTRIES TO CLEAN METAL PARTS PRIOR TO PAINTING. WHEN THESE CAUSTIC OR ACID SOLUTIONS BECOME CONTAMINATED AND MUST BE DISPOSED, THE WASTE WOULD BE A CORROSIVE HAZARDOUS WASTE.

Waste code: F001
Waste name: THE FOLLOWING SPENT HALOGENATED SOLVENTS USED IN DEGREASING: TETRACHLOROETHYLENE, TRICHLOROETHYLENE, METHYLENE CHLORIDE, 1,1,1-TRICHLOROETHANE, CARBON TETRACHLORIDE, AND CHLORINATED FLUOROCARBONS; ALL SPENT SOLVENT MIXTURES/BLENDS USED IN DEGREASING CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F002, F004, AND F005, AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Waste code: F002
Waste name: THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE, TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE, CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2-TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE LISTED IN F001, F004, OR F005, AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Waste code: F004
Waste name: THE FOLLOWING SPENT NON-HALOGENATED SOLVENTS: CRESOLS AND CRESYLIC ACID, AND NITROBENZENE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NON-HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

Evaluation Action Summary:

Evaluation date: 08/22/1994
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported

SOUTHERN TREE & LANDSCAPE CO (Continued) **1000835590**

Date achieved compliance: Not reported
Evaluation lead agency: State

FINDS:

Registry ID: 110007837305

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

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11 **VANCEBURG READY MIX CONCRETE** **FINDS** **1005681231**
3231 HIGHWAY 21 **N/A**
FORT MILL, SC 29715

FINDS:

Registry ID: 110010310207

Environmental Interest/Information System

AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

Map ID Direction Distance Distance (ft.)	Site	Database(s)	EDR ID Number EPA ID Number
12	**STATE STORE AND LOCK** **3203 HWY 21** **FORT MILL, SC 29715**	**FINDS**	**1008010065** **N/A**

FINDS:

Registry ID: 110002331138

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

13	**T & G S COUNTRY STORE** **2976 HWY 21** **FORT MILL, SC 29715**	**FINDS**	**1007228633** **N/A**

FINDS:

Registry ID: 110016998221

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

13	**HANDY PANTRY 28 FOOD MART** **3004 US 21 BYPASS** **FORT MILL, SC 29715**	**SC GWCI** **SC LUST** **SC UST**	**U001015802** **N/A**

SC GWIC:

Bureau:	BLWM
EAP ID:	Not reported
Solid Waste Permit #:	Not reported
Bureau of Land & Waste Management File #:	Not reported
Permit Number:	09316
WPC Permit:	Not reported
Program:	DUST
Contamination:	PETRO
Petroleum Products:	True
Volatile Organic Compounds:	False
Metals:	False
Nitrates or Potential to Nitrate:	False
Pesticides & Herbicides:	False
Polychlorinated Biphenyls:	False
Base, Neutral, & Acid Extractables:	False
Phenols:	False
Radionuclides Over Max Contaminant Levels:	False

HANDY PANTRY 28 FOOD MART (Continued) **U001015802**

Sources Not In Other Categories: False
Source: UST
Underground Storage Tanks: True
Pits, Ponds, & Lagoons: False
Spills & Leaks: False
Landfills: False
Aboveground Storage Tank: False
Spray Irrigation: False
Single-Event Spill: False
Unpermitted Disposal: False
Septic Tank/Tile Field: False
Substances Not In Other Categories: False
Sources of Contamination Undetermined: False
Assessment: No
Monitoring: No
Remediation: Yes
Surface Impact: No
Drinking Water Well Impact: No
Remarks: Site ID # 09316. RBCA Classification 1D4. Active corrective action.

LUST:
Facility ID: 09316
Release Number: 1
Facility Status: active corrective action
Substance: PETRO
Owner: ACME PETROLEUM AND FUEL COMPANY
NFA Date: **Not reported**
Date Confirmed: 01/21/99
Report Date: 01/21/99
Rank: 1D

LUST DETAIL:
Release Date: 01/21/1999
Cleanup Complete Date: Not reported
RP Name: ACME PETROLEUM AND FUEL COMPANY
RP Address: 543 COX RD STE C
RP City: GASTONIA
RP State: NC
RP Zip: 28054-0611
SCRBCA Class Code: CLASS1D
Depth to Ground Water: Not reported
Ground Water Flow Direction: Not reported
Project Manager: THOMA, DEBRA L
Release Fin Type Code: DHEC SUPERB with State Lead

UST:
Facility ID: 9316
Owner: ACME PETROLEUM AND FUEL COMPANY
Owner Contact: PETE OVERTON
Owner Address: 543 COX RD STE C
Owner City,St,Zip: GASTONIA, NC 28054-0611
Owner Phone: 704-867-7281
Contact: PETE OVERTON
Contact Tel: 803-548-0968

Tank ID: 1

HANDY PANTRY 28 FOOD MART (Continued) **U001015802**

Capacity:	10000
Product:	Gasoline
Calcage:	10
Status:	**Abandoned**

Tank ID:	2
Capacity:	10000
Product:	Gasoline
Calcage:	10
Status:	**Abandoned**

Tank ID:	3
Capacity:	10000
Product:	Gasoline
Calcage:	10
Status:	**Abandoned**

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13 **HANDY PANTRY 28 FOOD MART** **FINDS** **1007233028**
3004 US 21 BYPASS **N/A**
FORT MILL, SC 29715

FINDS:

Registry ID: 110017043518

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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13 **DIAMONDS #1** **FINDS** **1007236341**
3004 HWY 21 **N/A**
FORT MILL, SC 29715

FINDS:

Registry ID: 110017078008

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

Count: 33 records

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
CHARLOTTE	1007734258	BRIDGE MILL - PHASE I	8325-D ARROWBRIDGE BLVD	28273	FINDS
CHARLOTTE	1007734256	BRIDGEHAMPTON - PHASE 10	8325-D ARROWBRIDGE BLVD	28273	FINDS
CHARLOTTE	1004746368	WEST MARINE PRODUCTS INC	10125 W LAKE DR	28273	RCRA-CESQG, FINDS
FORT MILL	U003522021	H&S SEPTIC TANKS	RT 1		SC UST
FORT MILL	1004779753	DUKE POWER WYLIE HYDRO	RT 1	29715	RCRA-CESQG, FINDS
FORT MILL	1007233117	BIG HWY 160 AUTO PARTS	2471 HWY 160 W	29715	FINDS
FORT MILL	U003868976	GATE PETROLEUM 326	2911 HWY 160 W	29715	SC UST
FORT MILL	U003557742	C&A MARKET	HWY 160	29715	SC LUST, SC UST
FORT MILL	U003558411	RIVERSTOP GROCERY	HWY 160	29715	SC LUST, SC UST
FORT MILL	1014961224	CVS PHARMACY 1571	1740 HWY 160 W	29715	RCRA-SQG
FORT MILL	1004780614	SMITHS PAINT & BODY SHOP INC	2404 HWY 160 W	29715	RCRA-CESQG, FINDS
FORT MILL	U003994151	T & G'S COUNTRY STORE	2976 HWY 21 BYP	29715	SC GWCI, SC LUST, SC UST
FORT MILL	S112165802	CAROLINA BOAT AND CARS SITE	3310 HWY 51		SC RCR, SC VCP
FORT MILL	S111243487	CAROLINA BOAT AND CARS	3310 HWY 51 N		SC SHWS, SC BROWNFIELDS
FORT MILL	U003524736	WARRIOR SHOPPE	7770 HWY 521		SC GWCI, SC LUST, SC UST
FORT MILL	U003930245	F H YARBOROUGH USED CARS INC	7550 HWY 521	29715	SC LUST, SC UST
FORT MILL	1015731900	R-M INDUSTRIES INC	BANKS STREET EXT	29715	CERCLIS
FORT MILL	1005851368	WIKOFF COLOR/SC HWY 48 PLANT	PO BOX W	29715	FINDS
FORT MILL	1011841074	US FOODSERVICE - CAROLINAS DIVISION, FORT MILL	CAROLINAS DIVISION	29715	RMP
FORT MILL	1008405389	WELLMAN INC	1041 521 CORPORATE CENTER DR	29715	RCRA-NonGen
FORT MILL	1005488007	UTILS SRVS OF SC/FOXWOOD WWTP	0.6 MI E OF RD 674 & 1.4 MI N	29715	FINDS
FORT MILL	S111680916	UTILS SRVS OF SC/FOXWOOD SD WWTP	06 MI E OF RD 674 & 14 MI N OF	29715	SC NPDES
FORT MILL	1003868456	SOUTHERN RAILWAY/TANK CAR CLEANING SITE	2900 FORT OF MP S	29715	CERC-NFRAP, SC SHWS
FORT MILL	U003982810	CIRCLE K 2705963	1766 FORT MILL HWY	29715	SC UST
FORT MILL	U004017906	CRAFT BYPASS TRUCK STOP	2046 S HWY 21 BYP	29715	SC UST
FORT MILL	U003628972	SAMS MART 759	2891 WEST HWY	29715	SC GWCI, SC LUST, SC UST
FORT MILL	S109362346	SPRINGS INDUSTRIES - INDIAN LAND SERVICE CENTER	3223 KENDELL TRCE	29715	SC SHWS, SC BROWNFIELDS
FORT MILL	S110676080	UTILS SRVS OF SC/CAROWOOD SD	SSIDE OF GOLD HILL RD S	29715	SC NPDES
FORT MILL	1004595205	UTILS SRVS OF SC/CAROWOOD SD	SSIDE OF GOLD HILL RD S-46-98	29715	FINDS
PINEVILLE	U001200454	CHARLIE'S SUNOCO	RT 1	28134	NC UST
PINEVILLE	1007709876	WBT(AM) TRANSMITTER SITE	HIGHWAY 21, NORTH OF PINEVILLE	28134	FINDS
PINEVILLE	1000136440	SNO-WHITE CLEANERS	7629 HWY 51	28134	RCRA-NonGen, FINDS
YORK COUNTY	S108979395	W. L. POPE CONSTRUCTION C&D LANDFILL	OFF OF HIGHWAY 101		SC RCR

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

FEDERAL RECORDS

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 10/01/2012
Date Data Arrived at EDR: 10/11/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 70

Source: EPA
Telephone: N/A
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/22/2013
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 10/01/2012
Date Data Arrived at EDR: 10/11/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 70

Source: EPA
Telephone: N/A
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/22/2013
Data Release Frequency: Quarterly

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 10/01/2012
Date Data Arrived at EDR: 10/11/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 70

Source: EPA
Telephone: N/A
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/22/2013
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 11/02/2012
Date Data Arrived at EDR: 11/28/2012
Date Made Active in Reports: 01/07/2013
Number of Days to Update: 40

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Quarterly

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 11/02/2012
Date Data Arrived at EDR: 11/28/2012
Date Made Active in Reports: 01/07/2013
Number of Days to Update: 40

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Quarterly

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/16/2012
Date Data Arrived at EDR: 03/26/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 80

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 08/19/2011
Date Data Arrived at EDR: 08/31/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 132

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 11/12/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Quarterly

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 09/11/2012
Date Data Arrived at EDR: 10/04/2012
Date Made Active in Reports: 12/04/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Quarterly

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 09/11/2012
Date Data Arrived at EDR: 10/04/2012
Date Made Active in Reports: 12/04/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 09/11/2012
Date Data Arrived at EDR: 10/04/2012
Date Made Active in Reports: 12/04/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 09/11/2012
Date Data Arrived at EDR: 10/04/2012
Date Made Active in Reports: 12/04/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Varies

RCRA-NonGen: RCRA - Non Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 09/11/2012
Date Data Arrived at EDR: 10/04/2012
Date Made Active in Reports: 12/04/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 07/18/2012
Date Data Arrived at EDR: 07/24/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 104

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 12/10/2012
Next Scheduled EDR Contact: 03/25/2013
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 07/18/2012
Date Data Arrived at EDR: 07/24/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 104

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 12/10/2012
Next Scheduled EDR Contact: 03/25/2013
Data Release Frequency: Varies

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 04/02/2012
Date Data Arrived at EDR: 04/03/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 72

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Annually

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 04/01/2012
Date Data Arrived at EDR: 04/03/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 72

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Annually

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 11/06/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Varies

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 07/11/2012
Date Data Arrived at EDR: 09/12/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 54

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 12/03/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Quarterly

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/10/2012
Date Data Arrived at EDR: 12/11/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 9

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 12/11/2012
Next Scheduled EDR Contact: 04/08/2013
Data Release Frequency: Semi-Annually

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 10/18/2012
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 08/12/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 112

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 12/10/2012
Next Scheduled EDR Contact: 03/25/2013
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/09/2005
Date Data Arrived at EDR: 12/11/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 31

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 11/15/2012
Next Scheduled EDR Contact: 03/04/2013
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 10/01/2012
Date Data Arrived at EDR: 10/19/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 62

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 12/28/2012
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 02/27/2012
Date Data Arrived at EDR: 03/14/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 92

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 12/11/2012
Next Scheduled EDR Contact: 03/25/2013
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 11/28/2012
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Varies

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 07/03/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: No Update Planned

MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 09/08/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 21

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 12/05/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 09/01/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 131

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 11/28/2012
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2006
Date Data Arrived at EDR: 09/29/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 64

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 12/28/2012
Next Scheduled EDR Contact: 04/08/2013
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 11/26/2012
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 11/26/2012
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 07/20/2011
Date Data Arrived at EDR: 11/10/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 10/19/2012
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 11/01/2010
Date Data Arrived at EDR: 11/10/2010
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 98

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 10/19/2012
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/21/2011
Date Data Arrived at EDR: 07/15/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 60

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 12/10/2012
Next Scheduled EDR Contact: 03/25/2013
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 10/02/2012
Date Data Arrived at EDR: 10/02/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 01/09/2013
Next Scheduled EDR Contact: 04/22/2013
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 10/23/2011
Date Data Arrived at EDR: 12/13/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 79

Source: EPA
Telephone: (404) 562-9900
Last EDR Contact: 12/11/2012
Next Scheduled EDR Contact: 03/25/2013
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 05/08/2012
Date Data Arrived at EDR: 05/25/2012
Date Made Active in Reports: 07/10/2012
Number of Days to Update: 46

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 03/01/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 62

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 11/30/2012
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Biennially

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011	Source: Environmental Protection Agency
Date Data Arrived at EDR: 10/19/2011	Telephone: 202-566-0517
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 11/02/2012
Number of Days to Update: 83	Next Scheduled EDR Contact: 02/11/2013
	Data Release Frequency: Varies

COAL ASH DOE: Sleam-Electric Plan Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005	Source: Department of Energy
Date Data Arrived at EDR: 08/07/2009	Telephone: 202-586-8719
Date Made Active in Reports: 10/22/2009	Last EDR Contact: 10/16/2012
Number of Days to Update: 76	Next Scheduled EDR Contact: 01/28/2013
	Data Release Frequency: Varies

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010	Source: FEMA
Date Data Arrived at EDR: 02/16/2010	Telephone: 202-646-5797
Date Made Active in Reports: 04/12/2010	Last EDR Contact: 10/15/2012
Number of Days to Update: 55	Next Scheduled EDR Contact: 01/28/2013
	Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 08/17/2010	Source: Environmental Protection Agency
Date Data Arrived at EDR: 01/03/2011	Telephone: N/A
Date Made Active in Reports: 03/21/2011	Last EDR Contact: 12/11/2012
Number of Days to Update: 77	Next Scheduled EDR Contact: 03/25/2013
	Data Release Frequency: Varies

FEDERAL FACILITY: Federal Facility Site Information listing
A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 07/31/2012	Source: Environmental Protection Agency
Date Data Arrived at EDR: 10/09/2012	Telephone: 703-603-8704
Date Made Active in Reports: 12/20/2012	Last EDR Contact: 10/09/2012
Number of Days to Update: 72	Next Scheduled EDR Contact: 01/21/2013
	Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information
All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 08/20/2012	Source: Environmental Protection Agency
Date Data Arrived at EDR: 08/28/2012	Telephone: 202-566-1917
Date Made Active in Reports: 11/05/2012	Last EDR Contact: 11/16/2012
Number of Days to Update: 69	Next Scheduled EDR Contact: 03/04/2013
	Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST
EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/13/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 36

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 11/12/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Quarterly

US AIRS MINOR: Air Facility System Data
A listing of minor source facilities.

Date of Government Version: 01/18/2012
Date Data Arrived at EDR: 01/27/2012
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 34

Source: EPA
Telephone: 202-564-5962
Last EDR Contact: 12/28/2012
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Annually

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)
The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 01/18/2012
Date Data Arrived at EDR: 01/27/2012
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 34

Source: EPA
Telephone: 202-564-5962
Last EDR Contact: 12/28/2012
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 10/22/2012
Next Scheduled EDR Contact: 02/04/2013
Data Release Frequency: Varies

2020 COR ACTION: 2020 Corrective Action Program List
The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 11/11/2011
Date Data Arrived at EDR: 05/18/2012
Date Made Active in Reports: 05/25/2012
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 11/26/2012
Data Release Frequency: Varies

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 10/01/2012
Date Data Arrived at EDR: 10/04/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 32

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

STATE AND LOCAL RECORDS

SC SHWS: Site Assessment Section Project List

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 06/21/2012
Date Data Arrived at EDR: 06/27/2012
Date Made Active in Reports: 08/02/2012
Number of Days to Update: 36

Source: Department of Health and Environmental Control
Telephone: 803-734-5376
Last EDR Contact: 12/13/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Annually

NC SHWS: Inactive Hazardous Sites Inventory

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 08/24/2012
Date Data Arrived at EDR: 09/19/2012
Date Made Active in Reports: 10/15/2012
Number of Days to Update: 26

Source: Department of Environment, Health and Natural Resources
Telephone: 919-508-8400
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Quarterly

SC ALLSITES: Site Assessment & Remediation Public Record Database

The South Carolina Department of Health and Environmental Control is pleased to have the Public Record for your review. The purpose of this database is two-fold. First, it will provide to communities another form of notice of cleanup activity, allowing them to have more information about assessment and cleanup activities in their area and in the State. Second, it can assist those seeking to redevelop brownfield properties within South Carolina.

Date of Government Version: 03/02/2012
Date Data Arrived at EDR: 04/05/2012
Date Made Active in Reports: 05/04/2012
Number of Days to Update: 29

Source: Department of Health & Environmental Control
Telephone: 803-896-4000
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Quarterly

SC GWCI: Groundwater Contamination Inventory

An inventory of all groundwater contamination cases in the state.

Date of Government Version: 07/01/2008
Date Data Arrived at EDR: 11/06/2008
Date Made Active in Reports: 11/19/2008
Number of Days to Update: 13

Source: Department of Health and Environmental Control
Telephone: 803-898-3798
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Annually

NC IMD: Incident Management Database

Groundwater and/or soil contamination incidents

Date of Government Version: 07/21/2006
Date Data Arrived at EDR: 08/01/2006
Date Made Active in Reports: 08/23/2006
Number of Days to Update: 22

Source: Department of Environment and Natural Resources
Telephone: 919-733-3221
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: No Update Planned

NC HSDS: Hazardous Substance Disposal Site

Locations of uncontrolled and unregulated hazardous waste sites. The file includes sites on the National Priority List as well as those on the state priority list.

Date of Government Version: 08/09/2011
Date Data Arrived at EDR: 11/08/2011
Date Made Active in Reports: 12/05/2011
Number of Days to Update: 27

Source: North Carolina Center for Geographic Information and Analysis
Telephone: 919-754-6580
Last EDR Contact: 11/16/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Biennially

SC RCR: Registry of Conditional Remedies

The Bureau of Land and Waste Management established this Registry to help monitor and maintain sites that have conditional remedies. A Conditional Remedy is an environmental remedy that includes certain qualifications. These qualifications are divided into two major categories: Remedies requiring Land Use Controls and Conditional No Further Actions.

Date of Government Version: 09/19/2012
Date Data Arrived at EDR: 09/20/2012
Date Made Active in Reports: 10/22/2012
Number of Days to Update: 32

Source: Department of Health & Environmental Control
Telephone: 803-896-4000
Last EDR Contact: 12/21/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Varies

SC SWF/LF: Permitted Landfills List

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 08/13/2012
Date Data Arrived at EDR: 08/15/2012
Date Made Active in Reports: 10/10/2012
Number of Days to Update: 56

Source: Department of Health and Environmental Control
Telephone: 803-734-5165
Source: Department of Health and Environmental Control, GIS Section
Telephone: 803-896-4084
Last EDR Contact: 12/13/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Varies

NC SWF/LF: List of Solid Waste Facilities

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 09/25/2012
Date Data Arrived at EDR: 09/27/2012
Date Made Active in Reports: 10/26/2012
Number of Days to Update: 29

Source: Department of Environment and Natural Resources
Telephone: 919-733-0692
Last EDR Contact: 01/02/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Semi-Annually

NC OLI: Old Landfill Inventory

Old landfill inventory location information. (Does not include no further action sites and other agency lead sites).

Date of Government Version: 07/03/2012
Date Data Arrived at EDR: 07/23/2012
Date Made Active in Reports: 08/06/2012
Number of Days to Update: 14

Source: Department of Environment & Natural Resources
Telephone: 919-733-4996
Last EDR Contact: 11/30/2012
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Varies

SC UIC: Underground Injection Wells Listing

A listing of underground injection wells locations.

Date of Government Version: 11/16/2012
Date Data Arrived at EDR: 11/16/2012
Date Made Active in Reports: 11/29/2012
Number of Days to Update: 13

Source: Department of Health & Environmental Control
Telephone: 803-898-3799
Last EDR Contact: 11/12/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

NC UIC: Underground Injection Wells Listing
A listing of uncerground injection wells locations.

Date of Government Version: 11/13/2012
Date Data Arrived at EDR: 11/14/2012
Date Made Active in Reports: 12/27/2012
Number of Days to Update: 43

Source: Department of Environment & Natural Resources
Telephone: 919-807-6412
Last EDR Contact: 11/12/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Varies

SC SWRCY: Solid Waste Recycling Facilities
A listing of recycling center locations.

Date of Government Version: 03/06/2012
Date Data Arrived at EDR: 03/09/2012
Date Made Active in Reports: 04/04/2012
Number of Days to Update: 26

Source: Department of Health & Enviornmental Control
Telephone: 803-896-8985
Last EDR Contact: 12/03/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Varies

NC HIST LF: Solid Waste Facility Listing
A listing of solid waste facilities.

Date of Government Version: 11/06/2006
Date Data Arrived at EDR: 02/13/2007
Date Made Active in Reports: 03/02/2007
Number of Days to Update: 17

Source: Department of Environment & Natural Resources
Telephone: 919-733-0692
Last EDR Contact: 01/19/2009
Next Scheduled EDR Contact: 04/19/2009
Data Release Frequency: Quarterly

NC SWRCY: Recycling Center Listing
A listing of recycling center locations.

Date of Government Version: 08/06/2012
Date Data Arrived at EDR: 08/08/2012
Date Made Active in Reports: 09/13/2012
Number of Days to Update: 36

Source: Department of Environment & Natural Resources
Telephone: 919-707-8137
Last EDR Contact: 12/04/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Varies

SC LUST: Leaking Underground Storage Tank List
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 05/23/2012
Date Data Arrived at EDR: 05/24/2012
Date Made Active in Reports: 06/28/2012
Number of Days to Update: 35

Source: Department of Health and Environmental Control
Telephone: 803-898-4350
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

NC LUST: Regional UST Database
This database contains information obtained from the Regional Offices. It provides a more detailed explanation of current and historic activity for individual sites, as well as what was previously found in the Incident Management Database. Sites in this database with Incident Numbers are considered LUSTs.

Date of Government Version: 11/09/2012
Date Data Arrived at EDR: 11/14/2012
Date Made Active in Reports: 12/27/2012
Number of Days to Update: 43

Source: Department of Environment and Natural Resources
Telephone: 919-733-1308
Last EDR Contact: 11/14/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Quarterly

NC LUST TRUST: State Trust Fund Database
This database contains information about claims against the State Trust Funds for reimbursements for expenses incurred while remediating Leaking USTs.

Date of Government Version: 10/12/2012
Date Data Arrived at EDR: 10/17/2012
Date Made Active in Reports: 11/06/2012
Number of Days to Update: 20

Source: Department of Environment and Natural Resources
Telephone: 919-733-1315
Last EDR Contact: 10/17/2013
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Semi-Annually

SC UST: Comprehensive Underground Storage Tanks

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 11/26/2012
Date Data Arrived at EDR: 11/28/2012
Date Made Active in Reports: 12/05/2012
Number of Days to Update: 7

Source: Department of Health and Environmental Control
Telephone: 803-896-7957
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

NC UST: Petroleum Underground Storage Tank Database

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 11/09/2012
Date Data Arrived at EDR: 11/14/2012
Date Made Active in Reports: 12/27/2012
Number of Days to Update: 43

Source: Department of Environment and Natural Resources
Telephone: 919-733-1308
Last EDR Contact: 11/14/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Quarterly

NC LAST: Leaking Aboveground Storage Tanks

A listing of leaking aboveground storage tank site locations.

Date of Government Version: 11/09/2012
Date Data Arrived at EDR: 11/14/2012
Date Made Active in Reports: 12/27/2012
Number of Days to Update: 43

Source: Department of Environment & Natural Resources
Telephone: 877-623-6748
Last EDR Contact: 11/14/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Quarterly

SC AST: Aboveground Storage Tank List

Registered Aboveground Storage Tanks.

Date of Government Version: 03/25/2004
Date Data Arrived at EDR: 08/04/2004
Date Made Active in Reports: 09/23/2004
Number of Days to Update: 50

Source: Department of Health and Environmental Control
Telephone: 803-898-4350
Last EDR Contact: 12/03/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Varies

NC AST: AST Database

Facilities with aboveground storage tanks that have a capacity greater than 21,000 gallons.

Date of Government Version: 09/24/2012
Date Data Arrived at EDR: 09/25/2012
Date Made Active in Reports: 11/06/2012
Number of Days to Update: 42

Source: Department of Environment and Natural Resources
Telephone: 919-715-6183
Last EDR Contact: 12/18/2012
Next Scheduled EDR Contact: 04/08/2013
Data Release Frequency: Semi-Annually

SC SPILLS: Spill List

Spills and releases of petroleum and hazardous chemicals reported to the Oil & Chemical Emergency Response division.

Date of Government Version: 10/25/2012
Date Data Arrived at EDR: 10/26/2012
Date Made Active in Reports: 11/28/2012
Number of Days to Update: 33

Source: Department of Health and Environmental Control
Telephone: 803-898-4111
Last EDR Contact: 12/03/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

NC INST CONTROL: No Further Action Sites With Land Use Restrictions Monitoring

A land use restricted site is a property where there are limits or requirements on future use of the property due to varying levels of cleanup possible, practical, or necessary at the site.

Date of Government Version: 08/24/2012
Date Data Arrived at EDR: 09/19/2012
Date Made Active in Reports: 10/15/2012
Number of Days to Update: 26

Source: Department of Environment, Health and Natural Resources
Telephone: 919-508-8400
Last EDR Contact: 12/17/2110
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Quarterly

SC VCP: Voluntary Cleanup Sites

Sites participating in the Voluntary Cleanup Program. Once staff and a non-responsible party have agreed upon an approved scope of work for a site investigation and/or remediation, the party enters into a voluntary cleanup contract. Staff oversees the cleanup efforts to ensure that activities are performed to our satisfaction. Upon completion of the negotiated work in the voluntary cleanup contract, the non-responsible party receives State Superfund liability protection.

Date of Government Version: 09/19/2012
Date Data Arrived at EDR: 09/20/2012
Date Made Active in Reports: 10/22/2012
Number of Days to Update: 32

Source: Department of Health and Environmental Control
Telephone: 803-896-4049
Last EDR Contact: 12/21/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Varies

NC VCP: Responsible Party Voluntary Action Sites

Responsible Party Voluntary Action site locations.

Date of Government Version: 08/24/2012
Date Data Arrived at EDR: 09/19/2012
Date Made Active in Reports: 10/15/2012
Number of Days to Update: 26

Source: Department of Environment and Natural Resources
Telephone: 919-508-8400
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Semi-Annually

SC DRYCLEANERS: Drycleaner Database

The Drycleaning Facility Restoration Trust Fund database is used to access, prioritze and cleanup contaminated registered drycleaning sites.

Date of Government Version: 12/01/2010
Date Data Arrived at EDR: 02/11/2011
Date Made Active in Reports: 03/15/2011
Number of Days to Update: 32

Source: Department of Health & Environmental Control
Telephone: 803-898-3882
Last EDR Contact: 11/30/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Varies

NC DRYCLEANERS: Drycleaning Sites

Potential and known drycleaning sites, active and abandoned, that the Drycleaning Solvent Cleanup Program has knowledge of and entered into this database.

Date of Government Version: 09/12/2012
Date Data Arrived at EDR: 09/25/2012
Date Made Active in Reports: 10/25/2012
Number of Days to Update: 30

Source: Department of Environment & Natural Resources
Telephone: 919-508-8400
Last EDR Contact: 12/28/2012
Next Scheduled EDR Contact: 04/08/2013
Data Release Frequency: Varies

SC BROWNFIELDS: Brownfields Sites Listing

The Brownfields component of the Voluntary Cleanup Program allows a non-responsible party to acquire a contaminated property with State Superfund liability protection for existing contamination by agreeing to perform an environmental assessment and/or remediation.

Date of Government Version: 10/15/2012
Date Data Arrived at EDR: 10/17/2012
Date Made Active in Reports: 10/22/2012
Number of Days to Update: 5

Source: Department of Health & Environmental Control
Telephone: 803-896-4069
Last EDR Contact: 01/02/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

NC BROWNFIELDS: Brownfields Projects Inventory

A brownfield site is an abandoned, idled, or underused property where the threat of environmental contamination has hindered its redevelopment. All of the sites in the inventory are working toward a brownfield agreement for cleanup and liabitliy control.

Date of Government Version: 09/30/2010
Date Data Arrived at EDR: 04/15/2011
Date Made Active in Reports: 05/04/2011
Number of Days to Update: 19

Source: Department of Environment and Natural Resources
Telephone: 919-733-4996
Last EDR Contact: 10/11/2012
Next Scheduled EDR Contact: 01/21/2013
Data Release Frequency: Varies

SC CDL: Clandestine Drug Lab Sites

A listing of clandestine drug lab site locations.

Date of Government Version: 01/24/2012
Date Data Arrived at EDR: 01/26/2012
Date Made Active in Reports: 02/24/2012
Number of Days to Update: 29

Source: Department of Health & Environmental Control
Telephone: 803-896-4288
Last EDR Contact: 10/22/2012
Next Scheduled EDR Contact: 02/04/2013
Data Release Frequency: Varies

SC NPDES: Waste Water Treatment Facilities Listing

A listing of waste water treatment facility locations.

Date of Government Version: 09/27/2012
Date Data Arrived at EDR: 09/28/2012
Date Made Active in Reports: 10/22/2012
Number of Days to Update: 24

Source: Department of Health & Environmental Control
Telephone: 803-898-4300
Last EDR Contact: 12/18/2012
Next Scheduled EDR Contact: 04/08/2013
Data Release Frequency: Varies

NC NPDES: NPDES Facility Location Listing

General information regarding NPDES(National Pollutant Discharge Elimination System) permits.

Date of Government Version: 05/12/2011
Date Data Arrived at EDR: 05/13/2011
Date Made Active in Reports: 06/16/2011
Number of Days to Update: 34

Source: Department of Environment & Natural Resources
Telephone: 919-733-7015
Last EDR Contact: 12/04/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Varies

SC AIRS: Permiited Airs Facility Listing

A listing of permitted airs facilities.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 03/08/2012
Date Made Active in Reports: 04/04/2012
Number of Days to Update: 27

Source: Department of Health & Environmental Control
Telephone: 803-898-4279
Last EDR Contact: 12/03/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Varies

SC Financial Assurance 3: Financial Assurance Information Listing

UST financial assurance information.

Date of Government Version: 05/25/2011
Date Data Arrived at EDR: 05/27/2011
Date Made Active in Reports: 06/30/2011
Number of Days to Update: 34

Source: Department of Health & Environmental Control
Telephone: 803-898-3880
Last EDR Contact: 12/03/2012
Next Scheduled EDR Contact: 03/18/2013
Data Release Frequency: Varies

SC Financial Assurance 2: Financial Assurance Information Listing

Hazardous waste financial assurance information.

Date of Government Version: 08/08/2012
Date Data Arrived at EDR: 08/09/2012
Date Made Active in Reports: 09/28/2012
Number of Days to Update: 50

Source: Department of Health & Environmental Control
Telephone: 803-898-3880
Last EDR Contact: 12/13/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

SC Financial Assurance 1: Financial Assurance Information Listing

Financial assurance information for aolid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 08/01/2012
Date Data Arrived at EDR: 08/10/2012
Date Made Active in Reports: 09/28/2012
Number of Days to Update: 49

Source: Department of Health & Environmental Control
Telephone: 803-896-4067
Last EDR Contact: 12/13/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Quarterly

SC COAL ASH: Coal Ash Disposal Sites

A listing of sites with coal ash ponds.

Date of Government Version: 07/31/2009
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 08/17/2009
Number of Days to Update: 10

Source: Department of Health & Environmental Control
Telephone: 803-898-3964
Last EDR Contact: 12/26/2012
Next Scheduled EDR Contact: 04/08/2013
Data Release Frequency: Varies

NC COAL ASH: Coal Ash Disposal Sites

A listing of coal combustion products distribution permits issued by the Division for the treatment, storage, transportation, use and disposal of coal combustion products.

Date of Government Version: 12/31/2007
Date Data Arrived at EDR: 08/04/2009
Date Made Active in Reports: 08/17/2009
Number of Days to Update: 13

Source: Department of Environment & Natural Resources
Telephone: 919-807-6359
Last EDR Contact: 11/05/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Varies

NC Financial Assurance 3: Financial Assurance Information

Hazardous waste financial assurance information.

Date of Government Version: 09/30/2012
Date Data Arrived at EDR: 10/19/2012
Date Made Active in Reports: 11/29/2012
Number of Days to Update: 41

Source: Department of Environment & Natural Resources
Telephone: 919-707-8222
Last EDR Contact: 12/13/2012
Next Scheduled EDR Contact: 04/01/2013
Data Release Frequency: Varies

NC Financial Assurance 1: Financial Assurance Information Listing

A listing of financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 09/23/2011
Date Data Arrived at EDR: 10/06/2011
Date Made Active in Reports: 11/01/2011
Number of Days to Update: 26

Source: Department of Environment & Natural Resources
Telephone: 919-733-1322
Last EDR Contact: 11/14/2012
Next Scheduled EDR Contact: 02/25/2013
Data Release Frequency: Quarterly

NC Financial Assurance 2: Financial Assurance Information Listing

Information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 10/02/2012
Date Data Arrived at EDR: 10/03/2012
Date Made Active in Reports: 10/26/2012
Number of Days to Update: 23

Source: Department of Environmental & Natural Resources
Telephone: 919-508-8496
Last EDR Contact: 01/02/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Varies

TRIBAL RECORDS

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 10/18/2012
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Semi-Annually

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 11/05/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/12/2012
Date Data Arrived at EDR: 05/09/2012
Date Made Active in Reports: 07/10/2012
Number of Days to Update: 62

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 08/01/2012
Date Data Arrived at EDR: 08/02/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 75

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/30/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 59

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 12/14/2011
Date Data Arrived at EDR: 12/15/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 26

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Semi-Annually

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 09/06/2012
Date Data Arrived at EDR: 09/07/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 08/27/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 08/17/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 04/12/2012
Date Data Arrived at EDR: 05/02/2012
Date Made Active in Reports: 07/16/2012
Number of Days to Update: 75

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 11/01/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 05/10/2011
Date Data Arrived at EDR: 05/11/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 34

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Semi-Annually

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 08/01/2012
Date Data Arrived at EDR: 08/02/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 75

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 09/06/2012
Date Data Arrived at EDR: 09/07/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 39

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 08/02/2012
Date Data Arrived at EDR: 08/03/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 94

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 08/17/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 08/27/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Quarterly

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 12/14/2011
Date Data Arrived at EDR: 12/15/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 26

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 02/11/2013
Data Release Frequency: Semi-Annually

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/28/2012
Date Data Arrived at EDR: 10/02/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 14

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 01/04/2013
Next Scheduled EDR Contact: 04/15/2013
Data Release Frequency: Varies

EDR PROPRIETARY RECORDS

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 11/19/2012
Date Data Arrived at EDR: 11/19/2012
Date Made Active in Reports: 01/03/2013
Number of Days to Update: 45

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/19/2012
Next Scheduled EDR Contact: 03/04/2013
Data Release Frequency: Annually

NJ MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/19/2012
Date Made Active in Reports: 08/28/2012
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 10/16/2012
Next Scheduled EDR Contact: 01/28/2013
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data

Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 11/01/2012
Date Data Arrived at EDR: 11/07/2012
Date Made Active in Reports: 12/11/2012
Number of Days to Update: 34

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 11/07/2012
Next Scheduled EDR Contact: 02/18/2013
Data Release Frequency: Annually

PA MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/23/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 57

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 10/22/2012
Next Scheduled EDR Contact: 02/04/2013
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2011	Source: Department of Environmental Management
Date Data Arrived at EDR: 06/22/2012	Telephone: 401-222-2797
Date Made Active in Reports: 07/31/2012	Last EDR Contact: 11/26/2012
Number of Days to Update: 39	Next Scheduled EDR Contact: 03/11/2013
	Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2011	Source: Department of Natural Resources
Date Data Arrived at EDR: 07/19/2012	Telephone: N/A
Date Made Active in Reports: 09/27/2012	Last EDR Contact: 12/13/2012
Number of Days to Update: 70	Next Scheduled EDR Contact: 04/01/2013
	Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Child Day Care List
Source: Department of Social Services
Telephone: 803-898-7345

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Department of Natural Resources
Telephone: 803-734-9494

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

STREET AND ADDRESS INFORMATION

Appendix B

Site Photos

FUSS & O'NEILL		Site Photographs
Client Name: STV/Whitehead Associates	**Site Location:** US 21 and SC 51	**Project No.** 20120285.A10

Photo No. 1	
Direction of Photo: East	
Description: 3310 Highway 21	

Photo No. 2	
Direction of Photo: West	
Description: On-site well network	

FUSS & O'NEILL		Site Photographs
Client Name: STV/Whitehead Associates	**Site Location:** US 21 and SC 51	**Project No.** 20120285.A10

Photo No. 3	
Direction of Photo: West	
Description: 2488 Highway 21	

Photo No. 4	
Direction of Photo: West	
Description: On-site well network	

FUSS & O'NEILL		Site Photographs
Client Name: STV/Whitehead Associates	**Site Location:** US 21 and SC 51	**Project No.** 20120285.A10

Photo No. 5	
Direction of Photo: East	
Description: 2976 Highway 21	

Photo No. 6	
Direction of Photo: West	
Description: On-site well network	

FUSS & O'NEILL		Site Photographs
Client Name: STV/Whitehead Associates	**Site Location:** US 21 and SC 51	**Project No.** 20120285.A10

Photo No. 7

Direction of Photo:

South

Description:

3660 Highway 51

Photo No. 8

Direction of Photo:

East

Description:

3004 Highway 21

FUSS & O'NEILL		Site Photographs
Client Name: STV/Whitehead Associates	**Site Location:** US 21 and SC 51	**Project No.** 20120285.A10

Photo No. 9

Direction of Photo:

South

Description:

3550 Highway 51

Photo No. 10

Direction of Photo:

North

Description:

3551 Highway 51

Appendix C

Soil Survey

United States Department of Agriculture

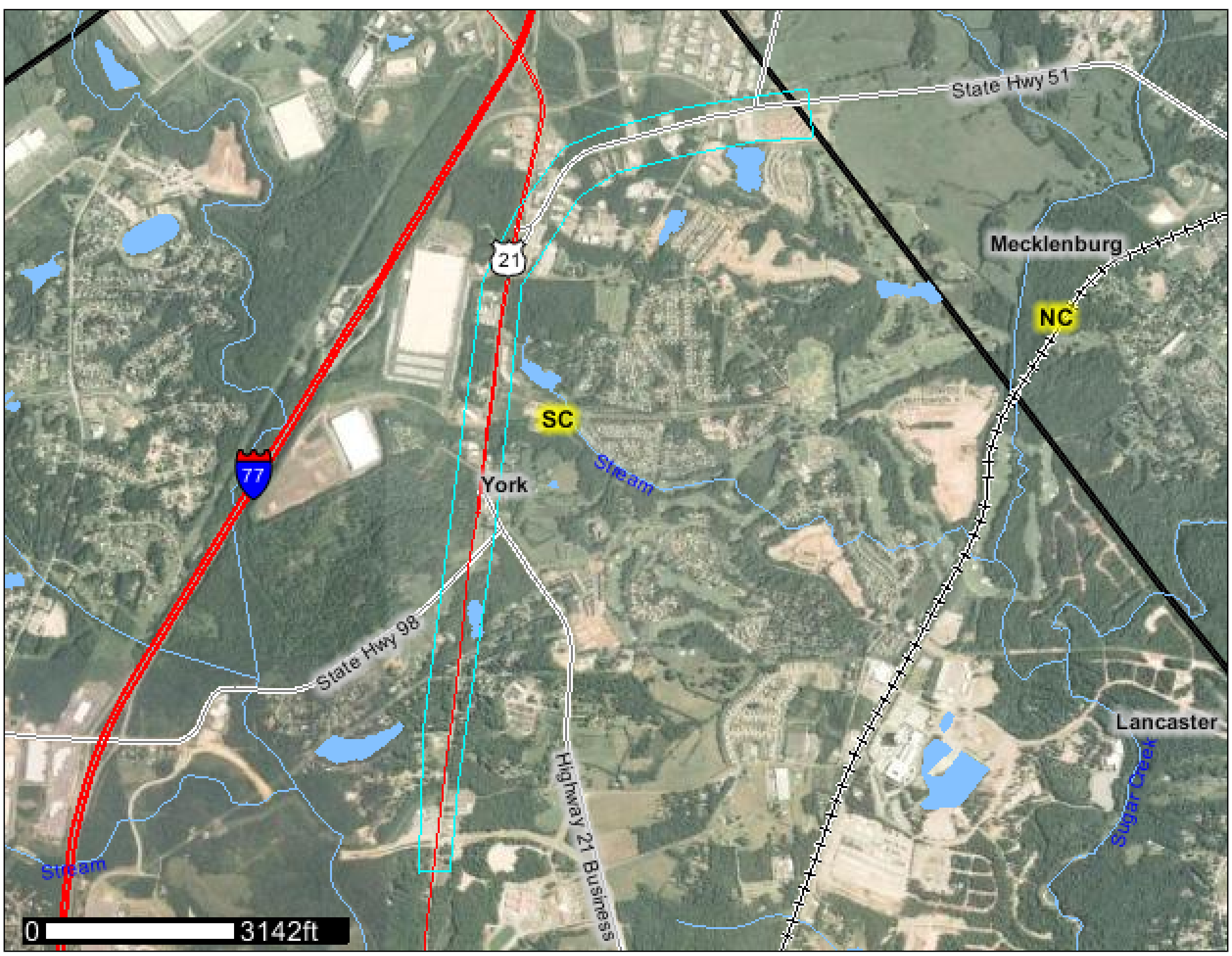
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Mecklenburg County, North Carolina, and York County, South Carolina

US 21 SC 51



April 29, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

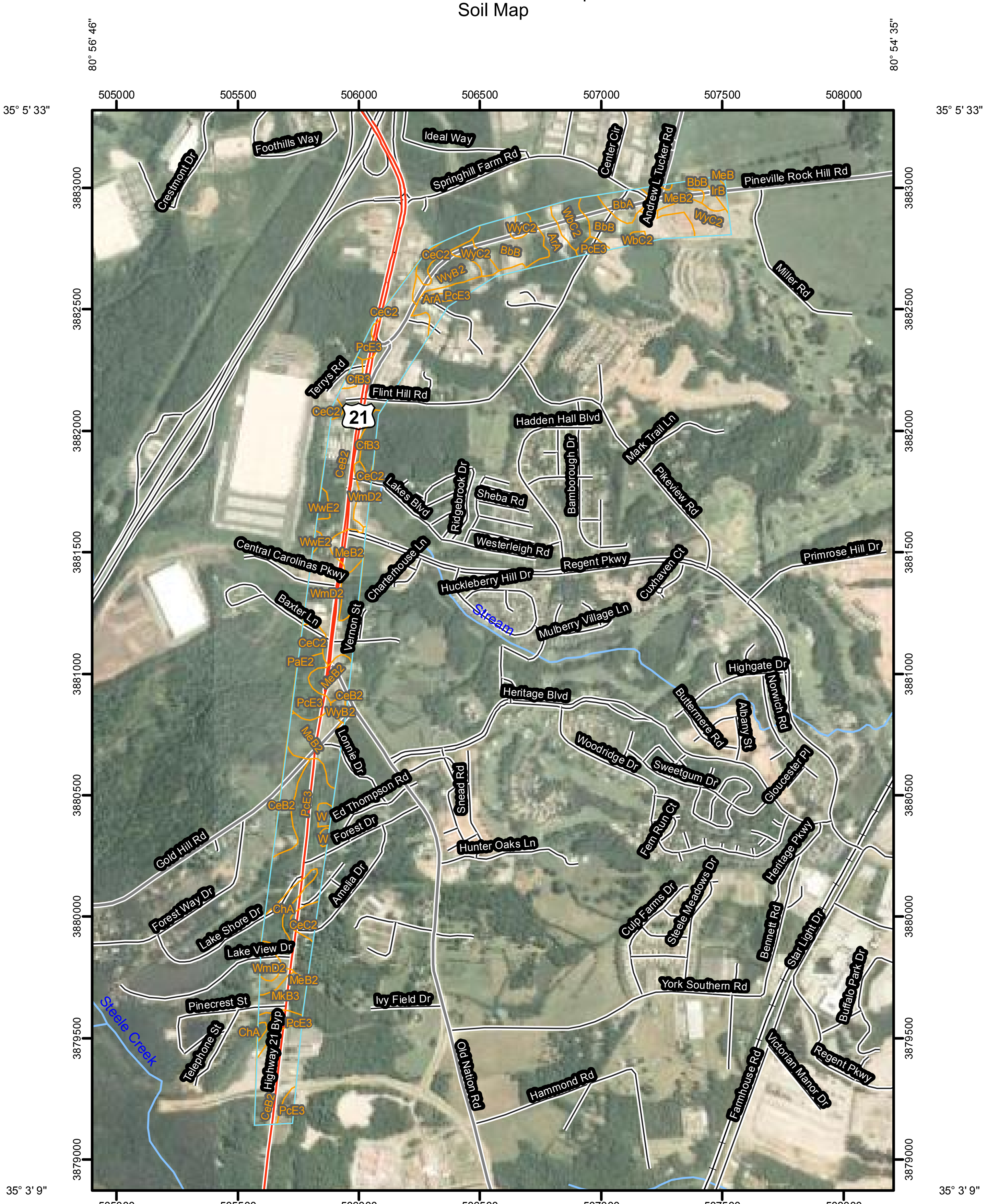
The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:21,200 if printed on A size (8.5" x 11") sheet.

N

Meters: 0, 200, 400, 800, 1,200

Feet: 0, 500, 1,000, 2,000, 3,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other

Special Line Features

Gully
Short Steep Slope
Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

MAP INFORMATION

Map Scale: 1:21,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,840 to 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mecklenburg County, North Carolina
Survey Area Data: Version 12, Jul 6, 2012

Soil Survey Area: York County, South Carolina
Survey Area Data: Version 9, Sep 29, 2011

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 7/10/2006; 7/17/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Mecklenburg County, North Carolina (NC119)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
IrB	Iredell fine sandy loam, 1 to 8 percent slopes	1.6	0.6%
MeB	Mecklenburg fine sandy loam, 2 to 8 percent slopes	0.2	0.1%
Subtotals for Soil Survey Area		**1.8**	**0.7%**
Totals for Area of Interest		**254.7**	**100.0%**

York County, South Carolina (SC091)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
ArA	Armenia loam, 0 to 2 percent slopes, occasionally flooded	6.7	2.6%
BbA	Brewback fine sandy loam, 0 to 2 percent slopes	4.5	1.8%
BbB	Brewback fine sandy loam, 2 to 6 percent slopes	25.5	10.0%
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	77.4	30.4%
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	10.6	4.2%
CfB3	Cecil clay loam, 2 to 6 percent slopes, severely eroded	4.7	1.8%
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	5.9	2.3%
MeB2	Mecklenburg-Wynott complex, 2 to 6 percent slopes, moderately eroded	26.5	10.4%
MkB3	Mecklenburg-Wynott complex, 2 to 6 percent slopes, severely eroded	5.6	2.2%
MkC3	Mecklenburg-Wynott complex, 6 to 10 percent slopes, severely eroded	0.5	0.2%
PaE2	Pacolet sandy clay loam, 15 to 25 percent slopes, moderately eroded	0.4	0.2%
PcE3	Pacolet clay loam, 15 to 25 percent slopes, severely eroded	46.9	18.4%
W	Water	1.8	0.7%
WbC2	Wynott-Brewback complex, 6 to 10 percent slopes, moderately eroded	6.2	2.4%
WmD2	Wynott-Mecklenburg complex, 10 to 15 percent slopes, moderately eroded	9.7	3.8%
WwE2	Wynott-Wilkes complex, 15 to 25 percent slopes, moderately eroded	1.7	0.7%
WyB2	Wynott-Winnsboro complex, 2 to 6 percent slopes, moderately eroded	7.8	3.0%
WyC2	Wynott-Winnsboro complex, 6 to 10 percent slopes, moderately eroded	10.5	4.1%
Subtotals for Soil Survey Area		**252.9**	**99.3%**
Totals for Area of Interest		**254.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mecklenburg County, North Carolina

IrB—Iredell fine sandy loam, 1 to 8 percent slopes

Map Unit Setting

Landscape: Uplands
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days

Map Unit Composition

Iredell and similar soils: 85 percent
Minor components: 15 percent

Description of Iredell

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 2e
Hydrologic Soil Group: C/D

Typical profile

0 to 6 inches: Fine sandy loam
6 to 24 inches: Clay
24 to 28 inches: Clay loam
28 to 80 inches: Loam

Minor Components

Sedgefield

Percent of map unit: 8 percent
Landform: Ridges
Landform position (two-dimensional): Summit, footslope
Down-slope shape: Concave
Across-slope shape: Concave

Wynott

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Armenia, undrained

Percent of map unit: 3 percent
Landform: Drainageways on interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

MeB—Mecklenburg fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

Landscape: Uplands
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days

Map Unit Composition

Mecklenburg and similar soils: 85 percent

Description of Mecklenburg

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.4 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: C

Typical profile

0 to 7 inches: Fine sandy loam
7 to 34 inches: Clay
34 to 80 inches: Loam

York County, South Carolina

ArA—Armenia loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

Landscape: Piedmonts
Elevation: 450 to 690 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Armenia, occasionally flooded, and similar soils: 86 percent
Minor components: 14 percent

Description of Armenia, Occasionally Flooded

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium derived from diabase and/or alluvium derived from gabbro and/or alluvium derived from diorite

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4w
Hydrologic Soil Group: D

Typical profile

0 to 4 inches: Loam
4 to 8 inches: Clay loam
8 to 51 inches: Clay
51 to 80 inches: Clay loam

Minor Components

Worsham, occasionally flooded

Percent of map unit: 14 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave

BbA—Brewback fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

Landscape: Piedmonts, uplands
Elevation: 200 to 1,400 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Brewback and similar soils: 80 percent
Minor components: 20 percent

Description of Brewback

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gabbro and/or residuum weathered from diorite and/or residuum weathered from diabase

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 2w
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Fine sandy loam
4 to 10 inches: Sandy clay loam
10 to 30 inches: Clay
30 to 36 inches: Clay
36 to 80 inches: Weathered bedrock

Minor Components

Iredell

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

BbB—Brewback fine sandy loam, 2 to 6 percent slopes

Map Unit Setting

Landscape: Piedmonts, uplands
Elevation: 200 to 1,400 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Brewback and similar soils: 80 percent
Minor components: 20 percent

Description of Brewback

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gabbro and/or residuum weathered from diorite and/or residuum weathered from diabase

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 2w
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Fine sandy loam
4 to 10 inches: Sandy clay loam
10 to 30 inches: Clay
30 to 36 inches: Clay
36 to 80 inches: Weathered bedrock

Minor Components

Iredell

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

CeB2—Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Cecil, moderately eroded, and similar soils: 86 percent
Minor components: 14 percent

Description of Cecil, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 3 inches: Sandy loam
3 to 48 inches: Clay
48 to 80 inches: Sandy clay loam

Minor Components

Cataula, moderately eroded

Percent of map unit: 14 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

CeC2—Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Cecil, moderately eroded, and similar soils: 90 percent
Minor components: 10 percent

Description of Cecil, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups
Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile
0 to 3 inches: Sandy loam
3 to 48 inches: Clay
48 to 80 inches: Sandy clay loam

Minor Components

Cataula, moderately eroded
Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

CfB3—Cecil clay loam, 2 to 6 percent slopes, severely eroded

Map Unit Setting
Landscape: Piedmonts
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition
Cecil, severely eroded, and similar soils: 97 percent
Minor components: 3 percent

Description of Cecil, Severely Eroded

Setting
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 1 inches: Sandy loam
1 to 3 inches: Sandy clay loam
3 to 80 inches: Clay

Minor Components

Cataula, moderately eroded

Percent of map unit: 3 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

ChA—Chewacla loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

Landscape: Piedmonts, valleys
Elevation: 380 to 610 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 80 percent
Minor components: 20 percent

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: High (about 11.3 inches)

Interpretive groups

Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Land capability (nonirrigated): 4w
Hydrologic Soil Group: C

Typical profile

0 to 10 inches: Loam
10 to 80 inches: Sandy clay loam

Minor Components

Riverview, frequently flooded

Percent of map unit: 15 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear
Across-slope shape: Linear

Wehadkee, inundated

Percent of map unit: 5 percent
Landform: Depressions on flood plains
Down-slope shape: Concave
Across-slope shape: Linear

MeB2—Mecklenburg-Wynott complex, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Mecklenburg, moderately eroded, and similar soils: 50 percent

Wynott, moderately eroded, and similar soils: 36 percent
Minor components: 14 percent

Description of Mecklenburg, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Sandy loam
4 to 35 inches: Clay
35 to 50 inches: Clay loam
50 to 80 inches: Loam

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 5 inches: Sandy loam
5 to 21 inches: Clay
21 to 29 inches: Sandy clay loam
29 to 80 inches: Weathered bedrock

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 14 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

MkB3—Mecklenburg-Wynott complex, 2 to 6 percent slopes, severely eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Mecklenburg, severely eroded, and similar soils: 50 percent
Wynott, severely eroded, and similar soils: 30 percent
Minor components: 20 percent

Description of Mecklenburg, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 2 inches: Sandy loam
2 to 26 inches: Clay
26 to 40 inches: Sandy clay loam
40 to 80 inches: Sandy loam

Description of Wynott, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 2 inches: Sandy loam
2 to 26 inches: Clay
26 to 32 inches: Sandy clay loam
32 to 80 inches: Weathered bedrock

Minor Components

Cecil, severely eroded

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

MkC3—Mecklenburg-Wynott complex, 6 to 10 percent slopes, severely eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Mecklenburg, severely eroded, and similar soils: 50 percent
Wynott, severely eroded, and similar soils: 30 percent
Minor components: 20 percent

Description of Mecklenburg, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 2 inches: Sandy loam
2 to 26 inches: Clay
26 to 40 inches: Sandy clay loam

40 to 80 inches: Sandy loam

Description of Wynott, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 2 inches: Sandy loam
2 to 26 inches: Clay
26 to 32 inches: Sandy clay loam
32 to 80 inches: Weathered bedrock

Minor Components

Cecil, severely eroded

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

PaE2—Pacolet sandy clay loam, 15 to 25 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts

Elevation: 220 to 750 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Pacolet, moderately eroded, and similar soils: 95 percent
Minor components: 5 percent

Description of Pacolet, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 2 inches: Sandy loam
2 to 26 inches: Clay
26 to 43 inches: Clay loam
43 to 80 inches: Loam

Minor Components

Hard labor

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear

PcE3—Pacolet clay loam, 15 to 25 percent slopes, severely eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 220 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Pacolet, severely eroded, and similar soils: 90 percent
Minor components: 10 percent

Description of Pacolet, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 1 inches: Sandy clay loam
1 to 26 inches: Clay
26 to 80 inches: Clay loam

Minor Components

Wynott, moderately eroded

Percent of map unit: 5 percent
Landform: Interfluves

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear

Winnsboro, moderately eroded
Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

W—Water

Map Unit Setting
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition
Water: 100 percent

WbC2—Wynott-Brewback complex, 6 to 10 percent slopes, moderately eroded

Map Unit Setting
Landscape: Piedmonts
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition
Wynott, moderately eroded, and similar soils: 45 percent
Brewback, moderately eroded, and similar soils: 35 percent
Minor components: 20 percent

Description of Wynott, Moderately Eroded

Setting
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 5 inches: Sandy loam
5 to 21 inches: Clay
21 to 29 inches: Sandy clay loam
29 to 80 inches: Weathered bedrock

Description of Brewback, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 2 inches: Sandy loam
2 to 9 inches: Sandy clay loam
9 to 36 inches: Clay
36 to 38 inches: Sandy clay loam
38 to 80 inches: Weathered bedrock

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

WmD2—Wynott-Mecklenburg complex, 10 to 15 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Wynott, moderately eroded, and similar soils: 45 percent
Mecklenburg, moderately eroded, and similar soils: 40 percent
Minor components: 15 percent

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: C

Typical profile

0 to 5 inches: Sandy loam
5 to 21 inches: Clay
21 to 29 inches: Sandy clay loam
29 to 80 inches: Weathered bedrock

Description of Mecklenburg, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Sandy loam
4 to 35 inches: Clay
35 to 50 inches: Clay loam
50 to 80 inches: Loam

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 15 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

WwE2—Wynott-Wilkes complex, 15 to 25 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Wynott, moderately eroded, and similar soils: 55 percent
Wilkes, moderately eroded, and similar soils: 40 percent
Minor components: 5 percent

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C

Typical profile

0 to 5 inches: Sandy loam
5 to 21 inches: Clay
21 to 29 inches: Sandy clay loam
29 to 80 inches: Weathered bedrock

Description of Wilkes, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 40 to 72 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Sandy loam
4 to 15 inches: Sandy clay loam
15 to 18 inches: Sandy loam
18 to 45 inches: Weathered bedrock
45 to 80 inches: Unweathered bedrock

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

WyB2—Wynott-Winnsboro complex, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Wynott, moderately eroded, and similar soils: 55 percent
Winnsboro, moderately eroded, and similar soils: 30 percent
Minor components: 15 percent

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 5 inches: Sandy loam
5 to 21 inches: Clay
21 to 29 inches: Sandy clay loam
29 to 80 inches: Weathered bedrock

Description of Winnsboro, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Sandy loam
4 to 25 inches: Clay
25 to 32 inches: Sandy clay loam
32 to 52 inches: Sandy loam
52 to 80 inches: Weathered bedrock

Minor Components

Mecklenburg, moderately eroded

Percent of map unit: 15 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear

WyC2—Wynott-Winnsboro complex, 6 to 10 percent slopes, moderately eroded

Map Unit Setting

Landscape: Piedmonts

Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days

Map Unit Composition

Wynott, moderately eroded, and similar soils: 55 percent
Winnsboro, moderately eroded, and similar soils: 35 percent
Minor components: 10 percent

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 5 inches: Sandy loam
5 to 21 inches: Clay
21 to 29 inches: Sandy clay loam
29 to 80 inches: Weathered bedrock

Description of Winnsboro, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Sandy loam
4 to 25 inches: Clay
25 to 32 inches: Sandy clay loam
32 to 52 inches: Sandy loam
52 to 80 inches: Weathered bedrock

Minor Components

Wilkes, moderately eroded

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear

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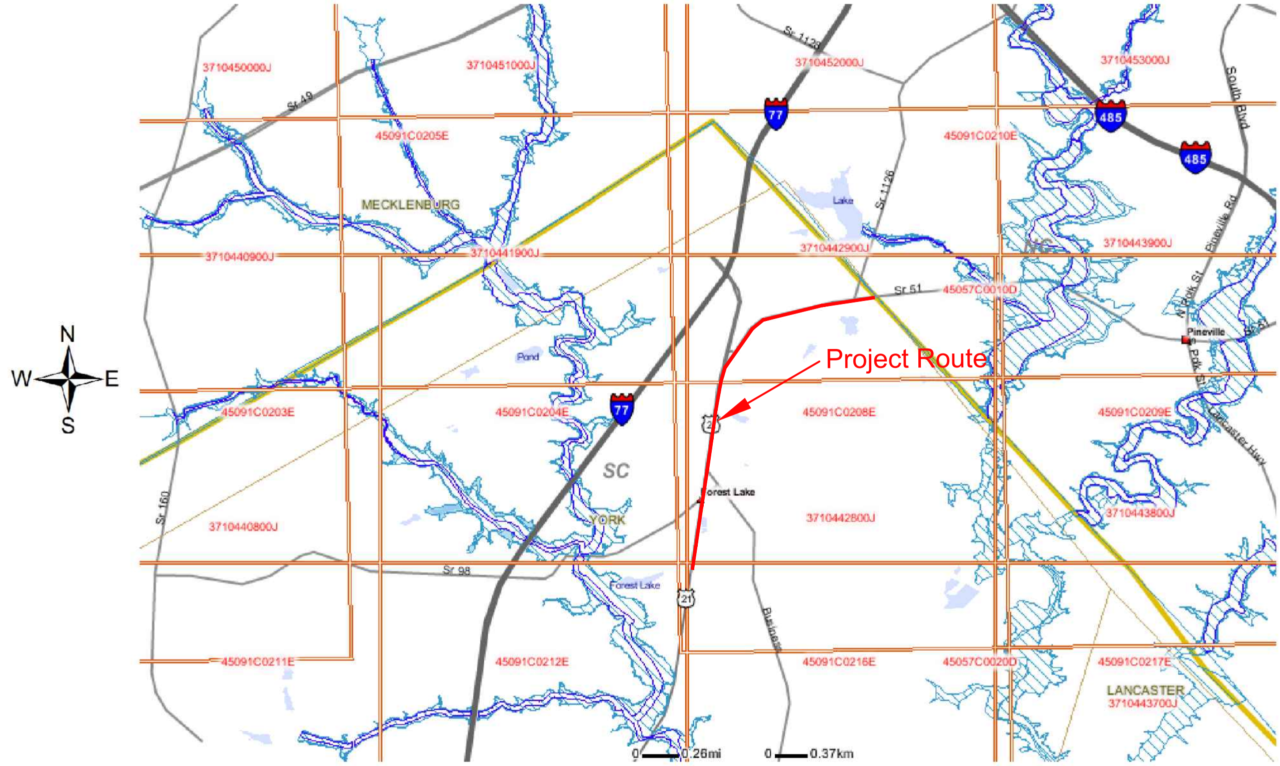
Appendix D

FEMA Map

Mapping Information Platform

US 21 / SC 51

This Map Is For Advisory Purposes Only



Legend

Cities
- Other Places
- Small Towns
- Small Cities
- State Largest Cities
- Major Cities

DFIRM Data Availability

DFIRM Panels

Political Jurisdictions

Floodways

Flood Hazard Zone Boundaries

Q3 Flood Hazards
- Special Flood Hazard Areas

Flood Hazard Zones
- Zone A
- (cont)
- Zone AE
- Zone AH
- Zone AO
- Zone AR
- Zone A99
- Zone V
- Zone VE
- Zone D
- 0.2% Annual Chance Flood Hazard Zone

County Boundary

Highways
- Major Highways
- Highways

Major Roads
- Major Roads

States

Lakes, Major Rivers

Land Areas
- US
- Other Countries

Tuesday, 30 April 2013 10:55

FEMA

SCALE:	
HORZ.: 1" = 2000'	
VERT.:	
DATUM:	
HORZ.:	
VERT.:	

0 1000 2000

GRAPHIC SCALE

FUSS & O'NEILL
717 LADY ST, SUITE E
COLUMBIA, SOUTH CAROLINA 29201
803.376.6034
www.fando.com

STV/Ralph Whitehead Associates

FEMA MAP

US Highway 21 / SC Highway 51 Road Widening

Fort Mill South Carolina

PROJ. No.: 20120285.A10

DATE: MAY 2013

Appendix F

File Path: F:\P2012\0285 STV York County US 21 SC 51A10\DWG\20091408A11_STP01_TOPOMAP.dwg Layout: APPENDIX Plotted: Tue, April 30, 2013 - 11:20 AM User: rbutler
Plotter: DWG TO PDF.PC3 CTB File: FO 2008 MONO (HALF).CTB
MS VIEW:
LAYER STATE:

Appendix E

Environmental Professional Resume

Jeremy B. Grant, PG
Project Manager

Mr. Grant is the manager of the assessment and remediation division of our South Carolina office and the office's emergency response team. During his career, he has completed a wide range of multi-media assessments from simple to complex. Based upon the results of these assessments, Mr. Grant has designed and implemented site-specific remediation systems for the sites, when needed. Remedial technologies include dual phase extraction, enhanced bioremediation, bioventing, air sparge/vapor extraction, and chemical oxidation. Mr. Grant also heads the company-wide PCB work group. His principal strength is understanding State and Federal regulations and how they relate to the needs of our clients. The following highlights some of his experience related to your needs.

Education
BA, Geology - 1993
University of New York
MS, Geology - 1998
University of South Carolina

Licenses & Registrations
SC Professional Geologist

Professional Affiliations
National Groundwater Association

11 years with Fuss & O'Neill
18 years Professional Experience

ENVIRONMENTAL ASSESSMENT AND REMEDIATION

Mr. Grant has conducted and/or directed a wide variety of environmental assessments. Representative projects include:

Columbia, SC: Project manager for the Phase I/II ESA and remediation of an industrial property containing 51 55-gallon drums and 31 5-gallon buckets of unidentified waste and metals contaminated soils. The unknown waste was characterized and properly disposed of and the metals contaminated soils were excavated to allow the closing to occur for the real estate transaction.

North Charleston, SC: Responded to an overturned petroleum tanker truck that ruptured, releasing over 8,000 gallons of petroleum product onto the I-526 West on-ramp and subsequently into Filbin Creek and its associated salt marsh. Oversaw an inter-agency spill response and clean-up effort designed to keep bulk product from impacting the nearby Cooper River.

Brookneal, VA: Project manager for the assessment of the extent of the free and dissolved phase petroleum hydrocarbon plume from two petroleum releases at the site. Oversaw the hook up of several residences and businesses with private water supply wells to the municipal water. Designed and implemented a dual phase extraction remediation system to remove the free phase petroleum product from the subsurface.

Johns Island, SC: Lead scientist in the preparation of documents used for drafting of a Voluntary Cleanup Contract (VCC) for the Former Trident Landfill, Johns Island, SC. Performed site reconnaissance of landfill cap conditions and potential groundwater contaminant migratory pathways. Conducted a soil vapor and groundwater assessment along the adjacent property boundary to assess whether methane and/or groundwater contaminants had impacted the property prior to the property's proposed development.

Irmo, SC: Project manager for the emergency spill response for a leaking high concentration PCB transformer and the assessment of the extent of the PCB contamination. Achieved a solution within the USEPA PCB regulations that allowed the client to continue to use their property without interuption.

Rustburg, VA: Project manager for the assessment of the extent of the free and dissolved phase petroleum hydrocarbon plumes from a petroleum release at the site. Conducted fate and transport modelling of the dissolved phase petroleum plume to determine remedial endpoints. Designed and implemented a dual phase extraction remediation system to remove the free phase petroleum product from the subsurface. Remedial endpoints achieved in June 2009.

Summerville, SC: Project manager for litigation support for a lawsuit between a private property owner and the responsible party/State of South Carolina. Sale of the property was halted due to the discovery of dissolved phase petroleum hydrocarbons in the groundwater on the property.

West Columbia, SC: Team scientist on an assessment of a former transformer storage area within a former utility company crew quarters. Conducted a multi-media assessment to assess the vertical and horizontal extent of the PCB contamination. Consulted with the client about remedial options for the contamination. Calculated the volume of materials necessary to remediate the site under a performance-based remediation prior to the sale of the property.

Phase II
Environmental Site Assessment

US 21 & SC 51 Corridor
York County, South Carolina
STV Project #1149-004

Prepared for:

STV Inc.

Rock Hill Business Technology Center
454 S. Anderson Road, Suite # BTC 517
Rock Hill, SC 29730

May 19, 2015

FUSS & O'NEILL

717 Lady Street, Suite E
Columbia, SC 29201
(803) 376-6034

Project No. 20120285.A12

FUSS & O'NEILL

Table of Contents

Phase II ESA
US Highway 21 & SC Highway 51

1 Introduction

Fuss & O'Neill, Inc. was retained by STV, Inc., to conduct a Phase II Environmental Site Assessment (ESA) in conjunction with a South Carolina Department of Transportation (SCDOT) road widening and right-of-way (ROW) expansion along U.S. Highway 21 and S.C. Highway 51 in York County, South Carolina. STV, under a York County "Pennies for Progress"/ SCDOT contract has designed and will manage construction of the project. The objectives of this ESA are to determine whether releases of hazardous substances or petroleum products have occurred associated with "recognized environmental conditions" (RECs) identified in a Limited Phase I ESA, prepared by Fuss & O'Neill, Inc. dated June 18, 2013. This Phase II ESA was performed as part of STV's and the SCDOTs due diligence as outlined in SCDOTs *Environmental Reference Document* (revision 2008) Section 6.2.7(e). It is the SCDOT's policy to avoid the acquisition of underground storage tanks and other hazardous materials, if possible.

Nine (9) properties that possessed RECs were identified during the Limited Phase I ESA conducted in 2013. Fuss & O'Neill identified the following sites as having RECs in the Limited Phase I ESA:

- Millers Produce & Farm (3660 SC Highway 51) – Petroleum leaking underground storage tank (LUST) site and currently operates as a petroleum retailer;
- Summerville Grocery (SC Highway 51) – Petroleum LUST site and petroleum retailer;
- Lords Armory (3578 SC Highway 51) – Petroleum LUST site;
- Partex / Eumeric Holdings (3551 SC Highway 51) – known to have had chromium contaminated soil; violations of the South Carolina (SC) Hazardous Waste Management Regulations and SC Pollution Control Act; and, non-compliance with administrative order issued by SC Department of Health and Environmental Control (SCDHEC);
- Paving Equipment of the Carolinas (3550 SC Highway 51) – formerly stored #2 fuel oil and manufactured petroleum-based asphalt;
- Southern Tree & Landscaping (Intersection US 21 / SC 51) – presence of on-site monitoring well network and limited available information;
- Handy Pantry 28 Food Mart (3004 US Highway 21 Bypass) – Petroleum LUST site;
- T&G Country Store (2976 US Highway 21) – Petroleum LUST site; and,
- Times Turn Around 10 (2488 Highway US 21 Bypass) – Petroleum LUST site and currently operates as a petroleum retailer.

Additional investigation revealed that the sites identified as Millers Produce & Farm and Summerville Grocery are the same parcel, but there are different responsible parties for the release of petroleum into the subsurface at the site. Although Southern Tree & Landscaping was within the search radius of the Limited Phase I ESA, this site was eliminated from requiring additional assessment during the Phase II ESA because no lands associated with the Southern Tree & Landscaping site will be acquired during this road-widening project. Therefore, seven (7) parcels require further investigation under this scope of work. These remaining seven (7) parcels will be referred to as Areas of Concern (AOCs) for the remainder of the report.

This assessment allows the potential property acquirer (i.e., SCDOT) to determine if environmental conditions exist that indicate an existing release, a past release, or a material threat of a release of petroleum products or hazardous materials into the vadose zone soils or groundwater in the vicinity of the proposed road widening and ROW expansion.

It should be noted that no ESA could wholly eliminate uncertainty regarding the potential for RECs in connection with a property or properties. This assessment was performed in conformance with ASTM E1903-11 (2011) *Standard Practice for Environmental Site Assessments: Phase II ESA Process* and SCDOTs *Environmental Reference Document* Section 6.2.7(e) (2008). The Phase II Environmental Site Assessment process is designed to reduce, but not eliminate, uncertainty regarding the RECs about the property within reasonable time and costs constraints.

2 Introduction

This section provides a summary of the information used to construct the initial conceptual model for the Site, which, in turn, guided the investigations. Information such as the Site's operational history, geology, hydrogeology, and potential receptors help identify areas where releases of hazardous materials could occur and how they might impact human health and the environment.

2.1 Physical Description

The US Highway 21/SC Highway 51 road-widening project is located north of downtown Fort Mill between Springfield Parkway and the North Carolina/South Carolina state line (*Figure 1*). The project corridor has a linear roadway distance of approximately 13,200 feet. The proposed limits of construction for this project will require acquisition of additional ROW.

The corridor is located in an area of mixed residential, industrial, and commercial parcels. A site location map showing the approximate project corridor is provided as *Figure 1* and site sample location maps are included as *Figures 2 through 4*.

Site Utilities

The City of Fort Mill and York County provides municipal water and sewer service in the area to the property. Duke Energy provides electrical power to the corridor. Electric, cable, and telephone services to the corridor are provided via a combination of underground conduits and overhead transmission lines.

2.2 Physiographic Setting

According to the topographic maps reviewed for this assessment, the corridor and surrounding area ranges from approximately 590 feet to 650 feet above mean sea level (MSL). Topography of the corridor site generally slopes south to southeast towards tributaries of the Blackmanship Branch, Steele Creek, and Sugar Creek. These creeks each ultimately discharge into the Catawba River.

2.3 Environmental Setting

2.3.1 Geology

According to the *Geologic Notes, Volume 9, Number 2* (State Development Board, June 2010), York County is situated in the north-central Piedmont of South Carolina, adjacent to the North Carolina state line. Rocks of the Piedmont occur in belts that conform to the regional-northeasterly trend of major structural features. The belts are delineated by gross differences in rock types, grade of metamorphism, and structure. York County straddles the Charlotte Belt and extends into the Carolina Slate Belt to the east and into the Kings Mountain Belt to the northwest.

Rocks of the Carolina Slate Belt are mainly low rank metamorphic rocks of sedimentary and volcanic origin. The Charlotte Belt includes medium- to high-rank metamorphic rocks and a complicated sequence of igneous intrusions. Major rock types of the Kings Mountain Belt are phyllite, schist, gneiss, quartzite, conglomerate, and marble. The metamorphic grade of the Kings Mountain Belt ranges from medium to low.

2.3.2 Hydrology & Hydrogeology

The soils encountered in this area are the residual product of in-place chemical weathering of rock presently underlying the site. In general, shallow unconfined groundwater movement within the overlying soils is controlled largely by topographic gradients. However, as the groundwater percolates downward to the bedrock, it becomes controlled by the orientation of the rock fracture systems. Thus, the direction of groundwater movement may not be consistent with the reflection topography.

Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary with seasonal fluctuations in precipitation. Movement of groundwater under water table conditions is generally from higher to lower elevations. As such, shallow groundwater at the subject site appears to move to the south and southeast towards lower elevations and off-site water bodies.

Based on USGS mapping and field observations of the local topography regarding the physical setting, the groundwater flow direction of the corridor appears to vary throughout the corridor. The inferred dominant groundwater flow direction along the project corridor appears to be to the south/southeast toward tributaries of Sugar Creek and the Sugar Creek. Groundwater along the project corridor is believed to vary from 5 feet to 60 feet below ground surface based on elevations of nearby water bodies.

The corridor is located west of Sugar Creek, which discharges to the Catawba River. Surface runoff from the site would appear to flow to the south/southeast toward Sugar Creek and its tributaries, with components of flow to the southwest towards Blankmanship Branch, which discharges to Steele Creek and eventually discharges to Sugar Creek.

2.4 Phase II Areas of Concern

The following is a description of the AOCs that were identified in the Fuss & O'Neill's Limited Phase I ESA and were investigated as part of this Phase II ESA. Maps displaying the locations of the listed AOCs are included as *Figures 2 through 4*.

Millers Produce & Farm / Summerville Grocery

The Millers Produce & Farm and Summerville Grocery refer to the same parcel, but there are different responsible parties for the distinct releases of petroleum into the subsurface at the site. Due to the limited available information pertaining to this site, its current operation as a fuel retailer, and known releases of petroleum on the site, this site is an AOC during this Phase II ESA.

Lords Armory

A former petroleum release at the Lords Armory site was granted a status of "Conditional No Further Action" (CNFA) by SCDHEC in 2003. The CNFA status was granted provided land use restrictions were in place and varying amounts of petroleum contamination were allowed to remain in place at the site. Because of petroleum contamination remaining in place at the site and the potential for this contamination to be encountered during construction activities, this site is an AOC during this Phase II ESA.

Partex / Eumeric Holdings

An administrative order (97-11-HW) was issued on the Partex/Eumeric Holdings facility by SCDHEC in 1997 for violations of the South Carolina Hazardous Waste Management Regulations and the South Carolina Pollution Control Act. Partex/Eumeric Holdings failed to comply with the following regulations.

1. R.61-79.262.11, a person who generates a solid waste, as defined in R.61-79.261.2 must accurately determine if that waste is a hazardous waste;
2. R.61-79.262.12(a), a generator must not treat, store, dispose of, or offer for transportation, hazardous waste without having received an US Environmental Protection Agency (EPA) identification number from SCDHEC;
3. R.61-79.262, Subpart C, pre-transport requirements for generators of hazardous waste;
4. R.61-79.262, Subpart D, record keeping and reporting requirements for generators of hazardous waste;
5. R.61-79.262.80, a generator must clean up any hazardous waste discharge that occurs during generation of processing or storage and take such other action as may be required or approved by Federal, State, or local officials so that the hazardous waste discharge no longer presents a hazard to human health of the environment;
6. 48-1-90 of the South Carolina Pollution control Act in that it shall be unlawful for any person, directly or indirectly, top throw, drain, run, allow to seep or otherwise discharge into the environment of the state organic or inorganic matter, including sewage, industrial wastes and other wastes, except as in compliance with a permit issued by SCDHEC.

Additional information regarding these violations and compliance or non-compliance of issues addressed in the administrative order was not found during file review and have likely been purged from SCDHECs file system. Due to the lack of information on this facility and known past soil contamination, this site is an AOC during this Phase II ESA.

Paving Equipment of the Carolinas

This property formerly stored #2 fuel oil and was a manufacturer of petroleum-based asphalt. Because of the storage of #2 fuel oil and past use of the property, this site is an AOC during this Phase II ESA.

Handy Pantry 28 Food Mart

The facility is a former LUST site and was listed on the 2008 Groundwater Contamination Inventory (GWCI) database compiled by SCDHEC. No additional information was available in the SCDHEC files. Due to the lack of additional information and the classification of the site as a LUST site, this site is an AOC during this Phase II ESA.

T&G Country Store

This site is located within the project corridor on the eastern side of Highway 21 and is a known LUST site with limited information available. Because of the known release of petroleum at this site, this site is an AOC during this Phase II ESA.

Times Turn Around 10

This site is located within the project corridor on the eastern side of Highway 21. This site is a known LUST site with limited information available, and currently operates as a fuel retailer. Because of the known release of petroleum at this site, the site is considered an AOC.

2.5 Previous Environmental Investigation Summary

Numerous soil and groundwater investigations have been conducted at different locations throughout the corridor. The following environmental investigations regarding AOCs involved in this Phase II ESA were reviewed during the performance of this assessment.

1. *Soil Sampling Analysis Report* by Environmental Management Solutions, Inc. (EMS) dated February 26, 1997 for Partex, Inc. / Eumeric Holdings. SCDHEC concluded that the areas of concern identified within the report had been adequately addressed with regard to the spill area on the exterior of this facility. Partex, Inc. / Eumeric Holdings is located at 3551 Highway 51.

2. *Post Remediation Sampling Report* conducted by Consultech Environmental, Inc. for Lords Armory dated August 18, 2003. Consultech Environmental, Inc. concluded that concentrations of the contaminants of concern in the monitoring wells that have site-specific target levels (SSTLs) are below SSTLs at the site, and recommended that all of the monitoring wells be properly abandoned, and that no further action be taken at the site. Lords Armory is located at 3660 Highway 51.

2.6 Potential Receptors

An assessment was conducted to evaluate the potential for sensitive human health or ecological receptors within or immediately down gradient project corridor. Our findings are summarized below:

- **Wetlands:** Based on the U.S. Fish and Wildlife Service's *National Wetlands Inventory* (NWI, 2012) and observations made during the site walkover, there are no **mapped** wetlands located within the project corridor. A wetlands survey is beyond the scope of this Phase II ESA and it is recommended that a wetlands survey be performed for the corridor if it is needed.

- **Tributaries of Sugar Creek and Blackmanship Branch:** Tributaries of Sugar Creek and Blackmanship Branch run through the project corridor and wetland soils may be present immediately adjacent to the tributaries. Groundwater and surface runoff from proposed construction areas also discharge to the tributaries.

- **Private Drinking Water Supply Wells:** The Site is located in an urbanized area where public water is available to nearby parcels. Therefore, private drinking water supply wells are not expected to be present.

- **Physical Contact with Impacted Media:** Contact with site soil and fill could potentially occur during activities requiring excavation (e.g., utility repair, repaving, etc.). Visitors to the site could also potentially encounter impacted soil or fill in unpaved areas.

3 Phase II Investigations

The Phase II investigations were conducted at the seven (7) AOCs listed in *Section 2.4* on March 3-5, 2015. This section provides an overview of the methods used to investigate the AOCs and evaluate the data collected, describes data quality objectives, constituents of concern, laboratory methods used to analyze environmental samples, and field investigation methods.

3.1 Data Quality Objectives and Reasonable Confidence Protocols

Data quality objectives (DQO) are used to ensure that data is collected in a manner that permits it to be used to evaluate a site and support decisions based on those evaluations. Procedures used to ensure that the DQOs for the project were met include:

- Development of preliminary conceptual models used to guide the selection of appropriate constituents of concern and sampling locations;
- Selection of analytical methods with applicable detection limits;
- Use of pre-determined sample handling and custody procedures;
- Use of pre-determined data management and documentation procedures;
- Selection of sampling locations and constituents of concern appropriate to the potential release areas; and,
- Use of trip blanks, equipment blanks, duplicates, and laboratory matrix spikes (MS) for quality assurance/quality control (QA/QC).

3.2 Constituents of Concern

A list of constituents of concern to be investigated was developed for each AOC. The constituent list comprises those compounds most likely to be released based on knowledge of site operations and results of any previous investigation. The constituents of concern include:

- Volatile Organic Compounds (VOCs);
- Semi-volatile Organic Compounds (SVOCs); and,
- Metals.

The analytical methods presented in the following table were selected to identify and evaluate potential releases because they are capable of achieving analytical detection limits less than the baseline numeric screening levels applicable to the sampled media.

Constituent of Concern	Analytical Method
VOCs	Field screening using a photoionization detector (PID). Where suspected, VOCs were confirmed with analysis by EPA Method 8260.
SVOCs	Field screening using visual and olfactory cues. Where suspected, SVOCs were confirmed with analysis by EPA Method 8270.
Metals	EPA Method 6010 (arsenic, barium, cadmium, chromium, lead, nickel, selenium, and silver). EPA Method 7471 (mercury).

Pace Analytical Laboratory of Huntersville, North Carolina conducted the laboratory sample analyses. Pace Analytical Laboratory is a South Carolina-certified laboratory.

3.3 Phase II Investigation Procedures

The Phase II investigation can be broken down into the following general field methods used to develop lines of evidence for each AOC based on its initial conceptual model:

- AOC Inspections
- Soil screening (40 Locations)
- Soil sampling (34 locations)
- Temporary Monitoring well installation (6 locations)
- Groundwater sampling (7 locations)

Sample locations are depicted on *Figures 2 through 4*. The following subsections provide overviews of the site characterization methods identified above.

3.3.1 AOC Inspections

During planning, each AOC was inspected to determine whether a mechanism was present for the release of hazardous substances or petroleum products to the environment. During the inspections, specific attention was given to materials present, processes and raw material/waste management, evidence of releases (e.g. staining, residue, etc.), and migration pathways. Where the potential for releases of hazardous materials or petroleum products to the environment was determined to be non-existent or highly unlikely, no further action was recommended. Where it was determined that there was a reasonable potential for a release to have occurred, investigations targeting the area most likely to be impacted and analysis for AOC-specific constituents of concern were conducted.

3.3.2 Soil Sampling

Soil borings were advanced at 40 locations (SB-1 through SB-40) using direct-push technology which can be utilized in relatively tight fitting areas due to its small footprint and large areas due to its high mobility and minimal assembly and disassembly time. Direct push technology was chosen due to the need to be highly mobile and because this method is unobtrusive to retail operations.

For the purpose of this report, the following definitions will be used: surface soils (0-1 foot below ground surface, no letter designation) and subsurface soils (2-foot minimum depth, denoted as with an "A" identifier). Specific sample depth for each boring is located in *Table 1*. The locations of these soil borings are displayed on *Figures 2 through 4*.

Soil borings were drilled using a direct-push drilling rig. Soil samples were collected continuously from the ground surface to the terminus of the boring using a macrocore. A macrocore is a five-foot long stainless steel tube fitted with a polyethylene sleeve. This tube is pushed into the ground, filling the sleeve with an undisturbed core of subsurface soils.

Each soil sample was inspected by a field scientist from Fuss & O'Neill for physical evidence of contamination, such as staining or odors. Where VOCs were a potential constituent of concern, samples were also field screened using a PID.

Soil sampling intervals were selected to characterize the maximum concentrations of constituents of concern within a potential release area and confirm the extent of impacted soil. If visual inspection and field screening did not yield evidence of impacted soil, samples were selected for laboratory analysis from predetermined intervals based on the conceptual release model for each AOC.

3.3.3 Temporary Monitoring Well Installation & Groundwater Sampling

As part of this scope of work, six (6) temporary monitoring wells were installed utilizing Geoprobe® direct-push technology. The locations of the the temporary wells are displayed on *Figures 2 through 4*. Additionally, one (1) existing monitoring well on the Times Turn Around parcel (i.e., MW-6) was also sampled and submitted for laboratory analysis.

Groundwater samples from the temporary wells were collected with a discrete sampler developed for use with direct-push technology. The discrete sampler is a four-foot long stainless steel screen housed inside the direct push rods. Upon reaching the desired sampling interval, the direct push rods were pulled up four feet allowing the screen to be released at the desired sampling interval. SCDHEC Water Well Record forms are included as *Appendix B.*

After the discrete sampler screen was exposed to the water table, dedicated disposable polyethylene tubing containing a check valve was inserted into the direct push rods. This tubing was moved up and down forcing groundwater into the tubing until it reached the surface where it was collected in the appropriate bottles for laboratory analytical use. This sampling technique limits turbidity and helps prevent volatilization of potential VOCs.

Groundwater samples for laboratory analysis were collected from the temporary monitoring wells and the existing permanent monitoring well MW-6 on the Times Turn Around property using dedicated disposable polyethylene tubing. The water was slowly poured into the sample bottles to prevent aeration and to ensure the bottles are not overfilled. Once the samples were collected, they were placed in a cooler filled with ice and kept at approximately four degrees centigrade (4°C) throughout the operation. Samples were transported to the laboratory under proper Chain of Custody protocols.

After groundwater samples were collected from temporary monitoring wells, the borings were properly abandoned using a neat cement grout. The neat cement grout was injected through a tremie pipe set approximately one foot above the total depth of the boring and filled from the bottom of the bore hole upward.

4 AOC Sample Collection & Analytical Results

This section presents the findings of the investigations conducted at each AOC and the analytical results. Samples were transported to Pace Analytical Services, Inc. for laboratory analyses. Samples were kept at approximately 4°C throughout the operation and during the transport to the laboratory. A chain of custody was maintained and documented during the shipping and handling process to ensure sample integrity. A copy of the chain of custody is included with the analytical report in *Appendix A*. Refer to *Figures 2 through 4* for locations of collected samples.

All samples were measured against EPA's Regional Screening Levels (RSLs) for residential and industrial soils and the EPAs National Primary Drinking Water Maximum Contaminant Levels (MCLs) for water samples.

4.1 Times Turn Around 10

4.1.1 Soil Sample Collection & Analysis

Soil Sample Collection

Ten (10) soil boings (SB-1 through SB-10) were installed to investigate the AOC associated with the Times Turn Around 10 site. Soil samples were collected using a macrocore. Each soil boring at the Times Turn Around AOC had a total depth of 10 feet below land surface (bls). Soils were screened with an organic vapor analyzer (OVA) PID for the presence of organic vapors. The highest OVA reading during field screening dictated the depth at which the subsurface sample was obtained.

Soil Analytical Results

Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 2.4*. Soil samples at this AOC were analyzed for benzene, toluene, ethylbenzene, xylene, methyl-tert-butyl ether (MTBE), and naphthalene. *Table2* is a summary of soil analytical results for VOCs identified during this Phase II ESA. Only detected constituents are reported in the tables. Sample analysis results were compared to EPA's RSLs for residential and industrial soils.

The concentration of ethylbenzene from soil boring SB-9 exceeded the industrial RSL for soils.

4.1.2 Groundwater Collection & Analysis

Groundwater Sample Collection

Two (2) temporary monitoring wells (TW-1 and TW-2) were installed to investigate the AOC associated with the Times Turn Around 10 site. Groundwater samples were collected from each temporary well using a discrete sampler. Groundwater was also collected from existing monitoring well identified as MW-6 that was part of the previous onsite monitoring well network. Groundwater from monitoring well MW-6 was collected using a dedicated polyethylene bailer.

Groundwater Analytical Results

Groundwater samples were analyzed for benzene, toluene, ethylbenzene, xylene, MTBE, and naphthalene. Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*.

Table3 is a summary of groundwater analytical results for VOCs identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's MCL for drinking water. However, since no MCL's exist for MTBE and naphthalene, SCHDEC's Risk-Based Screening Level (RBSL) as used to screen the groundwater analytical results.

Concentrations of benzene and MTBE exceeded their respective EPA MCLs or SCDHEC RBSLs in samples TW-1 and TW-2. Concentrations of toluene, ethylbenzene and naphthalene from temporary well TW-1 exceeded the EPAs MCL or SCHDEC RBSLs for groundwater.

4.2 T&G Country Store

4.2.1 Soil Sample Collection & Analysis

Soil Sample Collection

Three (3) soil boings (SB-11 through SB-13) were installed to investigate the AOC associated with the T&G Country Store site. Soil samples were collected using a macrocore. Each soil boring at the T&G Country Store AOC had a total depth of 10 feet bls. Soils were screened with an OVA PID for the presence of organic vapors. The highest OVA reading during field screening dictated the depth at which the deeper sample was obtained.

Soil Analytical Results

Soil samples were analyzed for benzene, toluene, ethylbenzene, xylene, MTBE, and naphthalene. Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*.

Table2 is a summary of soil analytical results for VOCs identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's current RSLs for residential and industrial soil.

No analyzed constituents exceeded their respective screening levels in soil samples SB-11 through SB-13.

4.2.2 Groundwater Collection & Analysis

Groundwater Sample Collection

Fuss & O'Neill had anticipated utilizing an existing monitoring well network on the T&G Country Store site in order to assess the groundwater conditions on this site. However, the monitoring well network that had been previously associated with the T&G Country Store had been abandoned after the Phase I activities had been completed but before Phase II ESA activities could commence. Fuss & O'Neill personnel attempted to install two (2) temporary monitoring wells at two (2) distinct locations associated with the T&G Country Store AOC investigation. Groundwater was not encountered within 30 feet bls. Fuss & O'Neill terminated efforts to collect groundwater at the AOC. Based on our understanding of the proposed road improvements, no construction activities will extend to a depth of 30 feet bls, thereby making groundwater collection efforts less relevant.

4.3 Handy Pantry 28 Food Mart

4.3.1 Soil Sample Collection & Analysis

Soil Sample Collection

Three (3) soil boings (SB-14 through SB-16) were installed to investigate the AOC associated with the Handy Pantry 28 Food Mart site. Soil samples were collected using a macrocore. Each soil boring at the Handy Pantry 28 Food Mart AOC had a total depth of 10 feet bls. Soils were screened with an organic vapor analyzer OVA PID for the presence of organic vapors. The highest OVA reading during field screening dictated the depth at which the deeper sample was obtained.

Soil Analytical Results

Soil samples were analyzed for benzene, toluene, ethylbenzene, xylene, MTBE, and naphthalene. Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*.

Table2 is a summary of soil analytical results for VOCs identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's current RSLs for residential and industrial soils.

No analyzed constituents exceeded their respective screening levels in soil samples SB-14 through SB-16.

4.3.2 Groundwater Collection & Analysis

Groundwater Sample Collection

Fuss & O'Neill had anticipated utilizing an existing monitoring well network on the Handy Pantry 28 Food Mart site in order to assess the groundwater conditions on this site. However, the monitoring well network that had been previously associated with the Handy Pantry 28 Food Mart had been abandoned before Phase II ESA activities could commence. Based on proposed road improvements and anticipated depth to groundwater, no attempts to were made to collect groundwater via temporary well installation during the investigation of the AOC associated with Handy Pantry 28 Food Mart. Refer to *Section 4.2.2* above.

4.4 Paving Equipment of the Carolinas

4.4.1 Soil Sample Collection & Analysis

Soil Sample Collection

Six (6) soil boings (SB-17 through SB-22) were installed to investigate the AOC associated with the Paving Equipment of the Carolinas site. Soil samples were collected using a macrocore. Each soil boring at the Paving Equipment of the Carolinas AOC had a total depth of 10 feet bls. Soils were screened with an OVA PID for the presence of organic vapors. Since no OVA readings were observed, three (3) of the six borings

(6) were selected and sampled at the terminus of the boring. Soil samples were collected from boring locations SB-18, SB-20, and SB-22.

Soil Analytical Results

Soil samples were analyzed for VOCs and SVOCs. Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*.

Table2 is a summary of soil analytical results for VOCs and *Table 4* is a summary of soil analytical results for SVOCs identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's residential and industrial RSLs.

No concentrations of SVOCs or VOCs in soil samples SB-18, SB-20, or SB-22 exceeded their respective EPA screening levels for soils.

4.4.2 Groundwater Collection & Analysis

Groundwater Sample Collection

Two (2) temporary monitoring wells (TW-3 and TW-4) were installed to investigate the AOC associated with the Paving Equipment of the Carolinas site. Groundwater samples were collected from each temporary well using a discrete sampler.

Groundwater Analytical Results

Groundwater samples were analyzed for VOCs and SVOCs. Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*.

Table 3 is a summary of groundwater analytical results for VOCs and *Table 5* is a summary of groundwater analytical results for SVOCs identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA MCLs. However, since no MCL's exist for MTBE and naphthalene, SCHDEC's RBSL was used to screen the groundwater analytical results.

No concentrations of SVOCs or VOCs in groundwater samples TW-3 or TW-4 exceeded their respective EPA MCLs or SCDHEC RBSLs.

4.5 Partex / Eumeric Holdings

4.5.1 Soil Sample Collection & Analysis

Soil Sample Collection

Four (4) soil boings (SB-23/23A through SB-26/26A) were installed to investigate the AOC associated with the Partex / Eumeric Holdings site. Soil samples were collected using a macrocore. Each soil boring at the Partex / Eumeric Holdings AOC had a total depth of 10 feet bls. Surface soils (0-1 foot below ground surface, no letter designation) and subsurface soils (2-foot minimum depth, denoted as with an "A" identifier) were collected from this AOC. Soils were screened with an OVA PID for the presence of organic vapors.

Soil Analytical Results

Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*. Each collected soil sample (SB-23/23A through SB-26/26A) was analyzed for metals. Soil samples SB-23 and SB-24 were also analyzed for VOCs and SVOCs. Since no measurable OVA readings were observed, two (2) of the six (6) borings were also sampled at the termination depth of the boring for VOCs and SVOCs.

Table 2 is a summary of soil analytical results for VOCs, *Table 4* is a summary of soil analytical results for SVOCs, and *Table 1* is a summary of analytical results for metals identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's RSLs for residential and industrial soils.

Soil samples SB-23, SB-24, SB-25, SB-25A, SB-26 and SB-26A exceed the EPAs Residential RSL for arsenic in soils, but were less than the Industrial RSL. Naturally occurring background arsenic conditions are further discussed in *Section 4.6.1* below. Soil sample SB-24 exceeded the EPAs Residential RSL for benzo(a)pyrene but was less than the Industrial RSL.

4.5.2 Groundwater Collection & Analysis

Groundwater Sample Collection

Two (2) temporary monitoring wells (TW-5 and TW-6) were installed to investigate the AOC associated with the Partex / Eumeric Holdings site. Groundwater samples were collected from each temporary well using a discrete sampler.

Groundwater Analytical Results

Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*.Groundwater samples were analyzed for metals, VOCs, and SVOCs.

Table 3 is a summary of groundwater analytical results for VOCs, *Table 5* is a summary of groundwater analytical results for SVOCs, and *Table 1* is a summary of analytical results for metals identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's MCLs. In the absence of an MCL (e.g., silver), analyzed concentrations are compared to the respective SCDHEC's RBSLs.

Groundwater samples TW-5 and TW-6 exceeded EPA MCLs for barium, chromium, and lead. Groundwater sample TW-5 exceeded the EPA MCL for arsenic. Groundwater sample TW-6 exceeded the SCDHEC RBSL for silver. However, it should be noted that the collected groundwater samples were obtained from temporary, unfiltered wells. Installation of a permanent, traditional sand-pack wells may address the elevated metal concentrations seen in these groundwater samples collected from temporary well points.

4.6 Lords Armory

4.6.1 Soil Sample Collection & Analysis

Soil Sample Collection

Eight (8) soil boings (SB-27 through SB-34) were installed to investigate the AOC associated with the Lords Armory site. Soil samples were collected using a macrocore. Each soil boring at the Lords Armory AOC had a total depth of 10 feet bls. Soils were screened with an OVA PID for the presence of organic vapors. Two (2) of the eight (8) borings were sampled at the termination depth of the boring for VOCs. Additionally, two (2) samples from this AOC were submitted for laboratory analysis for metals. The collected metal concentrations served as background samples for metals concentrations to compare to the metals concentrations of the Parex/Eumeric Holdings AOC.

Soil Analytical Results

Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*. Soil samples SB-33 and SB-34 were analyzed for metals. Additionally, soil samples SB-31 and SB-32 were analyzed for benzene, toluene, ethylbenzene, xylene, MTBE, and naphthalene.

Table2 is a summary of soil analytical results for VOCs and *Table 1* is a summary of analytical results for metals identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's residential and industrial RSL.

Soil samples SB-33 and SB-34, which were meant to represent naturally occurring background soil conditions, were above EPA residential screening level for arsenic. However, arsenic is frequently found within South Carolina soils at naturally occurring concentrations that exceed the Residential and Industrial RSLs. According to a SCDHEC study (Canova, 1999), naturally occurring concentrations of arsenic have a mean concentration of 2 mg/kg within South Carolina's Coastal Plain, which exceeds the Residential RSL, and a mean concentration of 11.0 mg/kg within the Piedmont Section of South Carolina, which exceeds both the Residential and Industrial RSLs. The statewide average for arsenic within the soil samples collected for the SCDHEC/Canova study was 6.1 mg/kg, with collected background samples ranging from 0.23 mg/kg to 45.0 mg/kg arsenic. Therefore, it does not appear that the arsenic results obtained from the Partex/Eumeric Holdings or the Lords Armory AOCs represent anything outside normal, background elemental soil conditions in South Carolina.

Groundwater Sample Collection

Due to the anticipated depth of groundwater at this site and the anticipated direction of groundwater flow, groundwater was not collected from the Lord's Armory AOC during this Phase II ESA scope of work.

4.7 Millers Produce & Farm / Summerville Grocery

4.7.1 Soil Sample Collection & Analysis

Soil Sample Collection

Six (6) soil boings (SB-35 through SB-40) were installed to investigate the AOC associated with the Millers Produce & Farm / Summerville Grocery site. Soil samples were collected using a macrocore. Each soil boring at the Lords Armory AOC had a total depth of 10 feet bls. Soils were screened with an OVA PID for the presence of organic vapors. Since no OVA readings were observed, three (3) of the six (6) borings were sampled at the termination depth of the boring. Three (3) soil samples (i.e., SB-38, SB-39, SB-40) were submitted to the laboratory for this AOC.

Soil Analytical Results

Analysis for each collected sample was determined by known activities associated with the AOC discussed in *Section 1.4*. Soil samples SB-38 through SB-40 were analyzed for benzene, toluene, ethylbenzene, xylene, MTBE, and naphthalene.

Table2 is a summary of soil analytical results for VOCs identified during this Phase II ESA. Only detected constituents are reported. Sample analysis results were compared to EPA's residential and industrial RSLs.

No samples collected from this AOC had concentrations above EPA screening levels for soils.

Groundwater Sample Collection

Due to the anticipated depth of groundwater at this site and the anticipated direction of groundwater flow, groundwater was not collected from the Millers Produce & Farm / Summerville Grocery AOC during this Phase II ESA scope of work.

4.8 Quality Assurance/Quality control (QA/QC)

Care was taken throughout the sampling activities to avoid cross contamination. Direct push drilling equipment was steam cleaned between boreholes. Samples were kept at approximately four degrees centigrade (4ºC) throughout the operation and during transport to Pace Analytical Laboratory. Chain-of-custody forms were maintained and signed during the shipping and handling process to ensure sample integrity.

After the soil and groundwater samples were collected, the borings were properly abandoned using a neat cement grout.

5 Conclusions

Times Turn Around 10

High concentrations of benzene, toluene, ethylbenzene, MTBE, and naphthalene were found in groundwater samples collected along the eastern property boundary of the investigated area associated with Times Turn Around 10 AOC. One soil sample from the Times Turn Around 10 site (i.e., SB-9) also exceeded the Residential and Industrial RSL for ethylbezene.

T&G Country Store

No elevated levels of any constituents of concern were observed in soil or groundwatersamples collected from the T&G Country Store AOC during this Phase II ESA.

Handy Pantry 28 Food Mart

No elevated levels of any constituents of concern were observed in soil or groundwater samples collected from the Handy Pantry 28 Food Mart AOC during this investigation.

Paving Equipment of the Carolinas

No elevated levels of any constituents of concern were observed in samples of media collected from the Paving Equipment of the Carolinas AOC during this Phase II ESA.

Partex / Eumeric Holdings

Partex / Eumeric Holdings had the following samples exceed either the EPAs Regional Screening Level or SCHECS RBSL during this Phase II ESA.

- Soil samples SB-23, SB-24, SB-25, SB-25A, SB-26, and SB-26A exceeded the EPAs Residential RSL for arsenic. However, analyzed concentrations of arsenic appear to be consistent with naturally occurring background soil conditions found within South Carolina (Canova, 1999).
- Soil sample SB-24 exceeded EPAs Residential RSL for benzo(a)pyrene in soils, but was below the Industrial RSL.
- Groundwater sample TW-5 exceeded EPA MCLs in Groundwater arsenic, barium, total chromium, and lead. Groundwater samples TW-6 exceeded EPA MCLs for barium, total chromium, lead and SCDHECs groundwater RBSL for silver. It should be noted that the collected groundwater samples were obtained from temporary, unfiltered wells. Installation of a permanent, traditional sand-pack well may address the elevated metal concentrations seen in these groundwater samples collected from temporary well points. However, it is unknown whether the concentrations of metals are naturally occurring in groundwater, as conditions can vary greatly depending on the method of collecting the groundwater sample and subsurface geology.

Lords Armory

Lords had the following samples exceed the EPAs Residential RSL during this Phase II ESA.

- Soil samples SB-33 and SB-34 exceeded the EPAs RSL for arsenic in soils. However, as stated above, analyzed concentrations of arsenic appear to be consistent with naturally occurring background soil conditions found within South Carolina (Canova, 1999).

Millers Produce & Farm / Summerville Grocery

No elevated levels of analyzed constituents were observed in soil or groundwater samples collected from the Millers Produce & Farm / Summerville Grocery AOC during this Phase II ESA.

6 Qualifications

Reginald Butler and Christine Cafagna prepared this Phase II Environmental Site Assessment on behalf of STV, Inc. in conjunction with STV project #1149-004. Mr. Butler has 7 years of experience and Ms. Cafagna has 11 years of experience with environmental site assessments.

Reginald O. Butler — 5/19/15

Reginald Butler
Environmental Scientist
Ext. 6109

Date

Christine A. Cafagna — 5/19/2015

Christine A. Cafagna
Project Manager
Ext. 6105

Date

Tables

FUSS & O'NEILL

TABLE 1

SUMMARY OF DETECTED METALS IN SOIL AND GROUNDWATER
US 21 SC 51
YORK, SC

SUMMARY OF METALS IN SOIL									
Sample Numbers	**Date Collected**	**Arsenic**	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Selenium**	**Silver**
		mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
PARTEX / EUMERIC HOLDINGS									
SB-23	3/3/2015	**1.2**	261	0.080 J	14.7	6.9	0.017	0.94 J	<0.56
SB-23A	3/3/2015	0.51 J	158	0.091	14.0	17.9	N/A	0.75 J	0.82
SB-24	3/3/2015	**0.81 J**	14.9	0.1	2.5	3.1	0.0320	1.20	<0.44
SB-24A	3/3/2015	0.66 J	210	0.13	27.2	5.7	N/A	0.80 J	<0.48
SB-25	3/3/2015	**<0.90**	157	0.1	50.2	3.1	N/A	1.20	1.1
SB-25A	3/3/2015	**<1.3**	504	0.096 J	48.2	6.20	N/A	1.1 J	<0.63
SB-26	3/3/2015	**<1.1**	129	0.16	75.8	10.8	N/A	1.50	0.58
SB-26A	3/3/2015	**<1.2**	157	0.10 J	36.9	2.2	N/A	1.30	0.70
LORDS ARMORY									
SB-33*	3/3/2015	**<0.99**	150.0	0.12	64.1	1.9	0.0096	1.30	0.45 J
SB-34*	3/3/2015	**<1.1**	87.5	<0.11	2.2	2.0	0.0017 J	0.84 J	0.590
EPA Residential RSL (mg/kg)		0.67	15,000	70	NS	400	23	390	390
EPA Industrial RSL (mg/kg)		3.0	220,000	980	NS	800	350	5,800	5,800

SUMMARY OF METALS IN GROUNDWATER									
Sample Numbers	**Date Collected**	**Arsenic**	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Selenium**	**Silver**
		µg/L	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
PARTEX / EUMERIC HOLDINGS									
TW-5	3/3/2015	31.3	**5,120**	4	**684**	**789**	0.64	17.2	<5.0
TW-6	3/3/2015	<10.0	**16,700**	3	**2,900**	**215**	0.46	30.2	6.5
EPA MCL (µg/L)		10	2,000	5	100	15	2	50	5[1]

Notes: **Bold/Highlighted** values exceed EPA Residential / Industrial Regional Screening Level for soils , or EPAs MCLs or SCDHECs RBSL for groundwater

A - Indicates subsurface sample

NS - No standard exists

N/A - Not Analyzed

J - Concentration is between the method detection limit and the reporting limit; estimated value

Screening Levels Based on Region 9 Regional Screening Level Summary Table (TR= 1E-06, HQ = 1.0) January 2015

[1]: The value indicated is the SCDHEC UST Risk Based Screening Level (RBSL). No EPA MCL primary drinking water standard exists for this constituent

* - Sample collected to represent naturally occurring background conditions

FUSS & O'NEILL

TABLE 2

SUMMARY OF DETECTED VOCs IN SOIL
US 21 SC 51
YORK, SC

Sample Numbers	Date Collected	Benzene	Toulene	Ethylbenzene	Xylene	MTBE	Naphthalene
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TIMES TURN AROUND							
SB-1	3/3/2015	<0.0031	<0.0031	<0.0031	<0.0063	<0.0031	<0.0031
SB-2	3/3/2015	<0.0028	<0.0028	<0.0028	<0.0056	<0.0028	<0.0028
SB-3	3/3/2015	<0.003	<0.003	<0.003	<0.0061	<0.003	<0.003
SB-4	3/3/2015	<0.0029	<0.0029	<0.0029	<0.0059	<0.0029	<0.0029
SB-5	3/3/2015	<0.0026	<0.0026	<0.0026	<0.0051	<0.0026	<0.0026
SB-6	3/3/2015	<0.0036	<0.0036	<0.0036	<0.0073	<0.0036	<0.0036
SB-7	3/3/2015	<0.0021	<0.0021	<0.0021	<0.0043	<0.0021	<0.0021
SB-8	3/3/2015	<0.072	<0.072	0.0447 J	<0.144	<0.072	0.0573 J
SB-9	3/3/2015	0.58	0.426	**29.5**	138	0.068 J	12.7
SB-10	3/3/2015	<0.0026	<0.0026	<0.0026	<0.0051	<0.0026	<0.0026
T & G COUNTRY STORE							
SB-11	3/4/2015	<0.0028	<0.0028	<0.0028	<0.0055	<0.0028	0.00099 J
SB-12	3/4/2015	<0.0024	<0.0024	<0.0024	<0.0049	<0.0024	<0.0024
SB-13	3/4/2015	<0.0025	<0.0025	<0.0025	<0.0050	<0.0025	<0.0025
HANDY PANTRY 28							
SB-14	3/4/2015	<0.0031	<0.0031	<0.0031	<0.0062	<0.0031	<0.0031
SB-15	3/4/2015	<0.0029	<0.0029	<0.0029	<0.0059	<0.0029	<0.0029
SB-16	3/4/2015	0.0114	<0.0037	<0.0037	<0.0074	<0.0037	<0.0037
PAVING EQUIPMENT							
SB-18	3/4/2015	<0.0040	<0.0040	<0.0040	<0.0080	<0.0040	<0.0040
SB-20	3/4/2015	<0.0023	<0.0023	<0.0023	<0.0046	<0.0023	<0.0023
SB-22	3/4/2015	<0.0025	<0.0025	<0.0025	<0.0049	<0.0025	<0.0025
PARTEX / EUMERIC HOLDINGS							
SB-23	3/4/2015	<0.0027	<0.0027	<0.0027	<0.0054	<0.0027	<0.0027
SB-24	3/4/2015	<0.0027	<0.0027	<0.0027	<0.0055	<0.0027	<0.0027
LORDS ARMORY							
SB-31	3/5/2015	<0.291	<0.291	0.879	1.11	<0.291	6.18
SB-32	3/5/2015	<0.126	<0.126	3.12	4.42	<0.126	7.64
MILLERS PRODUCE AND SUMMERVILLE GROCERY							
SB-38	3/5/2015	<0.0034	<0.0034	<0.0034	<0.0069	<0.0034	0.0024 J
SB-39	3/5/2015	<0.0029	<0.0029	<0.0029	<0.0057	<0.0029	<0.0029
SB-40	3/5/2015	<0.0023	<0.0023	<0.0023	<0.0046	<0.0023	<0.0023
EPA Residential RSL (mg/kg)		1.2	4,900	6	580	47	38
EPA Industrial RSL (mg/kg)		5.1	47,000	25	2,500	210	17

Notes: **Bold/Highlighte**d values exceed EPA Residential / Industrial Regional Screening Level for soil

NS - No standard Exists

J - Concentration is between the method detection limit and the reporting limit

Screening Levels Based on Region 9 Regional Screening Level Summary Table (TR= 1E-06, HQ = 1.0) January 2015

FUSS & O'NEILL

TABLE 3
SUMMARY OF DETECTED VOCs IN GROUNDWATER
US 21 SC 51
YORK, SC

Sample Numbers	Date Collected	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Naphthalene
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
TIMES TURN AROUND							
TW-1	3/3/2015	**6480**	**1,120**	**702**	536.0	**2,820**	**111**
TW-2	3/3/2015	**13.5**	0.95 J	7.8	16.4	**59.5**	2.8
MW-6	3/3/2015	<2.8	<1.0	<1.0	<2.0	1.3	<2.8
PAVING EQUIPMENT							
TW-3	3/4/2015	0.74 J	0.44 J	0.43 J	<2.0	0.41 J	<1.0
TW-4	3/4/2015	0.41 J	0.27 J	<1.0	<2.0	<1.0	<1.0
PARTEX / EUMERIC HOLDINGS							
TW-5	3/4/2015	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
TW-6	3/4/2015	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
EPA MCL (µg/L)		5.0	1,000	700	10,000	40[1]	25[1]

Notes: **Bold/Highlighted** values exceed EPAs MCLs or SCDHEC RBSL

J - Concentration is between the method detection limit and the reporting limit

[1]: The value indicated is the SCDHEC UST Risk Based Screening Level (RBSL). No EPA MCL drinking water standard exists for this constituent

TABLE 4
SUMMARY OF DETECTED SVOCs IN SOIL
US 21 SC 51
YORK, SC

Sample Numbers	SB-18	S-20	S-22	SB-23	SB-24	Residential RSL (MG/KG)	Industrial RSL (MG/KG)
Date Collected	3/4/15	3/4/15	3/4/15	3/4/15	3/4/15		
Site	Paving Equimpent			Partex / Eumeric			
Compounds							
Benzo(a)anthracene	<0.0139	<0.0104	<0.0111	<0.0122	0.0169 J	0.15	2.9
Benzo(a)pyrene	<0.0139	<0.0104	<0.0111	<0.0122	**0.0185 J**	0.015	0.29
Benzo(b)fluoranthene	<0.0139	<0.0104	<0.0111	<0.0122	0.0204 J	0.15	2.9
Benzo(k)fluoranthene	<0.0139	<0.0104	<0.0111	<0.0122	0.0179 J	1.5	29
Chrysene	<0.0139	<0.0104	<0.0111	<0.0122	0.0217 J	15	290
Fluoranthene	<0.0139	<0.0104	<0.0111	<0.0122	0.0396 J	2,300	30,000
Phenanthrene	<0.0139	<0.0104	<0.0111	<0.0122	0.0183 J	NS	NS
Pyrene	<0.0139	<0.0104	<0.0111	<0.0122	0.0346 J	1,700	23,000

Notes:

Bold/Highlighted values exceed EPA Residential / Industrial RSLs

J - Concentration is between the method detection limit and the reporting limit; estimated value

Screening Levels Based on Regoin 9 Regional Screening Level Summary Table (TR= 1E-06, HQ = 1.0) January 2015

NS - No standard exists

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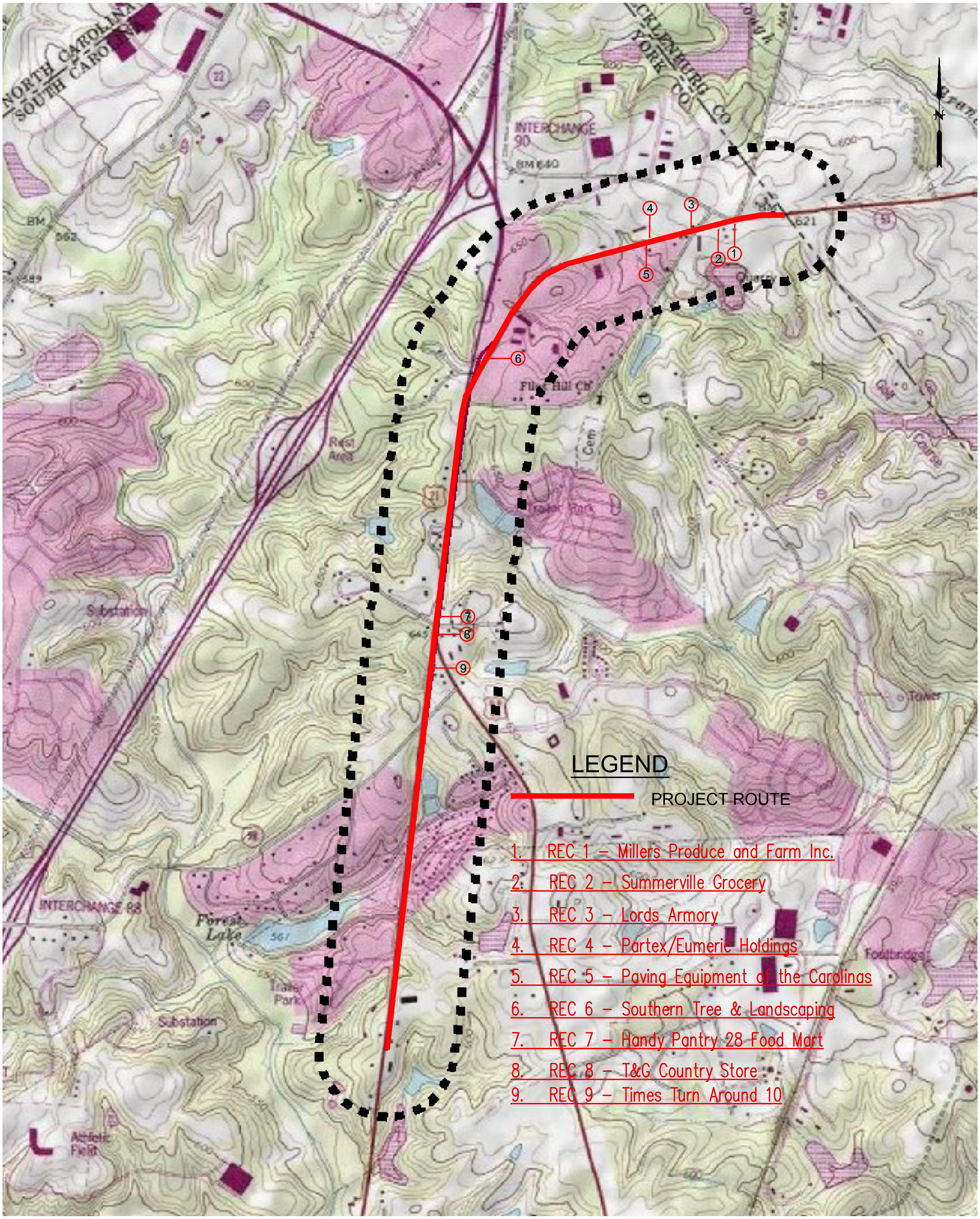
TABLE 5
SUMMARY OF DETECTED SVOCs IN GROUNDWATER
US 21 SC 51
YORK, SC

Sample Numbers	TW-3	TW-4	TW-5	TW-6	RBSL ($\mu g/L$)
Date Collected	3/4/15	3/4/15	3/4/15	3/4/15	
Site	Paving Equimpent		Partex / Eumeric		
Compounds					
Benzo(a)anthracene	<0.0139	<0.0104	<0.0111	<0.0122	10
Benzo(a)pyrene	<0.0139	<0.0104	<0.0111	<0.0122	NS
Benzo(b)fluoranthene	<0.0139	<0.0104	<0.0111	<0.0122	10
Benzo(k)fluoranthene	<0.0139	<0.0104	<0.0111	<0.0122	10
Chrysene	<0.0139	<0.0104	<0.0111	<0.0122	10
Fluoranthene	<0.0139	<0.0104	<0.0111	<0.0122	NS
Phenanthrene	<0.0139	<0.0104	<0.0111	<0.0122	NS
Pyrene	<0.0139	<0.0104	<0.0111	<0.0122	NS

Notes: Values screened using SCDHEC RBSLs
NS - No standard exists

Figures



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COLUMBIA, SOUTH CAROLINA 29201
803.376.6034
www.fando.com

STV, Inc.

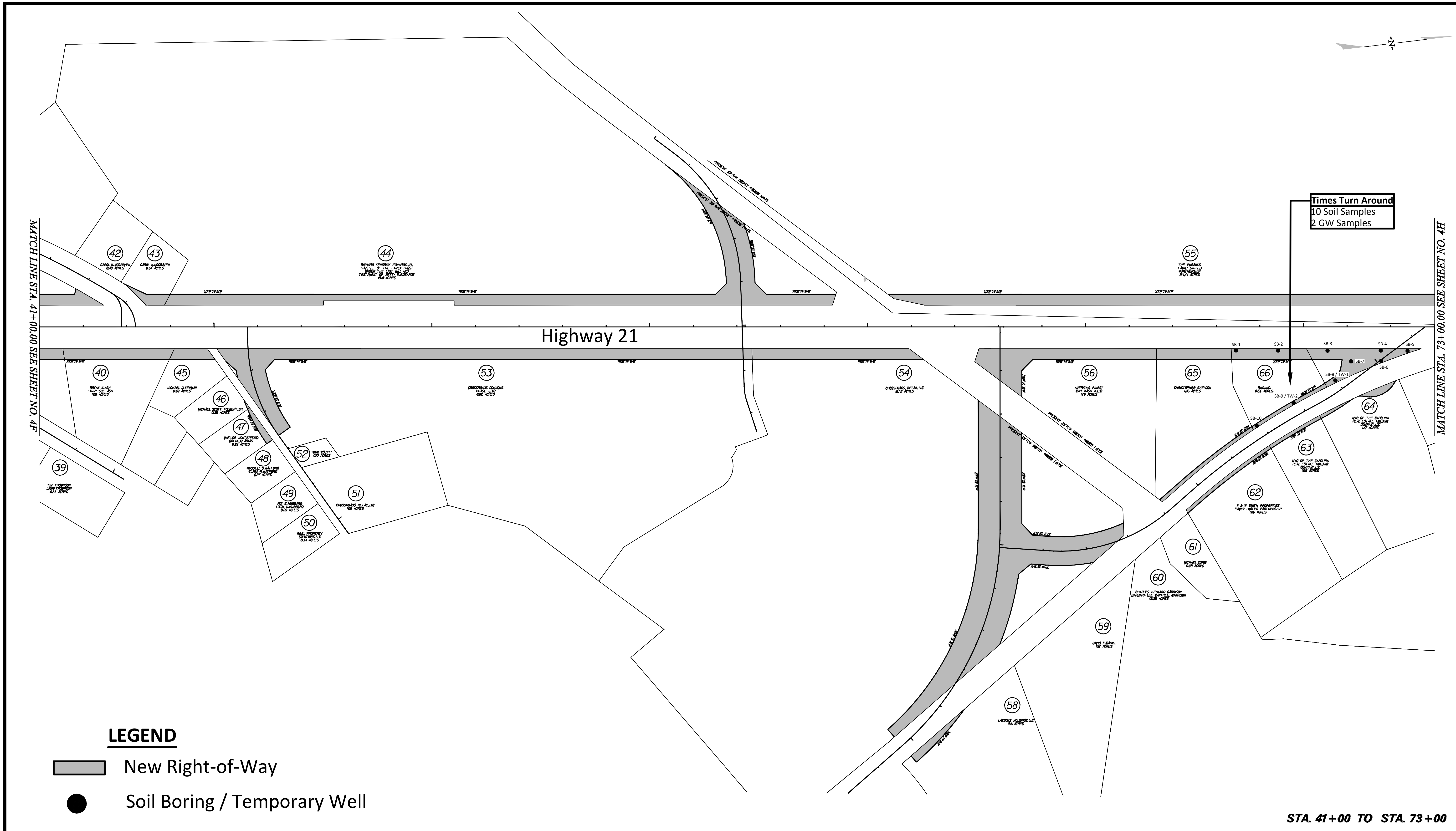
TOPOGRAPHIC SITE LOCATION MAP

US HIGHWAY 21 / SC HIGHWAY 51 PHASE II ESA

Fort Mill South Carolina

PROJ. No.: 20120285.A12
DATE: MAY 2015

Figure 1



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SOIL BORING / TEMPORARY WELL LOCATION MAP

US HIGHWAY 21 / SC HIGHWAY 51 PHASE II ESA

Fort Mill — SOUTH CAROLINA

PROJ. No.: 20120285.A12
DATE: May 2015

Figure 2

MS VIEW:
LAYER STATE:

File Path: F:\P2012\0285 STV York County US 21 SC 51A12\Deliverables\Report\DWG\20120285A12STP0002.dwg Layout: FIG 2 Plotted: Mon, May 18, 2015 - 9:57 AM User: rbutler
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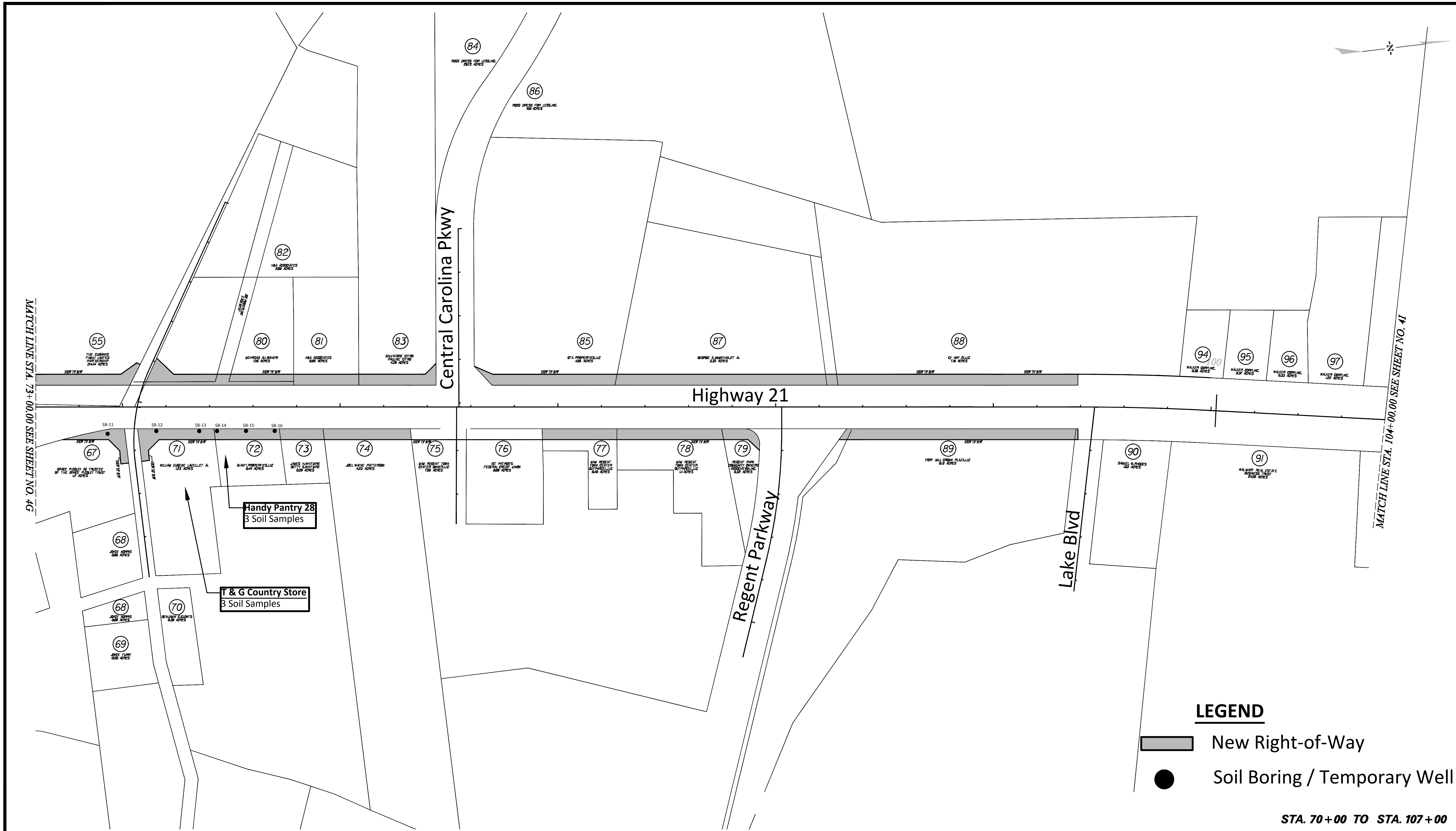

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SCALE:
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GRAPHIC SCALE

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SOIL BORING / TEMPORARY WELL LOCATION MAP

US HIGHWAY 21 / SC HIGHWAY 51 PHASE II ESA

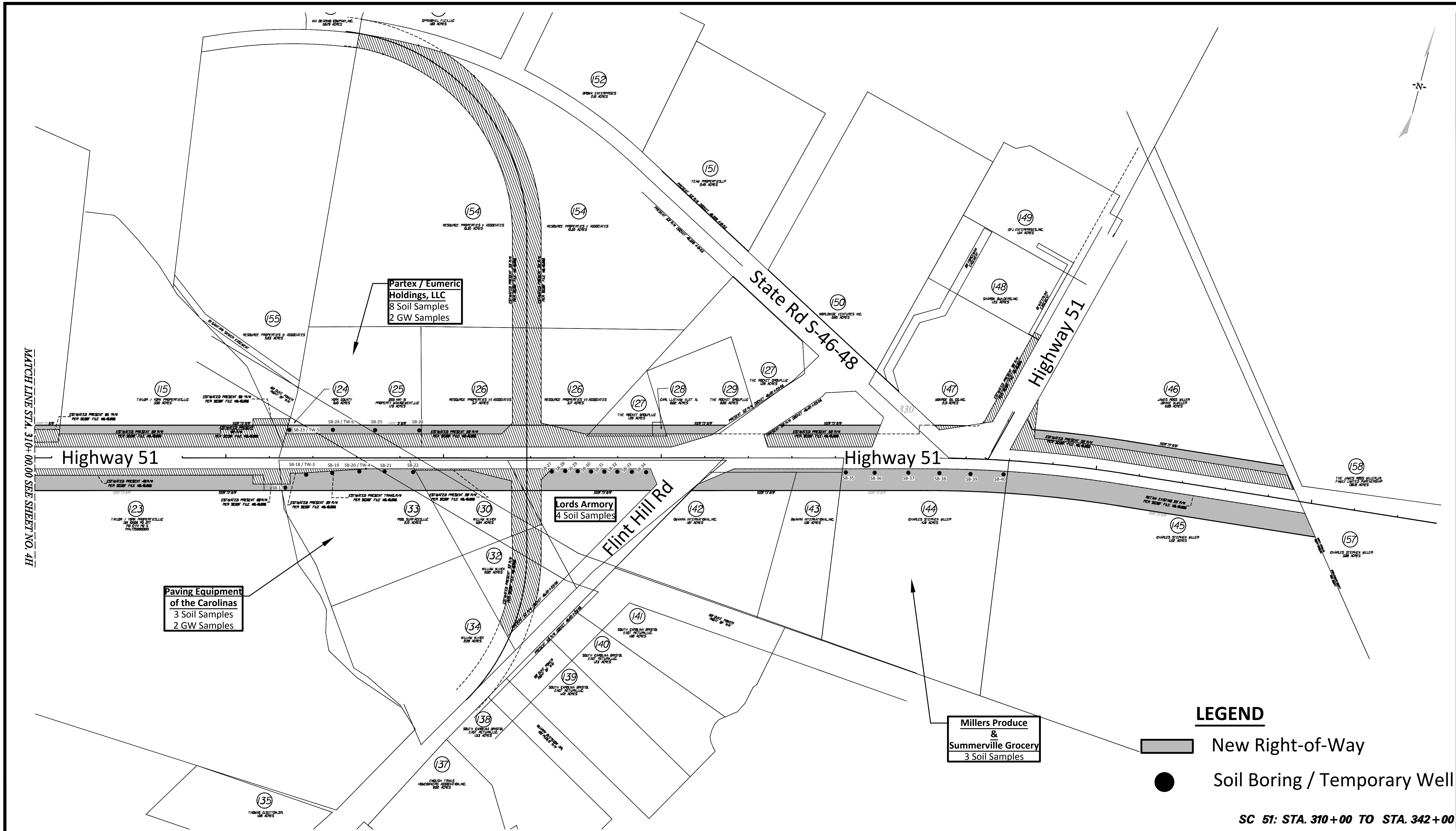
Fort Mill SOUTH CAROLINA

PROJ. No.: 20120285.A12
DATE: May 2015

Figure 3

File Path: F:\P2012\0285 STV York County US 21 SC 51\A12\Deliverables\Report\DWG\20120285A12STP0002.dwg Layout: FIG 3 Plotted: Mon, May 18, 2015 - 9:57 AM User: rbutler
Plotter: DWG TO PDF.PC3 CTB File: FO.STB

MS VIEW:
LAYER STATE:



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MS VIEW:

LAYER STATE:

SCALE:
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GRAPHIC SCALE

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SOIL BORING / TEMPORARY WELL LOCATION MAP

US HIGHWAY 21 / SC HIGHWAY 51 PHASE II ESA

Fort Mill SOUTH CAROLINA

PROJ. No.: 20120285.A12
DATE: May 2015

Figure 4

File Path: F:\P2012\0285 STV York County US 21 SC 51\A12\Deliverables\Report\DWG\20120285A12STP0002.dwg Layout: FIG 4 Plotted: Mon, May 18, 2015 - 9:57 AM User: rbutler
Plotter: DWG TO PDF.PC3 CTB File: FO.STB

Appendix A

Laboratory Analytical Results

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

March 23, 2015

Reggie Butler
Fuss & Oneill
717 Lady Street
Suite E
Columbia, SC 29201

RE: Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Dear Reggie Butler:

Enclosed are the analytical results for sample(s) received by the laboratory on March 09, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Analyses were performed at the Pace Analytical Services location indicated on the sample analyte page for analysis unless otherwise footnoted.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Herring for
Nicole Benjamin
nicole.benjamin@pacelabs.com
Project Manager

Enclosures

cc: Christine Cafagna
Andrew Derrick, Fuss & O'Neill Columbia

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

CERTIFICATIONS

Project:	US Hwy 21/SC51 - 20120285.A12
Pace Project No.:	92240289

Charlotte Certification IDs

9800 Kincey Ave. Ste 100, Huntersville, NC 28078
North Carolina Drinking Water Certification #: 37706
North Carolina Field Services Certification #: 5342
North Carolina Wastewater Certification #: 12
South Carolina Certification #: 99006001
Florida/NELAP Certification #: E87627
Kentucky UST Certification #: 84
West Virginia Certification #: 357
Virginia/VELAP Certification #: 460221

Asheville Certification IDs

2225 Riverside Drive, Asheville, NC 28804
Florida/NELAP Certification #: E87648
Massachusetts Certification #: M-NC030
North Carolina Drinking Water Certification #: 37712
North Carolina Wastewater Certification #: 40
South Carolina Certification #: 99030001
West Virginia Certification #: 356
Virginia/VELAP Certification #: 460222

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

SAMPLE SUMMARY

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92240289001	**SB-1**	Solid	03/03/15 10:40	03/09/15 14:25
92240289002	**SB-2**	Solid	03/03/15 11:00	03/09/15 14:25
92240289003	**SB-3**	Solid	03/03/15 11:15	03/09/15 14:25
92240289004	**SB-4**	Solid	03/03/15 11:30	03/09/15 14:25
92240289005	**SB-5**	Solid	03/03/15 12:00	03/09/15 14:25
92240289006	**SB-6**	Solid	03/03/15 12:20	03/09/15 14:25
92240289007	**SB-7**	Solid	03/03/15 12:05	03/09/15 14:25
92240289008	**SB-8**	Solid	03/03/15 13:05	03/09/15 14:25
92240289009	**SB-9**	Solid	03/03/15 14:00	03/09/15 14:25
92240289010	**SB-10**	Solid	03/03/15 14:30	03/09/15 14:25
92240289011	**SB-11**	Solid	03/04/15 08:45	03/09/15 14:25
92240289012	**SB-12**	Solid	03/04/15 09:00	03/09/15 14:25
92240289013	**SB-13**	Solid	03/04/15 09:50	03/09/15 14:25
92240289014	**SB-14**	Solid	03/04/15 10:20	03/09/15 14:25
92240289015	**SB-15**	Solid	03/04/15 10:35	03/09/15 14:25
92240289016	**SB-16**	Solid	03/04/15 10:50	03/09/15 14:25
92240289017	**SB-18**	Solid	03/04/15 13:30	03/09/15 14:25
92240289018	**SB-20**	Solid	03/04/15 14:00	03/09/15 14:25
92240289019	**SB-22**	Solid	03/04/15 14:25	03/09/15 14:25
92240289020	**SB-23**	Solid	03/04/15 17:30	03/09/15 14:25
92240289021	**SB-24**	Solid	03/04/15 16:30	03/09/15 14:25
92240289022	**SB-23A**	Solid	03/04/15 17:35	03/09/15 14:25
92240289023	**SB-24A**	Solid	03/04/15 16:35	03/09/15 14:25
92240289024	**SB-25**	Solid	03/04/15 16:15	03/09/15 14:25
92240289025	**SB-25A**	Solid	03/04/15 16:26	03/09/15 14:25
92240289026	**SB-26**	Solid	03/04/15 16:00	03/09/15 14:25
92240289027	**SB-26A**	Solid	03/04/15 16:05	03/09/15 14:25
92240289028	**SB-33**	Solid	03/05/15 09:40	03/09/15 16:55
92240289029	**SB-34**	Solid	03/05/15 09:45	03/09/15 16:55
92240289030	**SB-31**	Solid	03/05/15 09:15	03/09/15 16:55
92240289031	**SB-32**	Solid	03/05/15 09:30	03/09/15 16:55
92240289032	**SB-38**	Solid	03/05/15 11:10	03/09/15 16:55
92240289033	**SB-39**	Solid	03/05/15 11:20	03/09/15 16:55
92240289034	**SB-40**	Solid	03/05/15 11:33	03/09/15 16:55
92240289035	**MW-6**	Water	03/03/15 11:30	03/09/15 16:55
92240289036	**TW-1**	Water	03/03/15 13:30	03/09/15 16:55
92240289037	**TW-2**	Water	03/03/15 14:30	03/09/15 16:55

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SAMPLE SUMMARY

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92240289038	**TW-3**	Water	03/04/15 14:40	03/09/15 16:55
92240289039	**TW-4**	Water	03/04/15 14:55	03/09/15 16:55
92240289040	**TW-5**	Water	03/03/15 17:50	03/09/15 16:55
92240289041	**TW-6**	Water	03/03/15 16:30	03/09/15 16:55

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SAMPLE ANALYTE COUNT

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92240289001	**SB-1**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289002	**SB-2**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289003	**SB-3**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289004	**SB-4**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289005	**SB-5**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289006	**SB-6**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289007	**SB-7**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289008	**SB-8**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289009	**SB-9**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289010	**SB-10**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289011	**SB-11**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289012	**SB-12**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289013	**SB-13**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289014	**SB-14**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289015	**SB-15**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289016	**SB-16**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289017	**SB-18**	EPA 8270 by SIM	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289018	**SB-20**	EPA 8270 by SIM	RES	21	PASI-C

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SAMPLE ANALYTE COUNT

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289019	**SB-22**	EPA 8270 by SIM	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289020	**SB-23**	EPA 6010	JMW	7	PASI-A
		EPA 7471	HVK	1	PASI-A
		EPA 8270 by SIM	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289021	**SB-24**	EPA 6010	JMW	7	PASI-A
		EPA 7471	HVK	1	PASI-A
		EPA 8270 by SIM	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289022	**SB-23A**	EPA 6010	JMW	7	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289023	**SB-24A**	EPA 6010	JMW	7	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289024	**SB-25**	EPA 6010	JMW	7	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289025	**SB-25A**	EPA 6010	JMW	7	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289026	**SB-26**	EPA 6010	JMW	7	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289027	**SB-26A**	EPA 6010	JMW	7	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289028	**SB-33**	EPA 6010	JMW	7	PASI-A
		EPA 7471	HVK	1	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C
92240289029	**SB-34**	EPA 6010	JMW	7	PASI-A
		EPA 7471	HVK	1	PASI-A
		ASTM D2974-87	SLJ	1	PASI-C

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SAMPLE ANALYTE COUNT

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92240289030	**SB-31**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289031	**SB-32**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289032	**SB-38**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289033	**SB-39**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289034	**SB-40**	EPA 8260	DLK	11	PASI-C
		ASTM D2974-87	SLJ	1	PASI-C
92240289035	**MW-6**	EPA 8260	GAW	11	PASI-C
92240289036	**TW-1**	EPA 8260	GAW	11	PASI-C
92240289037	**TW-2**	EPA 8260	GAW	11	PASI-C
92240289038	**TW-3**	EPA 8270	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	GAW	62	PASI-C
92240289039	**TW-4**	EPA 8270	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	GAW	62	PASI-C
92240289040	**TW-5**	EPA 6010	JMW	7	PASI-A
		EPA 7470	HVK	1	PASI-A
		EPA 8270	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	GAW	62	PASI-C
92240289041	**TW-6**	EPA 6010	JMW	7	PASI-A
		EPA 7470	HVK	1	PASI-A
		EPA 8270	RES	21	PASI-C
		EPA 8270	BPJ	74	PASI-C
		EPA 8260	GAW	62	PASI-C

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SUMMARY OF DETECTION

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92240289001	**SB-1**					
ASTM D2974-87	Percent Moisture	19.9	%	0.10	03/10/15 16:22	
92240289002	**SB-2**					
ASTM D2974-87	Percent Moisture	10.2	%	0.10	03/10/15 16:22	
92240289003	**SB-3**					
ASTM D2974-87	Percent Moisture	20.8	%	0.10	03/10/15 16:26	
92240289004	**SB-4**					
ASTM D2974-87	Percent Moisture	14.2	%	0.10	03/10/15 16:26	
92240289005	**SB-5**					
ASTM D2974-87	Percent Moisture	11.4	%	0.10	03/10/15 16:26	
92240289006	**SB-6**					
ASTM D2974-87	Percent Moisture	15.0	%	0.10	03/10/15 16:27	
92240289007	**SB-7**					
ASTM D2974-87	Percent Moisture	16.7	%	0.10	03/10/15 16:27	
92240289008	**SB-8**					
EPA 8260	Ethylbenzene	44.7J	ug/kg	72.0	03/10/15 20:29	
EPA 8260	Naphthalene	57.3J	ug/kg	72.0	03/10/15 20:29	
ASTM D2974-87	Percent Moisture	7.4	%	0.10	03/10/15 16:27	
92240289009	**SB-9**					
EPA 8260	Benzene	580	ug/kg	69.2	03/10/15 20:49	
EPA 8260	Ethylbenzene	29500	ug/kg	3460	03/11/15 13:17	
EPA 8260	Methyl-tert-butyl ether	68.0J	ug/kg	69.2	03/10/15 20:49	B
EPA 8260	Naphthalene	12700	ug/kg	3460	03/11/15 13:17	
EPA 8260	Toluene	426	ug/kg	69.2	03/10/15 20:49	
EPA 8260	Xylene (Total)	138000	ug/kg	6920	03/11/15 13:17	
EPA 8260	m&p-Xylene	106000	ug/kg	6920	03/11/15 13:17	
EPA 8260	o-Xylene	32200	ug/kg	3460	03/11/15 13:17	
ASTM D2974-87	Percent Moisture	7.8	%	0.10	03/10/15 16:27	
92240289010	**SB-10**					
ASTM D2974-87	Percent Moisture	20.2	%	0.10	03/10/15 16:27	
92240289011	**SB-11**					
EPA 8260	Naphthalene	0.99J	ug/kg	2.8	03/10/15 21:29	
ASTM D2974-87	Percent Moisture	18.6	%	0.10	03/10/15 16:28	
92240289012	**SB-12**					
ASTM D2974-87	Percent Moisture	28.8	%	0.10	03/10/15 16:28	
92240289013	**SB-13**					
ASTM D2974-87	Percent Moisture	19.7	%	0.10	03/10/15 16:28	
92240289014	**SB-14**					
ASTM D2974-87	Percent Moisture	26.4	%	0.10	03/10/15 19:28	

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SUMMARY OF DETECTION

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92240289015	**SB-15**					
ASTM D2974-87	Percent Moisture	26.2	%	0.10	03/10/15 19:28	
92240289016	**SB-16**					
EPA 8260	Benzene	11.4	ug/kg	3.7	03/10/15 16:13	
ASTM D2974-87	Percent Moisture	22.8	%	0.10	03/10/15 19:28	
92240289017	**SB-18**					
ASTM D2974-87	Percent Moisture	28.0	%	0.10	03/11/15 10:16	
92240289018	**SB-20**					
ASTM D2974-87	Percent Moisture	3.5	%	0.10	03/11/15 10:16	
92240289019	**SB-22**					
ASTM D2974-87	Percent Moisture	9.9	%	0.10	03/11/15 10:16	
92240289020	**SB-23**					
EPA 6010	Arsenic	1.2	mg/kg	1.1	03/10/15 22:59	
EPA 6010	Barium	261	mg/kg	0.56	03/10/15 22:59	
EPA 6010	Cadmium	0.080J	mg/kg	0.11	03/10/15 22:59	
EPA 6010	Chromium	14.7	mg/kg	0.56	03/10/15 22:59	
EPA 6010	Lead	6.9	mg/kg	0.56	03/10/15 22:59	
EPA 6010	Selenium	0.94J	mg/kg	1.1	03/10/15 22:59	
EPA 7471	Mercury	0.017	mg/kg	0.0044	03/11/15 14:07	
ASTM D2974-87	Percent Moisture	18.1	%	0.10	03/11/15 10:16	
92240289021	**SB-24**					
EPA 6010	Arsenic	0.81J	mg/kg	0.88	03/10/15 23:02	
EPA 6010	Barium	14.9	mg/kg	0.44	03/10/15 23:02	
EPA 6010	Cadmium	0.10	mg/kg	0.088	03/10/15 23:02	
EPA 6010	Chromium	2.5	mg/kg	0.44	03/10/15 23:02	
EPA 6010	Lead	3.1	mg/kg	0.44	03/10/15 23:02	
EPA 6010	Selenium	1.2	mg/kg	0.88	03/10/15 23:02	
EPA 7471	Mercury	0.032	mg/kg	0.0046	03/11/15 14:15	
EPA 8270 by SIM	Benzo(a)anthracene	16.9J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Benzo(a)pyrene	18.5J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Benzo(b)fluoranthene	20.4J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Benzo(k)fluoranthene	17.9J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Chrysene	21.7J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Fluoranthene	39.6J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Phenanthrene	18.3J	ug/kg	64.1	03/13/15 19:54	
EPA 8270 by SIM	Pyrene	34.6J	ug/kg	64.1	03/13/15 19:54	
ASTM D2974-87	Percent Moisture	22.0	%	0.10	03/11/15 10:16	
92240289022	**SB-23A**					
EPA 6010	Arsenic	0.51J	mg/kg	0.90	03/10/15 23:05	
EPA 6010	Barium	158	mg/kg	0.45	03/10/15 23:05	
EPA 6010	Cadmium	0.091	mg/kg	0.090	03/10/15 23:05	
EPA 6010	Chromium	14.0	mg/kg	0.45	03/10/15 23:05	
EPA 6010	Lead	17.9	mg/kg	0.45	03/10/15 23:05	
EPA 6010	Selenium	0.75J	mg/kg	0.90	03/10/15 23:05	

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SUMMARY OF DETECTION

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92240289022	**SB-23A**					
EPA 6010	Silver	0.82	mg/kg	0.45	03/10/15 23:05	
ASTM D2974-87	Percent Moisture	10.8	%	0.10	03/11/15 10:17	
92240289023	**SB-24A**					
EPA 6010	Arsenic	0.66J	mg/kg	0.97	03/10/15 23:17	
EPA 6010	Barium	210	mg/kg	0.48	03/10/15 23:17	
EPA 6010	Cadmium	0.13	mg/kg	0.097	03/10/15 23:17	
EPA 6010	Chromium	27.2	mg/kg	0.48	03/10/15 23:17	
EPA 6010	Lead	5.7	mg/kg	0.48	03/10/15 23:17	
EPA 6010	Selenium	0.80J	mg/kg	0.97	03/10/15 23:17	
ASTM D2974-87	Percent Moisture	21.6	%	0.10	03/11/15 10:17	
92240289024	**SB-25**					
EPA 6010	Barium	157	mg/kg	0.45	03/10/15 23:20	
EPA 6010	Cadmium	0.098	mg/kg	0.090	03/10/15 23:20	
EPA 6010	Chromium	50.2	mg/kg	0.45	03/10/15 23:20	
EPA 6010	Lead	3.1	mg/kg	0.45	03/10/15 23:20	
EPA 6010	Selenium	1.2	mg/kg	0.90	03/10/15 23:20	
EPA 6010	Silver	1.1	mg/kg	0.45	03/10/15 23:20	
ASTM D2974-87	Percent Moisture	24.3	%	0.10	03/11/15 10:17	
92240289025	**SB-25A**					
EPA 6010	Barium	504	mg/kg	0.63	03/10/15 23:23	
EPA 6010	Cadmium	0.096J	mg/kg	0.13	03/10/15 23:23	
EPA 6010	Chromium	48.2	mg/kg	0.63	03/10/15 23:23	
EPA 6010	Lead	6.2	mg/kg	0.63	03/10/15 23:23	
EPA 6010	Selenium	1.1J	mg/kg	1.3	03/10/15 23:23	
ASTM D2974-87	Percent Moisture	29.3	%	0.10	03/11/15 10:17	
92240289026	**SB-26**					
EPA 6010	Barium	129	mg/kg	0.57	03/10/15 23:26	
EPA 6010	Cadmium	0.16	mg/kg	0.11	03/10/15 23:26	
EPA 6010	Chromium	75.8	mg/kg	0.57	03/10/15 23:26	
EPA 6010	Lead	10.8	mg/kg	0.57	03/10/15 23:26	
EPA 6010	Selenium	1.5	mg/kg	1.1	03/10/15 23:26	
EPA 6010	Silver	0.58	mg/kg	0.57	03/10/15 23:26	
ASTM D2974-87	Percent Moisture	29.5	%	0.10	03/11/15 10:18	
92240289027	**SB-26A**					
EPA 6010	Barium	157	mg/kg	0.61	03/10/15 23:29	
EPA 6010	Cadmium	0.10J	mg/kg	0.12	03/10/15 23:29	
EPA 6010	Chromium	36.9	mg/kg	0.61	03/10/15 23:29	
EPA 6010	Lead	2.2	mg/kg	0.61	03/10/15 23:29	
EPA 6010	Selenium	1.3	mg/kg	1.2	03/10/15 23:29	
EPA 6010	Silver	0.70	mg/kg	0.61	03/10/15 23:29	
ASTM D2974-87	Percent Moisture	27.3	%	0.10	03/11/15 10:18	
92240289028	**SB-33**					
EPA 6010	Barium	150	mg/kg	0.50	03/10/15 23:35	
EPA 6010	Cadmium	0.12	mg/kg	0.099	03/10/15 23:35	

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SUMMARY OF DETECTION

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92240289028	**SB-33**					
EPA 6010	Chromium	64.1	mg/kg	0.50	03/10/15 23:35	
EPA 6010	Lead	1.9	mg/kg	0.50	03/10/15 23:35	
EPA 6010	Selenium	1.3	mg/kg	0.99	03/10/15 23:35	
EPA 6010	Silver	0.45J	mg/kg	0.50	03/10/15 23:35	
EPA 7471	Mercury	0.0096	mg/kg	0.0054	03/12/15 13:41	
ASTM D2974-87	Percent Moisture	24.8	%	0.10	03/11/15 10:18	
92240289029	**SB-34**					
EPA 6010	Barium	87.5	mg/kg	0.53	03/10/15 23:38	
EPA 6010	Chromium	2.2	mg/kg	0.53	03/10/15 23:38	
EPA 6010	Lead	2.0	mg/kg	0.53	03/10/15 23:38	
EPA 6010	Selenium	0.84J	mg/kg	1.1	03/10/15 23:38	
EPA 6010	Silver	0.59	mg/kg	0.53	03/10/15 23:38	
EPA 7471	Mercury	0.0017J	mg/kg	0.0041	03/12/15 13:44	
ASTM D2974-87	Percent Moisture	10	%	0.10	03/11/15 10:19	
92240289030	**SB-31**					
EPA 8260	Ethylbenzene	879	ug/kg	291	03/11/15 15:56	
EPA 8260	Naphthalene	6180	ug/kg	291	03/11/15 15:56	
EPA 8260	Xylene (Total)	1110	ug/kg	583	03/11/15 15:56	
EPA 8260	m&p-Xylene	1110	ug/kg	583	03/11/15 15:56	
EPA 8260	o-Xylene	126J	ug/kg	291	03/11/15 15:56	
ASTM D2974-87	Percent Moisture	19.2	%	0.10	03/10/15 19:28	
92240289031	**SB-32**					
EPA 8260	Ethylbenzene	3120	ug/kg	126	03/11/15 16:16	
EPA 8260	Naphthalene	7640	ug/kg	504	03/12/15 14:16	
EPA 8260	Xylene (Total)	4420	ug/kg	252	03/11/15 16:16	
EPA 8260	m&p-Xylene	4420	ug/kg	252	03/11/15 16:16	
EPA 8260	o-Xylene	116J	ug/kg	126	03/11/15 16:16	
ASTM D2974-87	Percent Moisture	15.8	%	0.10	03/10/15 19:29	
92240289032	**SB-38**					
EPA 8260	Naphthalene	2.4J	ug/kg	3.4	03/11/15 16:36	
ASTM D2974-87	Percent Moisture	17.0	%	0.10	03/10/15 19:29	
92240289033	**SB-39**					
ASTM D2974-87	Percent Moisture	18.4	%	0.10	03/10/15 19:29	
92240289034	**SB-40**					
ASTM D2974-87	Percent Moisture	13.1	%	0.10	03/10/15 19:29	
92240289035	**MW-6**					
EPA 8260	Methyl-tert-butyl ether	1.3	ug/L	1.0	03/11/15 21:06	
92240289036	**TW-1**					
EPA 8260	Benzene	6480	ug/L	100	03/12/15 14:53	
EPA 8260	Ethylbenzene	702	ug/L	100	03/12/15 14:53	
EPA 8260	Methyl-tert-butyl ether	2820	ug/L	100	03/12/15 14:53	
EPA 8260	Naphthalene	111	ug/L	1.0	03/11/15 21:23	

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SUMMARY OF DETECTION

Project: US Hwy 21/SC51 - 20120285.A12

Pace Project No.: 92240289

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92240289036	**TW-1**					
EPA 8260	Toluene	1120	ug/L	100	03/12/15 14:53	
EPA 8260	Xylene (Total)	536	ug/L	2.0	03/11/15 21:23	
EPA 8260	m&p-Xylene	383	ug/L	2.0	03/11/15 21:23	
EPA 8260	o-Xylene	153	ug/L	1.0	03/11/15 21:23	
92240289037	**TW-2**					
EPA 8260	Benzene	13.5	ug/L	1.0	03/12/15 20:14	
EPA 8260	Ethylbenzene	7.8	ug/L	1.0	03/12/15 20:14	
EPA 8260	Methyl-tert-butyl ether	59.5	ug/L	1.0	03/12/15 20:14	
EPA 8260	Naphthalene	2.8	ug/L	1.0	03/12/15 20:14	
EPA 8260	Toluene	0.95J	ug/L	1.0	03/12/15 20:14	
EPA 8260	Xylene (Total)	16.4	ug/L	2.0	03/12/15 20:14	
EPA 8260	m&p-Xylene	15.1	ug/L	2.0	03/12/15 20:14	
EPA 8260	o-Xylene	1.3	ug/L	1.0	03/12/15 20:14	
92240289038	**TW-3**					
EPA 8270	Benzo(a)anthracene	2.5J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Benzo(a)pyrene	1.5J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Benzo(b)fluoranthene	1.9J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Benzo(g,h,i)perylene	1.5J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Benzo(k)fluoranthene	1.9J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Butylbenzylphthalate	2.5J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Chrysene	3.0J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Dibenz(a,h)anthracene	1.2J	ug/L	10.0	03/13/15 11:39	
EPA 8270	3,3'-Dichlorobenzidine	2.3J	ug/L	50.0	03/13/15 11:39	
EPA 8270	Di-n-octylphthalate	1.4J	ug/L	10.0	03/13/15 11:39	
EPA 8270	bis(2-Ethylhexyl)phthalate	2.0J	ug/L	6.0	03/13/15 11:39	
EPA 8270	Fluoranthene	4.1J	ug/L	10.0	03/13/15 11:39	
EPA 8270	Indeno(1,2,3-cd)pyrene	1.3J	ug/L	10.0	03/13/15 11:39	
EPA 8270	4-Nitroaniline	3.2J	ug/L	50.0	03/13/15 11:39	
EPA 8270	4-Nitrophenol	8.8J	ug/L	50.0	03/13/15 11:39	
EPA 8270	Pentachlorophenol	2.9J	ug/L	50.0	03/13/15 11:39	
EPA 8270	Pyrene	3.8J	ug/L	10.0	03/13/15 11:39	
EPA 8260	Benzene	0.74J	ug/L	1.0	03/11/15 21:57	
EPA 8260	Diisopropyl ether	0.17J	ug/L	1.0	03/11/15 21:57	
EPA 8260	Ethylbenzene	0.43J	ug/L	1.0	03/11/15 21:57	
EPA 8260	Methyl-tert-butyl ether	0.41J	ug/L	1.0	03/11/15 21:57	
EPA 8260	Toluene	0.44J	ug/L	1.0	03/11/15 21:57	
92240289039	**TW-4**					
EPA 8260	Benzene	0.41J	ug/L	1.0	03/11/15 22:14	
EPA 8260	Toluene	0.27J	ug/L	1.0	03/11/15 22:14	
92240289040	**TW-5**					
EPA 6010	Arsenic	31.3	ug/L	10.0	03/11/15 03:00	
EPA 6010	Barium	5120	ug/L	5.0	03/11/15 03:00	
EPA 6010	Cadmium	4.1	ug/L	1.0	03/11/15 03:00	
EPA 6010	Chromium	684	ug/L	5.0	03/11/15 03:00	
EPA 6010	Lead	789	ug/L	5.0	03/11/15 03:00	

REPORT OF LABORATORY ANALYSIS

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SUMMARY OF DETECTION

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92240289040	**TW-5**					
EPA 6010	Selenium	17.2	ug/L	10.0	03/11/15 03:00	M1
EPA 7470	Mercury	0.64	ug/L	0.20	03/11/15 13:25	
92240289041	**TW-6**					
EPA 6010	Barium	16700	ug/L	50.0	03/11/15 16:06	
EPA 6010	Cadmium	3.3	ug/L	1.0	03/11/15 03:18	
EPA 6010	Chromium	2900	ug/L	5.0	03/11/15 03:18	
EPA 6010	Lead	215	ug/L	5.0	03/11/15 03:18	
EPA 6010	Selenium	30.2	ug/L	10.0	03/11/15 03:18	
EPA 6010	Silver	6.5	ug/L	5.0	03/11/15 03:18	
EPA 7470	Mercury	0.46	ug/L	0.20	03/14/15 13:44	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12

Pace Project No.: 92240289

Sample: SB-1 **Lab ID: 92240289001** Collected: 03/03/15 10:40 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	3.1	1.0	1		03/10/15 18:10	71-43-2	
Ethylbenzene	ND	ug/kg	3.1	1.1	1		03/10/15 18:10	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	3.1	0.94	1		03/10/15 18:10	1634-04-4	
Naphthalene	ND	ug/kg	3.1	0.75	1		03/10/15 18:10	91-20-3	
Toluene	ND	ug/kg	3.1	1.1	1		03/10/15 18:10	108-88-3	
Xylene (Total)	ND	ug/kg	6.3	2.3	1		03/10/15 18:10	1330-20-7	
m&p-Xylene	ND	ug/kg	6.3	2.3	1		03/10/15 18:10	179601-23-1	
o-Xylene	ND	ug/kg	3.1	1.2	1		03/10/15 18:10	95-47-6	
Surrogates									
Toluene-d8 (S)	103	%	70-130		1		03/10/15 18:10	2037-26-5	
4-Bromofluorobenzene (S)	104	%	70-130		1		03/10/15 18:10	460-00-4	
1,2-Dichloroethane-d4 (S)	115	%	70-130		1		03/10/15 18:10	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**19.9**	%	0.10	0.10	1		03/10/15 16:22		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-2 **Lab ID: 92240289002** Collected: 03/03/15 11:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.8	0.89	1		03/10/15 18:30	71-43-2	
Ethylbenzene	ND	ug/kg	2.8	1.0	1		03/10/15 18:30	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.8	0.84	1		03/10/15 18:30	1634-04-4	
Naphthalene	ND	ug/kg	2.8	0.67	1		03/10/15 18:30	91-20-3	
Toluene	ND	ug/kg	2.8	1.0	1		03/10/15 18:30	108-88-3	
Xylene (Total)	ND	ug/kg	5.6	2.0	1		03/10/15 18:30	1330-20-7	
m&p-Xylene	ND	ug/kg	5.6	2.0	1		03/10/15 18:30	179601-23-1	
o-Xylene	ND	ug/kg	2.8	1.1	1		03/10/15 18:30	95-47-6	
Surrogates									
Toluene-d8 (S)	104	%	70-130		1		03/10/15 18:30	2037-26-5	
4-Bromofluorobenzene (S)	104	%	70-130		1		03/10/15 18:30	460-00-4	
1,2-Dichloroethane-d4 (S)	115	%	70-130		1		03/10/15 18:30	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**10.2**	%	0.10	0.10	1		03/10/15 16:22		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-3 **Lab ID: 92240289003** Collected: 03/03/15 11:15 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	3.0	0.97	1		03/10/15 18:50	71-43-2	
Ethylbenzene	ND	ug/kg	3.0	1.1	1		03/10/15 18:50	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	3.0	0.91	1		03/10/15 18:50	1634-04-4	
Naphthalene	ND	ug/kg	3.0	0.73	1		03/10/15 18:50	91-20-3	
Toluene	ND	ug/kg	3.0	1.1	1		03/10/15 18:50	108-88-3	
Xylene (Total)	ND	ug/kg	6.1	2.2	1		03/10/15 18:50	1330-20-7	
m&p-Xylene	ND	ug/kg	6.1	2.2	1		03/10/15 18:50	179601-23-1	
o-Xylene	ND	ug/kg	3.0	1.1	1		03/10/15 18:50	95-47-6	
Surrogates									
Toluene-d8 (S)	104	%	70-130		1		03/10/15 18:50	2037-26-5	
4-Bromofluorobenzene (S)	103	%	70-130		1		03/10/15 18:50	460-00-4	
1,2-Dichloroethane-d4 (S)	119	%	70-130		1		03/10/15 18:50	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.8**	%	0.10	0.10	1		03/10/15 16:26		

ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-4 **Lab ID: 92240289004** Collected: 03/03/15 11:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.9	0.94	1		03/10/15 19:10	71-43-2	
Ethylbenzene	ND	ug/kg	2.9	1.1	1		03/10/15 19:10	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.9	0.88	1		03/10/15 19:10	1634-04-4	
Naphthalene	ND	ug/kg	2.9	0.70	1		03/10/15 19:10	91-20-3	
Toluene	ND	ug/kg	2.9	1.1	1		03/10/15 19:10	108-88-3	
Xylene (Total)	ND	ug/kg	5.9	2.1	1		03/10/15 19:10	1330-20-7	
m&p-Xylene	ND	ug/kg	5.9	2.1	1		03/10/15 19:10	179601-23-1	
o-Xylene	ND	ug/kg	2.9	1.1	1		03/10/15 19:10	95-47-6	
Surrogates									
Toluene-d8 (S)	103	%	70-130		1		03/10/15 19:10	2037-26-5	
4-Bromofluorobenzene (S)	100	%	70-130		1		03/10/15 19:10	460-00-4	
1,2-Dichloroethane-d4 (S)	120	%	70-130		1		03/10/15 19:10	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**14.2**	%	0.10	0.10	1		03/10/15 16:26		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-5 **Lab ID: 92240289005** Collected: 03/03/15 12:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.6	0.82	1		03/10/15 19:30	71-43-2	
Ethylbenzene	ND	ug/kg	2.6	0.92	1		03/10/15 19:30	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.6	0.77	1		03/10/15 19:30	1634-04-4	
Naphthalene	ND	ug/kg	2.6	0.62	1		03/10/15 19:30	91-20-3	
Toluene	ND	ug/kg	2.6	0.92	1		03/10/15 19:30	108-88-3	
Xylene (Total)	ND	ug/kg	5.1	1.8	1		03/10/15 19:30	1330-20-7	
m&p-Xylene	ND	ug/kg	5.1	1.8	1		03/10/15 19:30	179601-23-1	
o-Xylene	ND	ug/kg	2.6	0.97	1		03/10/15 19:30	95-47-6	
Surrogates									
Toluene-d8 (S)	105	%	70-130		1		03/10/15 19:30	2037-26-5	
4-Bromofluorobenzene (S)	105	%	70-130		1		03/10/15 19:30	460-00-4	
1,2-Dichloroethane-d4 (S)	120	%	70-130		1		03/10/15 19:30	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**11.4**	%	0.10	0.10	1		03/10/15 16:26		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-6 **Lab ID: 92240289006** Collected: 03/03/15 12:20 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	3.6	1.2	1		03/10/15 19:49	71-43-2	
Ethylbenzene	ND	ug/kg	3.6	1.3	1		03/10/15 19:49	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	3.6	1.1	1		03/10/15 19:49	1634-04-4	
Naphthalene	ND	ug/kg	3.6	0.87	1		03/10/15 19:49	91-20-3	
Toluene	ND	ug/kg	3.6	1.3	1		03/10/15 19:49	108-88-3	
Xylene (Total)	ND	ug/kg	7.3	2.6	1		03/10/15 19:49	1330-20-7	
m&p-Xylene	ND	ug/kg	7.3	2.6	1		03/10/15 19:49	179601-23-1	
o-Xylene	ND	ug/kg	3.6	1.4	1		03/10/15 19:49	95-47-6	
Surrogates									
Toluene-d8 (S)	106	%	70-130		1		03/10/15 19:49	2037-26-5	
4-Bromofluorobenzene (S)	102	%	70-130		1		03/10/15 19:49	460-00-4	
1,2-Dichloroethane-d4 (S)	122	%	70-130		1		03/10/15 19:49	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**15.0**	%	0.10	0.10	1		03/10/15 16:27		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-7 **Lab ID: 92240289007** Collected: 03/03/15 12:05 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.1	0.69	1		03/10/15 20:09	71-43-2	
Ethylbenzene	ND	ug/kg	2.1	0.77	1		03/10/15 20:09	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.1	0.64	1		03/10/15 20:09	1634-04-4	
Naphthalene	ND	ug/kg	2.1	0.51	1		03/10/15 20:09	91-20-3	
Toluene	ND	ug/kg	2.1	0.77	1		03/10/15 20:09	108-88-3	
Xylene (Total)	ND	ug/kg	4.3	1.5	1		03/10/15 20:09	1330-20-7	
m&p-Xylene	ND	ug/kg	4.3	1.5	1		03/10/15 20:09	179601-23-1	
o-Xylene	ND	ug/kg	2.1	0.81	1		03/10/15 20:09	95-47-6	
Surrogates									
Toluene-d8 (S)	102	%	70-130		1		03/10/15 20:09	2037-26-5	
4-Bromofluorobenzene (S)	103	%	70-130		1		03/10/15 20:09	460-00-4	
1,2-Dichloroethane-d4 (S)	125	%	70-130		1		03/10/15 20:09	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.7**	%	0.10	0.10	1		03/10/15 16:27		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-8 **Lab ID: 92240289008** Collected: 03/03/15 13:05 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	72.0	23.0	25		03/10/15 20:29	71-43-2	
Ethylbenzene	**44.7J**	ug/kg	72.0	25.9	25		03/10/15 20:29	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	72.0	21.6	25		03/10/15 20:29	1634-04-4	
Naphthalene	**57.3J**	ug/kg	72.0	17.3	25		03/10/15 20:29	91-20-3	
Toluene	ND	ug/kg	72.0	25.9	25		03/10/15 20:29	108-88-3	
Xylene (Total)	ND	ug/kg	144	51.9	25		03/10/15 20:29	1330-20-7	
m&p-Xylene	ND	ug/kg	144	51.9	25		03/10/15 20:29	179601-23-1	
o-Xylene	ND	ug/kg	72.0	27.4	25		03/10/15 20:29	95-47-6	
Surrogates									
Toluene-d8 (S)	104	%	70-130		25		03/10/15 20:29	2037-26-5	D3
4-Bromofluorobenzene (S)	99	%	70-130		25		03/10/15 20:29	460-00-4	
1,2-Dichloroethane-d4 (S)	101	%	70-130		25		03/10/15 20:29	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**7.4**	%	0.10	0.10	1		03/10/15 16:27		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-9 **Lab ID: 92240289009** Collected: 03/03/15 14:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	**580**	ug/kg	69.2	22.2	25		03/10/15 20:49	71-43-2	
Ethylbenzene	**29500**	ug/kg	3460	1250	1250		03/11/15 13:17	100-41-4	
Methyl-tert-butyl ether	**68.0J**	ug/kg	69.2	20.8	25		03/10/15 20:49	1634-04-4	B
Naphthalene	**12700**	ug/kg	3460	831	1250		03/11/15 13:17	91-20-3	
Toluene	**426**	ug/kg	69.2	24.9	25		03/10/15 20:49	108-88-3	
Xylene (Total)	**138000**	ug/kg	6920	2490	1250		03/11/15 13:17	1330-20-7	
m&p-Xylene	**106000**	ug/kg	6920	2490	1250		03/11/15 13:17	179601-23-1	
o-Xylene	**32200**	ug/kg	3460	1320	1250		03/11/15 13:17	95-47-6	
Surrogates									
Toluene-d8 (S)	76	%	70-130		25		03/10/15 20:49	2037-26-5	
4-Bromofluorobenzene (S)	116	%	70-130		25		03/10/15 20:49	460-00-4	
1,2-Dichloroethane-d4 (S)	326	%	70-130		25		03/10/15 20:49	17060-07-0	S1
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**7.8**	%	0.10	0.10	1		03/10/15 16:27		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-10 **Lab ID: 92240289010** Collected: 03/03/15 14:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.6	0.82	1		03/11/15 14:56	71-43-2	
Ethylbenzene	ND	ug/kg	2.6	0.92	1		03/11/15 14:56	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.6	0.77	1		03/11/15 14:56	1634-04-4	
Naphthalene	ND	ug/kg	2.6	0.62	1		03/11/15 14:56	91-20-3	
Toluene	ND	ug/kg	2.6	0.92	1		03/11/15 14:56	108-88-3	
Xylene (Total)	ND	ug/kg	5.1	1.8	1		03/11/15 14:56	1330-20-7	
m&p-Xylene	ND	ug/kg	5.1	1.8	1		03/11/15 14:56	179601-23-1	
o-Xylene	ND	ug/kg	2.6	0.97	1		03/11/15 14:56	95-47-6	
Surrogates									
Toluene-d8 (S)	104	%	70-130		1		03/11/15 14:56	2037-26-5	
4-Bromofluorobenzene (S)	103	%	70-130		1		03/11/15 14:56	460-00-4	
1,2-Dichloroethane-d4 (S)	120	%	70-130		1		03/11/15 14:56	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.2**	%	0.10	0.10	1		03/10/15 16:27		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-11 **Lab ID: 92240289011** Collected: 03/04/15 08:45 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.8	0.88	1		03/10/15 21:29	71-43-2	
Ethylbenzene	ND	ug/kg	2.8	0.99	1		03/10/15 21:29	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.8	0.83	1		03/10/15 21:29	1634-04-4	
Naphthalene	**0.99J**	ug/kg	2.8	0.66	1		03/10/15 21:29	91-20-3	
Toluene	ND	ug/kg	2.8	0.99	1		03/10/15 21:29	108-88-3	
Xylene (Total)	ND	ug/kg	5.5	2.0	1		03/10/15 21:29	1330-20-7	
m&p-Xylene	ND	ug/kg	5.5	2.0	1		03/10/15 21:29	179601-23-1	
o-Xylene	ND	ug/kg	2.8	1.0	1		03/10/15 21:29	95-47-6	
Surrogates									
Toluene-d8 (S)	103	%	70-130		1		03/10/15 21:29	2037-26-5	
4-Bromofluorobenzene (S)	101	%	70-130		1		03/10/15 21:29	460-00-4	
1,2-Dichloroethane-d4 (S)	109	%	70-130		1		03/10/15 21:29	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.6**	%	0.10	0.10	1		03/10/15 16:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-12 **Lab ID: 92240289012** Collected: 03/04/15 09:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.4	0.78	1		03/10/15 21:49	71-43-2	
Ethylbenzene	ND	ug/kg	2.4	0.88	1		03/10/15 21:49	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.4	0.73	1		03/10/15 21:49	1634-04-4	
Naphthalene	ND	ug/kg	2.4	0.58	1		03/10/15 21:49	91-20-3	
Toluene	ND	ug/kg	2.4	0.88	1		03/10/15 21:49	108-88-3	
Xylene (Total)	ND	ug/kg	4.9	1.8	1		03/10/15 21:49	1330-20-7	
m&p-Xylene	ND	ug/kg	4.9	1.8	1		03/10/15 21:49	179601-23-1	
o-Xylene	ND	ug/kg	2.4	0.93	1		03/10/15 21:49	95-47-6	
Surrogates									
Toluene-d8 (S)	106	%	70-130		1		03/10/15 21:49	2037-26-5	
4-Bromofluorobenzene (S)	101	%	70-130		1		03/10/15 21:49	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	70-130		1		03/10/15 21:49	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**28.8**	%	0.10	0.10	1		03/10/15 16:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12

Pace Project No.: 92240289

Sample: SB-13 **Lab ID: 92240289013** Collected: 03/04/15 09:50 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.5	0.79	1		03/10/15 22:08	71-43-2	
Ethylbenzene	ND	ug/kg	2.5	0.89	1		03/10/15 22:08	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.5	0.74	1		03/10/15 22:08	1634-04-4	
Naphthalene	ND	ug/kg	2.5	0.59	1		03/10/15 22:08	91-20-3	
Toluene	ND	ug/kg	2.5	0.89	1		03/10/15 22:08	108-88-3	
Xylene (Total)	ND	ug/kg	5.0	1.8	1		03/10/15 22:08	1330-20-7	
m&p-Xylene	ND	ug/kg	5.0	1.8	1		03/10/15 22:08	179601-23-1	
o-Xylene	ND	ug/kg	2.5	0.94	1		03/10/15 22:08	95-47-6	
Surrogates									
Toluene-d8 (S)	104	%	70-130		1		03/10/15 22:08	2037-26-5	
4-Bromofluorobenzene (S)	101	%	70-130		1		03/10/15 22:08	460-00-4	
1,2-Dichloroethane-d4 (S)	107	%	70-130		1		03/10/15 22:08	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**19.7**	%	0.10	0.10	1		03/10/15 16:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-14 **Lab ID: 92240289014** Collected: 03/04/15 10:20 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	3.1	0.99	1		03/10/15 22:28	71-43-2	
Ethylbenzene	ND	ug/kg	3.1	1.1	1		03/10/15 22:28	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	3.1	0.93	1		03/10/15 22:28	1634-04-4	
Naphthalene	ND	ug/kg	3.1	0.75	1		03/10/15 22:28	91-20-3	
Toluene	ND	ug/kg	3.1	1.1	1		03/10/15 22:28	108-88-3	
Xylene (Total)	ND	ug/kg	6.2	2.2	1		03/10/15 22:28	1330-20-7	
m&p-Xylene	ND	ug/kg	6.2	2.2	1		03/10/15 22:28	179601-23-1	
o-Xylene	ND	ug/kg	3.1	1.2	1		03/10/15 22:28	95-47-6	
Surrogates									
Toluene-d8 (S)	108	%	70-130		1		03/10/15 22:28	2037-26-5	
4-Bromofluorobenzene (S)	103	%	70-130		1		03/10/15 22:28	460-00-4	
1,2-Dichloroethane-d4 (S)	110	%	70-130		1		03/10/15 22:28	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**26.4**	%	0.10	0.10	1		03/10/15 19:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-15 **Lab ID: 92240289015** Collected: 03/04/15 10:35 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.9	0.94	1		03/11/15 15:16	71-43-2	
Ethylbenzene	ND	ug/kg	2.9	1.1	1		03/11/15 15:16	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.9	0.88	1		03/11/15 15:16	1634-04-4	
Naphthalene	ND	ug/kg	2.9	0.70	1		03/11/15 15:16	91-20-3	
Toluene	ND	ug/kg	2.9	1.1	1		03/11/15 15:16	108-88-3	
Xylene (Total)	ND	ug/kg	5.9	2.1	1		03/11/15 15:16	1330-20-7	
m&p-Xylene	ND	ug/kg	5.9	2.1	1		03/11/15 15:16	179601-23-1	
o-Xylene	ND	ug/kg	2.9	1.1	1		03/11/15 15:16	95-47-6	
Surrogates									
Toluene-d8 (S)	105	%	70-130		1		03/11/15 15:16	2037-26-5	
4-Bromofluorobenzene (S)	106	%	70-130		1		03/11/15 15:16	460-00-4	
1,2-Dichloroethane-d4 (S)	119	%	70-130		1		03/11/15 15:16	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**26.2**	%	0.10	0.10	1		03/10/15 19:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-16 **Lab ID: 92240289016** Collected: 03/04/15 10:50 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	**11.4**	ug/kg	3.7	1.2	1		03/10/15 16:13	71-43-2	
Ethylbenzene	ND	ug/kg	3.7	1.3	1		03/10/15 16:13	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	3.7	1.1	1		03/10/15 16:13	1634-04-4	
Naphthalene	ND	ug/kg	3.7	0.89	1		03/10/15 16:13	91-20-3	
Toluene	ND	ug/kg	3.7	1.3	1		03/10/15 16:13	108-88-3	
Xylene (Total)	ND	ug/kg	7.4	2.7	1		03/10/15 16:13	1330-20-7	
m&p-Xylene	ND	ug/kg	7.4	2.7	1		03/10/15 16:13	179601-23-1	
o-Xylene	ND	ug/kg	3.7	1.4	1		03/10/15 16:13	95-47-6	
Surrogates									
Toluene-d8 (S)	109	%	70-130		1		03/10/15 16:13	2037-26-5	
4-Bromofluorobenzene (S)	97	%	70-130		1		03/10/15 16:13	460-00-4	
1,2-Dichloroethane-d4 (S)	115	%	70-130		1		03/10/15 16:13	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**22.8**	%	0.10	0.10	1		03/10/15 19:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-18 **Lab ID: 92240289017** Collected: 03/04/15 13:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV MW PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	13.9	2.1	1	03/16/15 08:55	03/16/15 13:01	83-32-9	
Acenaphthylene	ND	ug/kg	13.9	1.8	1	03/16/15 08:55	03/16/15 13:01	208-96-8	
Anthracene	ND	ug/kg	13.9	1.9	1	03/16/15 08:55	03/16/15 13:01	120-12-7	
Benzo(a)anthracene	ND	ug/kg	13.9	0.99	1	03/16/15 08:55	03/16/15 13:01	56-55-3	
Benzo(a)pyrene	ND	ug/kg	13.9	1.5	1	03/16/15 08:55	03/16/15 13:01	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	13.9	0.93	1	03/16/15 08:55	03/16/15 13:01	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	13.9	3.6	1	03/16/15 08:55	03/16/15 13:01	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	13.9	2.1	1	03/16/15 08:55	03/16/15 13:01	207-08-9	
Chrysene	ND	ug/kg	13.9	2.5	1	03/16/15 08:55	03/16/15 13:01	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	13.9	2.5	1	03/16/15 08:55	03/16/15 13:01	53-70-3	
Fluoranthene	ND	ug/kg	13.9	1.2	1	03/16/15 08:55	03/16/15 13:01	206-44-0	
Fluorene	ND	ug/kg	13.9	2.2	1	03/16/15 08:55	03/16/15 13:01	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	13.9	3.9	1	03/16/15 08:55	03/16/15 13:01	193-39-5	
1-Methylnaphthalene	ND	ug/kg	13.9	1.7	1	03/16/15 08:55	03/16/15 13:01	90-12-0	
2-Methylnaphthalene	ND	ug/kg	13.9	1.5	1	03/16/15 08:55	03/16/15 13:01	91-57-6	
Naphthalene	ND	ug/kg	13.9	3.2	1	03/16/15 08:55	03/16/15 13:01	91-20-3	
Phenanthrene	ND	ug/kg	13.9	2.1	1	03/16/15 08:55	03/16/15 13:01	85-01-8	
Pyrene	ND	ug/kg	13.9	2.5	1	03/16/15 08:55	03/16/15 13:01	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	51	%	10-128		1	03/16/15 08:55	03/16/15 13:01	4165-60-0	
2-Fluorobiphenyl (S)	45	%	10-110		1	03/16/15 08:55	03/16/15 13:01	321-60-8	
Terphenyl-d14 (S)	53	%	39-119		1	03/16/15 08:55	03/16/15 13:01	1718-51-0	
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	458	106	1	03/10/15 13:35	03/11/15 16:42	83-32-9	
Acenaphthylene	ND	ug/kg	458	108	1	03/10/15 13:35	03/11/15 16:42	208-96-8	
Aniline	ND	ug/kg	458	124	1	03/10/15 13:35	03/11/15 16:42	62-53-3	
Anthracene	ND	ug/kg	458	103	1	03/10/15 13:35	03/11/15 16:42	120-12-7	
Benzo(a)anthracene	ND	ug/kg	458	84.7	1	03/10/15 13:35	03/11/15 16:42	56-55-3	
Benzo(a)pyrene	ND	ug/kg	458	87.5	1	03/10/15 13:35	03/11/15 16:42	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	458	79.2	1	03/10/15 13:35	03/11/15 16:42	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	458	117	1	03/10/15 13:35	03/11/15 16:42	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	458	90.3	1	03/10/15 13:35	03/11/15 16:42	207-08-9	
Benzoic Acid	ND	ug/kg	2290	83.3	1	03/10/15 13:35	03/11/15 16:42	65-85-0	
Benzyl alcohol	ND	ug/kg	917	91.7	1	03/10/15 13:35	03/11/15 16:42	100-51-6	
4-Bromophenylphenyl ether	ND	ug/kg	458	83.3	1	03/10/15 13:35	03/11/15 16:42	101-55-3	
Butylbenzylphthalate	ND	ug/kg	458	97.2	1	03/10/15 13:35	03/11/15 16:42	85-68-7	
4-Chloro-3-methylphenol	ND	ug/kg	917	94.4	1	03/10/15 13:35	03/11/15 16:42	59-50-7	
4-Chloroaniline	ND	ug/kg	2290	128	1	03/10/15 13:35	03/11/15 16:42	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/kg	458	107	1	03/10/15 13:35	03/11/15 16:42	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/kg	458	117	1	03/10/15 13:35	03/11/15 16:42	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/kg	458	122	1	03/10/15 13:35	03/11/15 16:42	108-60-1	
2-Chloronaphthalene	ND	ug/kg	458	90.3	1	03/10/15 13:35	03/11/15 16:42	91-58-7	
2-Chlorophenol	ND	ug/kg	458	125	1	03/10/15 13:35	03/11/15 16:42	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/kg	458	94.4	1	03/10/15 13:35	03/11/15 16:42	7005-72-3	

REPORT OF LABORATORY ANALYSIS

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Huntersville, NC 28078
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-18 **Lab ID: 92240289017** Collected: 03/04/15 13:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Chrysene	ND	ug/kg	458	61.1	1	03/10/15 13:35	03/11/15 16:42	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	458	97.2	1	03/10/15 13:35	03/11/15 16:42	53-70-3	
Dibenzofuran	ND	ug/kg	458	75.0	1	03/10/15 13:35	03/11/15 16:42	132-64-9	
1,2-Dichlorobenzene	ND	ug/kg	458	122	1	03/10/15 13:35	03/11/15 16:42	95-50-1	
1,3-Dichlorobenzene	ND	ug/kg	458	104	1	03/10/15 13:35	03/11/15 16:42	541-73-1	
1,4-Dichlorobenzene	ND	ug/kg	458	129	1	03/10/15 13:35	03/11/15 16:42	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/kg	2290	100	1	03/10/15 13:35	03/11/15 16:42	91-94-1	
2,4-Dichlorophenol	ND	ug/kg	458	100	1	03/10/15 13:35	03/11/15 16:42	120-83-2	
Diethylphthalate	ND	ug/kg	458	70.8	1	03/10/15 13:35	03/11/15 16:42	84-66-2	
2,4-Dimethylphenol	ND	ug/kg	458	181	1	03/10/15 13:35	03/11/15 16:42	105-67-9	
Dimethylphthalate	ND	ug/kg	458	93.0	1	03/10/15 13:35	03/11/15 16:42	131-11-3	
Di-n-butylphthalate	ND	ug/kg	458	75.0	1	03/10/15 13:35	03/11/15 16:42	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/kg	917	91.7	1	03/10/15 13:35	03/11/15 16:42	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	2290	75.0	1	03/10/15 13:35	03/11/15 16:42	51-28-5	
2,4-Dinitrotoluene	ND	ug/kg	458	86.1	1	03/10/15 13:35	03/11/15 16:42	121-14-2	
2,6-Dinitrotoluene	ND	ug/kg	458	95.8	1	03/10/15 13:35	03/11/15 16:42	606-20-2	
Di-n-octylphthalate	ND	ug/kg	458	95.8	1	03/10/15 13:35	03/11/15 16:42	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/kg	458	125	1	03/10/15 13:35	03/11/15 16:42	117-81-7	
Fluoranthene	ND	ug/kg	458	66.7	1	03/10/15 13:35	03/11/15 16:42	206-44-0	
Fluorene	ND	ug/kg	458	94.4	1	03/10/15 13:35	03/11/15 16:42	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/kg	458	79.2	1	03/10/15 13:35	03/11/15 16:42	87-68-3	
Hexachlorobenzene	ND	ug/kg	458	58.3	1	03/10/15 13:35	03/11/15 16:42	118-74-1	
Hexachlorocyclopentadiene	ND	ug/kg	458	84.7	1	03/10/15 13:35	03/11/15 16:42	77-47-4	
Hexachloroethane	ND	ug/kg	458	121	1	03/10/15 13:35	03/11/15 16:42	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	458	94.4	1	03/10/15 13:35	03/11/15 16:42	193-39-5	
Isophorone	ND	ug/kg	458	103	1	03/10/15 13:35	03/11/15 16:42	78-59-1	
1-Methylnaphthalene	ND	ug/kg	458	119	1	03/10/15 13:35	03/11/15 16:42	90-12-0	
2-Methylnaphthalene	ND	ug/kg	458	98.6	1	03/10/15 13:35	03/11/15 16:42	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/kg	458	139	1	03/10/15 13:35	03/11/15 16:42	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/kg	458	181	1	03/10/15 13:35	03/11/15 16:42		
Naphthalene	ND	ug/kg	458	112	1	03/10/15 13:35	03/11/15 16:42	91-20-3	
2-Nitroaniline	ND	ug/kg	2290	142	1	03/10/15 13:35	03/11/15 16:42	88-74-4	
3-Nitroaniline	ND	ug/kg	2290	125	1	03/10/15 13:35	03/11/15 16:42	99-09-2	
4-Nitroaniline	ND	ug/kg	917	129	1	03/10/15 13:35	03/11/15 16:42	100-01-6	
Nitrobenzene	ND	ug/kg	458	125	1	03/10/15 13:35	03/11/15 16:42	98-95-3	
2-Nitrophenol	ND	ug/kg	458	111	1	03/10/15 13:35	03/11/15 16:42	88-75-5	
4-Nitrophenol	ND	ug/kg	2290	81.9	1	03/10/15 13:35	03/11/15 16:42	100-02-7	
N-Nitrosodimethylamine	ND	ug/kg	458	149	1	03/10/15 13:35	03/11/15 16:42	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/kg	458	87.5	1	03/10/15 13:35	03/11/15 16:42	621-64-7	
N-Nitrosodiphenylamine	ND	ug/kg	458	136	1	03/10/15 13:35	03/11/15 16:42	86-30-6	
Pentachlorophenol	ND	ug/kg	2290	83.3	1	03/10/15 13:35	03/11/15 16:42	87-86-5	
Phenanthrene	ND	ug/kg	458	76.4	1	03/10/15 13:35	03/11/15 16:42	85-01-8	
Phenol	ND	ug/kg	458	137	1	03/10/15 13:35	03/11/15 16:42	108-95-2	
Pyrene	ND	ug/kg	458	77.8	1	03/10/15 13:35	03/11/15 16:42	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/kg	458	88.9	1	03/10/15 13:35	03/11/15 16:42	120-82-1	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-18 **Lab ID: 92240289017** Collected: 03/04/15 13:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4,5-Trichlorophenol	ND	ug/kg	458	142	1	03/10/15 13:35	03/11/15 16:42	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	458	101	1	03/10/15 13:35	03/11/15 16:42	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	58	%	23-110		1	03/10/15 13:35	03/11/15 16:42	4165-60-0	
2-Fluorobiphenyl (S)	67	%	30-110		1	03/10/15 13:35	03/11/15 16:42	321-60-8	
Terphenyl-d14 (S)	75	%	28-110		1	03/10/15 13:35	03/11/15 16:42	1718-51-0	
Phenol-d6 (S)	59	%	22-110		1	03/10/15 13:35	03/11/15 16:42	13127-88-3	
2-Fluorophenol (S)	56	%	13-110		1	03/10/15 13:35	03/11/15 16:42	367-12-4	
2,4,6-Tribromophenol (S)	62	%	27-110		1	03/10/15 13:35	03/11/15 16:42	118-79-6	
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	4.0	1.3	1		03/11/15 15:36	71-43-2	
Ethylbenzene	ND	ug/kg	4.0	1.4	1		03/11/15 15:36	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	4.0	1.2	1		03/11/15 15:36	1634-04-4	
Naphthalene	ND	ug/kg	4.0	0.96	1		03/11/15 15:36	91-20-3	
Toluene	ND	ug/kg	4.0	1.4	1		03/11/15 15:36	108-88-3	
Xylene (Total)	ND	ug/kg	8.0	2.9	1		03/11/15 15:36	1330-20-7	
m&p-Xylene	ND	ug/kg	8.0	2.9	1		03/11/15 15:36	179601-23-1	
o-Xylene	ND	ug/kg	4.0	1.5	1		03/11/15 15:36	95-47-6	
Surrogates									
Toluene-d8 (S)	103	%	70-130		1		03/11/15 15:36	2037-26-5	
4-Bromofluorobenzene (S)	104	%	70-130		1		03/11/15 15:36	460-00-4	
1,2-Dichloroethane-d4 (S)	117	%	70-130		1		03/11/15 15:36	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**28.0**	%	0.10	0.10	1		03/11/15 10:16		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-20 **Lab ID: 92240289018** Collected: 03/04/15 14:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV MW PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	10.4	1.6	1	03/11/15 10:07	03/13/15 18:54	83-32-9	
Acenaphthylene	ND	ug/kg	10.4	1.3	1	03/11/15 10:07	03/13/15 18:54	208-96-8	
Anthracene	ND	ug/kg	10.4	1.5	1	03/11/15 10:07	03/13/15 18:54	120-12-7	
Benzo(a)anthracene	ND	ug/kg	10.4	0.74	1	03/11/15 10:07	03/13/15 18:54	56-55-3	
Benzo(a)pyrene	ND	ug/kg	10.4	1.1	1	03/11/15 10:07	03/13/15 18:54	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	10.4	0.69	1	03/11/15 10:07	03/13/15 18:54	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	10.4	2.7	1	03/11/15 10:07	03/13/15 18:54	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	10.4	1.6	1	03/11/15 10:07	03/13/15 18:54	207-08-9	
Chrysene	ND	ug/kg	10.4	1.9	1	03/11/15 10:07	03/13/15 18:54	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	10.4	1.9	1	03/11/15 10:07	03/13/15 18:54	53-70-3	
Fluoranthene	ND	ug/kg	10.4	0.86	1	03/11/15 10:07	03/13/15 18:54	206-44-0	
Fluorene	ND	ug/kg	10.4	1.7	1	03/11/15 10:07	03/13/15 18:54	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	10.4	2.9	1	03/11/15 10:07	03/13/15 18:54	193-39-5	
1-Methylnaphthalene	ND	ug/kg	10.4	1.2	1	03/11/15 10:07	03/13/15 18:54	90-12-0	
2-Methylnaphthalene	ND	ug/kg	10.4	1.1	1	03/11/15 10:07	03/13/15 18:54	91-57-6	
Naphthalene	ND	ug/kg	10.4	2.4	1	03/11/15 10:07	03/13/15 18:54	91-20-3	
Phenanthrene	ND	ug/kg	10.4	1.6	1	03/11/15 10:07	03/13/15 18:54	85-01-8	
Pyrene	ND	ug/kg	10.4	1.9	1	03/11/15 10:07	03/13/15 18:54	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	57	%	10-128		1	03/11/15 10:07	03/13/15 18:54	4165-60-0	
2-Fluorobiphenyl (S)	50	%	10-110		1	03/11/15 10:07	03/13/15 18:54	321-60-8	
Terphenyl-d14 (S)	61	%	39-119		1	03/11/15 10:07	03/13/15 18:54	1718-51-0	
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	342	78.7	1	03/10/15 13:35	03/11/15 17:09	83-32-9	
Acenaphthylene	ND	ug/kg	342	80.8	1	03/10/15 13:35	03/11/15 17:09	208-96-8	
Aniline	ND	ug/kg	342	92.2	1	03/10/15 13:35	03/11/15 17:09	62-53-3	
Anthracene	ND	ug/kg	342	76.7	1	03/10/15 13:35	03/11/15 17:09	120-12-7	
Benzo(a)anthracene	ND	ug/kg	342	63.2	1	03/10/15 13:35	03/11/15 17:09	56-55-3	
Benzo(a)pyrene	ND	ug/kg	342	65.3	1	03/10/15 13:35	03/11/15 17:09	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	342	59.0	1	03/10/15 13:35	03/11/15 17:09	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	342	87.0	1	03/10/15 13:35	03/11/15 17:09	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	342	67.3	1	03/10/15 13:35	03/11/15 17:09	207-08-9	
Benzoic Acid	ND	ug/kg	1710	62.2	1	03/10/15 13:35	03/11/15 17:09	65-85-0	
Benzyl alcohol	ND	ug/kg	684	68.4	1	03/10/15 13:35	03/11/15 17:09	100-51-6	
4-Bromophenylphenyl ether	ND	ug/kg	342	62.2	1	03/10/15 13:35	03/11/15 17:09	101-55-3	
Butylbenzylphthalate	ND	ug/kg	342	72.5	1	03/10/15 13:35	03/11/15 17:09	85-68-7	
4-Chloro-3-methylphenol	ND	ug/kg	684	70.4	1	03/10/15 13:35	03/11/15 17:09	59-50-7	
4-Chloroaniline	ND	ug/kg	1710	95.3	1	03/10/15 13:35	03/11/15 17:09	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/kg	342	79.8	1	03/10/15 13:35	03/11/15 17:09	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/kg	342	87.0	1	03/10/15 13:35	03/11/15 17:09	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/kg	342	91.2	1	03/10/15 13:35	03/11/15 17:09	108-60-1	
2-Chloronaphthalene	ND	ug/kg	342	67.3	1	03/10/15 13:35	03/11/15 17:09	91-58-7	
2-Chlorophenol	ND	ug/kg	342	93.2	1	03/10/15 13:35	03/11/15 17:09	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/kg	342	70.4	1	03/10/15 13:35	03/11/15 17:09	7005-72-3	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-20 **Lab ID: 92240289018** Collected: 03/04/15 14:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Chrysene	ND	ug/kg	342	45.6	1	03/10/15 13:35	03/11/15 17:09	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	342	72.5	1	03/10/15 13:35	03/11/15 17:09	53-70-3	
Dibenzofuran	ND	ug/kg	342	55.9	1	03/10/15 13:35	03/11/15 17:09	132-64-9	
1,2-Dichlorobenzene	ND	ug/kg	342	91.2	1	03/10/15 13:35	03/11/15 17:09	95-50-1	
1,3-Dichlorobenzene	ND	ug/kg	342	77.7	1	03/10/15 13:35	03/11/15 17:09	541-73-1	
1,4-Dichlorobenzene	ND	ug/kg	342	96.3	1	03/10/15 13:35	03/11/15 17:09	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/kg	1710	74.6	1	03/10/15 13:35	03/11/15 17:09	91-94-1	
2,4-Dichlorophenol	ND	ug/kg	342	74.6	1	03/10/15 13:35	03/11/15 17:09	120-83-2	
Diethylphthalate	ND	ug/kg	342	52.8	1	03/10/15 13:35	03/11/15 17:09	84-66-2	
2,4-Dimethylphenol	ND	ug/kg	342	135	1	03/10/15 13:35	03/11/15 17:09	105-67-9	
Dimethylphthalate	ND	ug/kg	342	69.4	1	03/10/15 13:35	03/11/15 17:09	131-11-3	
Di-n-butylphthalate	ND	ug/kg	342	55.9	1	03/10/15 13:35	03/11/15 17:09	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/kg	684	68.4	1	03/10/15 13:35	03/11/15 17:09	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	1710	55.9	1	03/10/15 13:35	03/11/15 17:09	51-28-5	
2,4-Dinitrotoluene	ND	ug/kg	342	64.2	1	03/10/15 13:35	03/11/15 17:09	121-14-2	
2,6-Dinitrotoluene	ND	ug/kg	342	71.5	1	03/10/15 13:35	03/11/15 17:09	606-20-2	
Di-n-octylphthalate	ND	ug/kg	342	71.5	1	03/10/15 13:35	03/11/15 17:09	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/kg	342	93.2	1	03/10/15 13:35	03/11/15 17:09	117-81-7	
Fluoranthene	ND	ug/kg	342	49.7	1	03/10/15 13:35	03/11/15 17:09	206-44-0	
Fluorene	ND	ug/kg	342	70.4	1	03/10/15 13:35	03/11/15 17:09	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/kg	342	59.0	1	03/10/15 13:35	03/11/15 17:09	87-68-3	
Hexachlorobenzene	ND	ug/kg	342	43.5	1	03/10/15 13:35	03/11/15 17:09	118-74-1	
Hexachlorocyclopentadiene	ND	ug/kg	342	63.2	1	03/10/15 13:35	03/11/15 17:09	77-47-4	
Hexachloroethane	ND	ug/kg	342	90.1	1	03/10/15 13:35	03/11/15 17:09	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	342	70.4	1	03/10/15 13:35	03/11/15 17:09	193-39-5	
Isophorone	ND	ug/kg	342	76.7	1	03/10/15 13:35	03/11/15 17:09	78-59-1	
1-Methylnaphthalene	ND	ug/kg	342	89.1	1	03/10/15 13:35	03/11/15 17:09	90-12-0	
2-Methylnaphthalene	ND	ug/kg	342	73.5	1	03/10/15 13:35	03/11/15 17:09	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/kg	342	104	1	03/10/15 13:35	03/11/15 17:09	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/kg	342	135	1	03/10/15 13:35	03/11/15 17:09		
Naphthalene	ND	ug/kg	342	83.9	1	03/10/15 13:35	03/11/15 17:09	91-20-3	
2-Nitroaniline	ND	ug/kg	1710	106	1	03/10/15 13:35	03/11/15 17:09	88-74-4	
3-Nitroaniline	ND	ug/kg	1710	93.2	1	03/10/15 13:35	03/11/15 17:09	99-09-2	
4-Nitroaniline	ND	ug/kg	684	96.3	1	03/10/15 13:35	03/11/15 17:09	100-01-6	
Nitrobenzene	ND	ug/kg	342	93.2	1	03/10/15 13:35	03/11/15 17:09	98-95-3	
2-Nitrophenol	ND	ug/kg	342	82.9	1	03/10/15 13:35	03/11/15 17:09	88-75-5	
4-Nitrophenol	ND	ug/kg	1710	61.1	1	03/10/15 13:35	03/11/15 17:09	100-02-7	
N-Nitrosodimethylamine	ND	ug/kg	342	111	1	03/10/15 13:35	03/11/15 17:09	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/kg	342	65.3	1	03/10/15 13:35	03/11/15 17:09	621-64-7	
N-Nitrosodiphenylamine	ND	ug/kg	342	102	1	03/10/15 13:35	03/11/15 17:09	86-30-6	
Pentachlorophenol	ND	ug/kg	1710	62.2	1	03/10/15 13:35	03/11/15 17:09	87-86-5	
Phenanthrene	ND	ug/kg	342	57.0	1	03/10/15 13:35	03/11/15 17:09	85-01-8	
Phenol	ND	ug/kg	342	103	1	03/10/15 13:35	03/11/15 17:09	108-95-2	
Pyrene	ND	ug/kg	342	58.0	1	03/10/15 13:35	03/11/15 17:09	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/kg	342	66.3	1	03/10/15 13:35	03/11/15 17:09	120-82-1	

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Huntersville, NC 28078
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-20 **Lab ID: 92240289018** Collected: 03/04/15 14:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4,5-Trichlorophenol	ND	ug/kg	342	106	1	03/10/15 13:35	03/11/15 17:09	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	342	75.6	1	03/10/15 13:35	03/11/15 17:09	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	38	%	23-110		1	03/10/15 13:35	03/11/15 17:09	4165-60-0	
2-Fluorobiphenyl (S)	40	%	30-110		1	03/10/15 13:35	03/11/15 17:09	321-60-8	
Terphenyl-d14 (S)	52	%	28-110		1	03/10/15 13:35	03/11/15 17:09	1718-51-0	
Phenol-d6 (S)	45	%	22-110		1	03/10/15 13:35	03/11/15 17:09	13127-88-3	
2-Fluorophenol (S)	44	%	13-110		1	03/10/15 13:35	03/11/15 17:09	367-12-4	
2,4,6-Tribromophenol (S)	40	%	27-110		1	03/10/15 13:35	03/11/15 17:09	118-79-6	
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.3	0.74	1		03/10/15 16:52	71-43-2	
Ethylbenzene	ND	ug/kg	2.3	0.84	1		03/10/15 16:52	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.3	0.70	1		03/10/15 16:52	1634-04-4	
Naphthalene	ND	ug/kg	2.3	0.56	1		03/10/15 16:52	91-20-3	
Toluene	ND	ug/kg	2.3	0.84	1		03/10/15 16:52	108-88-3	
Xylene (Total)	ND	ug/kg	4.6	1.7	1		03/10/15 16:52	1330-20-7	
m&p-Xylene	ND	ug/kg	4.6	1.7	1		03/10/15 16:52	179601-23-1	
o-Xylene	ND	ug/kg	2.3	0.88	1		03/10/15 16:52	95-47-6	
Surrogates									
Toluene-d8 (S)	109	%	70-130		1		03/10/15 16:52	2037-26-5	
4-Bromofluorobenzene (S)	97	%	70-130		1		03/10/15 16:52	460-00-4	
1,2-Dichloroethane-d4 (S)	127	%	70-130		1		03/10/15 16:52	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**3.5**	%	0.10	0.10	1		03/11/15 10:16		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-22 **Lab ID: 92240289019** Collected: 03/04/15 14:25 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV MW PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	11.1	1.7	1	03/11/15 10:07	03/13/15 19:14	83-32-9	
Acenaphthylene	ND	ug/kg	11.1	1.4	1	03/11/15 10:07	03/13/15 19:14	208-96-8	
Anthracene	ND	ug/kg	11.1	1.6	1	03/11/15 10:07	03/13/15 19:14	120-12-7	
Benzo(a)anthracene	ND	ug/kg	11.1	0.79	1	03/11/15 10:07	03/13/15 19:14	56-55-3	
Benzo(a)pyrene	ND	ug/kg	11.1	1.2	1	03/11/15 10:07	03/13/15 19:14	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	11.1	0.74	1	03/11/15 10:07	03/13/15 19:14	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	11.1	2.9	1	03/11/15 10:07	03/13/15 19:14	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	11.1	1.7	1	03/11/15 10:07	03/13/15 19:14	207-08-9	
Chrysene	ND	ug/kg	11.1	2.0	1	03/11/15 10:07	03/13/15 19:14	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	11.1	2.0	1	03/11/15 10:07	03/13/15 19:14	53-70-3	
Fluoranthene	ND	ug/kg	11.1	0.92	1	03/11/15 10:07	03/13/15 19:14	206-44-0	
Fluorene	ND	ug/kg	11.1	1.8	1	03/11/15 10:07	03/13/15 19:14	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	11.1	3.1	1	03/11/15 10:07	03/13/15 19:14	193-39-5	
1-Methylnaphthalene	ND	ug/kg	11.1	1.3	1	03/11/15 10:07	03/13/15 19:14	90-12-0	
2-Methylnaphthalene	ND	ug/kg	11.1	1.2	1	03/11/15 10:07	03/13/15 19:14	91-57-6	
Naphthalene	ND	ug/kg	11.1	2.6	1	03/11/15 10:07	03/13/15 19:14	91-20-3	
Phenanthrene	ND	ug/kg	11.1	1.7	1	03/11/15 10:07	03/13/15 19:14	85-01-8	
Pyrene	ND	ug/kg	11.1	2.0	1	03/11/15 10:07	03/13/15 19:14	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	46	%	10-128		1	03/11/15 10:07	03/13/15 19:14	4165-60-0	
2-Fluorobiphenyl (S)	38	%	10-110		1	03/11/15 10:07	03/13/15 19:14	321-60-8	
Terphenyl-d14 (S)	44	%	39-119		1	03/11/15 10:07	03/13/15 19:14	1718-51-0	
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	366	84.4	1	03/10/15 13:35	03/11/15 17:37	83-32-9	
Acenaphthylene	ND	ug/kg	366	86.6	1	03/10/15 13:35	03/11/15 17:37	208-96-8	
Aniline	ND	ug/kg	366	98.8	1	03/10/15 13:35	03/11/15 17:37	62-53-3	
Anthracene	ND	ug/kg	366	82.2	1	03/10/15 13:35	03/11/15 17:37	120-12-7	
Benzo(a)anthracene	ND	ug/kg	366	67.7	1	03/10/15 13:35	03/11/15 17:37	56-55-3	
Benzo(a)pyrene	ND	ug/kg	366	70.0	1	03/10/15 13:35	03/11/15 17:37	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	366	63.3	1	03/10/15 13:35	03/11/15 17:37	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	366	93.3	1	03/10/15 13:35	03/11/15 17:37	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	366	72.2	1	03/10/15 13:35	03/11/15 17:37	207-08-9	
Benzoic Acid	ND	ug/kg	1830	66.6	1	03/10/15 13:35	03/11/15 17:37	65-85-0	
Benzyl alcohol	ND	ug/kg	733	73.3	1	03/10/15 13:35	03/11/15 17:37	100-51-6	
4-Bromophenylphenyl ether	ND	ug/kg	366	66.6	1	03/10/15 13:35	03/11/15 17:37	101-55-3	
Butylbenzylphthalate	ND	ug/kg	366	77.7	1	03/10/15 13:35	03/11/15 17:37	85-68-7	
4-Chloro-3-methylphenol	ND	ug/kg	733	75.5	1	03/10/15 13:35	03/11/15 17:37	59-50-7	
4-Chloroaniline	ND	ug/kg	1830	102	1	03/10/15 13:35	03/11/15 17:37	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/kg	366	85.5	1	03/10/15 13:35	03/11/15 17:37	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/kg	366	93.3	1	03/10/15 13:35	03/11/15 17:37	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/kg	366	97.7	1	03/10/15 13:35	03/11/15 17:37	108-60-1	
2-Chloronaphthalene	ND	ug/kg	366	72.2	1	03/10/15 13:35	03/11/15 17:37	91-58-7	
2-Chlorophenol	ND	ug/kg	366	99.9	1	03/10/15 13:35	03/11/15 17:37	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/kg	366	75.5	1	03/10/15 13:35	03/11/15 17:37	7005-72-3	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-22 **Lab ID: 92240289019** Collected: 03/04/15 14:25 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Chrysene	ND	ug/kg	366	48.9	1	03/10/15 13:35	03/11/15 17:37	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	366	77.7	1	03/10/15 13:35	03/11/15 17:37	53-70-3	
Dibenzofuran	ND	ug/kg	366	60.0	1	03/10/15 13:35	03/11/15 17:37	132-64-9	
1,2-Dichlorobenzene	ND	ug/kg	366	97.7	1	03/10/15 13:35	03/11/15 17:37	95-50-1	
1,3-Dichlorobenzene	ND	ug/kg	366	83.3	1	03/10/15 13:35	03/11/15 17:37	541-73-1	
1,4-Dichlorobenzene	ND	ug/kg	366	103	1	03/10/15 13:35	03/11/15 17:37	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/kg	1830	79.9	1	03/10/15 13:35	03/11/15 17:37	91-94-1	
2,4-Dichlorophenol	ND	ug/kg	366	79.9	1	03/10/15 13:35	03/11/15 17:37	120-83-2	
Diethylphthalate	ND	ug/kg	366	56.6	1	03/10/15 13:35	03/11/15 17:37	84-66-2	
2,4-Dimethylphenol	ND	ug/kg	366	144	1	03/10/15 13:35	03/11/15 17:37	105-67-9	
Dimethylphthalate	ND	ug/kg	366	74.4	1	03/10/15 13:35	03/11/15 17:37	131-11-3	
Di-n-butylphthalate	ND	ug/kg	366	60.0	1	03/10/15 13:35	03/11/15 17:37	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/kg	733	73.3	1	03/10/15 13:35	03/11/15 17:37	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	1830	60.0	1	03/10/15 13:35	03/11/15 17:37	51-28-5	
2,4-Dinitrotoluene	ND	ug/kg	366	68.8	1	03/10/15 13:35	03/11/15 17:37	121-14-2	
2,6-Dinitrotoluene	ND	ug/kg	366	76.6	1	03/10/15 13:35	03/11/15 17:37	606-20-2	
Di-n-octylphthalate	ND	ug/kg	366	76.6	1	03/10/15 13:35	03/11/15 17:37	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/kg	366	99.9	1	03/10/15 13:35	03/11/15 17:37	117-81-7	
Fluoranthene	ND	ug/kg	366	53.3	1	03/10/15 13:35	03/11/15 17:37	206-44-0	
Fluorene	ND	ug/kg	366	75.5	1	03/10/15 13:35	03/11/15 17:37	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/kg	366	63.3	1	03/10/15 13:35	03/11/15 17:37	87-68-3	
Hexachlorobenzene	ND	ug/kg	366	46.6	1	03/10/15 13:35	03/11/15 17:37	118-74-1	
Hexachlorocyclopentadiene	ND	ug/kg	366	67.7	1	03/10/15 13:35	03/11/15 17:37	77-47-4	
Hexachloroethane	ND	ug/kg	366	96.6	1	03/10/15 13:35	03/11/15 17:37	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	366	75.5	1	03/10/15 13:35	03/11/15 17:37	193-39-5	
Isophorone	ND	ug/kg	366	82.2	1	03/10/15 13:35	03/11/15 17:37	78-59-1	
1-Methylnaphthalene	ND	ug/kg	366	95.5	1	03/10/15 13:35	03/11/15 17:37	90-12-0	
2-Methylnaphthalene	ND	ug/kg	366	78.8	1	03/10/15 13:35	03/11/15 17:37	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/kg	366	111	1	03/10/15 13:35	03/11/15 17:37	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/kg	366	144	1	03/10/15 13:35	03/11/15 17:37		
Naphthalene	ND	ug/kg	366	89.9	1	03/10/15 13:35	03/11/15 17:37	91-20-3	
2-Nitroaniline	ND	ug/kg	1830	113	1	03/10/15 13:35	03/11/15 17:37	88-74-4	
3-Nitroaniline	ND	ug/kg	1830	99.9	1	03/10/15 13:35	03/11/15 17:37	99-09-2	
4-Nitroaniline	ND	ug/kg	733	103	1	03/10/15 13:35	03/11/15 17:37	100-01-6	
Nitrobenzene	ND	ug/kg	366	99.9	1	03/10/15 13:35	03/11/15 17:37	98-95-3	
2-Nitrophenol	ND	ug/kg	366	88.8	1	03/10/15 13:35	03/11/15 17:37	88-75-5	
4-Nitrophenol	ND	ug/kg	1830	65.5	1	03/10/15 13:35	03/11/15 17:37	100-02-7	
N-Nitrosodimethylamine	ND	ug/kg	366	119	1	03/10/15 13:35	03/11/15 17:37	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/kg	366	70.0	1	03/10/15 13:35	03/11/15 17:37	621-64-7	
N-Nitrosodiphenylamine	ND	ug/kg	366	109	1	03/10/15 13:35	03/11/15 17:37	86-30-6	
Pentachlorophenol	ND	ug/kg	1830	66.6	1	03/10/15 13:35	03/11/15 17:37	87-86-5	
Phenanthrene	ND	ug/kg	366	61.1	1	03/10/15 13:35	03/11/15 17:37	85-01-8	
Phenol	ND	ug/kg	366	110	1	03/10/15 13:35	03/11/15 17:37	108-95-2	
Pyrene	ND	ug/kg	366	62.2	1	03/10/15 13:35	03/11/15 17:37	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/kg	366	71.1	1	03/10/15 13:35	03/11/15 17:37	120-82-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12

Pace Project No.: 92240289

Sample: SB-22 **Lab ID: 92240289019** Collected: 03/04/15 14:25 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
2,4,5-Trichlorophenol	ND	ug/kg	366	113	1	03/10/15 13:35	03/11/15 17:37	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	366	81.1	1	03/10/15 13:35	03/11/15 17:37	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	36	%	23-110		1	03/10/15 13:35	03/11/15 17:37	4165-60-0	
2-Fluorobiphenyl (S)	39	%	30-110		1	03/10/15 13:35	03/11/15 17:37	321-60-8	
Terphenyl-d14 (S)	56	%	28-110		1	03/10/15 13:35	03/11/15 17:37	1718-51-0	
Phenol-d6 (S)	40	%	22-110		1	03/10/15 13:35	03/11/15 17:37	13127-88-3	
2-Fluorophenol (S)	36	%	13-110		1	03/10/15 13:35	03/11/15 17:37	367-12-4	
2,4,6-Tribromophenol (S)	37	%	27-110		1	03/10/15 13:35	03/11/15 17:37	118-79-6	
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.5	0.79	1		03/10/15 17:12	71-43-2	
Ethylbenzene	ND	ug/kg	2.5	0.89	1		03/10/15 17:12	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.5	0.74	1		03/10/15 17:12	1634-04-4	
Naphthalene	ND	ug/kg	2.5	0.59	1		03/10/15 17:12	91-20-3	
Toluene	ND	ug/kg	2.5	0.89	1		03/10/15 17:12	108-88-3	
Xylene (Total)	ND	ug/kg	4.9	1.8	1		03/10/15 17:12	1330-20-7	
m&p-Xylene	ND	ug/kg	4.9	1.8	1		03/10/15 17:12	179601-23-1	
o-Xylene	ND	ug/kg	2.5	0.94	1		03/10/15 17:12	95-47-6	
Surrogates									
Toluene-d8 (S)	109	%	70-130		1		03/10/15 17:12	2037-26-5	
4-Bromofluorobenzene (S)	93	%	70-130		1		03/10/15 17:12	460-00-4	
1,2-Dichloroethane-d4 (S)	132	%	70-130		1		03/10/15 17:12	17060-07-0	S3
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**9.9**	%	0.10	0.10	1		03/11/15 10:16		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-23 **Lab ID: 92240289020** Collected: 03/04/15 17:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**1.2**	mg/kg	1.1	0.56	1	03/10/15 16:30	03/10/15 22:59	7440-38-2	
Barium	**261**	mg/kg	0.56	0.28	1	03/10/15 16:30	03/10/15 22:59	7440-39-3	
Cadmium	**0.080J**	mg/kg	0.11	0.056	1	03/10/15 16:30	03/10/15 22:59	7440-43-9	
Chromium	**14.7**	mg/kg	0.56	0.28	1	03/10/15 16:30	03/10/15 22:59	7440-47-3	
Lead	**6.9**	mg/kg	0.56	0.28	1	03/10/15 16:30	03/10/15 22:59	7439-92-1	
Selenium	**0.94J**	mg/kg	1.1	0.56	1	03/10/15 16:30	03/10/15 22:59	7782-49-2	
Silver	ND	mg/kg	0.56	0.28	1	03/10/15 16:30	03/10/15 22:59	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**0.017**	mg/kg	0.0044	0.000087	1	03/10/15 18:30	03/11/15 14:07	7439-97-6	
8270 MSSV MW PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	12.2	1.8	1	03/11/15 10:07	03/13/15 19:34	83-32-9	
Acenaphthylene	ND	ug/kg	12.2	1.6	1	03/11/15 10:07	03/13/15 19:34	208-96-8	
Anthracene	ND	ug/kg	12.2	1.7	1	03/11/15 10:07	03/13/15 19:34	120-12-7	
Benzo(a)anthracene	ND	ug/kg	12.2	0.87	1	03/11/15 10:07	03/13/15 19:34	56-55-3	
Benzo(a)pyrene	ND	ug/kg	12.2	1.3	1	03/11/15 10:07	03/13/15 19:34	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	12.2	0.82	1	03/11/15 10:07	03/13/15 19:34	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	12.2	3.2	1	03/11/15 10:07	03/13/15 19:34	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	12.2	1.8	1	03/11/15 10:07	03/13/15 19:34	207-08-9	
Chrysene	ND	ug/kg	12.2	2.2	1	03/11/15 10:07	03/13/15 19:34	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	12.2	2.2	1	03/11/15 10:07	03/13/15 19:34	53-70-3	
Fluoranthene	ND	ug/kg	12.2	1.0	1	03/11/15 10:07	03/13/15 19:34	206-44-0	
Fluorene	ND	ug/kg	12.2	2.0	1	03/11/15 10:07	03/13/15 19:34	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	12.2	3.4	1	03/11/15 10:07	03/13/15 19:34	193-39-5	
1-Methylnaphthalene	ND	ug/kg	12.2	1.5	1	03/11/15 10:07	03/13/15 19:34	90-12-0	
2-Methylnaphthalene	ND	ug/kg	12.2	1.3	1	03/11/15 10:07	03/13/15 19:34	91-57-6	
Naphthalene	ND	ug/kg	12.2	2.8	1	03/11/15 10:07	03/13/15 19:34	91-20-3	
Phenanthrene	ND	ug/kg	12.2	1.8	1	03/11/15 10:07	03/13/15 19:34	85-01-8	
Pyrene	ND	ug/kg	12.2	2.2	1	03/11/15 10:07	03/13/15 19:34	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	61	%	10-128		1	03/11/15 10:07	03/13/15 19:34	4165-60-0	
2-Fluorobiphenyl (S)	54	%	10-110		1	03/11/15 10:07	03/13/15 19:34	321-60-8	
Terphenyl-d14 (S)	53	%	39-119		1	03/11/15 10:07	03/13/15 19:34	1718-51-0	
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	403	92.8	1	03/10/15 13:35	03/11/15 18:05	83-32-9	
Acenaphthylene	ND	ug/kg	403	95.3	1	03/10/15 13:35	03/11/15 18:05	208-96-8	
Aniline	ND	ug/kg	403	109	1	03/10/15 13:35	03/11/15 18:05	62-53-3	
Anthracene	ND	ug/kg	403	90.4	1	03/10/15 13:35	03/11/15 18:05	120-12-7	
Benzo(a)anthracene	ND	ug/kg	403	74.5	1	03/10/15 13:35	03/11/15 18:05	56-55-3	
Benzo(a)pyrene	ND	ug/kg	403	77.0	1	03/10/15 13:35	03/11/15 18:05	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	403	69.6	1	03/10/15 13:35	03/11/15 18:05	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	403	103	1	03/10/15 13:35	03/11/15 18:05	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	403	79.4	1	03/10/15 13:35	03/11/15 18:05	207-08-9	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-23 **Lab ID: 92240289020** Collected: 03/04/15 17:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Benzoic Acid	ND	ug/kg	2020	73.3	1	03/10/15 13:35	03/11/15 18:05	65-85-0	
Benzyl alcohol	ND	ug/kg	806	80.6	1	03/10/15 13:35	03/11/15 18:05	100-51-6	
4-Bromophenylphenyl ether	ND	ug/kg	403	73.3	1	03/10/15 13:35	03/11/15 18:05	101-55-3	
Butylbenzylphthalate	ND	ug/kg	403	85.5	1	03/10/15 13:35	03/11/15 18:05	85-68-7	
4-Chloro-3-methylphenol	ND	ug/kg	806	83.1	1	03/10/15 13:35	03/11/15 18:05	59-50-7	
4-Chloroaniline	ND	ug/kg	2020	112	1	03/10/15 13:35	03/11/15 18:05	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/kg	403	94.1	1	03/10/15 13:35	03/11/15 18:05	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/kg	403	103	1	03/10/15 13:35	03/11/15 18:05	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/kg	403	108	1	03/10/15 13:35	03/11/15 18:05	108-60-1	
2-Chloronaphthalene	ND	ug/kg	403	79.4	1	03/10/15 13:35	03/11/15 18:05	91-58-7	
2-Chlorophenol	ND	ug/kg	403	110	1	03/10/15 13:35	03/11/15 18:05	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/kg	403	83.1	1	03/10/15 13:35	03/11/15 18:05	7005-72-3	
Chrysene	ND	ug/kg	403	53.8	1	03/10/15 13:35	03/11/15 18:05	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	403	85.5	1	03/10/15 13:35	03/11/15 18:05	53-70-3	
Dibenzofuran	ND	ug/kg	403	66.0	1	03/10/15 13:35	03/11/15 18:05	132-64-9	
1,2-Dichlorobenzene	ND	ug/kg	403	108	1	03/10/15 13:35	03/11/15 18:05	95-50-1	
1,3-Dichlorobenzene	ND	ug/kg	403	91.6	1	03/10/15 13:35	03/11/15 18:05	541-73-1	
1,4-Dichlorobenzene	ND	ug/kg	403	114	1	03/10/15 13:35	03/11/15 18:05	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/kg	2020	88.0	1	03/10/15 13:35	03/11/15 18:05	91-94-1	
2,4-Dichlorophenol	ND	ug/kg	403	88.0	1	03/10/15 13:35	03/11/15 18:05	120-83-2	
Diethylphthalate	ND	ug/kg	403	62.3	1	03/10/15 13:35	03/11/15 18:05	84-66-2	
2,4-Dimethylphenol	ND	ug/kg	403	159	1	03/10/15 13:35	03/11/15 18:05	105-67-9	
Dimethylphthalate	ND	ug/kg	403	81.8	1	03/10/15 13:35	03/11/15 18:05	131-11-3	
Di-n-butylphthalate	ND	ug/kg	403	66.0	1	03/10/15 13:35	03/11/15 18:05	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/kg	806	80.6	1	03/10/15 13:35	03/11/15 18:05	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	2020	66.0	1	03/10/15 13:35	03/11/15 18:05	51-28-5	
2,4-Dinitrotoluene	ND	ug/kg	403	75.7	1	03/10/15 13:35	03/11/15 18:05	121-14-2	
2,6-Dinitrotoluene	ND	ug/kg	403	84.3	1	03/10/15 13:35	03/11/15 18:05	606-20-2	
Di-n-octylphthalate	ND	ug/kg	403	84.3	1	03/10/15 13:35	03/11/15 18:05	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/kg	403	110	1	03/10/15 13:35	03/11/15 18:05	117-81-7	
Fluoranthene	ND	ug/kg	403	58.6	1	03/10/15 13:35	03/11/15 18:05	206-44-0	
Fluorene	ND	ug/kg	403	83.1	1	03/10/15 13:35	03/11/15 18:05	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/kg	403	69.6	1	03/10/15 13:35	03/11/15 18:05	87-68-3	
Hexachlorobenzene	ND	ug/kg	403	51.3	1	03/10/15 13:35	03/11/15 18:05	118-74-1	
Hexachlorocyclopentadiene	ND	ug/kg	403	74.5	1	03/10/15 13:35	03/11/15 18:05	77-47-4	
Hexachloroethane	ND	ug/kg	403	106	1	03/10/15 13:35	03/11/15 18:05	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	403	83.1	1	03/10/15 13:35	03/11/15 18:05	193-39-5	
Isophorone	ND	ug/kg	403	90.4	1	03/10/15 13:35	03/11/15 18:05	78-59-1	
1-Methylnaphthalene	ND	ug/kg	403	105	1	03/10/15 13:35	03/11/15 18:05	90-12-0	
2-Methylnaphthalene	ND	ug/kg	403	86.7	1	03/10/15 13:35	03/11/15 18:05	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/kg	403	122	1	03/10/15 13:35	03/11/15 18:05	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/kg	403	159	1	03/10/15 13:35	03/11/15 18:05		
Naphthalene	ND	ug/kg	403	99.0	1	03/10/15 13:35	03/11/15 18:05	91-20-3	
2-Nitroaniline	ND	ug/kg	2020	125	1	03/10/15 13:35	03/11/15 18:05	88-74-4	
3-Nitroaniline	ND	ug/kg	2020	110	1	03/10/15 13:35	03/11/15 18:05	99-09-2	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-23 **Lab ID: 92240289020** Collected: 03/04/15 17:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
4-Nitroaniline	ND	ug/kg	806	114	1	03/10/15 13:35	03/11/15 18:05	100-01-6	
Nitrobenzene	ND	ug/kg	403	110	1	03/10/15 13:35	03/11/15 18:05	98-95-3	
2-Nitrophenol	ND	ug/kg	403	97.7	1	03/10/15 13:35	03/11/15 18:05	88-75-5	
4-Nitrophenol	ND	ug/kg	2020	72.1	1	03/10/15 13:35	03/11/15 18:05	100-02-7	
N-Nitrosodimethylamine	ND	ug/kg	403	131	1	03/10/15 13:35	03/11/15 18:05	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/kg	403	77.0	1	03/10/15 13:35	03/11/15 18:05	621-64-7	
N-Nitrosodiphenylamine	ND	ug/kg	403	120	1	03/10/15 13:35	03/11/15 18:05	86-30-6	
Pentachlorophenol	ND	ug/kg	2020	73.3	1	03/10/15 13:35	03/11/15 18:05	87-86-5	
Phenanthrene	ND	ug/kg	403	67.2	1	03/10/15 13:35	03/11/15 18:05	85-01-8	
Phenol	ND	ug/kg	403	121	1	03/10/15 13:35	03/11/15 18:05	108-95-2	
Pyrene	ND	ug/kg	403	68.4	1	03/10/15 13:35	03/11/15 18:05	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/kg	403	78.2	1	03/10/15 13:35	03/11/15 18:05	120-82-1	
2,4,5-Trichlorophenol	ND	ug/kg	403	125	1	03/10/15 13:35	03/11/15 18:05	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	403	89.2	1	03/10/15 13:35	03/11/15 18:05	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	50	%	23-110		1	03/10/15 13:35	03/11/15 18:05	4165-60-0	
2-Fluorobiphenyl (S)	64	%	30-110		1	03/10/15 13:35	03/11/15 18:05	321-60-8	
Terphenyl-d14 (S)	71	%	28-110		1	03/10/15 13:35	03/11/15 18:05	1718-51-0	
Phenol-d6 (S)	61	%	22-110		1	03/10/15 13:35	03/11/15 18:05	13127-88-3	
2-Fluorophenol (S)	56	%	13-110		1	03/10/15 13:35	03/11/15 18:05	367-12-4	
2,4,6-Tribromophenol (S)	62	%	27-110		1	03/10/15 13:35	03/11/15 18:05	118-79-6	
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.7	0.86	1		03/10/15 17:32	71-43-2	
Ethylbenzene	ND	ug/kg	2.7	0.96	1		03/10/15 17:32	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.7	0.80	1		03/10/15 17:32	1634-04-4	
Naphthalene	ND	ug/kg	2.7	0.64	1		03/10/15 17:32	91-20-3	
Toluene	ND	ug/kg	2.7	0.96	1		03/10/15 17:32	108-88-3	
Xylene (Total)	ND	ug/kg	5.4	1.9	1		03/10/15 17:32	1330-20-7	
m&p-Xylene	ND	ug/kg	5.4	1.9	1		03/10/15 17:32	179601-23-1	
o-Xylene	ND	ug/kg	2.7	1.0	1		03/10/15 17:32	95-47-6	
Surrogates									
Toluene-d8 (S)	108	%	70-130		1		03/10/15 17:32	2037-26-5	
4-Bromofluorobenzene (S)	92	%	70-130		1		03/10/15 17:32	460-00-4	
1,2-Dichloroethane-d4 (S)	129	%	70-130		1		03/10/15 17:32	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.1**	%	0.10	0.10	1		03/11/15 10:16		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-24 **Lab ID: 92240289021** Collected: 03/04/15 16:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**0.81J**	mg/kg	0.88	0.44	1	03/10/15 16:30	03/10/15 23:02	7440-38-2	
Barium	**14.9**	mg/kg	0.44	0.22	1	03/10/15 16:30	03/10/15 23:02	7440-39-3	
Cadmium	**0.10**	mg/kg	0.088	0.044	1	03/10/15 16:30	03/10/15 23:02	7440-43-9	
Chromium	**2.5**	mg/kg	0.44	0.22	1	03/10/15 16:30	03/10/15 23:02	7440-47-3	
Lead	**3.1**	mg/kg	0.44	0.22	1	03/10/15 16:30	03/10/15 23:02	7439-92-1	
Selenium	**1.2**	mg/kg	0.88	0.44	1	03/10/15 16:30	03/10/15 23:02	7782-49-2	
Silver	ND	mg/kg	0.44	0.22	1	03/10/15 16:30	03/10/15 23:02	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**0.032**	mg/kg	0.0046	0.000092	1	03/10/15 18:30	03/11/15 14:15	7439-97-6	
8270 MSSV MW PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	64.1	9.6	5	03/11/15 10:07	03/13/15 19:54	83-32-9	
Acenaphthylene	ND	ug/kg	64.1	8.3	5	03/11/15 10:07	03/13/15 19:54	208-96-8	
Anthracene	ND	ug/kg	64.1	9.0	5	03/11/15 10:07	03/13/15 19:54	120-12-7	
Benzo(a)anthracene	**16.9J**	ug/kg	64.1	4.5	5	03/11/15 10:07	03/13/15 19:54	56-55-3	
Benzo(a)pyrene	**18.5J**	ug/kg	64.1	7.0	5	03/11/15 10:07	03/13/15 19:54	50-32-8	
Benzo(b)fluoranthene	**20.4J**	ug/kg	64.1	4.3	5	03/11/15 10:07	03/13/15 19:54	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	64.1	16.7	5	03/11/15 10:07	03/13/15 19:54	191-24-2	
Benzo(k)fluoranthene	**17.9J**	ug/kg	64.1	9.6	5	03/11/15 10:07	03/13/15 19:54	207-08-9	
Chrysene	**21.7J**	ug/kg	64.1	11.5	5	03/11/15 10:07	03/13/15 19:54	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	64.1	11.5	5	03/11/15 10:07	03/13/15 19:54	53-70-3	
Fluoranthene	**39.6J**	ug/kg	64.1	5.3	5	03/11/15 10:07	03/13/15 19:54	206-44-0	
Fluorene	ND	ug/kg	64.1	10.3	5	03/11/15 10:07	03/13/15 19:54	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	64.1	17.9	5	03/11/15 10:07	03/13/15 19:54	193-39-5	
1-Methylnaphthalene	ND	ug/kg	64.1	7.7	5	03/11/15 10:07	03/13/15 19:54	90-12-0	
2-Methylnaphthalene	ND	ug/kg	64.1	7.0	5	03/11/15 10:07	03/13/15 19:54	91-57-6	
Naphthalene	ND	ug/kg	64.1	14.7	5	03/11/15 10:07	03/13/15 19:54	91-20-3	
Phenanthrene	**18.3J**	ug/kg	64.1	9.6	5	03/11/15 10:07	03/13/15 19:54	85-01-8	
Pyrene	**34.6J**	ug/kg	64.1	11.5	5	03/11/15 10:07	03/13/15 19:54	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	60	%	10-128		5	03/11/15 10:07	03/13/15 19:54	4165-60-0	D3
2-Fluorobiphenyl (S)	54	%	10-110		5	03/11/15 10:07	03/13/15 19:54	321-60-8	
Terphenyl-d14 (S)	68	%	39-119		5	03/11/15 10:07	03/13/15 19:54	1718-51-0	
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Acenaphthene	ND	ug/kg	423	97.4	1	03/10/15 13:35	03/11/15 18:32	83-32-9	
Acenaphthylene	ND	ug/kg	423	100	1	03/10/15 13:35	03/11/15 18:32	208-96-8	
Aniline	ND	ug/kg	423	114	1	03/10/15 13:35	03/11/15 18:32	62-53-3	
Anthracene	ND	ug/kg	423	94.8	1	03/10/15 13:35	03/11/15 18:32	120-12-7	
Benzo(a)anthracene	ND	ug/kg	423	78.2	1	03/10/15 13:35	03/11/15 18:32	56-55-3	
Benzo(a)pyrene	ND	ug/kg	423	80.7	1	03/10/15 13:35	03/11/15 18:32	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	423	73.1	1	03/10/15 13:35	03/11/15 18:32	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	423	108	1	03/10/15 13:35	03/11/15 18:32	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	423	83.3	1	03/10/15 13:35	03/11/15 18:32	207-08-9	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-24 **Lab ID: 92240289021** Collected: 03/04/15 16:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
Benzoic Acid	ND	ug/kg	2110	76.9	1	03/10/15 13:35	03/11/15 18:32	65-85-0	
Benzyl alcohol	ND	ug/kg	846	84.6	1	03/10/15 13:35	03/11/15 18:32	100-51-6	
4-Bromophenylphenyl ether	ND	ug/kg	423	76.9	1	03/10/15 13:35	03/11/15 18:32	101-55-3	
Butylbenzylphthalate	ND	ug/kg	423	89.7	1	03/10/15 13:35	03/11/15 18:32	85-68-7	
4-Chloro-3-methylphenol	ND	ug/kg	846	87.2	1	03/10/15 13:35	03/11/15 18:32	59-50-7	
4-Chloroaniline	ND	ug/kg	2110	118	1	03/10/15 13:35	03/11/15 18:32	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/kg	423	98.7	1	03/10/15 13:35	03/11/15 18:32	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/kg	423	108	1	03/10/15 13:35	03/11/15 18:32	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/kg	423	113	1	03/10/15 13:35	03/11/15 18:32	108-60-1	
2-Chloronaphthalene	ND	ug/kg	423	83.3	1	03/10/15 13:35	03/11/15 18:32	91-58-7	
2-Chlorophenol	ND	ug/kg	423	115	1	03/10/15 13:35	03/11/15 18:32	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/kg	423	87.2	1	03/10/15 13:35	03/11/15 18:32	7005-72-3	
Chrysene	ND	ug/kg	423	56.4	1	03/10/15 13:35	03/11/15 18:32	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	423	89.7	1	03/10/15 13:35	03/11/15 18:32	53-70-3	
Dibenzofuran	ND	ug/kg	423	69.2	1	03/10/15 13:35	03/11/15 18:32	132-64-9	
1,2-Dichlorobenzene	ND	ug/kg	423	113	1	03/10/15 13:35	03/11/15 18:32	95-50-1	
1,3-Dichlorobenzene	ND	ug/kg	423	96.1	1	03/10/15 13:35	03/11/15 18:32	541-73-1	
1,4-Dichlorobenzene	ND	ug/kg	423	119	1	03/10/15 13:35	03/11/15 18:32	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/kg	2110	92.3	1	03/10/15 13:35	03/11/15 18:32	91-94-1	
2,4-Dichlorophenol	ND	ug/kg	423	92.3	1	03/10/15 13:35	03/11/15 18:32	120-83-2	
Diethylphthalate	ND	ug/kg	423	65.4	1	03/10/15 13:35	03/11/15 18:32	84-66-2	
2,4-Dimethylphenol	ND	ug/kg	423	167	1	03/10/15 13:35	03/11/15 18:32	105-67-9	
Dimethylphthalate	ND	ug/kg	423	85.9	1	03/10/15 13:35	03/11/15 18:32	131-11-3	
Di-n-butylphthalate	ND	ug/kg	423	69.2	1	03/10/15 13:35	03/11/15 18:32	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/kg	846	84.6	1	03/10/15 13:35	03/11/15 18:32	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	2110	69.2	1	03/10/15 13:35	03/11/15 18:32	51-28-5	
2,4-Dinitrotoluene	ND	ug/kg	423	79.5	1	03/10/15 13:35	03/11/15 18:32	121-14-2	
2,6-Dinitrotoluene	ND	ug/kg	423	88.4	1	03/10/15 13:35	03/11/15 18:32	606-20-2	
Di-n-octylphthalate	ND	ug/kg	423	88.4	1	03/10/15 13:35	03/11/15 18:32	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/kg	423	115	1	03/10/15 13:35	03/11/15 18:32	117-81-7	
Fluoranthene	ND	ug/kg	423	61.5	1	03/10/15 13:35	03/11/15 18:32	206-44-0	
Fluorene	ND	ug/kg	423	87.2	1	03/10/15 13:35	03/11/15 18:32	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/kg	423	73.1	1	03/10/15 13:35	03/11/15 18:32	87-68-3	
Hexachlorobenzene	ND	ug/kg	423	53.8	1	03/10/15 13:35	03/11/15 18:32	118-74-1	
Hexachlorocyclopentadiene	ND	ug/kg	423	78.2	1	03/10/15 13:35	03/11/15 18:32	77-47-4	
Hexachloroethane	ND	ug/kg	423	112	1	03/10/15 13:35	03/11/15 18:32	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	423	87.2	1	03/10/15 13:35	03/11/15 18:32	193-39-5	
Isophorone	ND	ug/kg	423	94.8	1	03/10/15 13:35	03/11/15 18:32	78-59-1	
1-Methylnaphthalene	ND	ug/kg	423	110	1	03/10/15 13:35	03/11/15 18:32	90-12-0	
2-Methylnaphthalene	ND	ug/kg	423	91.0	1	03/10/15 13:35	03/11/15 18:32	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/kg	423	128	1	03/10/15 13:35	03/11/15 18:32	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/kg	423	167	1	03/10/15 13:35	03/11/15 18:32		
Naphthalene	ND	ug/kg	423	104	1	03/10/15 13:35	03/11/15 18:32	91-20-3	
2-Nitroaniline	ND	ug/kg	2110	131	1	03/10/15 13:35	03/11/15 18:32	88-74-4	
3-Nitroaniline	ND	ug/kg	2110	115	1	03/10/15 13:35	03/11/15 18:32	99-09-2	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-24 **Lab ID: 92240289021** Collected: 03/04/15 16:30 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Microwave SC	Analytical Method: EPA 8270 Preparation Method: EPA 3546								
4-Nitroaniline	ND	ug/kg	846	119	1	03/10/15 13:35	03/11/15 18:32	100-01-6	
Nitrobenzene	ND	ug/kg	423	115	1	03/10/15 13:35	03/11/15 18:32	98-95-3	
2-Nitrophenol	ND	ug/kg	423	103	1	03/10/15 13:35	03/11/15 18:32	88-75-5	
4-Nitrophenol	ND	ug/kg	2110	75.6	1	03/10/15 13:35	03/11/15 18:32	100-02-7	
N-Nitrosodimethylamine	ND	ug/kg	423	137	1	03/10/15 13:35	03/11/15 18:32	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/kg	423	80.7	1	03/10/15 13:35	03/11/15 18:32	621-64-7	
N-Nitrosodiphenylamine	ND	ug/kg	423	126	1	03/10/15 13:35	03/11/15 18:32	86-30-6	
Pentachlorophenol	ND	ug/kg	2110	76.9	1	03/10/15 13:35	03/11/15 18:32	87-86-5	
Phenanthrene	ND	ug/kg	423	70.5	1	03/10/15 13:35	03/11/15 18:32	85-01-8	
Phenol	ND	ug/kg	423	127	1	03/10/15 13:35	03/11/15 18:32	108-95-2	
Pyrene	ND	ug/kg	423	71.8	1	03/10/15 13:35	03/11/15 18:32	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/kg	423	82.0	1	03/10/15 13:35	03/11/15 18:32	120-82-1	
2,4,5-Trichlorophenol	ND	ug/kg	423	131	1	03/10/15 13:35	03/11/15 18:32	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	423	93.6	1	03/10/15 13:35	03/11/15 18:32	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	51	%	23-110		1	03/10/15 13:35	03/11/15 18:32	4165-60-0	
2-Fluorobiphenyl (S)	50	%	30-110		1	03/10/15 13:35	03/11/15 18:32	321-60-8	
Terphenyl-d14 (S)	58	%	28-110		1	03/10/15 13:35	03/11/15 18:32	1718-51-0	
Phenol-d6 (S)	37	%	22-110		1	03/10/15 13:35	03/11/15 18:32	13127-88-3	
2-Fluorophenol (S)	34	%	13-110		1	03/10/15 13:35	03/11/15 18:32	367-12-4	
2,4,6-Tribromophenol (S)	37	%	27-110		1	03/10/15 13:35	03/11/15 18:32	118-79-6	
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.7	0.88	1		03/10/15 17:52	71-43-2	
Ethylbenzene	ND	ug/kg	2.7	0.99	1		03/10/15 17:52	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.7	0.82	1		03/10/15 17:52	1634-04-4	
Naphthalene	ND	ug/kg	2.7	0.66	1		03/10/15 17:52	91-20-3	
Toluene	ND	ug/kg	2.7	0.99	1		03/10/15 17:52	108-88-3	
Xylene (Total)	ND	ug/kg	5.5	2.0	1		03/10/15 17:52	1330-20-7	
m&p-Xylene	ND	ug/kg	5.5	2.0	1		03/10/15 17:52	179601-23-1	
o-Xylene	ND	ug/kg	2.7	1.0	1		03/10/15 17:52	95-47-6	
Surrogates									
Toluene-d8 (S)	104	%	70-130		1		03/10/15 17:52	2037-26-5	
4-Bromofluorobenzene (S)	100	%	70-130		1		03/10/15 17:52	460-00-4	
1,2-Dichloroethane-d4 (S)	123	%	70-130		1		03/10/15 17:52	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**22.0**	%	0.10	0.10	1		03/11/15 10:16		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-23A **Lab ID: 92240289022** Collected: 03/04/15 17:35 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**0.51J**	mg/kg	0.90	0.45	1	03/10/15 16:30	03/10/15 23:05	7440-38-2	
Barium	**158**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:05	7440-39-3	
Cadmium	**0.091**	mg/kg	0.090	0.045	1	03/10/15 16:30	03/10/15 23:05	7440-43-9	
Chromium	**14.0**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:05	7440-47-3	
Lead	**17.9**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:05	7439-92-1	
Selenium	**0.75J**	mg/kg	0.90	0.45	1	03/10/15 16:30	03/10/15 23:05	7782-49-2	
Silver	**0.82**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:05	7440-22-4	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**10.8**	%	0.10	0.10	1		03/11/15 10:17		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-24A **Lab ID: 92240289023** Collected: 03/04/15 16:35 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**0.66J**	mg/kg	0.97	0.48	1	03/10/15 16:30	03/10/15 23:17	7440-38-2	
Barium	**210**	mg/kg	0.48	0.24	1	03/10/15 16:30	03/10/15 23:17	7440-39-3	
Cadmium	**0.13**	mg/kg	0.097	0.048	1	03/10/15 16:30	03/10/15 23:17	7440-43-9	
Chromium	**27.2**	mg/kg	0.48	0.24	1	03/10/15 16:30	03/10/15 23:17	7440-47-3	
Lead	**5.7**	mg/kg	0.48	0.24	1	03/10/15 16:30	03/10/15 23:17	7439-92-1	
Selenium	**0.80J**	mg/kg	0.97	0.48	1	03/10/15 16:30	03/10/15 23:17	7782-49-2	
Silver	ND	mg/kg	0.48	0.24	1	03/10/15 16:30	03/10/15 23:17	7440-22-4	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**21.6**	%	0.10	0.10	1		03/11/15 10:17		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-25 **Lab ID: 92240289024** Collected: 03/04/15 16:15 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	ND	mg/kg	0.90	0.45	1	03/10/15 16:30	03/10/15 23:20	7440-38-2	
Barium	**157**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:20	7440-39-3	
Cadmium	**0.098**	mg/kg	0.090	0.045	1	03/10/15 16:30	03/10/15 23:20	7440-43-9	
Chromium	**50.2**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:20	7440-47-3	
Lead	**3.1**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:20	7439-92-1	
Selenium	**1.2**	mg/kg	0.90	0.45	1	03/10/15 16:30	03/10/15 23:20	7782-49-2	
Silver	**1.1**	mg/kg	0.45	0.23	1	03/10/15 16:30	03/10/15 23:20	7440-22-4	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**24.3**	%	0.10	0.10	1		03/11/15 10:17		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-25A **Lab ID: 92240289025** Collected: 03/04/15 16:26 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	ND	mg/kg	1.3	0.63	1	03/10/15 16:30	03/10/15 23:23	7440-38-2	
Barium	**504**	mg/kg	0.63	0.32	1	03/10/15 16:30	03/10/15 23:23	7440-39-3	
Cadmium	**0.096J**	mg/kg	0.13	0.063	1	03/10/15 16:30	03/10/15 23:23	7440-43-9	
Chromium	**48.2**	mg/kg	0.63	0.32	1	03/10/15 16:30	03/10/15 23:23	7440-47-3	
Lead	**6.2**	mg/kg	0.63	0.32	1	03/10/15 16:30	03/10/15 23:23	7439-92-1	
Selenium	**1.1J**	mg/kg	1.3	0.63	1	03/10/15 16:30	03/10/15 23:23	7782-49-2	
Silver	ND	mg/kg	0.63	0.32	1	03/10/15 16:30	03/10/15 23:23	7440-22-4	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**29.3**	%	0.10	0.10	1		03/11/15 10:17		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-26 **Lab ID: 92240289026** Collected: 03/04/15 16:00 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	ND	mg/kg	1.1	0.57	1	03/10/15 16:30	03/10/15 23:26	7440-38-2	
Barium	**129**	mg/kg	0.57	0.29	1	03/10/15 16:30	03/10/15 23:26	7440-39-3	
Cadmium	**0.16**	mg/kg	0.11	0.057	1	03/10/15 16:30	03/10/15 23:26	7440-43-9	
Chromium	**75.8**	mg/kg	0.57	0.29	1	03/10/15 16:30	03/10/15 23:26	7440-47-3	
Lead	**10.8**	mg/kg	0.57	0.29	1	03/10/15 16:30	03/10/15 23:26	7439-92-1	
Selenium	**1.5**	mg/kg	1.1	0.57	1	03/10/15 16:30	03/10/15 23:26	7782-49-2	
Silver	**0.58**	mg/kg	0.57	0.29	1	03/10/15 16:30	03/10/15 23:26	7440-22-4	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**29.5**	%	0.10	0.10	1		03/11/15 10:18		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-26A **Lab ID: 92240289027** Collected: 03/04/15 16:05 Received: 03/09/15 14:25 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	ND	mg/kg	1.2	0.61	1	03/10/15 16:30	03/10/15 23:29	7440-38-2	
Barium	**157**	mg/kg	0.61	0.31	1	03/10/15 16:30	03/10/15 23:29	7440-39-3	
Cadmium	**0.10J**	mg/kg	0.12	0.061	1	03/10/15 16:30	03/10/15 23:29	7440-43-9	
Chromium	**36.9**	mg/kg	0.61	0.31	1	03/10/15 16:30	03/10/15 23:29	7440-47-3	
Lead	**2.2**	mg/kg	0.61	0.31	1	03/10/15 16:30	03/10/15 23:29	7439-92-1	
Selenium	**1.3**	mg/kg	1.2	0.61	1	03/10/15 16:30	03/10/15 23:29	7782-49-2	
Silver	**0.70**	mg/kg	0.61	0.31	1	03/10/15 16:30	03/10/15 23:29	7440-22-4	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**27.3**	%	0.10	0.10	1		03/11/15 10:18		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-33 **Lab ID: 92240289028** Collected: 03/05/15 09:40 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	ND	mg/kg	0.99	0.50	1	03/10/15 16:30	03/10/15 23:35	7440-38-2	
Barium	**150**	mg/kg	0.50	0.25	1	03/10/15 16:30	03/10/15 23:35	7440-39-3	
Cadmium	**0.12**	mg/kg	0.099	0.050	1	03/10/15 16:30	03/10/15 23:35	7440-43-9	
Chromium	**64.1**	mg/kg	0.50	0.25	1	03/10/15 16:30	03/10/15 23:35	7440-47-3	
Lead	**1.9**	mg/kg	0.50	0.25	1	03/10/15 16:30	03/10/15 23:35	7439-92-1	
Selenium	**1.3**	mg/kg	0.99	0.50	1	03/10/15 16:30	03/10/15 23:35	7782-49-2	
Silver	**0.45J**	mg/kg	0.50	0.25	1	03/10/15 16:30	03/10/15 23:35	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**0.0096**	mg/kg	0.0054	0.00011	1	03/11/15 13:50	03/12/15 13:41	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**24.8**	%	0.10	0.10	1		03/11/15 10:18		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-34 **Lab ID: 92240289029** Collected: 03/05/15 09:45 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	ND	mg/kg	1.1	0.53	1	03/10/15 16:30	03/10/15 23:38	7440-38-2	
Barium	**87.5**	mg/kg	0.53	0.27	1	03/10/15 16:30	03/10/15 23:38	7440-39-3	
Cadmium	ND	mg/kg	0.11	0.053	1	03/10/15 16:30	03/10/15 23:38	7440-43-9	
Chromium	**2.2**	mg/kg	0.53	0.27	1	03/10/15 16:30	03/10/15 23:38	7440-47-3	
Lead	**2.0**	mg/kg	0.53	0.27	1	03/10/15 16:30	03/10/15 23:38	7439-92-1	
Selenium	**0.84J**	mg/kg	1.1	0.53	1	03/10/15 16:30	03/10/15 23:38	7782-49-2	
Silver	**0.59**	mg/kg	0.53	0.27	1	03/10/15 16:30	03/10/15 23:38	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**0.0017J**	mg/kg	0.0041	0.000081	1	03/11/15 13:50	03/12/15 13:44	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**10**	%	0.10	0.10	1		03/11/15 10:19		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-31 **Lab ID: 92240289030** Collected: 03/05/15 09:15 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	291	93.3	100		03/11/15 15:56	71-43-2	
Ethylbenzene	**879**	ug/kg	291	105	100		03/11/15 15:56	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	291	87.4	100		03/11/15 15:56	1634-04-4	
Naphthalene	**6180**	ug/kg	291	69.9	100		03/11/15 15:56	91-20-3	
Toluene	ND	ug/kg	291	105	100		03/11/15 15:56	108-88-3	
Xylene (Total)	**1110**	ug/kg	583	210	100		03/11/15 15:56	1330-20-7	
m&p-Xylene	**1110**	ug/kg	583	210	100		03/11/15 15:56	179601-23-1	
o-Xylene	**126J**	ug/kg	291	111	100		03/11/15 15:56	95-47-6	
Surrogates									
Toluene-d8 (S)	114	%	70-130		100		03/11/15 15:56	2037-26-5	
4-Bromofluorobenzene (S)	109	%	70-130		100		03/11/15 15:56	460-00-4	
1,2-Dichloroethane-d4 (S)	117	%	70-130		100		03/11/15 15:56	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**19.2**	%	0.10	0.10	1		03/10/15 19:28		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-32 **Lab ID: 92240289031** Collected: 03/05/15 09:30 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	126	40.3	50		03/11/15 16:16	71-43-2	
Ethylbenzene	**3120**	ug/kg	126	45.3	50		03/11/15 16:16	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	126	37.8	50		03/11/15 16:16	1634-04-4	
Naphthalene	**7640**	ug/kg	504	121	200		03/12/15 14:16	91-20-3	
Toluene	ND	ug/kg	126	45.3	50		03/11/15 16:16	108-88-3	
Xylene (Total)	**4420**	ug/kg	252	90.7	50		03/11/15 16:16	1330-20-7	
m&p-Xylene	**4420**	ug/kg	252	90.7	50		03/11/15 16:16	179601-23-1	
o-Xylene	**116J**	ug/kg	126	47.8	50		03/11/15 16:16	95-47-6	
Surrogates									
Toluene-d8 (S)	114	%	70-130		50		03/11/15 16:16	2037-26-5	
4-Bromofluorobenzene (S)	115	%	70-130		50		03/11/15 16:16	460-00-4	
1,2-Dichloroethane-d4 (S)	114	%	70-130		50		03/11/15 16:16	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**15.8**	%	0.10	0.10	1		03/10/15 19:29		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-38 **Lab ID: 92240289032** Collected: 03/05/15 11:10 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	3.4	1.1	1		03/11/15 16:36	71-43-2	
Ethylbenzene	ND	ug/kg	3.4	1.2	1		03/11/15 16:36	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	3.4	1.0	1		03/11/15 16:36	1634-04-4	
Naphthalene	**2.4J**	ug/kg	3.4	0.82	1		03/11/15 16:36	91-20-3	
Toluene	ND	ug/kg	3.4	1.2	1		03/11/15 16:36	108-88-3	
Xylene (Total)	ND	ug/kg	6.9	2.5	1		03/11/15 16:36	1330-20-7	
m&p-Xylene	ND	ug/kg	6.9	2.5	1		03/11/15 16:36	179601-23-1	
o-Xylene	ND	ug/kg	3.4	1.3	1		03/11/15 16:36	95-47-6	
Surrogates									
Toluene-d8 (S)	102	%	70-130		1		03/11/15 16:36	2037-26-5	
4-Bromofluorobenzene (S)	102	%	70-130		1		03/11/15 16:36	460-00-4	
1,2-Dichloroethane-d4 (S)	112	%	70-130		1		03/11/15 16:36	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.0**	%	0.10	0.10	1		03/10/15 19:29		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-39 **Lab ID: 92240289033** Collected: 03/05/15 11:20 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.9	0.92	1		03/11/15 16:56	71-43-2	
Ethylbenzene	ND	ug/kg	2.9	1.0	1		03/11/15 16:56	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.9	0.86	1		03/11/15 16:56	1634-04-4	
Naphthalene	ND	ug/kg	2.9	0.69	1		03/11/15 16:56	91-20-3	
Toluene	ND	ug/kg	2.9	1.0	1		03/11/15 16:56	108-88-3	
Xylene (Total)	ND	ug/kg	5.7	2.1	1		03/11/15 16:56	1330-20-7	
m&p-Xylene	ND	ug/kg	5.7	2.1	1		03/11/15 16:56	179601-23-1	
o-Xylene	ND	ug/kg	2.9	1.1	1		03/11/15 16:56	95-47-6	
Surrogates									
Toluene-d8 (S)	102	%	70-130		1		03/11/15 16:56	2037-26-5	
4-Bromofluorobenzene (S)	104	%	70-130		1		03/11/15 16:56	460-00-4	
1,2-Dichloroethane-d4 (S)	106	%	70-130		1		03/11/15 16:56	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.4**	%	0.10	0.10	1		03/10/15 19:29		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: SB-40 **Lab ID: 92240289034** Collected: 03/05/15 11:33 Received: 03/09/15 16:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5035A SC Volatile Org	Analytical Method: EPA 8260								
Benzene	ND	ug/kg	2.3	0.73	1		03/11/15 17:15	71-43-2	
Ethylbenzene	ND	ug/kg	2.3	0.82	1		03/11/15 17:15	100-41-4	
Methyl-tert-butyl ether	ND	ug/kg	2.3	0.69	1		03/11/15 17:15	1634-04-4	
Naphthalene	ND	ug/kg	2.3	0.55	1		03/11/15 17:15	91-20-3	
Toluene	ND	ug/kg	2.3	0.82	1		03/11/15 17:15	108-88-3	
Xylene (Total)	ND	ug/kg	4.6	1.6	1		03/11/15 17:15	1330-20-7	
m&p-Xylene	ND	ug/kg	4.6	1.6	1		03/11/15 17:15	179601-23-1	
o-Xylene	ND	ug/kg	2.3	0.87	1		03/11/15 17:15	95-47-6	
Surrogates									
Toluene-d8 (S)	105	%	70-130		1		03/11/15 17:15	2037-26-5	
4-Bromofluorobenzene (S)	98	%	70-130		1		03/11/15 17:15	460-00-4	
1,2-Dichloroethane-d4 (S)	101	%	70-130		1		03/11/15 17:15	17060-07-0	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**13.1**	%	0.10	0.10	1		03/10/15 19:29		

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: MW-6 **Lab ID: 92240289035** Collected: 03/03/15 11:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Benzene	ND	ug/L	1.0	0.25	1		03/11/15 21:06	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.30	1		03/11/15 21:06	100-41-4	
Methyl-tert-butyl ether	**1.3**	ug/L	1.0	0.21	1		03/11/15 21:06	1634-04-4	
Naphthalene	ND	ug/L	1.0	0.24	1		03/11/15 21:06	91-20-3	
Toluene	ND	ug/L	1.0	0.26	1		03/11/15 21:06	108-88-3	
Xylene (Total)	ND	ug/L	2.0	0.66	1		03/11/15 21:06	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		03/11/15 21:06	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		03/11/15 21:06	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	101	%	70-130		1		03/11/15 21:06	460-00-4	
1,2-Dichloroethane-d4 (S)	114	%	70-130		1		03/11/15 21:06	17060-07-0	
Toluene-d8 (S)	95	%	70-130		1		03/11/15 21:06	2037-26-5	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-1 **Lab ID: 92240289036** Collected: 03/03/15 13:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Benzene	**6480**	ug/L	100	25.0	100		03/12/15 14:53	71-43-2	
Ethylbenzene	**702**	ug/L	100	30.0	100		03/12/15 14:53	100-41-4	
Methyl-tert-butyl ether	**2820**	ug/L	100	21.0	100		03/12/15 14:53	1634-04-4	
Naphthalene	**111**	ug/L	1.0	0.24	1		03/11/15 21:23	91-20-3	
Toluene	**1120**	ug/L	100	26.0	100		03/12/15 14:53	108-88-3	
Xylene (Total)	**536**	ug/L	2.0	0.66	1		03/11/15 21:23	1330-20-7	
m&p-Xylene	**383**	ug/L	2.0	0.66	1		03/11/15 21:23	179601-23-1	
o-Xylene	**153**	ug/L	1.0	0.23	1		03/11/15 21:23	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	94	%	70-130		1		03/11/15 21:23	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	70-130		1		03/11/15 21:23	17060-07-0	
Toluene-d8 (S)	102	%	70-130		1		03/11/15 21:23	2037-26-5	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-2 **Lab ID: 92240289037** Collected: 03/03/15 14:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Benzene	**13.5**	ug/L	1.0	0.25	1		03/12/15 20:14	71-43-2	
Ethylbenzene	**7.8**	ug/L	1.0	0.30	1		03/12/15 20:14	100-41-4	
Methyl-tert-butyl ether	**59.5**	ug/L	1.0	0.21	1		03/12/15 20:14	1634-04-4	
Naphthalene	**2.8**	ug/L	1.0	0.24	1		03/12/15 20:14	91-20-3	
Toluene	**0.95J**	ug/L	1.0	0.26	1		03/12/15 20:14	108-88-3	
Xylene (Total)	**16.4**	ug/L	2.0	0.66	1		03/12/15 20:14	1330-20-7	
m&p-Xylene	**15.1**	ug/L	2.0	0.66	1		03/12/15 20:14	179601-23-1	
o-Xylene	**1.3**	ug/L	1.0	0.23	1		03/12/15 20:14	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	105	%	70-130		1		03/12/15 20:14	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	70-130		1		03/12/15 20:14	17060-07-0	
Toluene-d8 (S)	96	%	70-130		1		03/12/15 20:14	2037-26-5	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-3 **Lab ID: 92240289038** Collected: 03/04/15 14:40 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM 3510	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:13	83-32-9	
Acenaphthylene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 17:13	208-96-8	
Anthracene	ND	ug/L	0.050	0.050	1	03/10/15 16:00	03/13/15 17:13	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:13	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	207-08-9	
Chrysene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:13	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	53-70-3	
Fluoranthene	ND	ug/L	0.30	0.30	1	03/10/15 16:00	03/13/15 17:13	206-44-0	
Fluorene	ND	ug/L	0.31	0.31	1	03/10/15 16:00	03/13/15 17:13	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	193-39-5	
1-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:13	90-12-0	
2-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:13	91-57-6	
Naphthalene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 17:13	91-20-3	
Phenanthrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:13	85-01-8	
Pyrene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:13	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	83	%	70-130		1	03/10/15 16:00	03/13/15 17:13	4165-60-0	
2-Fluorobiphenyl (S)	62	%	70-130		1	03/10/15 16:00	03/13/15 17:13	321-60-8	2g,S0
Terphenyl-d14 (S)	67	%	70-130		1	03/10/15 16:00	03/13/15 17:13	1718-51-0	2g,S0
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/13/15 11:39	83-32-9	
Acenaphthylene	ND	ug/L	10.0	0.99	1	03/10/15 08:15	03/13/15 11:39	208-96-8	
Aniline	ND	ug/L	10.0	0.80	1	03/10/15 08:15	03/13/15 11:39	62-53-3	
Anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/13/15 11:39	120-12-7	
Benzo(a)anthracene	**2.5J**	ug/L	10.0	0.47	1	03/10/15 08:15	03/13/15 11:39	56-55-3	
Benzo(a)pyrene	**1.5J**	ug/L	10.0	0.55	1	03/10/15 08:15	03/13/15 11:39	50-32-8	
Benzo(b)fluoranthene	**1.9J**	ug/L	10.0	0.44	1	03/10/15 08:15	03/13/15 11:39	205-99-2	
Benzo(g,h,i)perylene	**1.5J**	ug/L	10.0	0.45	1	03/10/15 08:15	03/13/15 11:39	191-24-2	
Benzo(k)fluoranthene	**1.9J**	ug/L	10.0	0.53	1	03/10/15 08:15	03/13/15 11:39	207-08-9	
Benzoic Acid	ND	ug/L	50.0	4.9	1	03/10/15 08:15	03/13/15 11:39	65-85-0	
Benzyl alcohol	ND	ug/L	20.0	2.1	1	03/10/15 08:15	03/13/15 11:39	100-51-6	
4-Bromophenylphenyl ether	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	101-55-3	
Butylbenzylphthalate	**2.5J**	ug/L	10.0	0.48	1	03/10/15 08:15	03/13/15 11:39	85-68-7	
4-Chloro-3-methylphenol	ND	ug/L	20.0	2.0	1	03/10/15 08:15	03/13/15 11:39	59-50-7	
4-Chloroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/13/15 11:39	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/13/15 11:39	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/L	10.0	0.89	1	03/10/15 08:15	03/13/15 11:39	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/L	10.0	0.86	1	03/10/15 08:15	03/13/15 11:39	108-60-1	
2-Chloronaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	91-58-7	
2-Chlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/13/15 11:39	7005-72-3	
Chrysene	**3.0J**	ug/L	10.0	0.49	1	03/10/15 08:15	03/13/15 11:39	218-01-9	

REPORT OF LABORATORY ANALYSIS

Pace Analytical
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Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-3 **Lab ID: 92240289038** Collected: 03/04/15 14:40 Received: 03/09/15 16:55 Matrix: Water

8270 MSSV Semivolatile Org SC Analytical Method: EPA 8270 Preparation Method: EPA 3510

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dibenz(a,h)anthracene	**1.2J**	ug/L	10.0	0.49	1	03/10/15 08:15	03/13/15 11:39	53-70-3	
Dibenzofuran	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	132-64-9	
1,2-Dichlorobenzene	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/13/15 11:39	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	10.0	0.78	1	03/10/15 08:15	03/13/15 11:39	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/13/15 11:39	106-46-7	
3,3'-Dichlorobenzidine	**2.3J**	ug/L	50.0	0.67	1	03/10/15 08:15	03/13/15 11:39	91-94-1	
2,4-Dichlorophenol	ND	ug/L	10.0	1.7	1	03/10/15 08:15	03/13/15 11:39	120-83-2	
Diethylphthalate	ND	ug/L	10.0	0.91	1	03/10/15 08:15	03/13/15 11:39	84-66-2	
2,4-Dimethylphenol	ND	ug/L	10.0	0.96	1	03/10/15 08:15	03/13/15 11:39	105-67-9	
Dimethylphthalate	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/13/15 11:39	131-11-3	
Di-n-butylphthalate	ND	ug/L	10.0	0.37	1	03/10/15 08:15	03/13/15 11:39	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/L	20.0	1.1	1	03/10/15 08:15	03/13/15 11:39	534-52-1	
2,4-Dinitrophenol	ND	ug/L	50.0	2.5	1	03/10/15 08:15	03/13/15 11:39	51-28-5	
2,4-Dinitrotoluene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/13/15 11:39	121-14-2	
2,6-Dinitrotoluene	ND	ug/L	10.0	2.1	1	03/10/15 08:15	03/13/15 11:39	606-20-2	
Di-n-octylphthalate	**1.4J**	ug/L	10.0	0.12	1	03/10/15 08:15	03/13/15 11:39	117-84-0	
bis(2-Ethylhexyl)phthalate	**2.0J**	ug/L	6.0	0.49	1	03/10/15 08:15	03/13/15 11:39	117-81-7	
Fluoranthene	**4.1J**	ug/L	10.0	0.41	1	03/10/15 08:15	03/13/15 11:39	206-44-0	
Fluorene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/13/15 11:39	87-68-3	
Hexachlorobenzene	ND	ug/L	10.0	0.76	1	03/10/15 08:15	03/13/15 11:39	118-74-1	
Hexachlorocyclopentadiene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/13/15 11:39	77-47-4	
Hexachloroethane	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/13/15 11:39	67-72-1	
Indeno(1,2,3-cd)pyrene	**1.3J**	ug/L	10.0	0.53	1	03/10/15 08:15	03/13/15 11:39	193-39-5	
Isophorone	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/13/15 11:39	78-59-1	
1-Methylnaphthalene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/13/15 11:39	90-12-0	
2-Methylnaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39		
Naphthalene	ND	ug/L	10.0	0.93	1	03/10/15 08:15	03/13/15 11:39	91-20-3	
2-Nitroaniline	ND	ug/L	50.0	1.5	1	03/10/15 08:15	03/13/15 11:39	88-74-4	
3-Nitroaniline	ND	ug/L	50.0	1.3	1	03/10/15 08:15	03/13/15 11:39	99-09-2	
4-Nitroaniline	**3.2J**	ug/L	50.0	1.6	1	03/10/15 08:15	03/13/15 11:39	100-01-6	
Nitrobenzene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	98-95-3	
2-Nitrophenol	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/13/15 11:39	88-75-5	
4-Nitrophenol	**8.8J**	ug/L	50.0	3.9	1	03/10/15 08:15	03/13/15 11:39	100-02-7	
N-Nitrosodimethylamine	ND	ug/L	10.0	0.94	1	03/10/15 08:15	03/13/15 11:39	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/13/15 11:39	621-64-7	
N-Nitrosodiphenylamine	ND	ug/L	10.0	0.64	1	03/10/15 08:15	03/13/15 11:39	86-30-6	
Pentachlorophenol	**2.9J**	ug/L	50.0	1.2	1	03/10/15 08:15	03/13/15 11:39	87-86-5	
Phenanthrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/13/15 11:39	85-01-8	
Phenol	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/13/15 11:39	108-95-2	
Pyrene	**3.8J**	ug/L	10.0	0.49	1	03/10/15 08:15	03/13/15 11:39	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/13/15 11:39	120-82-1	
2,4,5-Trichlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/13/15 11:39	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/13/15 11:39	88-06-2	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-3 **Lab ID: 92240289038** Collected: 03/04/15 14:40 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Surrogates									
Nitrobenzene-d5 (S)	61	%	21-110		1	03/10/15 08:15	03/13/15 11:39	4165-60-0	
2-Fluorobiphenyl (S)	69	%	27-110		1	03/10/15 08:15	03/13/15 11:39	321-60-8	
Terphenyl-d14 (S)	84	%	31-107		1	03/10/15 08:15	03/13/15 11:39	1718-51-0	
Phenol-d6 (S)	32	%	10-110		1	03/10/15 08:15	03/13/15 11:39	13127-88-3	
2-Fluorophenol (S)	41	%	12-110		1	03/10/15 08:15	03/13/15 11:39	367-12-4	
2,4,6-Tribromophenol (S)	71	%	27-110		1	03/10/15 08:15	03/13/15 11:39	118-79-6	
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	25.0	10.0	1		03/11/15 21:57	67-64-1	
Benzene	**0.74J**	ug/L	1.0	0.25	1		03/11/15 21:57	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.30	1		03/11/15 21:57	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.17	1		03/11/15 21:57	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		03/11/15 21:57	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		03/11/15 21:57	75-25-2	
Bromomethane	ND	ug/L	5.0	0.29	1		03/11/15 21:57	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		03/11/15 21:57	78-93-3	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		03/11/15 21:57	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.23	1		03/11/15 21:57	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		03/11/15 21:57	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		03/11/15 21:57	67-66-3	
Chloromethane	ND	ug/L	1.0	0.11	1		03/11/15 21:57	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.35	1		03/11/15 21:57	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.31	1		03/11/15 21:57	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	2.0	2.0	1		03/11/15 21:57	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		03/11/15 21:57	124-48-1	
Dibromomethane	ND	ug/L	1.0	0.21	1		03/11/15 21:57	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		03/11/15 21:57	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.24	1		03/11/15 21:57	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.33	1		03/11/15 21:57	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.21	1		03/11/15 21:57	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.32	1		03/11/15 21:57	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		03/11/15 21:57	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		03/11/15 21:57	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		03/11/15 21:57	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/11/15 21:57	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		03/11/15 21:57	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.28	1		03/11/15 21:57	142-28-9	
2,2-Dichloropropane	ND	ug/L	1.0	0.13	1		03/11/15 21:57	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.49	1		03/11/15 21:57	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		03/11/15 21:57	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		03/11/15 21:57	10061-02-6	
Diisopropyl ether	**0.17J**	ug/L	1.0	0.12	1		03/11/15 21:57	108-20-3	
Ethylbenzene	**0.43J**	ug/L	1.0	0.30	1		03/11/15 21:57	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	1.0	0.71	1		03/11/15 21:57	87-68-3	
2-Hexanone	ND	ug/L	5.0	0.46	1		03/11/15 21:57	591-78-6	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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Huntersville, NC 28078
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-3 **Lab ID: 92240289038** Collected: 03/04/15 14:40 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
p-Isopropyltoluene	ND	ug/L	1.0	0.31	1		03/11/15 21:57	99-87-6	
Methylene Chloride	ND	ug/L	2.0	0.97	1		03/11/15 21:57	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		03/11/15 21:57	108-10-1	
Methyl-tert-butyl ether	**0.41J**	ug/L	1.0	0.21	1		03/11/15 21:57	1634-04-4	
Naphthalene	ND	ug/L	1.0	0.24	1		03/11/15 21:57	91-20-3	
Styrene	ND	ug/L	1.0	0.26	1		03/11/15 21:57	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		03/11/15 21:57	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		03/11/15 21:57	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		03/11/15 21:57	127-18-4	
Toluene	**0.44J**	ug/L	1.0	0.26	1		03/11/15 21:57	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.33	1		03/11/15 21:57	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.35	1		03/11/15 21:57	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		03/11/15 21:57	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		03/11/15 21:57	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.47	1		03/11/15 21:57	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		03/11/15 21:57	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		03/11/15 21:57	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		03/11/15 21:57	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/11/15 21:57	75-01-4	
Xylene (Total)	ND	ug/L	2.0	0.66	1		03/11/15 21:57	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		03/11/15 21:57	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		03/11/15 21:57	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	97	%	70-130		1		03/11/15 21:57	460-00-4	
1,2-Dichloroethane-d4 (S)	107	%	70-130		1		03/11/15 21:57	17060-07-0	
Toluene-d8 (S)	96	%	70-130		1		03/11/15 21:57	2037-26-5	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-4 **Lab ID: 92240289039** Collected: 03/04/15 14:55 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM 3510	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:33	83-32-9	
Acenaphthylene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 17:33	208-96-8	
Anthracene	ND	ug/L	0.050	0.050	1	03/10/15 16:00	03/13/15 17:33	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:33	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	207-08-9	
Chrysene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:33	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	53-70-3	
Fluoranthene	ND	ug/L	0.30	0.30	1	03/10/15 16:00	03/13/15 17:33	206-44-0	
Fluorene	ND	ug/L	0.31	0.31	1	03/10/15 16:00	03/13/15 17:33	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	193-39-5	
1-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:33	90-12-0	
2-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:33	91-57-6	
Naphthalene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 17:33	91-20-3	
Phenanthrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:33	85-01-8	
Pyrene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:33	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	86	%	70-130		1	03/10/15 16:00	03/13/15 17:33	4165-60-0	
2-Fluorobiphenyl (S)	67	%	70-130		1	03/10/15 16:00	03/13/15 17:33	321-60-8	2g,S0
Terphenyl-d14 (S)	76	%	70-130		1	03/10/15 16:00	03/13/15 17:33	1718-51-0	
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 15:06	83-32-9	
Acenaphthylene	ND	ug/L	10.0	0.99	1	03/10/15 08:15	03/12/15 15:06	208-96-8	
Aniline	ND	ug/L	10.0	0.80	1	03/10/15 08:15	03/12/15 15:06	62-53-3	
Anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/12/15 15:06	120-12-7	
Benzo(a)anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/12/15 15:06	56-55-3	
Benzo(a)pyrene	ND	ug/L	10.0	0.55	1	03/10/15 08:15	03/12/15 15:06	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	10.0	0.44	1	03/10/15 08:15	03/12/15 15:06	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	10.0	0.45	1	03/10/15 08:15	03/12/15 15:06	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 15:06	207-08-9	
Benzoic Acid	ND	ug/L	50.0	4.9	1	03/10/15 08:15	03/12/15 15:06	65-85-0	
Benzyl alcohol	ND	ug/L	20.0	2.1	1	03/10/15 08:15	03/12/15 15:06	100-51-6	
4-Bromophenylphenyl ether	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	101-55-3	
Butylbenzylphthalate	ND	ug/L	10.0	0.48	1	03/10/15 08:15	03/12/15 15:06	85-68-7	
4-Chloro-3-methylphenol	ND	ug/L	20.0	2.0	1	03/10/15 08:15	03/12/15 15:06	59-50-7	
4-Chloroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/12/15 15:06	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/12/15 15:06	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/L	10.0	0.89	1	03/10/15 08:15	03/12/15 15:06	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/L	10.0	0.86	1	03/10/15 08:15	03/12/15 15:06	108-60-1	
2-Chloronaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	91-58-7	
2-Chlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 15:06	7005-72-3	
Chrysene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 15:06	218-01-9	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12

Pace Project No.: 92240289

Sample: TW-4 **Lab ID: 92240289039** Collected: 03/04/15 14:55 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Dibenz(a,h)anthracene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 15:06	53-70-3	
Dibenzofuran	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	132-64-9	
1,2-Dichlorobenzene	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/12/15 15:06	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	10.0	0.78	1	03/10/15 08:15	03/12/15 15:06	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/12/15 15:06	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/L	50.0	0.67	1	03/10/15 08:15	03/12/15 15:06	91-94-1	
2,4-Dichlorophenol	ND	ug/L	10.0	1.7	1	03/10/15 08:15	03/12/15 15:06	120-83-2	
Diethylphthalate	ND	ug/L	10.0	0.91	1	03/10/15 08:15	03/12/15 15:06	84-66-2	
2,4-Dimethylphenol	ND	ug/L	10.0	0.96	1	03/10/15 08:15	03/12/15 15:06	105-67-9	
Dimethylphthalate	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/12/15 15:06	131-11-3	
Di-n-butylphthalate	ND	ug/L	10.0	0.37	1	03/10/15 08:15	03/12/15 15:06	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/L	20.0	1.1	1	03/10/15 08:15	03/12/15 15:06	534-52-1	
2,4-Dinitrophenol	ND	ug/L	50.0	2.5	1	03/10/15 08:15	03/12/15 15:06	51-28-5	
2,4-Dinitrotoluene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 15:06	121-14-2	
2,6-Dinitrotoluene	ND	ug/L	10.0	2.1	1	03/10/15 08:15	03/12/15 15:06	606-20-2	
Di-n-octylphthalate	ND	ug/L	10.0	0.12	1	03/10/15 08:15	03/12/15 15:06	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/L	6.0	0.49	1	03/10/15 08:15	03/12/15 15:06	117-81-7	
Fluoranthene	ND	ug/L	10.0	0.41	1	03/10/15 08:15	03/12/15 15:06	206-44-0	
Fluorene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/12/15 15:06	87-68-3	
Hexachlorobenzene	ND	ug/L	10.0	0.76	1	03/10/15 08:15	03/12/15 15:06	118-74-1	
Hexachlorocyclopentadiene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 15:06	77-47-4	
Hexachloroethane	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/12/15 15:06	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 15:06	193-39-5	
Isophorone	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 15:06	78-59-1	
1-Methylnaphthalene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 15:06	90-12-0	
2-Methylnaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06		
Naphthalene	ND	ug/L	10.0	0.93	1	03/10/15 08:15	03/12/15 15:06	91-20-3	
2-Nitroaniline	ND	ug/L	50.0	1.5	1	03/10/15 08:15	03/12/15 15:06	88-74-4	
3-Nitroaniline	ND	ug/L	50.0	1.3	1	03/10/15 08:15	03/12/15 15:06	99-09-2	
4-Nitroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/12/15 15:06	100-01-6	
Nitrobenzene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	98-95-3	
2-Nitrophenol	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/12/15 15:06	88-75-5	
4-Nitrophenol	ND	ug/L	50.0	3.9	1	03/10/15 08:15	03/12/15 15:06	100-02-7	
N-Nitrosodimethylamine	ND	ug/L	10.0	0.94	1	03/10/15 08:15	03/12/15 15:06	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/12/15 15:06	621-64-7	
N-Nitrosodiphenylamine	ND	ug/L	10.0	0.64	1	03/10/15 08:15	03/12/15 15:06	86-30-6	
Pentachlorophenol	ND	ug/L	50.0	1.2	1	03/10/15 08:15	03/12/15 15:06	87-86-5	
Phenanthrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 15:06	85-01-8	
Phenol	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 15:06	108-95-2	
Pyrene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 15:06	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/12/15 15:06	120-82-1	
2,4,5-Trichlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 15:06	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/12/15 15:06	88-06-2	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-4 | **Lab ID: 92240289039** | Collected: 03/04/15 14:55 | Received: 03/09/15 16:55 | Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Surrogates									
Nitrobenzene-d5 (S)	77	%	21-110		1	03/10/15 08:15	03/12/15 15:06	4165-60-0	
2-Fluorobiphenyl (S)	77	%	27-110		1	03/10/15 08:15	03/12/15 15:06	321-60-8	
Terphenyl-d14 (S)	92	%	31-107		1	03/10/15 08:15	03/12/15 15:06	1718-51-0	
Phenol-d6 (S)	35	%	10-110		1	03/10/15 08:15	03/12/15 15:06	13127-88-3	
2-Fluorophenol (S)	47	%	12-110		1	03/10/15 08:15	03/12/15 15:06	367-12-4	
2,4,6-Tribromophenol (S)	85	%	27-110		1	03/10/15 08:15	03/12/15 15:06	118-79-6	
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	25.0	10.0	1		03/11/15 22:14	67-64-1	
Benzene	**0.41J**	ug/L	1.0	0.25	1		03/11/15 22:14	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.30	1		03/11/15 22:14	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.17	1		03/11/15 22:14	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		03/11/15 22:14	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		03/11/15 22:14	75-25-2	
Bromomethane	ND	ug/L	5.0	0.29	1		03/11/15 22:14	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		03/11/15 22:14	78-93-3	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		03/11/15 22:14	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.23	1		03/11/15 22:14	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		03/11/15 22:14	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		03/11/15 22:14	67-66-3	
Chloromethane	ND	ug/L	1.0	0.11	1		03/11/15 22:14	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.35	1		03/11/15 22:14	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.31	1		03/11/15 22:14	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	2.0	2.0	1		03/11/15 22:14	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		03/11/15 22:14	124-48-1	
Dibromomethane	ND	ug/L	1.0	0.21	1		03/11/15 22:14	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		03/11/15 22:14	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.24	1		03/11/15 22:14	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.33	1		03/11/15 22:14	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.21	1		03/11/15 22:14	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.32	1		03/11/15 22:14	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		03/11/15 22:14	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		03/11/15 22:14	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		03/11/15 22:14	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/11/15 22:14	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		03/11/15 22:14	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.28	1		03/11/15 22:14	142-28-9	
2,2-Dichloropropane	ND	ug/L	1.0	0.13	1		03/11/15 22:14	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.49	1		03/11/15 22:14	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		03/11/15 22:14	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		03/11/15 22:14	10061-02-6	
Diisopropyl ether	ND	ug/L	1.0	0.12	1		03/11/15 22:14	108-20-3	
Ethylbenzene	ND	ug/L	1.0	0.30	1		03/11/15 22:14	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	1.0	0.71	1		03/11/15 22:14	87-68-3	
2-Hexanone	ND	ug/L	5.0	0.46	1		03/11/15 22:14	591-78-6	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-4 **Lab ID: 92240289039** Collected: 03/04/15 14:55 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
p-Isopropyltoluene	ND	ug/L	1.0	0.31	1		03/11/15 22:14	99-87-6	
Methylene Chloride	ND	ug/L	2.0	0.97	1		03/11/15 22:14	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		03/11/15 22:14	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.21	1		03/11/15 22:14	1634-04-4	
Naphthalene	ND	ug/L	1.0	0.24	1		03/11/15 22:14	91-20-3	
Styrene	ND	ug/L	1.0	0.26	1		03/11/15 22:14	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		03/11/15 22:14	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		03/11/15 22:14	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		03/11/15 22:14	127-18-4	
Toluene	**0.27J**	ug/L	1.0	0.26	1		03/11/15 22:14	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.33	1		03/11/15 22:14	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.35	1		03/11/15 22:14	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		03/11/15 22:14	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		03/11/15 22:14	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.47	1		03/11/15 22:14	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		03/11/15 22:14	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		03/11/15 22:14	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		03/11/15 22:14	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/11/15 22:14	75-01-4	
Xylene (Total)	ND	ug/L	2.0	0.66	1		03/11/15 22:14	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		03/11/15 22:14	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		03/11/15 22:14	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	96	%	70-130		1		03/11/15 22:14	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	70-130		1		03/11/15 22:14	17060-07-0	
Toluene-d8 (S)	95	%	70-130		1		03/11/15 22:14	2037-26-5	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-5 **Lab ID: 92240289040** Collected: 03/03/15 17:50 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
Arsenic	**31.3**	ug/L	10.0	5.0	1	03/10/15 15:05	03/11/15 03:00	7440-38-2	
Barium	**5120**	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:00	7440-39-3	
Cadmium	**4.1**	ug/L	1.0	0.050	1	03/10/15 15:05	03/11/15 03:00	7440-43-9	
Chromium	**684**	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:00	7440-47-3	
Lead	**789**	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:00	7439-92-1	
Selenium	**17.2**	ug/L	10.0	5.0	1	03/10/15 15:05	03/11/15 03:00	7782-49-2	M1
Silver	ND	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:00	7440-22-4	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
Mercury	**0.64**	ug/L	0.20	0.10	1	03/10/15 15:30	03/11/15 13:25	7439-97-6	
8270 MSSV PAH by SIM 3510	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:53	83-32-9	
Acenaphthylene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 17:53	208-96-8	
Anthracene	ND	ug/L	0.050	0.050	1	03/10/15 16:00	03/13/15 17:53	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:53	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	207-08-9	
Chrysene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:53	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	53-70-3	
Fluoranthene	ND	ug/L	0.30	0.30	1	03/10/15 16:00	03/13/15 17:53	206-44-0	
Fluorene	ND	ug/L	0.31	0.31	1	03/10/15 16:00	03/13/15 17:53	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	193-39-5	
1-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:53	90-12-0	
2-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 17:53	91-57-6	
Naphthalene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 17:53	91-20-3	
Phenanthrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 17:53	85-01-8	
Pyrene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 17:53	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	88	%	70-130		1	03/10/15 16:00	03/13/15 17:53	4165-60-0	
2-Fluorobiphenyl (S)	66	%	70-130		1	03/10/15 16:00	03/13/15 17:53	321-60-8	2g,S0
Terphenyl-d14 (S)	76	%	70-130		1	03/10/15 16:00	03/13/15 17:53	1718-51-0	
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 13:31	83-32-9	
Acenaphthylene	ND	ug/L	10.0	0.99	1	03/10/15 08:15	03/12/15 13:31	208-96-8	
Aniline	ND	ug/L	10.0	0.80	1	03/10/15 08:15	03/12/15 13:31	62-53-3	
Anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/12/15 13:31	120-12-7	
Benzo(a)anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/12/15 13:31	56-55-3	
Benzo(a)pyrene	ND	ug/L	10.0	0.55	1	03/10/15 08:15	03/12/15 13:31	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	10.0	0.44	1	03/10/15 08:15	03/12/15 13:31	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	10.0	0.45	1	03/10/15 08:15	03/12/15 13:31	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 13:31	207-08-9	
Benzoic Acid	ND	ug/L	50.0	4.9	1	03/10/15 08:15	03/12/15 13:31	65-85-0	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-5 **Lab ID: 92240289040** Collected: 03/03/15 17:50 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Benzyl alcohol	ND	ug/L	20.0	2.1	1	03/10/15 08:15	03/12/15 13:31	100-51-6	
4-Bromophenylphenyl ether	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	101-55-3	
Butylbenzylphthalate	ND	ug/L	10.0	0.48	1	03/10/15 08:15	03/12/15 13:31	85-68-7	
4-Chloro-3-methylphenol	ND	ug/L	20.0	2.0	1	03/10/15 08:15	03/12/15 13:31	59-50-7	
4-Chloroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/12/15 13:31	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/12/15 13:31	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/L	10.0	0.89	1	03/10/15 08:15	03/12/15 13:31	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/L	10.0	0.86	1	03/10/15 08:15	03/12/15 13:31	108-60-1	
2-Chloronaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	91-58-7	
2-Chlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 13:31	7005-72-3	
Chrysene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 13:31	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 13:31	53-70-3	
Dibenzofuran	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	132-64-9	
1,2-Dichlorobenzene	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/12/15 13:31	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	10.0	0.78	1	03/10/15 08:15	03/12/15 13:31	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/12/15 13:31	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/L	50.0	0.67	1	03/10/15 08:15	03/12/15 13:31	91-94-1	
2,4-Dichlorophenol	ND	ug/L	10.0	1.7	1	03/10/15 08:15	03/12/15 13:31	120-83-2	
Diethylphthalate	ND	ug/L	10.0	0.91	1	03/10/15 08:15	03/12/15 13:31	84-66-2	
2,4-Dimethylphenol	ND	ug/L	10.0	0.96	1	03/10/15 08:15	03/12/15 13:31	105-67-9	
Dimethylphthalate	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/12/15 13:31	131-11-3	
Di-n-butylphthalate	ND	ug/L	10.0	0.37	1	03/10/15 08:15	03/12/15 13:31	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/L	20.0	1.1	1	03/10/15 08:15	03/12/15 13:31	534-52-1	
2,4-Dinitrophenol	ND	ug/L	50.0	2.5	1	03/10/15 08:15	03/12/15 13:31	51-28-5	
2,4-Dinitrotoluene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 13:31	121-14-2	
2,6-Dinitrotoluene	ND	ug/L	10.0	2.1	1	03/10/15 08:15	03/12/15 13:31	606-20-2	
Di-n-octylphthalate	ND	ug/L	10.0	0.12	1	03/10/15 08:15	03/12/15 13:31	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/L	6.0	0.49	1	03/10/15 08:15	03/12/15 13:31	117-81-7	
Fluoranthene	ND	ug/L	10.0	0.41	1	03/10/15 08:15	03/12/15 13:31	206-44-0	
Fluorene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/12/15 13:31	87-68-3	
Hexachlorobenzene	ND	ug/L	10.0	0.76	1	03/10/15 08:15	03/12/15 13:31	118-74-1	
Hexachlorocyclopentadiene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 13:31	77-47-4	
Hexachloroethane	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/12/15 13:31	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 13:31	193-39-5	
Isophorone	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 13:31	78-59-1	
1-Methylnaphthalene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 13:31	90-12-0	
2-Methylnaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31		
Naphthalene	ND	ug/L	10.0	0.93	1	03/10/15 08:15	03/12/15 13:31	91-20-3	
2-Nitroaniline	ND	ug/L	50.0	1.5	1	03/10/15 08:15	03/12/15 13:31	88-74-4	
3-Nitroaniline	ND	ug/L	50.0	1.3	1	03/10/15 08:15	03/12/15 13:31	99-09-2	
4-Nitroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/12/15 13:31	100-01-6	
Nitrobenzene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	98-95-3	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-5 **Lab ID: 92240289040** Collected: 03/03/15 17:50 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
2-Nitrophenol	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/12/15 13:31	88-75-5	
4-Nitrophenol	ND	ug/L	50.0	3.9	1	03/10/15 08:15	03/12/15 13:31	100-02-7	
N-Nitrosodimethylamine	ND	ug/L	10.0	0.94	1	03/10/15 08:15	03/12/15 13:31	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/12/15 13:31	621-64-7	
N-Nitrosodiphenylamine	ND	ug/L	10.0	0.64	1	03/10/15 08:15	03/12/15 13:31	86-30-6	
Pentachlorophenol	ND	ug/L	50.0	1.2	1	03/10/15 08:15	03/12/15 13:31	87-86-5	
Phenanthrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 13:31	85-01-8	
Phenol	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 13:31	108-95-2	
Pyrene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 13:31	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/12/15 13:31	120-82-1	
2,4,5-Trichlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 13:31	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/12/15 13:31	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	78	%	21-110		1	03/10/15 08:15	03/12/15 13:31	4165-60-0	
2-Fluorobiphenyl (S)	77	%	27-110		1	03/10/15 08:15	03/12/15 13:31	321-60-8	
Terphenyl-d14 (S)	97	%	31-107		1	03/10/15 08:15	03/12/15 13:31	1718-51-0	
Phenol-d6 (S)	33	%	10-110		1	03/10/15 08:15	03/12/15 13:31	13127-88-3	
2-Fluorophenol (S)	47	%	12-110		1	03/10/15 08:15	03/12/15 13:31	367-12-4	
2,4,6-Tribromophenol (S)	84	%	27-110		1	03/10/15 08:15	03/12/15 13:31	118-79-6	
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	25.0	10.0	1		03/10/15 21:26	67-64-1	
Benzene	ND	ug/L	1.0	0.25	1		03/10/15 21:26	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.30	1		03/10/15 21:26	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.17	1		03/10/15 21:26	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		03/10/15 21:26	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		03/10/15 21:26	75-25-2	
Bromomethane	ND	ug/L	5.0	0.29	1		03/10/15 21:26	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		03/10/15 21:26	78-93-3	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		03/10/15 21:26	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.23	1		03/10/15 21:26	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		03/10/15 21:26	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		03/10/15 21:26	67-66-3	
Chloromethane	ND	ug/L	1.0	0.11	1		03/10/15 21:26	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.35	1		03/10/15 21:26	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.31	1		03/10/15 21:26	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	2.0	2.0	1		03/10/15 21:26	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		03/10/15 21:26	124-48-1	
Dibromomethane	ND	ug/L	1.0	0.21	1		03/10/15 21:26	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		03/10/15 21:26	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.24	1		03/10/15 21:26	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.33	1		03/10/15 21:26	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.21	1		03/10/15 21:26	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.32	1		03/10/15 21:26	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		03/10/15 21:26	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		03/10/15 21:26	75-35-4	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-5 **Lab ID: 92240289040** Collected: 03/03/15 17:50 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		03/10/15 21:26	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/10/15 21:26	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		03/10/15 21:26	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.28	1		03/10/15 21:26	142-28-9	
2,2-Dichloropropane	ND	ug/L	1.0	0.13	1		03/10/15 21:26	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.49	1		03/10/15 21:26	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		03/10/15 21:26	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		03/10/15 21:26	10061-02-6	
Diisopropyl ether	ND	ug/L	1.0	0.12	1		03/10/15 21:26	108-20-3	
Ethylbenzene	ND	ug/L	1.0	0.30	1		03/10/15 21:26	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	1.0	0.71	1		03/10/15 21:26	87-68-3	
2-Hexanone	ND	ug/L	5.0	0.46	1		03/10/15 21:26	591-78-6	
p-Isopropyltoluene	ND	ug/L	1.0	0.31	1		03/10/15 21:26	99-87-6	
Methylene Chloride	ND	ug/L	2.0	0.97	1		03/10/15 21:26	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		03/10/15 21:26	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.21	1		03/10/15 21:26	1634-04-4	
Naphthalene	ND	ug/L	1.0	0.24	1		03/10/15 21:26	91-20-3	
Styrene	ND	ug/L	1.0	0.26	1		03/10/15 21:26	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		03/10/15 21:26	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		03/10/15 21:26	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		03/10/15 21:26	127-18-4	
Toluene	ND	ug/L	1.0	0.26	1		03/10/15 21:26	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.33	1		03/10/15 21:26	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.35	1		03/10/15 21:26	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		03/10/15 21:26	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		03/10/15 21:26	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.47	1		03/10/15 21:26	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		03/10/15 21:26	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		03/10/15 21:26	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		03/10/15 21:26	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/10/15 21:26	75-01-4	
Xylene (Total)	ND	ug/L	2.0	0.66	1		03/10/15 21:26	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		03/10/15 21:26	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		03/10/15 21:26	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	100	%	70-130		1		03/10/15 21:26	460-00-4	
1,2-Dichloroethane-d4 (S)	108	%	70-130		1		03/10/15 21:26	17060-07-0	
Toluene-d8 (S)	97	%	70-130		1		03/10/15 21:26	2037-26-5	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-6 **Lab ID: 92240289041** Collected: 03/03/15 16:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
Arsenic	ND	ug/L	10.0	5.0	1	03/10/15 15:05	03/11/15 03:18	7440-38-2	
Barium	**16700**	ug/L	50.0	25.0	10	03/10/15 15:05	03/11/15 16:06	7440-39-3	
Cadmium	**3.3**	ug/L	1.0	0.050	1	03/10/15 15:05	03/11/15 03:18	7440-43-9	
Chromium	**2900**	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:18	7440-47-3	
Lead	**215**	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:18	7439-92-1	
Selenium	**30.2**	ug/L	10.0	5.0	1	03/10/15 15:05	03/11/15 03:18	7782-49-2	
Silver	**6.5**	ug/L	5.0	2.5	1	03/10/15 15:05	03/11/15 03:18	7440-22-4	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
Mercury	**0.46**	ug/L	0.20	0.10	1	03/13/15 12:00	03/14/15 13:44	7439-97-6	
8270 MSSV PAH by SIM 3510	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 18:14	83-32-9	
Acenaphthylene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 18:14	208-96-8	
Anthracene	ND	ug/L	0.050	0.050	1	03/10/15 16:00	03/13/15 18:14	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 18:14	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	207-08-9	
Chrysene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 18:14	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	53-70-3	
Fluoranthene	ND	ug/L	0.30	0.30	1	03/10/15 16:00	03/13/15 18:14	206-44-0	
Fluorene	ND	ug/L	0.31	0.31	1	03/10/15 16:00	03/13/15 18:14	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	193-39-5	
1-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 18:14	90-12-0	
2-Methylnaphthalene	ND	ug/L	2.0	2.0	1	03/10/15 16:00	03/13/15 18:14	91-57-6	
Naphthalene	ND	ug/L	1.5	1.5	1	03/10/15 16:00	03/13/15 18:14	91-20-3	
Phenanthrene	ND	ug/L	0.20	0.20	1	03/10/15 16:00	03/13/15 18:14	85-01-8	
Pyrene	ND	ug/L	0.10	0.10	1	03/10/15 16:00	03/13/15 18:14	129-00-0	
Surrogates									
Nitrobenzene-d5 (S)	85	%	70-130		1	03/10/15 16:00	03/13/15 18:14	4165-60-0	
2-Fluorobiphenyl (S)	68	%	70-130		1	03/10/15 16:00	03/13/15 18:14	321-60-8	2g,S0
Terphenyl-d14 (S)	72	%	70-130		1	03/10/15 16:00	03/13/15 18:14	1718-51-0	
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 14:03	83-32-9	
Acenaphthylene	ND	ug/L	10.0	0.99	1	03/10/15 08:15	03/12/15 14:03	208-96-8	
Aniline	ND	ug/L	10.0	0.80	1	03/10/15 08:15	03/12/15 14:03	62-53-3	
Anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/12/15 14:03	120-12-7	
Benzo(a)anthracene	ND	ug/L	10.0	0.47	1	03/10/15 08:15	03/12/15 14:03	56-55-3	
Benzo(a)pyrene	ND	ug/L	10.0	0.55	1	03/10/15 08:15	03/12/15 14:03	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	10.0	0.44	1	03/10/15 08:15	03/12/15 14:03	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	10.0	0.45	1	03/10/15 08:15	03/12/15 14:03	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 14:03	207-08-9	
Benzoic Acid	ND	ug/L	50.0	4.9	1	03/10/15 08:15	03/12/15 14:03	65-85-0	

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12

Pace Project No.: 92240289

Sample: TW-6 **Lab ID: 92240289041** Collected: 03/03/15 16:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
Benzyl alcohol	ND	ug/L	20.0	2.1	1	03/10/15 08:15	03/12/15 14:03	100-51-6	
4-Bromophenylphenyl ether	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	101-55-3	
Butylbenzylphthalate	ND	ug/L	10.0	0.48	1	03/10/15 08:15	03/12/15 14:03	85-68-7	
4-Chloro-3-methylphenol	ND	ug/L	20.0	2.0	1	03/10/15 08:15	03/12/15 14:03	59-50-7	
4-Chloroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/12/15 14:03	106-47-8	
bis(2-Chloroethoxy)methane	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/12/15 14:03	111-91-1	
bis(2-Chloroethyl) ether	ND	ug/L	10.0	0.89	1	03/10/15 08:15	03/12/15 14:03	111-44-4	
bis(2-Chloroisopropyl) ether	ND	ug/L	10.0	0.86	1	03/10/15 08:15	03/12/15 14:03	108-60-1	
2-Chloronaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	91-58-7	
2-Chlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	95-57-8	
4-Chlorophenylphenyl ether	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 14:03	7005-72-3	
Chrysene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 14:03	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 14:03	53-70-3	
Dibenzofuran	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	132-64-9	
1,2-Dichlorobenzene	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/12/15 14:03	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	10.0	0.78	1	03/10/15 08:15	03/12/15 14:03	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/12/15 14:03	106-46-7	
3,3'-Dichlorobenzidine	ND	ug/L	50.0	0.67	1	03/10/15 08:15	03/12/15 14:03	91-94-1	
2,4-Dichlorophenol	ND	ug/L	10.0	1.7	1	03/10/15 08:15	03/12/15 14:03	120-83-2	
Diethylphthalate	ND	ug/L	10.0	0.91	1	03/10/15 08:15	03/12/15 14:03	84-66-2	
2,4-Dimethylphenol	ND	ug/L	10.0	0.96	1	03/10/15 08:15	03/12/15 14:03	105-67-9	
Dimethylphthalate	ND	ug/L	10.0	0.62	1	03/10/15 08:15	03/12/15 14:03	131-11-3	
Di-n-butylphthalate	ND	ug/L	10.0	0.37	1	03/10/15 08:15	03/12/15 14:03	84-74-2	
4,6-Dinitro-2-methylphenol	ND	ug/L	20.0	1.1	1	03/10/15 08:15	03/12/15 14:03	534-52-1	
2,4-Dinitrophenol	ND	ug/L	50.0	2.5	1	03/10/15 08:15	03/12/15 14:03	51-28-5	
2,4-Dinitrotoluene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 14:03	121-14-2	
2,6-Dinitrotoluene	ND	ug/L	10.0	2.1	1	03/10/15 08:15	03/12/15 14:03	606-20-2	
Di-n-octylphthalate	ND	ug/L	10.0	0.12	1	03/10/15 08:15	03/12/15 14:03	117-84-0	
bis(2-Ethylhexyl)phthalate	ND	ug/L	6.0	0.49	1	03/10/15 08:15	03/12/15 14:03	117-81-7	
Fluoranthene	ND	ug/L	10.0	0.41	1	03/10/15 08:15	03/12/15 14:03	206-44-0	
Fluorene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	86-73-7	
Hexachloro-1,3-butadiene	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/12/15 14:03	87-68-3	
Hexachlorobenzene	ND	ug/L	10.0	0.76	1	03/10/15 08:15	03/12/15 14:03	118-74-1	
Hexachlorocyclopentadiene	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 14:03	77-47-4	
Hexachloroethane	ND	ug/L	10.0	0.90	1	03/10/15 08:15	03/12/15 14:03	67-72-1	
Indeno(1,2,3-cd)pyrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 14:03	193-39-5	
Isophorone	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 14:03	78-59-1	
1-Methylnaphthalene	ND	ug/L	10.0	0.92	1	03/10/15 08:15	03/12/15 14:03	90-12-0	
2-Methylnaphthalene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	91-57-6	
2-Methylphenol(o-Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	95-48-7	
3&4-Methylphenol(m&p Cresol)	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03		
Naphthalene	ND	ug/L	10.0	0.93	1	03/10/15 08:15	03/12/15 14:03	91-20-3	
2-Nitroaniline	ND	ug/L	50.0	1.5	1	03/10/15 08:15	03/12/15 14:03	88-74-4	
3-Nitroaniline	ND	ug/L	50.0	1.3	1	03/10/15 08:15	03/12/15 14:03	99-09-2	
4-Nitroaniline	ND	ug/L	50.0	1.6	1	03/10/15 08:15	03/12/15 14:03	100-01-6	
Nitrobenzene	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	98-95-3	

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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-6 **Lab ID: 92240289041** Collected: 03/03/15 16:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV Semivolatile Org SC	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
2-Nitrophenol	ND	ug/L	10.0	0.71	1	03/10/15 08:15	03/12/15 14:03	88-75-5	
4-Nitrophenol	ND	ug/L	50.0	3.9	1	03/10/15 08:15	03/12/15 14:03	100-02-7	
N-Nitrosodimethylamine	ND	ug/L	10.0	0.94	1	03/10/15 08:15	03/12/15 14:03	62-75-9	
N-Nitroso-di-n-propylamine	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/12/15 14:03	621-64-7	
N-Nitrosodiphenylamine	ND	ug/L	10.0	0.64	1	03/10/15 08:15	03/12/15 14:03	86-30-6	
Pentachlorophenol	ND	ug/L	50.0	1.2	1	03/10/15 08:15	03/12/15 14:03	87-86-5	
Phenanthrene	ND	ug/L	10.0	0.53	1	03/10/15 08:15	03/12/15 14:03	85-01-8	
Phenol	ND	ug/L	10.0	1.1	1	03/10/15 08:15	03/12/15 14:03	108-95-2	
Pyrene	ND	ug/L	10.0	0.49	1	03/10/15 08:15	03/12/15 14:03	129-00-0	
1,2,4-Trichlorobenzene	ND	ug/L	10.0	1.3	1	03/10/15 08:15	03/12/15 14:03	120-82-1	
2,4,5-Trichlorophenol	ND	ug/L	10.0	1.0	1	03/10/15 08:15	03/12/15 14:03	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	10.0	0.85	1	03/10/15 08:15	03/12/15 14:03	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	77	%	21-110		1	03/10/15 08:15	03/12/15 14:03	4165-60-0	
2-Fluorobiphenyl (S)	77	%	27-110		1	03/10/15 08:15	03/12/15 14:03	321-60-8	
Terphenyl-d14 (S)	96	%	31-107		1	03/10/15 08:15	03/12/15 14:03	1718-51-0	
Phenol-d6 (S)	36	%	10-110		1	03/10/15 08:15	03/12/15 14:03	13127-88-3	
2-Fluorophenol (S)	47	%	12-110		1	03/10/15 08:15	03/12/15 14:03	367-12-4	
2,4,6-Tribromophenol (S)	79	%	27-110		1	03/10/15 08:15	03/12/15 14:03	118-79-6	
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	25.0	10.0	1		03/10/15 21:43	67-64-1	
Benzene	ND	ug/L	1.0	0.25	1		03/10/15 21:43	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.30	1		03/10/15 21:43	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.17	1		03/10/15 21:43	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		03/10/15 21:43	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		03/10/15 21:43	75-25-2	
Bromomethane	ND	ug/L	5.0	0.29	1		03/10/15 21:43	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		03/10/15 21:43	78-93-3	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		03/10/15 21:43	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.23	1		03/10/15 21:43	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		03/10/15 21:43	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		03/10/15 21:43	67-66-3	
Chloromethane	ND	ug/L	1.0	0.11	1		03/10/15 21:43	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.35	1		03/10/15 21:43	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.31	1		03/10/15 21:43	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	2.0	2.0	1		03/10/15 21:43	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		03/10/15 21:43	124-48-1	
Dibromomethane	ND	ug/L	1.0	0.21	1		03/10/15 21:43	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		03/10/15 21:43	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.24	1		03/10/15 21:43	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.33	1		03/10/15 21:43	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.21	1		03/10/15 21:43	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.32	1		03/10/15 21:43	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		03/10/15 21:43	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		03/10/15 21:43	75-35-4	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Sample: TW-6 **Lab ID: 92240289041** Collected: 03/03/15 16:30 Received: 03/09/15 16:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		03/10/15 21:43	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/10/15 21:43	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		03/10/15 21:43	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.28	1		03/10/15 21:43	142-28-9	
2,2-Dichloropropane	ND	ug/L	1.0	0.13	1		03/10/15 21:43	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.49	1		03/10/15 21:43	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		03/10/15 21:43	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		03/10/15 21:43	10061-02-6	
Diisopropyl ether	ND	ug/L	1.0	0.12	1		03/10/15 21:43	108-20-3	
Ethylbenzene	ND	ug/L	1.0	0.30	1		03/10/15 21:43	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	1.0	0.71	1		03/10/15 21:43	87-68-3	
2-Hexanone	ND	ug/L	5.0	0.46	1		03/10/15 21:43	591-78-6	
p-Isopropyltoluene	ND	ug/L	1.0	0.31	1		03/10/15 21:43	99-87-6	
Methylene Chloride	ND	ug/L	2.0	0.97	1		03/10/15 21:43	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		03/10/15 21:43	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.21	1		03/10/15 21:43	1634-04-4	
Naphthalene	ND	ug/L	1.0	0.24	1		03/10/15 21:43	91-20-3	
Styrene	ND	ug/L	1.0	0.26	1		03/10/15 21:43	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		03/10/15 21:43	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		03/10/15 21:43	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		03/10/15 21:43	127-18-4	
Toluene	ND	ug/L	1.0	0.26	1		03/10/15 21:43	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.33	1		03/10/15 21:43	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.35	1		03/10/15 21:43	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		03/10/15 21:43	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		03/10/15 21:43	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.47	1		03/10/15 21:43	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		03/10/15 21:43	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		03/10/15 21:43	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		03/10/15 21:43	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/10/15 21:43	75-01-4	
Xylene (Total)	ND	ug/L	2.0	0.66	1		03/10/15 21:43	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		03/10/15 21:43	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		03/10/15 21:43	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	99	%	70-130		1		03/10/15 21:43	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	70-130		1		03/10/15 21:43	17060-07-0	
Toluene-d8 (S)	97	%	70-130		1		03/10/15 21:43	2037-26-5	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MERP/7648 Analysis Method: EPA 7470
QC Batch Method: EPA 7470 Analysis Description: 7470 Mercury
Associated Lab Samples: 92240289040

METHOD BLANK: 1406658 Matrix: Water
Associated Lab Samples: 92240289040

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	03/11/15 12:14	

LABORATORY CONTROL SAMPLE: 1406659

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	2.5	2.5	102	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406660 1406661

Parameter	Units	92240070001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	ND	2.5	2.5	1.5	1.4	58	54	75-125	7	25	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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(704)875-9092

QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MERP/7662 | Analysis Method: EPA 7470
QC Batch Method: EPA 7470 | Analysis Description: 7470 Mercury
Associated Lab Samples: 92240289041

METHOD BLANK: 1410177 | Matrix: Water
Associated Lab Samples: 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	03/14/15 13:36	

LABORATORY CONTROL SAMPLE: 1410178

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	2.5	2.6	102	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1410179 1410180

Parameter	Units	92240608001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	ND	2.5	2.5	2.4	2.5	94	100	75-125	5	25	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MERP/7650 Analysis Method: EPA 7471
QC Batch Method: EPA 7471 Analysis Description: 7471 Mercury
Associated Lab Samples: 92240289020, 92240289021, 92240289022, 92240289023, 92240289024, 92240289025, 92240289026

METHOD BLANK: 1407297 Matrix: Solid
Associated Lab Samples: 92240289020, 92240289021, 92240289022, 92240289023, 92240289024, 92240289025, 92240289026

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	0.00035J	0.0050	03/11/15 13:43	

LABORATORY CONTROL SAMPLE: 1407298

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.067	0.068	102	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1407299 1407300

Parameter	Units	92240137001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.029	.057	.049	0.084	0.078	98	101	75-125	7	20	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MERP/7652 | Analysis Method: EPA 7471
QC Batch Method: EPA 7471 | Analysis Description: 7471 Mercury
Associated Lab Samples: 92240289027, 92240289028, 92240289029

METHOD BLANK: 1407883 | Matrix: Solid
Associated Lab Samples: 92240289027, 92240289028, 92240289029

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.0050	03/12/15 13:28	

LABORATORY CONTROL SAMPLE: 1407884

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.067	0.057	86	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1407885 1407886

Parameter	Units	92240289027 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.0084	.066	.056	0.066	0.061	88	94	75-125	8	20	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MPRP/18045 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET
Associated Lab Samples: 92240289020, 92240289021, 92240289022, 92240289023, 92240289024, 92240289025, 92240289026, 92240289027, 92240289028, 92240289029

METHOD BLANK: 1407132 Matrix: Solid
Associated Lab Samples: 92240289020, 92240289021, 92240289022, 92240289023, 92240289024, 92240289025, 92240289026, 92240289027, 92240289028, 92240289029

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	1.0	03/10/15 22:19	
Barium	mg/kg	ND	0.50	03/10/15 22:19	
Cadmium	mg/kg	ND	0.10	03/10/15 22:19	
Chromium	mg/kg	ND	0.50	03/10/15 22:19	
Lead	mg/kg	ND	0.50	03/10/15 22:19	
Selenium	mg/kg	ND	1.0	03/10/15 22:19	
Silver	mg/kg	ND	0.50	03/10/15 22:19	

LABORATORY CONTROL SAMPLE: 1407133

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	50	49.0	98	80-120	
Barium	mg/kg	50	46.1	92	80-120	
Cadmium	mg/kg	50	48.7	97	80-120	
Chromium	mg/kg	50	46.3	93	80-120	
Lead	mg/kg	50	48.3	97	80-120	
Selenium	mg/kg	50	49.4	99	80-120	
Silver	mg/kg	25	24.2	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1407134 1407135

Parameter	Units	92239874001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	ND	47.7	44.7	45.0	42.7	92	94	75-125	5	20	
Barium	mg/kg	52.0	47.7	44.7	93.8	104	88	115	75-125	10	20	
Cadmium	mg/kg	ND	47.7	44.7	44.1	41.2	92	92	75-125	7	20	
Chromium	mg/kg	2.3	47.7	44.7	44.7	42.3	89	90	75-125	6	20	
Lead	mg/kg	ND	47.7	44.7	43.5	40.4	90	89	75-125	7	20	
Selenium	mg/kg	ND	47.7	44.7	45.0	41.8	94	93	75-125	7	20	
Silver	mg/kg	ND	23.9	22.3	22.2	20.8	93	92	75-125	7	20	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MPRP/18042 | Analysis Method: EPA 6010
QC Batch Method: EPA 3010 | Analysis Description: 6010 MET
Associated Lab Samples: 92240289040, 92240289041

METHOD BLANK: 1406886 | Matrix: Water
Associated Lab Samples: 92240289040, 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	ug/L	ND	10.0	03/11/15 02:54	
Barium	ug/L	ND	5.0	03/11/15 02:54	
Cadmium	ug/L	0.082J	1.0	03/11/15 02:54	
Chromium	ug/L	ND	5.0	03/11/15 02:54	
Lead	ug/L	ND	5.0	03/11/15 02:54	
Selenium	ug/L	ND	10.0	03/11/15 02:54	
Silver	ug/L	ND	5.0	03/11/15 02:54	

LABORATORY CONTROL SAMPLE: 1406887

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	ug/L	500	467	93	80-120	
Barium	ug/L	500	454	91	80-120	
Cadmium	ug/L	500	472	94	80-120	
Chromium	ug/L	500	453	91	80-120	
Lead	ug/L	500	464	93	80-120	
Selenium	ug/L	500	474	95	80-120	
Silver	ug/L	250	234	93	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406888 1406889

Parameter	Units	92240289040 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	ug/L	31.3	500	500	405	414	75	76	75-125	2	20	
Barium	ug/L	5120	500	500	5690	5630	114	101	75-125	1	20	
Cadmium	ug/L	4.1	500	500	410	415	81	82	75-125	1	20	
Chromium	ug/L	684	500	500	1090	1080	81	80	75-125	0	20	
Lead	ug/L	789	500	500	1170	1180	77	78	75-125	0	20	
Selenium	ug/L	17.2	500	500	359	369	68	70	75-125	3	20	M1
Silver	ug/L	ND	250	250	206	208	82	83	75-125	1	20	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30666 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92240289040, 92240289041

METHOD BLANK: 1407128 Matrix: Water
Associated Lab Samples: 92240289040, 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	03/10/15 20:18	
1,1,1-Trichloroethane	ug/L	ND	1.0	03/10/15 20:18	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	03/10/15 20:18	
1,1,2-Trichloroethane	ug/L	ND	1.0	03/10/15 20:18	
1,1-Dichloroethane	ug/L	ND	1.0	03/10/15 20:18	
1,1-Dichloroethene	ug/L	ND	1.0	03/10/15 20:18	
1,1-Dichloropropene	ug/L	ND	1.0	03/10/15 20:18	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	03/10/15 20:18	
1,2,3-Trichloropropane	ug/L	ND	1.0	03/10/15 20:18	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	03/10/15 20:18	
1,2-Dibromo-3-chloropropane	ug/L	ND	2.0	03/10/15 20:18	
1,2-Dichlorobenzene	ug/L	ND	1.0	03/10/15 20:18	
1,2-Dichloroethane	ug/L	0.29J	1.0	03/10/15 20:18	
1,2-Dichloropropane	ug/L	ND	1.0	03/10/15 20:18	
1,3-Dichlorobenzene	ug/L	ND	1.0	03/10/15 20:18	
1,3-Dichloropropane	ug/L	ND	1.0	03/10/15 20:18	
1,4-Dichlorobenzene	ug/L	ND	1.0	03/10/15 20:18	
2,2-Dichloropropane	ug/L	ND	1.0	03/10/15 20:18	
2-Butanone (MEK)	ug/L	ND	5.0	03/10/15 20:18	
2-Chlorotoluene	ug/L	ND	1.0	03/10/15 20:18	
2-Hexanone	ug/L	ND	5.0	03/10/15 20:18	
4-Chlorotoluene	ug/L	ND	1.0	03/10/15 20:18	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	03/10/15 20:18	
Acetone	ug/L	ND	25.0	03/10/15 20:18	
Benzene	ug/L	ND	1.0	03/10/15 20:18	
Bromobenzene	ug/L	ND	1.0	03/10/15 20:18	
Bromochloromethane	ug/L	ND	1.0	03/10/15 20:18	
Bromodichloromethane	ug/L	ND	1.0	03/10/15 20:18	
Bromoform	ug/L	ND	1.0	03/10/15 20:18	
Bromomethane	ug/L	ND	5.0	03/10/15 20:18	
Carbon tetrachloride	ug/L	ND	1.0	03/10/15 20:18	
Chlorobenzene	ug/L	ND	1.0	03/10/15 20:18	
Chloroethane	ug/L	ND	1.0	03/10/15 20:18	
Chloroform	ug/L	ND	1.0	03/10/15 20:18	
Chloromethane	ug/L	ND	1.0	03/10/15 20:18	
cis-1,2-Dichloroethene	ug/L	ND	1.0	03/10/15 20:18	
cis-1,3-Dichloropropene	ug/L	ND	1.0	03/10/15 20:18	
Dibromochloromethane	ug/L	ND	1.0	03/10/15 20:18	
Dibromomethane	ug/L	ND	1.0	03/10/15 20:18	
Dichlorodifluoromethane	ug/L	ND	1.0	03/10/15 20:18	
Diisopropyl ether	ug/L	ND	1.0	03/10/15 20:18	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

METHOD BLANK: 1407128 Matrix: Water
Associated Lab Samples: 92240289040, 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethylbenzene	ug/L	ND	1.0	03/10/15 20:18	
Hexachloro-1,3-butadiene	ug/L	ND	1.0	03/10/15 20:18	
m&p-Xylene	ug/L	ND	2.0	03/10/15 20:18	
Methyl-tert-butyl ether	ug/L	ND	1.0	03/10/15 20:18	
Methylene Chloride	ug/L	ND	2.0	03/10/15 20:18	
Naphthalene	ug/L	ND	1.0	03/10/15 20:18	
o-Xylene	ug/L	ND	1.0	03/10/15 20:18	
p-Isopropyltoluene	ug/L	ND	1.0	03/10/15 20:18	
Styrene	ug/L	ND	1.0	03/10/15 20:18	
Tetrachloroethene	ug/L	ND	1.0	03/10/15 20:18	
Toluene	ug/L	ND	1.0	03/10/15 20:18	
trans-1,2-Dichloroethene	ug/L	ND	1.0	03/10/15 20:18	
trans-1,3-Dichloropropene	ug/L	ND	1.0	03/10/15 20:18	
Trichloroethene	ug/L	ND	1.0	03/10/15 20:18	
Trichlorofluoromethane	ug/L	ND	1.0	03/10/15 20:18	
Vinyl acetate	ug/L	ND	2.0	03/10/15 20:18	
Vinyl chloride	ug/L	ND	1.0	03/10/15 20:18	
Xylene (Total)	ug/L	ND	2.0	03/10/15 20:18	
1,2-Dichloroethane-d4 (S)	%	105	70-130	03/10/15 20:18	
4-Bromofluorobenzene (S)	%	100	70-130	03/10/15 20:18	
Toluene-d8 (S)	%	97	70-130	03/10/15 20:18	

LABORATORY CONTROL SAMPLE: 1407129

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	49.9	100	70-130	
1,1,1-Trichloroethane	ug/L	50	50.0	100	70-130	
1,1,2,2-Tetrachloroethane	ug/L	50	46.7	93	70-130	
1,1,2-Trichloroethane	ug/L	50	50.9	102	70-130	
1,1-Dichloroethane	ug/L	50	48.6	97	70-130	
1,1-Dichloroethene	ug/L	50	45.6	91	70-130	
1,1-Dichloropropene	ug/L	50	52.5	105	70-130	
1,2,3-Trichlorobenzene	ug/L	50	53.6	107	70-130	
1,2,3-Trichloropropane	ug/L	50	46.9	94	70-130	
1,2,4-Trichlorobenzene	ug/L	50	53.7	107	70-130	
1,2-Dibromo-3-chloropropane	ug/L	50	51.5	103	70-130	
1,2-Dichlorobenzene	ug/L	50	50.0	100	70-130	
1,2-Dichloroethane	ug/L	50	49.2	98	70-130	
1,2-Dichloropropane	ug/L	50	50.2	100	70-130	
1,3-Dichlorobenzene	ug/L	50	49.9	100	70-130	
1,3-Dichloropropane	ug/L	50	49.1	98	70-130	
1,4-Dichlorobenzene	ug/L	50	49.1	98	70-130	
2,2-Dichloropropane	ug/L	50	49.1	98	70-130	
2-Butanone (MEK)	ug/L	100	101	101	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1407129

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2-Chlorotoluene	ug/L	50	45.9	92	70-130	
2-Hexanone	ug/L	100	108	108	70-130	
4-Chlorotoluene	ug/L	50	49.5	99	70-130	
4-Methyl-2-pentanone (MIBK)	ug/L	100	114	114	70-130	
Acetone	ug/L	100	106	106	70-130	
Benzene	ug/L	50	51.3	103	70-130	
Bromobenzene	ug/L	50	50.3	101	70-130	
Bromochloromethane	ug/L	50	50.6	101	70-130	
Bromodichloromethane	ug/L	50	46.9	94	70-130	
Bromoform	ug/L	50	45.6	91	70-130	
Bromomethane	ug/L	50	52.8	106	70-130	
Carbon tetrachloride	ug/L	50	51.1	102	70-130	
Chlorobenzene	ug/L	50	48.6	97	70-130	
Chloroethane	ug/L	50	49.2	98	70-130	
Chloroform	ug/L	50	45.1	90	70-130	
Chloromethane	ug/L	50	50.2	100	70-130	
cis-1,2-Dichloroethene	ug/L	50	50.7	101	70-130	
cis-1,3-Dichloropropene	ug/L	50	52.8	106	70-130	
Dibromochloromethane	ug/L	50	45.3	91	70-130	
Dibromomethane	ug/L	50	48.7	97	70-130	
Dichlorodifluoromethane	ug/L	50	59.7	119	70-130	
Diisopropyl ether	ug/L	50	52.2	104	70-130	
Ethylbenzene	ug/L	50	49.3	99	70-130	
Hexachloro-1,3-butadiene	ug/L	50	49.7	99	70-130	
m&p-Xylene	ug/L	100	98.6	99	70-130	
Methyl-tert-butyl ether	ug/L	50	52.5	105	70-130	
Methylene Chloride	ug/L	50	50.8	102	70-130	
Naphthalene	ug/L	50	47.1	94	70-130	
o-Xylene	ug/L	50	50.0	100	70-130	
p-Isopropyltoluene	ug/L	50	50.3	101	70-130	
Styrene	ug/L	50	53.2	106	70-130	
Tetrachloroethene	ug/L	50	50.1	100	70-130	
Toluene	ug/L	50	49.5	99	70-130	
trans-1,2-Dichloroethene	ug/L	50	48.7	97	70-130	
trans-1,3-Dichloropropene	ug/L	50	52.8	106	70-130	
Trichloroethene	ug/L	50	49.5	99	70-130	
Trichlorofluoromethane	ug/L	50	48.0	96	70-130	
Vinyl acetate	ug/L	100	101	101	70-130	
Vinyl chloride	ug/L	50	52.2	104	70-130	
Xylene (Total)	ug/L	150	149	99	70-130	
1,2-Dichloroethane-d4 (S)	%			98	70-130	
4-Bromofluorobenzene (S)	%			100	70-130	
Toluene-d8 (S)	%			101	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1407131

Parameter	Units	92240143001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	20	22.1	110	70-130	
1,1,1-Trichloroethane	ug/L	ND	20	23.0	115	70-130	
1,1,2,2-Tetrachloroethane	ug/L	ND	20	19.9	99	70-130	
1,1,2-Trichloroethane	ug/L	ND	20	21.1	105	70-130	
1,1-Dichloroethane	ug/L	ND	20	21.3	106	70-130	
1,1-Dichloroethene	ug/L	ND	20	20.5	102	70-130	
1,1-Dichloropropene	ug/L	ND	20	22.5	113	70-130	
1,2,3-Trichlorobenzene	ug/L	ND	20	20.1	100	70-130	
1,2,3-Trichloropropane	ug/L	ND	20	21.1	106	70-130	
1,2,4-Trichlorobenzene	ug/L	ND	20	19.3	97	70-130	
1,2-Dibromo-3-chloropropane	ug/L	ND	20	20.0	100	70-130	
1,2-Dichlorobenzene	ug/L	ND	20	20.8	104	70-130	
1,2-Dichloroethane	ug/L	ND	20	21.6	108	70-130	
1,2-Dichloropropane	ug/L	ND	20	21.0	105	70-130	
1,3-Dichlorobenzene	ug/L	ND	20	21.2	106	70-130	
1,3-Dichloropropane	ug/L	ND	20	20.7	103	70-130	
1,4-Dichlorobenzene	ug/L	ND	20	21.3	107	70-130	
2,2-Dichloropropane	ug/L	ND	20	19.4	97	70-130	
2-Butanone (MEK)	ug/L	ND	40	38.9	97	70-130	
2-Chlorotoluene	ug/L	ND	20	19.4	97	70-130	
2-Hexanone	ug/L	ND	40	44.6	112	70-130	
4-Chlorotoluene	ug/L	ND	20	21.6	108	70-130	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	40	44.6	111	70-130	
Acetone	ug/L	ND	40	52.7	132	70-130	M1
Benzene	ug/L	ND	20	22.0	110	70-130	
Bromobenzene	ug/L	ND	20	20.6	103	70-130	
Bromochloromethane	ug/L	ND	20	22.7	113	70-130	
Bromodichloromethane	ug/L	ND	20	20.0	100	70-130	
Bromoform	ug/L	ND	20	19.0	95	70-130	
Bromomethane	ug/L	ND	20	13.5	68	70-130	M1
Carbon tetrachloride	ug/L	ND	20	24.3	122	70-130	
Chlorobenzene	ug/L	ND	20	21.6	108	70-130	
Chloroethane	ug/L	ND	20	23.2	116	70-130	
Chloroform	ug/L	ND	20	19.3	96	70-130	
Chloromethane	ug/L	ND	20	20.2	101	70-130	
cis-1,2-Dichloroethene	ug/L	ND	20	21.2	106	70-130	
cis-1,3-Dichloropropene	ug/L	ND	20	18.6	93	70-130	
Dibromochloromethane	ug/L	ND	20	19.1	95	70-130	
Dibromomethane	ug/L	ND	20	20.2	101	70-130	
Dichlorodifluoromethane	ug/L	ND	20	27.1	136	70-130	M1
Diisopropyl ether	ug/L	ND	20	20.4	102	70-130	
Ethylbenzene	ug/L	ND	20	21.8	109	70-130	
Hexachloro-1,3-butadiene	ug/L	ND	20	24.2	121	70-130	
m&p-Xylene	ug/L	ND	40	44.2	110	70-130	
Methyl-tert-butyl ether	ug/L	ND	20	20.4	102	70-130	
Methylene Chloride	ug/L	ND	20	20.7	103	70-130	
Naphthalene	ug/L	ND	20	18.0	90	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1407131

Parameter	Units	92240143001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
o-Xylene	ug/L	ND	20	20.4	102	70-130	
p-Isopropyltoluene	ug/L	ND	20	20.9	105	70-130	
Styrene	ug/L	ND	20	21.8	109	70-130	
Tetrachloroethene	ug/L	ND	20	22.1	110	70-130	
Toluene	ug/L	ND	20	21.1	105	70-130	
trans-1,2-Dichloroethene	ug/L	ND	20	21.6	108	70-130	
trans-1,3-Dichloropropene	ug/L	ND	20	20.9	105	70-130	
Trichloroethene	ug/L	ND	20	22.9	114	70-130	
Trichlorofluoromethane	ug/L	ND	20	23.8	119	70-130	
Vinyl acetate	ug/L	ND	40	32.5	81	70-130	
Vinyl chloride	ug/L	ND	20	21.7	108	70-130	
1,2-Dichloroethane-d4 (S)	%				99	70-130	
4-Bromofluorobenzene (S)	%				96	70-130	
Toluene-d8 (S)	%				97	70-130	

SAMPLE DUPLICATE: 1407130

Parameter	Units	92240143002 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,1-Trichloroethane	ug/L	ND	ND		30	
1,1,2,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,2-Trichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethene	ug/L	ND	ND		30	
1,1-Dichloropropene	ug/L	ND	ND		30	
1,2,3-Trichlorobenzene	ug/L	ND	ND		30	
1,2,3-Trichloropropane	ug/L	ND	ND		30	
1,2,4-Trichlorobenzene	ug/L	ND	ND		30	
1,2-Dibromo-3-chloropropane	ug/L	ND	ND		30	
1,2-Dichlorobenzene	ug/L	ND	ND		30	
1,2-Dichloroethane	ug/L	ND	ND		30	
1,2-Dichloropropane	ug/L	ND	ND		30	
1,3-Dichlorobenzene	ug/L	ND	ND		30	
1,3-Dichloropropane	ug/L	ND	ND		30	
1,4-Dichlorobenzene	ug/L	ND	ND		30	
2,2-Dichloropropane	ug/L	ND	ND		30	
2-Butanone (MEK)	ug/L	ND	ND		30	
2-Chlorotoluene	ug/L	ND	ND		30	
2-Hexanone	ug/L	ND	ND		30	
4-Chlorotoluene	ug/L	ND	ND		30	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	ND		30	
Acetone	ug/L	ND	ND		30	
Benzene	ug/L	ND	ND		30	
Bromobenzene	ug/L	ND	ND		30	
Bromochloromethane	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

SAMPLE DUPLICATE: 1407130

Parameter	Units	92240143002 Result	Dup Result	RPD	Max RPD	Qualifiers
Bromodichloromethane	ug/L	ND	ND		30	
Bromoform	ug/L	ND	ND		30	
Bromomethane	ug/L	ND	ND		30	
Carbon tetrachloride	ug/L	ND	ND		30	
Chlorobenzene	ug/L	ND	ND		30	
Chloroethane	ug/L	ND	ND		30	
Chloroform	ug/L	ND	ND		30	
Chloromethane	ug/L	ND	ND		30	
cis-1,2-Dichloroethene	ug/L	ND	ND		30	
cis-1,3-Dichloropropene	ug/L	ND	ND		30	
Dibromochloromethane	ug/L	ND	ND		30	
Dibromomethane	ug/L	ND	ND		30	
Dichlorodifluoromethane	ug/L	ND	ND		30	
Diisopropyl ether	ug/L	ND	ND		30	
Ethylbenzene	ug/L	ND	ND		30	
Hexachloro-1,3-butadiene	ug/L	ND	ND		30	
m&p-Xylene	ug/L	ND	ND		30	
Methyl-tert-butyl ether	ug/L	ND	ND		30	
Methylene Chloride	ug/L	ND	ND		30	
Naphthalene	ug/L	ND	ND		30	
o-Xylene	ug/L	ND	ND		30	
p-Isopropyltoluene	ug/L	ND	ND		30	
Styrene	ug/L	ND	ND		30	
Tetrachloroethene	ug/L	ND	ND		30	
Toluene	ug/L	ND	ND		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
trans-1,3-Dichloropropene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Trichlorofluoromethane	ug/L	ND	ND		30	
Vinyl acetate	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
Xylene (Total)	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	108	111	2		
4-Bromofluorobenzene (S)	%	100	101	1		
Toluene-d8 (S)	%	96	97	1		

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30684 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92240289035, 92240289036, 92240289038, 92240289039

METHOD BLANK: 1408410 Matrix: Water
Associated Lab Samples: 92240289035, 92240289036, 92240289038, 92240289039

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	03/11/15 16:02	
1,1,1-Trichloroethane	ug/L	ND	1.0	03/11/15 16:02	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	03/11/15 16:02	
1,1,2-Trichloroethane	ug/L	ND	1.0	03/11/15 16:02	
1,1-Dichloroethane	ug/L	ND	1.0	03/11/15 16:02	
1,1-Dichloroethene	ug/L	ND	1.0	03/11/15 16:02	
1,1-Dichloropropene	ug/L	ND	1.0	03/11/15 16:02	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	03/11/15 16:02	
1,2,3-Trichloropropane	ug/L	ND	1.0	03/11/15 16:02	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	03/11/15 16:02	
1,2-Dibromo-3-chloropropane	ug/L	ND	2.0	03/11/15 16:02	
1,2-Dichlorobenzene	ug/L	ND	1.0	03/11/15 16:02	
1,2-Dichloroethane	ug/L	0.20J	1.0	03/11/15 16:02	
1,2-Dichloropropane	ug/L	ND	1.0	03/11/15 16:02	
1,3-Dichlorobenzene	ug/L	ND	1.0	03/11/15 16:02	
1,3-Dichloropropane	ug/L	ND	1.0	03/11/15 16:02	
1,4-Dichlorobenzene	ug/L	ND	1.0	03/11/15 16:02	
2,2-Dichloropropane	ug/L	ND	1.0	03/11/15 16:02	
2-Butanone (MEK)	ug/L	ND	5.0	03/11/15 16:02	
2-Chlorotoluene	ug/L	ND	1.0	03/11/15 16:02	
2-Hexanone	ug/L	ND	5.0	03/11/15 16:02	
4-Chlorotoluene	ug/L	ND	1.0	03/11/15 16:02	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	03/11/15 16:02	
Acetone	ug/L	ND	25.0	03/11/15 16:02	
Benzene	ug/L	ND	1.0	03/11/15 16:02	
Bromobenzene	ug/L	ND	1.0	03/11/15 16:02	
Bromochloromethane	ug/L	ND	1.0	03/11/15 16:02	
Bromodichloromethane	ug/L	ND	1.0	03/11/15 16:02	
Bromoform	ug/L	ND	1.0	03/11/15 16:02	
Bromomethane	ug/L	ND	5.0	03/11/15 16:02	
Carbon tetrachloride	ug/L	ND	1.0	03/11/15 16:02	
Chlorobenzene	ug/L	ND	1.0	03/11/15 16:02	
Chloroethane	ug/L	ND	1.0	03/11/15 16:02	
Chloroform	ug/L	ND	1.0	03/11/15 16:02	
Chloromethane	ug/L	ND	1.0	03/11/15 16:02	
cis-1,2-Dichloroethene	ug/L	ND	1.0	03/11/15 16:02	
cis-1,3-Dichloropropene	ug/L	ND	1.0	03/11/15 16:02	
Dibromochloromethane	ug/L	ND	1.0	03/11/15 16:02	
Dibromomethane	ug/L	ND	1.0	03/11/15 16:02	
Dichlorodifluoromethane	ug/L	ND	1.0	03/11/15 16:02	
Diisopropyl ether	ug/L	ND	1.0	03/11/15 16:02	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

METHOD BLANK: 1408410 Matrix: Water

Associated Lab Samples: 92240289035, 92240289036, 92240289038, 92240289039

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethylbenzene	ug/L	ND	1.0	03/11/15 16:02	
Hexachloro-1,3-butadiene	ug/L	ND	1.0	03/11/15 16:02	
m&p-Xylene	ug/L	ND	2.0	03/11/15 16:02	
Methyl-tert-butyl ether	ug/L	ND	1.0	03/11/15 16:02	
Methylene Chloride	ug/L	ND	2.0	03/11/15 16:02	
Naphthalene	ug/L	ND	1.0	03/11/15 16:02	
o-Xylene	ug/L	ND	1.0	03/11/15 16:02	
p-Isopropyltoluene	ug/L	ND	1.0	03/11/15 16:02	
Styrene	ug/L	ND	1.0	03/11/15 16:02	
Tetrachloroethene	ug/L	ND	1.0	03/11/15 16:02	
Toluene	ug/L	ND	1.0	03/11/15 16:02	
trans-1,2-Dichloroethene	ug/L	ND	1.0	03/11/15 16:02	
trans-1,3-Dichloropropene	ug/L	ND	1.0	03/11/15 16:02	
Trichloroethene	ug/L	ND	1.0	03/11/15 16:02	
Trichlorofluoromethane	ug/L	ND	1.0	03/11/15 16:02	
Vinyl acetate	ug/L	ND	2.0	03/11/15 16:02	
Vinyl chloride	ug/L	ND	1.0	03/11/15 16:02	
Xylene (Total)	ug/L	ND	2.0	03/11/15 16:02	
1,2-Dichloroethane-d4 (S)	%	109	70-130	03/11/15 16:02	
4-Bromofluorobenzene (S)	%	98	70-130	03/11/15 16:02	
Toluene-d8 (S)	%	95	70-130	03/11/15 16:02	

LABORATORY CONTROL SAMPLE: 1408411

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	51.6	103	70-130	
1,1,1-Trichloroethane	ug/L	50	52.6	105	70-130	
1,1,2,2-Tetrachloroethane	ug/L	50	48.2	96	70-130	
1,1,2-Trichloroethane	ug/L	50	50.9	102	70-130	
1,1-Dichloroethane	ug/L	50	51.5	103	70-130	
1,1-Dichloroethene	ug/L	50	48.3	97	70-130	
1,1-Dichloropropene	ug/L	50	55.8	112	70-130	
1,2,3-Trichlorobenzene	ug/L	50	55.7	111	70-130	
1,2,3-Trichloropropane	ug/L	50	49.6	99	70-130	
1,2,4-Trichlorobenzene	ug/L	50	56.7	113	70-130	
1,2-Dibromo-3-chloropropane	ug/L	50	54.3	109	70-130	
1,2-Dichlorobenzene	ug/L	50	52.0	104	70-130	
1,2-Dichloroethane	ug/L	50	51.0	102	70-130	
1,2-Dichloropropane	ug/L	50	51.4	103	70-130	
1,3-Dichlorobenzene	ug/L	50	51.2	102	70-130	
1,3-Dichloropropane	ug/L	50	51.1	102	70-130	
1,4-Dichlorobenzene	ug/L	50	51.6	103	70-130	
2,2-Dichloropropane	ug/L	50	53.4	107	70-130	
2-Butanone (MEK)	ug/L	100	113	113	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1408411

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2-Chlorotoluene	ug/L	50	46.8	94	70-130	
2-Hexanone	ug/L	100	117	117	70-130	
4-Chlorotoluene	ug/L	50	50.7	101	70-130	
4-Methyl-2-pentanone (MIBK)	ug/L	100	121	121	70-130	
Acetone	ug/L	100	114	114	70-130	
Benzene	ug/L	50	52.8	106	70-130	
Bromobenzene	ug/L	50	49.7	99	70-130	
Bromochloromethane	ug/L	50	50.7	101	70-130	
Bromodichloromethane	ug/L	50	48.0	96	70-130	
Bromoform	ug/L	50	47.8	96	70-130	
Bromomethane	ug/L	50	56.0	112	70-130	
Carbon tetrachloride	ug/L	50	52.9	106	70-130	
Chlorobenzene	ug/L	50	49.5	99	70-130	
Chloroethane	ug/L	50	53.3	107	70-130	
Chloroform	ug/L	50	46.3	93	70-130	
Chloromethane	ug/L	50	50.9	102	70-130	
cis-1,2-Dichloroethene	ug/L	50	52.1	104	70-130	
cis-1,3-Dichloropropene	ug/L	50	54.0	108	70-130	
Dibromochloromethane	ug/L	50	45.9	92	70-130	
Dibromomethane	ug/L	50	51.1	102	70-130	
Dichlorodifluoromethane	ug/L	50	60.7	121	70-130	
Diisopropyl ether	ug/L	50	54.5	109	70-130	
Ethylbenzene	ug/L	50	50.3	101	70-130	
Hexachloro-1,3-butadiene	ug/L	50	63.1	126	70-130	
m&p-Xylene	ug/L	100	101	101	70-130	
Methyl-tert-butyl ether	ug/L	50	54.5	109	70-130	
Methylene Chloride	ug/L	50	53.5	107	70-130	
Naphthalene	ug/L	50	49.0	98	70-130	
o-Xylene	ug/L	50	50.9	102	70-130	
p-Isopropyltoluene	ug/L	50	53.6	107	70-130	
Styrene	ug/L	50	54.6	109	70-130	
Tetrachloroethene	ug/L	50	51.6	103	70-130	
Toluene	ug/L	50	50.8	102	70-130	
trans-1,2-Dichloroethene	ug/L	50	52.5	105	70-130	
trans-1,3-Dichloropropene	ug/L	50	54.6	109	70-130	
Trichloroethene	ug/L	50	51.5	103	70-130	
Trichlorofluoromethane	ug/L	50	51.9	104	70-130	
Vinyl acetate	ug/L	100	106	106	70-130	
Vinyl chloride	ug/L	50	54.6	109	70-130	
Xylene (Total)	ug/L	150	152	101	70-130	
1,2-Dichloroethane-d4 (S)	%			97	70-130	
4-Bromofluorobenzene (S)	%			95	70-130	
Toluene-d8 (S)	%			101	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1408413

Parameter	Units	92240301016 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	20	24.5	122	70-130	
1,1,1-Trichloroethane	ug/L	ND	20	25.9	130	70-130	
1,1,2,2-Tetrachloroethane	ug/L	ND	20	22.0	110	70-130	
1,1,2-Trichloroethane	ug/L	ND	20	23.0	115	70-130	
1,1-Dichloroethane	ug/L	ND	20	23.3	117	70-130	
1,1-Dichloroethene	ug/L	ND	20	23.7	119	70-130	
1,1-Dichloropropene	ug/L	ND	20	24.8	124	70-130	
1,2,3-Trichlorobenzene	ug/L	ND	20	20.0	100	70-130	
1,2,3-Trichloropropane	ug/L	ND	20	23.2	116	70-130	
1,2,4-Trichlorobenzene	ug/L	ND	20	19.9	99	70-130	
1,2-Dibromo-3-chloropropane	ug/L	ND	20	22.6	113	70-130	
1,2-Dichlorobenzene	ug/L	ND	20	21.7	108	70-130	
1,2-Dichloroethane	ug/L	ND	20	24.4	122	70-130	
1,2-Dichloropropane	ug/L	ND	20	22.7	113	70-130	
1,3-Dichlorobenzene	ug/L	ND	20	22.1	111	70-130	
1,3-Dichloropropane	ug/L	ND	20	22.8	114	70-130	
1,4-Dichlorobenzene	ug/L	ND	20	21.8	109	70-130	
2,2-Dichloropropane	ug/L	ND	20	23.3	117	70-130	
2-Butanone (MEK)	ug/L	ND	40	43.4	109	70-130	
2-Chlorotoluene	ug/L	ND	20	19.8	99	70-130	
2-Hexanone	ug/L	ND	40	49.6	124	70-130	
4-Chlorotoluene	ug/L	ND	20	22.4	112	70-130	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	40	50.2	125	70-130	
Acetone	ug/L	ND	40	50.9	127	70-130	
Benzene	ug/L	ND	20	24.3	121	70-130	
Bromobenzene	ug/L	ND	20	21.4	107	70-130	
Bromochloromethane	ug/L	ND	20	23.9	119	70-130	
Bromodichloromethane	ug/L	ND	20	22.6	113	70-130	
Bromoform	ug/L	ND	20	21.6	108	70-130	
Bromomethane	ug/L	ND	20	15.9	80	70-130	
Carbon tetrachloride	ug/L	ND	20	27.6	138	70-130	M1
Chlorobenzene	ug/L	ND	20	23.4	117	70-130	
Chloroethane	ug/L	ND	20	25.2	126	70-130	
Chloroform	ug/L	ND	20	22.1	110	70-130	
Chloromethane	ug/L	ND	20	21.3	106	70-130	
cis-1,2-Dichloroethene	ug/L	ND	20	22.4	112	70-130	
cis-1,3-Dichloropropene	ug/L	ND	20	20.5	103	70-130	
Dibromochloromethane	ug/L	ND	20	20.7	103	70-130	
Dibromomethane	ug/L	ND	20	22.8	114	70-130	
Dichlorodifluoromethane	ug/L	ND	20	28.7	144	70-130	M1
Diisopropyl ether	ug/L	ND	20	22.4	112	70-130	
Ethylbenzene	ug/L	ND	20	23.6	118	70-130	
Hexachloro-1,3-butadiene	ug/L	ND	20	22.3	111	70-130	
m&p-Xylene	ug/L	ND	40	47.6	118	70-130	
Methyl-tert-butyl ether	ug/L	ND	20	23.2	116	70-130	
Methylene Chloride	ug/L	ND	20	23.2	116	70-130	
Naphthalene	ug/L	ND	20	17.3	86	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1408413

Parameter	Units	92240301016 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
o-Xylene	ug/L	ND	20	22.5	113	70-130	
p-Isopropyltoluene	ug/L	ND	20	21.6	108	70-130	
Styrene	ug/L	ND	20	24.0	120	70-130	
Tetrachloroethene	ug/L	ND	20	23.6	118	70-130	
Toluene	ug/L	ND	20	23.4	117	70-130	
trans-1,2-Dichloroethene	ug/L	ND	20	23.4	117	70-130	
trans-1,3-Dichloropropene	ug/L	ND	20	23.4	117	70-130	
Trichloroethene	ug/L	ND	20	24.6	123	70-130	
Trichlorofluoromethane	ug/L	ND	20	27.0	135	70-130	M1
Vinyl acetate	ug/L	ND	40	39.7	99	70-130	
Vinyl chloride	ug/L	ND	20	22.9	114	70-130	
1,2-Dichloroethane-d4 (S)	%				96	70-130	
4-Bromofluorobenzene (S)	%				98	70-130	
Toluene-d8 (S)	%				97	70-130	

SAMPLE DUPLICATE: 1408412

Parameter	Units	92240301015 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,1-Trichloroethane	ug/L	ND	ND		30	
1,1,2,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,2-Trichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethene	ug/L	ND	ND		30	
1,1-Dichloropropene	ug/L	ND	ND		30	
1,2,3-Trichlorobenzene	ug/L	ND	ND		30	
1,2,3-Trichloropropane	ug/L	ND	ND		30	
1,2,4-Trichlorobenzene	ug/L	ND	ND		30	
1,2-Dibromo-3-chloropropane	ug/L	ND	ND		30	
1,2-Dichlorobenzene	ug/L	ND	ND		30	
1,2-Dichloroethane	ug/L	ND	ND		30	
1,2-Dichloropropane	ug/L	ND	ND		30	
1,3-Dichlorobenzene	ug/L	ND	ND		30	
1,3-Dichloropropane	ug/L	ND	ND		30	
1,4-Dichlorobenzene	ug/L	ND	ND		30	
2,2-Dichloropropane	ug/L	ND	ND		30	
2-Butanone (MEK)	ug/L	ND	ND		30	
2-Chlorotoluene	ug/L	ND	ND		30	
2-Hexanone	ug/L	ND	ND		30	
4-Chlorotoluene	ug/L	ND	ND		30	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	ND		30	
Acetone	ug/L	ND	ND		30	
Benzene	ug/L	ND	ND		30	
Bromobenzene	ug/L	ND	ND		30	
Bromochloromethane	ug/L	ND	ND		30	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

SAMPLE DUPLICATE: 1408412

Parameter	Units	92240301015 Result	Dup Result	RPD	Max RPD	Qualifiers
Bromodichloromethane	ug/L	ND	ND		30	
Bromoform	ug/L	ND	ND		30	
Bromomethane	ug/L	ND	ND		30	
Carbon tetrachloride	ug/L	ND	ND		30	
Chlorobenzene	ug/L	ND	ND		30	
Chloroethane	ug/L	ND	ND		30	
Chloroform	ug/L	ND	ND		30	
Chloromethane	ug/L	ND	ND		30	
cis-1,2-Dichloroethene	ug/L	ND	ND		30	
cis-1,3-Dichloropropene	ug/L	ND	ND		30	
Dibromochloromethane	ug/L	ND	ND		30	
Dibromomethane	ug/L	ND	ND		30	
Dichlorodifluoromethane	ug/L	ND	ND		30	
Diisopropyl ether	ug/L	ND	ND		30	
Ethylbenzene	ug/L	ND	ND		30	
Hexachloro-1,3-butadiene	ug/L	ND	ND		30	
m&p-Xylene	ug/L	ND	ND		30	
Methyl-tert-butyl ether	ug/L	ND	ND		30	
Methylene Chloride	ug/L	ND	ND		30	
Naphthalene	ug/L	ND	ND		30	
o-Xylene	ug/L	ND	ND		30	
p-Isopropyltoluene	ug/L	ND	ND		30	
Styrene	ug/L	ND	ND		30	
Tetrachloroethene	ug/L	ND	ND		30	
Toluene	ug/L	ND	ND		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
trans-1,3-Dichloropropene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Trichlorofluoromethane	ug/L	ND	ND		30	
Vinyl acetate	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
Xylene (Total)	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	107	110	3		
4-Bromofluorobenzene (S)	%	101	100	1		
Toluene-d8 (S)	%	96	96	0		

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30694 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92240289037

METHOD BLANK: 1409522 Matrix: Water
Associated Lab Samples: 92240289037

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	03/12/15 16:18	
Ethylbenzene	ug/L	ND	1.0	03/12/15 16:18	
m&p-Xylene	ug/L	ND	2.0	03/12/15 16:18	
Methyl-tert-butyl ether	ug/L	ND	1.0	03/12/15 16:18	
Naphthalene	ug/L	ND	1.0	03/12/15 16:18	
o-Xylene	ug/L	ND	1.0	03/12/15 16:18	
Toluene	ug/L	ND	1.0	03/12/15 16:18	
Xylene (Total)	ug/L	ND	2.0	03/12/15 16:18	
1,2-Dichloroethane-d4 (S)	%	109	70-130	03/12/15 16:18	
4-Bromofluorobenzene (S)	%	103	70-130	03/12/15 16:18	
Toluene-d8 (S)	%	95	70-130	03/12/15 16:18	

LABORATORY CONTROL SAMPLE: 1409523

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	50	50.6	101	70-130	
Ethylbenzene	ug/L	50	49.2	98	70-130	
m&p-Xylene	ug/L	100	97.9	98	70-130	
Methyl-tert-butyl ether	ug/L	50	52.2	104	70-130	
Naphthalene	ug/L	50	46.0	92	70-130	
o-Xylene	ug/L	50	49.3	99	70-130	
Toluene	ug/L	50	49.5	99	70-130	
Xylene (Total)	ug/L	150	147	98	70-130	
1,2-Dichloroethane-d4 (S)	%			98	70-130	
4-Bromofluorobenzene (S)	%			100	70-130	
Toluene-d8 (S)	%			101	70-130	

MATRIX SPIKE SAMPLE: 1409525

Parameter	Units	92240421006 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	ND	20	24.3	121	70-130	
Ethylbenzene	ug/L	ND	20	23.2	116	70-130	
m&p-Xylene	ug/L	ND	40	47.6	119	70-130	
Methyl-tert-butyl ether	ug/L	ND	20	22.0	110	70-130	
Naphthalene	ug/L	ND	20	17.0	85	70-130	
o-Xylene	ug/L	ND	20	22.2	111	70-130	
Toluene	ug/L	ND	20	23.6	118	70-130	
1,2-Dichloroethane-d4 (S)	%				97	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1409525

Parameter	Units	92240421006 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
4-Bromofluorobenzene (S)	%				96	70-130	
Toluene-d8 (S)	%				99	70-130	

SAMPLE DUPLICATE: 1409524

Parameter	Units	92240421005 Result	Dup Result	RPD	Max RPD	Qualifiers
Benzene	ug/L	ND	ND		30	
Ethylbenzene	ug/L	ND	ND		30	
m&p-Xylene	ug/L	ND	ND		30	
Methyl-tert-butyl ether	ug/L	ND	ND		30	
Naphthalene	ug/L	ND	ND		30	
o-Xylene	ug/L	ND	ND		30	
Toluene	ug/L	ND	ND		30	
Xylene (Total)	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	112	114	2		
4-Bromofluorobenzene (S)	%	107	107	0		
Toluene-d8 (S)	%	96	96	1		

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30656 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV 5035A Volatile Organics
Associated Lab Samples: 92240289001, 92240289002, 92240289003, 92240289004, 92240289005, 92240289006, 92240289007, 92240289008, 92240289009

METHOD BLANK: 1406624 Matrix: Solid
Associated Lab Samples: 92240289001, 92240289002, 92240289003, 92240289004, 92240289005, 92240289006, 92240289007, 92240289008, 92240289009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/kg	ND	6.7	03/10/15 12:33	
Ethylbenzene	ug/kg	ND	6.7	03/10/15 12:33	
m&p-Xylene	ug/kg	ND	13.5	03/10/15 12:33	
Methyl-tert-butyl ether	ug/kg	ND	6.7	03/10/15 12:33	
Naphthalene	ug/kg	ND	6.7	03/10/15 12:33	
o-Xylene	ug/kg	ND	6.7	03/10/15 12:33	
Toluene	ug/kg	ND	6.7	03/10/15 12:33	
Xylene (Total)	ug/kg	ND	13.5	03/10/15 12:33	
1,2-Dichloroethane-d4 (S)	%	94	70-130	03/10/15 12:33	
4-Bromofluorobenzene (S)	%	95	70-130	03/10/15 12:33	
Toluene-d8 (S)	%	102	70-130	03/10/15 12:33	

LABORATORY CONTROL SAMPLE: 1406625

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	69.6	71.2	102	70-130	
Ethylbenzene	ug/kg	69.6	70.1	101	70-130	
m&p-Xylene	ug/kg	139	139	100	70-130	
Methyl-tert-butyl ether	ug/kg	69.6	61.8	89	70-130	
Naphthalene	ug/kg	69.6	72.2	104	70-130	
o-Xylene	ug/kg	69.6	70.5	101	70-130	
Toluene	ug/kg	69.6	68.8	99	70-130	
Xylene (Total)	ug/kg	209	210	100	70-130	
1,2-Dichloroethane-d4 (S)	%			96	70-130	
4-Bromofluorobenzene (S)	%			102	70-130	
Toluene-d8 (S)	%			100	70-130	

MATRIX SPIKE SAMPLE: 1407692

Parameter	Units	92240301001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	ND	13.3	11.4	85	70-130	
Ethylbenzene	ug/kg	ND	13.3	11.2	84	70-130	
m&p-Xylene	ug/kg	ND	26.6	23.0	86	70-130	
Methyl-tert-butyl ether	ug/kg	ND	13.3	12.5	94	70-130	
Naphthalene	ug/kg	ND	13.3	12.3	92	70-130	
o-Xylene	ug/kg	ND	13.3	11.3	85	70-130	
Toluene	ug/kg	ND	13.3	11.9	89	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1407692

Parameter	Units	92240301001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,2-Dichloroethane-d4 (S)	%				106	70-130	
4-Bromofluorobenzene (S)	%				104	70-130	
Toluene-d8 (S)	%				101	70-130	

SAMPLE DUPLICATE: 1407691

Parameter	Units	92240289001 Result	Dup Result	RPD	Max RPD	Qualifiers
Benzene	ug/kg	ND	ND		30	
Ethylbenzene	ug/kg	ND	ND		30	
m&p-Xylene	ug/kg	ND	ND		30	
Methyl-tert-butyl ether	ug/kg	ND	ND		30	
Naphthalene	ug/kg	ND	ND		30	
o-Xylene	ug/kg	ND	ND		30	
Toluene	ug/kg	ND	ND		30	
Xylene (Total)	ug/kg	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	115	114	5		
4-Bromofluorobenzene (S)	%	104	103	5		
Toluene-d8 (S)	%	103	103	5		

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30657 | Analysis Method: EPA 8260
QC Batch Method: EPA 8260 | Analysis Description: 8260 MSV 5035A Volatile Organics
Associated Lab Samples: 92240289011, 92240289012, 92240289013, 92240289014

METHOD BLANK: 1406626 | Matrix: Solid
Associated Lab Samples: 92240289011, 92240289012, 92240289013, 92240289014

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/kg	ND	5.6	03/10/15 12:13	
Ethylbenzene	ug/kg	ND	5.6	03/10/15 12:13	
m&p-Xylene	ug/kg	ND	11.2	03/10/15 12:13	
Methyl-tert-butyl ether	ug/kg	ND	5.6	03/10/15 12:13	
Naphthalene	ug/kg	1.7J	5.6	03/10/15 12:13	
o-Xylene	ug/kg	ND	5.6	03/10/15 12:13	
Toluene	ug/kg	ND	5.6	03/10/15 12:13	
Xylene (Total)	ug/kg	ND	11.2	03/10/15 12:13	
1,2-Dichloroethane-d4 (S)	%	94	70-130	03/10/15 12:13	
4-Bromofluorobenzene (S)	%	95	70-130	03/10/15 12:13	
Toluene-d8 (S)	%	103	70-130	03/10/15 12:13	

LABORATORY CONTROL SAMPLE: 1406627

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	65.8	72.2	110	70-130	
Ethylbenzene	ug/kg	65.8	72.4	110	70-130	
m&p-Xylene	ug/kg	132	142	108	70-130	
Methyl-tert-butyl ether	ug/kg	65.8	67.4	102	70-130	
Naphthalene	ug/kg	65.8	71.4	108	70-130	
o-Xylene	ug/kg	65.8	71.0	108	70-130	
Toluene	ug/kg	65.8	72.0	109	70-130	
Xylene (Total)	ug/kg	197	213	108	70-130	
1,2-Dichloroethane-d4 (S)	%			99	70-130	
4-Bromofluorobenzene (S)	%			103	70-130	
Toluene-d8 (S)	%			100	70-130	

MATRIX SPIKE SAMPLE: 1407699

Parameter	Units	92240289012 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	ND	11.1	10.0	90	70-130	
Ethylbenzene	ug/kg	ND	11.1	9.7	87	70-130	
m&p-Xylene	ug/kg	ND	22.3	19.4	86	70-130	
Methyl-tert-butyl ether	ug/kg	ND	11.1	10.1	91	70-130	
Naphthalene	ug/kg	ND	11.1	10	86	70-130	
o-Xylene	ug/kg	ND	11.1	9.5	85	70-130	
Toluene	ug/kg	ND	11.1	10.1	90	70-130	
1,2-Dichloroethane-d4 (S)	%				107	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1407699

Parameter	Units	92240289012 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
4-Bromofluorobenzene (S)	%				102	70-130	
Toluene-d8 (S)	%				103	70-130	

SAMPLE DUPLICATE: 1407698

Parameter	Units	92240289011 Result	Dup Result	RPD	Max RPD	Qualifiers
Benzene	ug/kg	ND	ND		30	
Ethylbenzene	ug/kg	ND	ND		30	
m&p-Xylene	ug/kg	ND	ND		30	
Methyl-tert-butyl ether	ug/kg	ND	ND		30	
Naphthalene	ug/kg	0.99J	ND		30	
o-Xylene	ug/kg	ND	ND		30	
Toluene	ug/kg	ND	ND		30	
Xylene (Total)	ug/kg	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	109	117	4		
4-Bromofluorobenzene (S)	%	101	105	1		
Toluene-d8 (S)	%	103	104	3		

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30661 — Analysis Method: EPA 8260
QC Batch Method: EPA 8260 — Analysis Description: 8260 MSV 5035A Volatile Organics
Associated Lab Samples: 92240289016, 92240289018, 92240289019, 92240289020, 92240289021

METHOD BLANK: 1406819 — Matrix: Solid
Associated Lab Samples: 92240289016, 92240289018, 92240289019, 92240289020, 92240289021

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/kg	ND	5.7	03/10/15 15:33	
Ethylbenzene	ug/kg	ND	5.7	03/10/15 15:33	
m&p-Xylene	ug/kg	ND	11.4	03/10/15 15:33	
Methyl-tert-butyl ether	ug/kg	ND	5.7	03/10/15 15:33	
Naphthalene	ug/kg	2.0J	5.7	03/10/15 15:33	
o-Xylene	ug/kg	ND	5.7	03/10/15 15:33	
Toluene	ug/kg	ND	5.7	03/10/15 15:33	
Xylene (Total)	ug/kg	ND	11.4	03/10/15 15:33	
1,2-Dichloroethane-d4 (S)	%	101	70-130	03/10/15 15:33	
4-Bromofluorobenzene (S)	%	98	70-130	03/10/15 15:33	
Toluene-d8 (S)	%	110	70-130	03/10/15 15:33	

LABORATORY CONTROL SAMPLE: 1406820

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	58.8	58.0	99	70-130	
Ethylbenzene	ug/kg	58.8	57.3	97	70-130	
m&p-Xylene	ug/kg	118	112	96	70-130	
Methyl-tert-butyl ether	ug/kg	58.8	55.7	95	70-130	
Naphthalene	ug/kg	58.8	66.4	113	70-130	
o-Xylene	ug/kg	58.8	56.0	95	70-130	
Toluene	ug/kg	58.8	55.6	94	70-130	
Xylene (Total)	ug/kg	176	168	95	70-130	
1,2-Dichloroethane-d4 (S)	%			96	70-130	
4-Bromofluorobenzene (S)	%			97	70-130	
Toluene-d8 (S)	%			101	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: MSV/30674 — Analysis Method: EPA 8260
QC Batch Method: EPA 8260 — Analysis Description: 8260 MSV 5035A Volatile Organics
Associated Lab Samples: 92240289010, 92240289015, 92240289017, 92240289030, 92240289031, 92240289032, 92240289033, 92240289034

METHOD BLANK: 1407870 — Matrix: Solid
Associated Lab Samples: 92240289010, 92240289015, 92240289017, 92240289030, 92240289031, 92240289032, 92240289033, 92240289034

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/kg	ND	6.2	03/11/15 12:17	
Ethylbenzene	ug/kg	ND	6.2	03/11/15 12:17	
m&p-Xylene	ug/kg	ND	12.5	03/11/15 12:17	
Methyl-tert-butyl ether	ug/kg	ND	6.2	03/11/15 12:17	
Naphthalene	ug/kg	ND	6.2	03/11/15 12:17	
o-Xylene	ug/kg	ND	6.2	03/11/15 12:17	
Toluene	ug/kg	ND	6.2	03/11/15 12:17	
Xylene (Total)	ug/kg	ND	12.5	03/11/15 12:17	
1,2-Dichloroethane-d4 (S)	%	97	70-130	03/11/15 12:17	
4-Bromofluorobenzene (S)	%	101	70-130	03/11/15 12:17	
Toluene-d8 (S)	%	102	70-130	03/11/15 12:17	

LABORATORY CONTROL SAMPLE: 1407871

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	61.7	67.4	109	70-130	
Ethylbenzene	ug/kg	61.7	68.4	111	70-130	
m&p-Xylene	ug/kg	123	135	110	70-130	
Methyl-tert-butyl ether	ug/kg	61.7	61.9	100	70-130	
Naphthalene	ug/kg	61.7	68.1	110	70-130	
o-Xylene	ug/kg	61.7	66.2	107	70-130	
Toluene	ug/kg	61.7	67.1	109	70-130	
Xylene (Total)	ug/kg	185	202	109	70-130	
1,2-Dichloroethane-d4 (S)	%			98	70-130	
4-Bromofluorobenzene (S)	%			103	70-130	
Toluene-d8 (S)	%			100	70-130	

MATRIX SPIKE SAMPLE: 1409136

Parameter	Units	92240537003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Benzene	ug/kg	ND	26.7	28.7	107	70-130	
Ethylbenzene	ug/kg	ND	26.7	26.2	98	70-130	
m&p-Xylene	ug/kg	ND	53.3	52.2	97	70-130	
Methyl-tert-butyl ether	ug/kg	ND	26.7	34.9	131	70-130	M1
Naphthalene	ug/kg	ND	26.7	20.9	74	70-130	
o-Xylene	ug/kg	ND	26.7	26.1	97	70-130	
Toluene	ug/kg	ND	26.7	26.4	98	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE SAMPLE: 1409136

Parameter	Units	92240537003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,2-Dichloroethane-d4 (S)	%				108	70-130	
4-Bromofluorobenzene (S)	%				98	70-130	
Toluene-d8 (S)	%				99	70-130	

SAMPLE DUPLICATE: 1409135

Parameter	Units	92240289015 Result	Dup Result	RPD	Max RPD	Qualifiers
Benzene	ug/kg	ND	ND		30	
Ethylbenzene	ug/kg	ND	ND		30	
m&p-Xylene	ug/kg	ND	ND		30	
Methyl-tert-butyl ether	ug/kg	ND	ND		30	
Naphthalene	ug/kg	ND	ND		30	
o-Xylene	ug/kg	ND	ND		30	
Toluene	ug/kg	ND	ND		30	
Xylene (Total)	ug/kg	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	119	107	6		
4-Bromofluorobenzene (S)	%	106	100	2		
Toluene-d8 (S)	%	105	104	3		

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: OEXT/33485 Analysis Method: EPA 8270 by SIM
QC Batch Method: EPA 3546 Analysis Description: 8270 MSSV PAH by SIM
Associated Lab Samples: 92240289018, 92240289019, 92240289020, 92240289021

METHOD BLANK: 1407753 Matrix: Solid
Associated Lab Samples: 92240289018, 92240289019, 92240289020, 92240289021

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1-Methylnaphthalene	ug/kg	ND	10.0	03/12/15 18:49	
2-Methylnaphthalene	ug/kg	ND	10.0	03/12/15 18:49	
Acenaphthene	ug/kg	ND	10.0	03/12/15 18:49	
Acenaphthylene	ug/kg	ND	10.0	03/12/15 18:49	
Anthracene	ug/kg	ND	10.0	03/12/15 18:49	
Benzo(a)anthracene	ug/kg	ND	10.0	03/12/15 18:49	
Benzo(a)pyrene	ug/kg	ND	10.0	03/12/15 18:49	
Benzo(b)fluoranthene	ug/kg	ND	10.0	03/12/15 18:49	
Benzo(g,h,i)perylene	ug/kg	ND	10.0	03/12/15 18:49	
Benzo(k)fluoranthene	ug/kg	ND	10.0	03/12/15 18:49	
Chrysene	ug/kg	ND	10.0	03/12/15 18:49	
Dibenz(a,h)anthracene	ug/kg	ND	10.0	03/12/15 18:49	
Fluoranthene	ug/kg	ND	10.0	03/12/15 18:49	
Fluorene	ug/kg	ND	10.0	03/12/15 18:49	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	10.0	03/12/15 18:49	
Naphthalene	ug/kg	ND	10.0	03/12/15 18:49	
Phenanthrene	ug/kg	ND	10.0	03/12/15 18:49	
Pyrene	ug/kg	ND	10.0	03/12/15 18:49	
2-Fluorobiphenyl (S)	%	55	10-110	03/12/15 18:49	
Nitrobenzene-d5 (S)	%	64	10-128	03/12/15 18:49	
Terphenyl-d14 (S)	%	60	39-119	03/12/15 18:49	

LABORATORY CONTROL SAMPLE: 1407754

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1-Methylnaphthalene	ug/kg	33.3	21.2	64	44-130	
2-Methylnaphthalene	ug/kg	33.3	20.8	62	41-134	
Acenaphthene	ug/kg	33.3	24.2	73	52-123	
Acenaphthylene	ug/kg	33.3	24.3	73	49-116	
Anthracene	ug/kg	33.3	23.2	69	41-133	
Benzo(a)anthracene	ug/kg	33.3	22.6	68	56-130	
Benzo(a)pyrene	ug/kg	33.3	22.8	68	51-136	
Benzo(b)fluoranthene	ug/kg	33.3	21.8	65	37-149	
Benzo(g,h,i)perylene	ug/kg	33.3	16.1	48	39-127	
Benzo(k)fluoranthene	ug/kg	33.3	22.9	69	45-139	
Chrysene	ug/kg	33.3	23.4	70	59-127	
Dibenz(a,h)anthracene	ug/kg	33.3	17.7	53	37-139	
Fluoranthene	ug/kg	33.3	22.7	68	53-132	
Fluorene	ug/kg	33.3	25.0	75	45-127	
Indeno(1,2,3-cd)pyrene	ug/kg	33.3	17.9	54	35-145	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1407754

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Naphthalene	ug/kg	33.3	22.5	67	45-123	
Phenanthrene	ug/kg	33.3	23.9	72	50-125	
Pyrene	ug/kg	33.3	22.7	68	52-132	
2-Fluorobiphenyl (S)	%			56	10-110	
Nitrobenzene-d5 (S)	%			67	10-128	
Terphenyl-d14 (S)	%			61	39-119	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1407755 1407756

Parameter	Units	92240123004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1-Methylnaphthalene	ug/kg	ND	41	41	23.9	22.8	58	56	50-150	5	30	
2-Methylnaphthalene	ug/kg	ND	41	41	23.7	22.4	58	55	50-150	6	30	
Acenaphthene	ug/kg	ND	41	41	27.2	26.3	66	64	50-150	3	30	
Acenaphthylene	ug/kg	ND	41	41	27.0	25.5	66	62	50-150	6	30	
Anthracene	ug/kg	ND	41	41	25.6	31.2	63	76	50-150	19	30	
Benzo(a)anthracene	ug/kg	ND	41	41	23.3	35.0	57	85	50-150	40	30	R1
Benzo(a)pyrene	ug/kg	ND	41	41	22.7	37.2	55	91	50-150	49	30	R1
Benzo(b)fluoranthene	ug/kg	ND	41	41	26.9	44.1	66	107	50-150	49	30	R1
Benzo(g,h,i)perylene	ug/kg	ND	41	41	21.9	40.4	53	99	50-150	60	30	R1
Benzo(k)fluoranthene	ug/kg	ND	41	41	22.6	37.1	55	91	50-150	48	30	R1
Chrysene	ug/kg	ND	41	41	24.4	37.7	60	92	50-150	43	30	R1
Dibenz(a,h)anthracene	ug/kg	ND	41	41	21.7	38.8	53	95	50-150	57	30	R1
Fluoranthene	ug/kg	ND	41	41	24.6	35.2	60	86	50-150	36	30	R1
Fluorene	ug/kg	ND	41	41	28.5	29.3	69	71	50-150	3	30	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	41	41	22.7	40.5	55	99	50-150	57	30	R1
Naphthalene	ug/kg	ND	41	41	26.1	24.5	64	60	50-150	6	30	
Phenanthrene	ug/kg	ND	41	41	26.6	32.8	65	80	50-150	21	30	
Pyrene	ug/kg	ND	41	41	25.0	35.5	61	86	50-150	35	30	R1
2-Fluorobiphenyl (S)	%						51	49	10-110			
Nitrobenzene-d5 (S)	%						60	59	10-128			
Terphenyl-d14 (S)	%						61	59	39-119			

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: OEXT/33588 | Analysis Method: EPA 8270 by SIM
QC Batch Method: EPA 3546 | Analysis Description: 8270 MSSV PAH by SIM
Associated Lab Samples: 92240289017

METHOD BLANK: 1411585 | Matrix: Solid
Associated Lab Samples: 92240289017

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1-Methylnaphthalene	ug/kg	ND	10.0	03/16/15 12:00	
2-Methylnaphthalene	ug/kg	ND	10.0	03/16/15 12:00	
Acenaphthene	ug/kg	ND	10.0	03/16/15 12:00	
Acenaphthylene	ug/kg	ND	10.0	03/16/15 12:00	
Anthracene	ug/kg	ND	10.0	03/16/15 12:00	
Benzo(a)anthracene	ug/kg	ND	10.0	03/16/15 12:00	
Benzo(a)pyrene	ug/kg	ND	10.0	03/16/15 12:00	
Benzo(b)fluoranthene	ug/kg	ND	10.0	03/16/15 12:00	
Benzo(g,h,i)perylene	ug/kg	ND	10.0	03/16/15 12:00	
Benzo(k)fluoranthene	ug/kg	ND	10.0	03/16/15 12:00	
Chrysene	ug/kg	ND	10.0	03/16/15 12:00	
Dibenz(a,h)anthracene	ug/kg	ND	10.0	03/16/15 12:00	
Fluoranthene	ug/kg	ND	10.0	03/16/15 12:00	
Fluorene	ug/kg	ND	10.0	03/16/15 12:00	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	10.0	03/16/15 12:00	
Naphthalene	ug/kg	ND	10.0	03/16/15 12:00	
Phenanthrene	ug/kg	ND	10.0	03/16/15 12:00	
Pyrene	ug/kg	ND	10.0	03/16/15 12:00	
2-Fluorobiphenyl (S)	%	45	10-110	03/16/15 12:00	
Nitrobenzene-d5 (S)	%	55	10-128	03/16/15 12:00	
Terphenyl-d14 (S)	%	68	39-119	03/16/15 12:00	

LABORATORY CONTROL SAMPLE & LCSD: 1411586 1411587

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1-Methylnaphthalene	ug/kg	33.3	23.3	24.2	70	73	44-130	4	30	
2-Methylnaphthalene	ug/kg	33.3	22.7	23.4	68	70	41-134	3	30	
Acenaphthene	ug/kg	33.3	27.3	28.4	82	85	52-123	4	30	
Acenaphthylene	ug/kg	33.3	27.1	28.4	81	85	49-116	5	30	
Anthracene	ug/kg	33.3	28.4	29.8	85	89	41-133	5	30	
Benzo(a)anthracene	ug/kg	33.3	28.8	29.9	86	90	56-130	4	30	
Benzo(a)pyrene	ug/kg	33.3	29.1	30.4	87	91	51-136	4	30	
Benzo(b)fluoranthene	ug/kg	33.3	32.9	35.3	99	106	37-149	7	30	
Benzo(g,h,i)perylene	ug/kg	33.3	30.6	31.9	92	96	39-127	4	30	
Benzo(k)fluoranthene	ug/kg	33.3	31.1	31.9	93	96	45-139	3	30	
Chrysene	ug/kg	33.3	30.4	31.9	91	96	59-127	5	30	
Dibenz(a,h)anthracene	ug/kg	33.3	29.8	31.2	89	93	37-139	4	30	
Fluoranthene	ug/kg	33.3	27.9	29.7	84	89	53-132	6	30	
Fluorene	ug/kg	33.3	29.4	30.9	88	93	45-127	5	30	
Indeno(1,2,3-cd)pyrene	ug/kg	33.3	30.7	32.0	92	96	35-145	4	30	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE & LCSD: 1411586 1411587

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Naphthalene	ug/kg	33.3	24.8	25.7	74	77	45-123	4	30	
Phenanthrene	ug/kg	33.3	29.6	31.1	89	93	50-125	5	30	
Pyrene	ug/kg	33.3	28.2	29.8	85	89	52-132	5	30	
2-Fluorobiphenyl (S)	%				64	67	10-110			
Nitrobenzene-d5 (S)	%				75	78	10-128			
Terphenyl-d14 (S)	%				75	79	39-119			

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: OEXT/33453 Analysis Method: EPA 8270
QC Batch Method: EPA 3546 Analysis Description: 8270 Solid MSSV Microwave SC
Associated Lab Samples: 92240289017, 92240289018, 92240289019, 92240289020, 92240289021

METHOD BLANK: 1406782 Matrix: Solid
Associated Lab Samples: 92240289017, 92240289018, 92240289019, 92240289020, 92240289021

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trichlorobenzene	ug/kg	ND	330	03/11/15 16:14	
1,2-Dichlorobenzene	ug/kg	ND	330	03/11/15 16:14	
1,3-Dichlorobenzene	ug/kg	ND	330	03/11/15 16:14	
1,4-Dichlorobenzene	ug/kg	ND	330	03/11/15 16:14	
1-Methylnaphthalene	ug/kg	ND	330	03/11/15 16:14	
2,4,5-Trichlorophenol	ug/kg	ND	330	03/11/15 16:14	
2,4,6-Trichlorophenol	ug/kg	ND	330	03/11/15 16:14	
2,4-Dichlorophenol	ug/kg	ND	330	03/11/15 16:14	
2,4-Dimethylphenol	ug/kg	ND	330	03/11/15 16:14	
2,4-Dinitrophenol	ug/kg	ND	1650	03/11/15 16:14	
2,4-Dinitrotoluene	ug/kg	ND	330	03/11/15 16:14	
2,6-Dinitrotoluene	ug/kg	ND	330	03/11/15 16:14	
2-Chloronaphthalene	ug/kg	ND	330	03/11/15 16:14	
2-Chlorophenol	ug/kg	ND	330	03/11/15 16:14	
2-Methylnaphthalene	ug/kg	ND	330	03/11/15 16:14	
2-Methylphenol(o-Cresol)	ug/kg	ND	330	03/11/15 16:14	
2-Nitroaniline	ug/kg	ND	1650	03/11/15 16:14	
2-Nitrophenol	ug/kg	ND	330	03/11/15 16:14	
3&4-Methylphenol(m&p Cresol)	ug/kg	ND	330	03/11/15 16:14	
3,3'-Dichlorobenzidine	ug/kg	ND	1650	03/11/15 16:14	
3-Nitroaniline	ug/kg	ND	1650	03/11/15 16:14	
4,6-Dinitro-2-methylphenol	ug/kg	ND	660	03/11/15 16:14	
4-Bromophenylphenyl ether	ug/kg	ND	330	03/11/15 16:14	
4-Chloro-3-methylphenol	ug/kg	ND	660	03/11/15 16:14	
4-Chloroaniline	ug/kg	ND	1650	03/11/15 16:14	
4-Chlorophenylphenyl ether	ug/kg	ND	330	03/11/15 16:14	
4-Nitroaniline	ug/kg	ND	660	03/11/15 16:14	
4-Nitrophenol	ug/kg	ND	1650	03/11/15 16:14	
Acenaphthene	ug/kg	ND	330	03/11/15 16:14	
Acenaphthylene	ug/kg	ND	330	03/11/15 16:14	
Aniline	ug/kg	ND	330	03/11/15 16:14	
Anthracene	ug/kg	ND	330	03/11/15 16:14	
Benzo(a)anthracene	ug/kg	ND	330	03/11/15 16:14	
Benzo(a)pyrene	ug/kg	ND	330	03/11/15 16:14	
Benzo(b)fluoranthene	ug/kg	ND	330	03/11/15 16:14	
Benzo(g,h,i)perylene	ug/kg	ND	330	03/11/15 16:14	
Benzo(k)fluoranthene	ug/kg	ND	330	03/11/15 16:14	
Benzoic Acid	ug/kg	ND	1650	03/11/15 16:14	
Benzyl alcohol	ug/kg	ND	660	03/11/15 16:14	
bis(2-Chloroethoxy)methane	ug/kg	ND	330	03/11/15 16:14	
bis(2-Chloroethyl) ether	ug/kg	ND	330	03/11/15 16:14	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

METHOD BLANK: 1406782 Matrix: Solid
Associated Lab Samples: 92240289017, 92240289018, 92240289019, 92240289020, 92240289021

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
bis(2-Chloroisopropyl) ether	ug/kg	ND	330	03/11/15 16:14	
bis(2-Ethylhexyl)phthalate	ug/kg	ND	330	03/11/15 16:14	
Butylbenzylphthalate	ug/kg	ND	330	03/11/15 16:14	
Chrysene	ug/kg	ND	330	03/11/15 16:14	
Di-n-butylphthalate	ug/kg	ND	330	03/11/15 16:14	
Di-n-octylphthalate	ug/kg	ND	330	03/11/15 16:14	
Dibenz(a,h)anthracene	ug/kg	ND	330	03/11/15 16:14	
Dibenzofuran	ug/kg	ND	330	03/11/15 16:14	
Diethylphthalate	ug/kg	ND	330	03/11/15 16:14	
Dimethylphthalate	ug/kg	ND	330	03/11/15 16:14	
Fluoranthene	ug/kg	ND	330	03/11/15 16:14	
Fluorene	ug/kg	ND	330	03/11/15 16:14	
Hexachloro-1,3-butadiene	ug/kg	ND	330	03/11/15 16:14	
Hexachlorobenzene	ug/kg	ND	330	03/11/15 16:14	
Hexachlorocyclopentadiene	ug/kg	ND	330	03/11/15 16:14	
Hexachloroethane	ug/kg	ND	330	03/11/15 16:14	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	330	03/11/15 16:14	
Isophorone	ug/kg	ND	330	03/11/15 16:14	
N-Nitroso-di-n-propylamine	ug/kg	ND	330	03/11/15 16:14	
N-Nitrosodimethylamine	ug/kg	ND	330	03/11/15 16:14	
N-Nitrosodiphenylamine	ug/kg	ND	330	03/11/15 16:14	
Naphthalene	ug/kg	ND	330	03/11/15 16:14	
Nitrobenzene	ug/kg	ND	330	03/11/15 16:14	
Pentachlorophenol	ug/kg	ND	1650	03/11/15 16:14	
Phenanthrene	ug/kg	ND	330	03/11/15 16:14	
Phenol	ug/kg	ND	330	03/11/15 16:14	
Pyrene	ug/kg	ND	330	03/11/15 16:14	
2,4,6-Tribromophenol (S)	%	80	27-110	03/11/15 16:14	
2-Fluorobiphenyl (S)	%	69	30-110	03/11/15 16:14	
2-Fluorophenol (S)	%	66	13-110	03/11/15 16:14	
Nitrobenzene-d5 (S)	%	66	23-110	03/11/15 16:14	
Phenol-d6 (S)	%	69	22-110	03/11/15 16:14	
Terphenyl-d14 (S)	%	89	28-110	03/11/15 16:14	

LABORATORY CONTROL SAMPLE: 1406783

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trichlorobenzene	ug/kg	1670	1380	83	70-130	
1,2-Dichlorobenzene	ug/kg	1670	1320	79	70-130	
1,3-Dichlorobenzene	ug/kg	1670	1240	75	70-130	
1,4-Dichlorobenzene	ug/kg	1670	1300	78	70-130	
1-Methylnaphthalene	ug/kg	1670	1430	86	70-130	
2,4,5-Trichlorophenol	ug/kg	1670	1330	80	70-130	
2,4,6-Trichlorophenol	ug/kg	1670	1310	79	70-130	

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REPORT OF LABORATORY ANALYSIS

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(704)875-9092

QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1406783

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2,4-Dichlorophenol	ug/kg	1670	1350	81	70-130	
2,4-Dimethylphenol	ug/kg	1670	1480	89	70-130	
2,4-Dinitrophenol	ug/kg	8330	7340	88	28-103	
2,4-Dinitrotoluene	ug/kg	1670	1600	96	70-130	
2,6-Dinitrotoluene	ug/kg	1670	1500	90	70-130	
2-Chloronaphthalene	ug/kg	1670	1310	78	70-130	
2-Chlorophenol	ug/kg	1670	1330	80	70-130	
2-Methylnaphthalene	ug/kg	1670	1300	78	70-130	
2-Methylphenol(o-Cresol)	ug/kg	1670	1330	80	70-130	
2-Nitroaniline	ug/kg	3330	2800	84	70-130	
2-Nitrophenol	ug/kg	1670	1410	84	70-130	
3&4-Methylphenol(m&p Cresol)	ug/kg	1670	1360	82	70-130	
3,3'-Dichlorobenzidine	ug/kg	3330	2850	86	50-150	
3-Nitroaniline	ug/kg	3330	2780	83	35-110	
4,6-Dinitro-2-methylphenol	ug/kg	3330	3620	109	70-130	
4-Bromophenylphenyl ether	ug/kg	1670	1430	86	70-130	
4-Chloro-3-methylphenol	ug/kg	3330	2930	88	70-130	
4-Chloroaniline	ug/kg	3330	2750	82	70-130	
4-Chlorophenylphenyl ether	ug/kg	1670	1420	85	70-130	
4-Nitroaniline	ug/kg	3330	2920	88	70-130	
4-Nitrophenol	ug/kg	8330	6330	76	70-130	
Acenaphthene	ug/kg	1670	1340	80	70-130	
Acenaphthylene	ug/kg	1670	1330	80	70-130	
Aniline	ug/kg	1670	1130	68	29-110	
Anthracene	ug/kg	1670	1430	86	70-130	
Benzo(a)anthracene	ug/kg	1670	1440	86	70-130	
Benzo(a)pyrene	ug/kg	1670	1460	88	70-130	
Benzo(b)fluoranthene	ug/kg	1670	1430	86	70-130	
Benzo(g,h,i)perylene	ug/kg	1670	1510	91	70-130	
Benzo(k)fluoranthene	ug/kg	1670	1530	92	70-130	
Benzoic Acid	ug/kg	8330	6000	72	16-110	
Benzyl alcohol	ug/kg	3330	2850	86	70-130	
bis(2-Chloroethoxy)methane	ug/kg	1670	1430	86	70-130	
bis(2-Chloroethyl) ether	ug/kg	1670	1500	90	70-130	
bis(2-Chloroisopropyl) ether	ug/kg	1670	1320	79	70-130	
bis(2-Ethylhexyl)phthalate	ug/kg	1670	1380	83	70-130	
Butylbenzylphthalate	ug/kg	1670	1390	83	70-130	
Chrysene	ug/kg	1670	1520	91	70-130	
Di-n-butylphthalate	ug/kg	1670	1430	86	70-130	
Di-n-octylphthalate	ug/kg	1670	1370	82	70-130	
Dibenz(a,h)anthracene	ug/kg	1670	1550	93	70-130	
Dibenzofuran	ug/kg	1670	1410	85	70-130	
Diethylphthalate	ug/kg	1670	1410	85	70-130	
Dimethylphthalate	ug/kg	1670	1400	84	70-130	
Fluoranthene	ug/kg	1670	1440	87	70-130	
Fluorene	ug/kg	1670	1440	87	70-130	
Hexachloro-1,3-butadiene	ug/kg	1670	1330	80	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1406783

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Hexachlorobenzene	ug/kg	1670	1410	85	70-130	
Hexachlorocyclopentadiene	ug/kg	1670	1130	68	70-130	1g,L0
Hexachloroethane	ug/kg	1670	1240	74	70-130	
Indeno(1,2,3-cd)pyrene	ug/kg	1670	1600	96	70-130	
Isophorone	ug/kg	1670	1450	87	70-130	
N-Nitroso-di-n-propylamine	ug/kg	1670	1380	83	70-130	
N-Nitrosodimethylamine	ug/kg	1670	1250	75	70-130	
N-Nitrosodiphenylamine	ug/kg	1670	1450	87	70-130	
Naphthalene	ug/kg	1670	1380	83	70-130	
Nitrobenzene	ug/kg	1670	1330	80	70-130	
Pentachlorophenol	ug/kg	3330	2950	88	70-130	
Phenanthrene	ug/kg	1670	1380	83	70-130	
Phenol	ug/kg	1670	1530	92	70-130	
Pyrene	ug/kg	1670	1370	82	70-130	
2,4,6-Tribromophenol (S)	%			89	27-110	
2-Fluorobiphenyl (S)	%			73	30-110	
2-Fluorophenol (S)	%			76	13-110	
Nitrobenzene-d5 (S)	%			73	23-110	
Phenol-d6 (S)	%			80	22-110	
Terphenyl-d14 (S)	%			92	28-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406784 1406785

Parameter	Units	92240289019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trichlorobenzene	ug/kg	ND	1850	1850	1020	827	55	45	70-130	20	30	
1,2-Dichlorobenzene	ug/kg	ND	1850	1850	1030	806	56	44	70-130	25	30	
1,3-Dichlorobenzene	ug/kg	ND	1850	1850	971	763	52	41	70-130	24	30	
1,4-Dichlorobenzene	ug/kg	ND	1850	1850	1020	799	55	43	70-130	24	30	
1-Methylnaphthalene	ug/kg	ND	1850	1850	1070	810	58	44	70-130	27	30	
2,4,5-Trichlorophenol	ug/kg	ND	1850	1850	1010	762	55	41	70-130	28	30	
2,4,6-Trichlorophenol	ug/kg	ND	1850	1850	1010	723	54	39	70-130	33	30	R1
2,4-Dichlorophenol	ug/kg	ND	1850	1850	1010	763	54	41	70-130	28	30	
2,4-Dimethylphenol	ug/kg	ND	1850	1850	1040	795	56	43	70-130	27	30	
2,4-Dinitrophenol	ug/kg	ND	9250	9250	5050	4750	55	51	70-130	6	30	
2,4-Dinitrotoluene	ug/kg	ND	1850	1850	1170	992	63	54	70-130	17	30	
2,6-Dinitrotoluene	ug/kg	ND	1850	1850	1170	912	63	49	70-130	25	30	
2-Chloronaphthalene	ug/kg	ND	1850	1850	1030	755	55	41	70-130	30	30	
2-Chlorophenol	ug/kg	ND	1850	1850	1050	786	57	42	70-130	28	30	
2-Methylnaphthalene	ug/kg	ND	1850	1850	986	743	53	40	70-130	28	30	
2-Methylphenol(o-Cresol)	ug/kg	ND	1850	1850	1020	764	55	41	70-130	29	30	
2-Nitroaniline	ug/kg	ND	3700	3700	2120	1690J	57	46	70-130		30	
2-Nitrophenol	ug/kg	ND	1850	1850	1060	782	57	42	70-130	31	30	R1
3&4-Methylphenol(m&p Cresol)	ug/kg	ND	1850	1850	1060	801	57	43	70-130	28	30	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406784 1406785

Parameter	Units	92240289019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
3,3'-Dichlorobenzidine	ug/kg	ND	3700	3700	2150	1790J	57	47	70-130		30	
3-Nitroaniline	ug/kg	ND	3700	3700	2130	1790J	57	48	70-130		30	
4,6-Dinitro-2-methylphenol	ug/kg	ND	3700	3700	2580	2210	70	60	70-130	15	30	
4-Bromophenylphenyl ether	ug/kg	ND	1850	1850	1110	856	60	46	70-130	26	30	
4-Chloro-3-methylphenol	ug/kg	ND	3700	3700	2140	1610	58	43	70-130	29	30	
4-Chloroaniline	ug/kg	ND	3700	3700	2070	1540J	56	42	70-130		30	
4-Chlorophenylphenyl ether	ug/kg	ND	1850	1850	1090	870	59	47	70-130	23	30	
4-Nitroaniline	ug/kg	ND	3700	3700	2190	2080	59	56	70-130	5	30	
4-Nitrophenol	ug/kg	ND	9250	9250	4630	4510	50	49	70-130	3	30	
Acenaphthene	ug/kg	ND	1850	1850	1040	783	56	42	70-130	28	30	
Acenaphthylene	ug/kg	ND	1850	1850	1010	757	55	41	70-130	29	30	
Aniline	ug/kg	ND	1850	1850	788	613	43	33	70-130	25	30	
Anthracene	ug/kg	ND	1850	1850	1100	901	59	49	70-130	20	30	
Benzo(a)anthracene	ug/kg	ND	1850	1850	1120	936	61	51	70-130	18	30	
Benzo(a)pyrene	ug/kg	ND	1850	1850	1110	944	58	49	70-130	16	30	
Benzo(b)fluoranthene	ug/kg	ND	1850	1850	1110	946	60	51	70-130	16	30	
Benzo(g,h,i)perylene	ug/kg	ND	1850	1850	1070	948	58	51	70-130	12	30	
Benzo(k)fluoranthene	ug/kg	ND	1850	1850	1150	974	62	53	70-130	17	30	
Benzoic Acid	ug/kg	ND	9250	9250	72.7J	1530J	1	17	70-130		30	
Benzyl alcohol	ug/kg	ND	3700	3700	2130	1640	58	44	70-130	26	30	
bis(2-Chloroethoxy)methane	ug/kg	ND	1850	1850	1060	810	58	44	70-130	27	30	
bis(2-Chloroethyl) ether	ug/kg	ND	1850	1850	1220	976	66	53	70-130	22	30	
bis(2-Chloroisopropyl) ether	ug/kg	ND	1850	1850	1030	803	56	43	70-130	25	30	
bis(2-Ethylhexyl)phthalate	ug/kg	ND	1850	1850	1040	799	56	43	70-130	26	30	
Butylbenzylphthalate	ug/kg	ND	1850	1850	1020	802	55	43	70-130	24	30	
Chrysene	ug/kg	ND	1850	1850	1180	982	64	53	70-130	19	30	
Di-n-butylphthalate	ug/kg	ND	1850	1850	1120	920	61	50	70-130	20	30	
Di-n-octylphthalate	ug/kg	ND	1850	1850	1000	789	54	43	70-130	24	30	
Dibenz(a,h)anthracene	ug/kg	ND	1850	1850	1140	965	61	52	70-130	16	30	
Dibenzofuran	ug/kg	ND	1850	1850	1090	851	59	46	70-130	25	30	
Diethylphthalate	ug/kg	ND	1850	1850	1110	904	60	49	70-130	20	30	
Dimethylphthalate	ug/kg	ND	1850	1850	1080	880	58	48	70-130	21	30	
Fluoranthene	ug/kg	ND	1850	1850	1100	987	59	53	70-130	11	30	
Fluorene	ug/kg	ND	1850	1850	1100	882	59	48	70-130	22	30	
Hexachloro-1,3-butadiene	ug/kg	ND	1850	1850	990	793	53	43	70-130	22	30	
Hexachlorobenzene	ug/kg	ND	1850	1850	1080	861	59	47	70-130	23	30	
Hexachlorocyclopentadiene	ug/kg	ND	1850	1850	838	622	45	34	70-130	30	30	
Hexachloroethane	ug/kg	ND	1850	1850	969	746	52	40	70-130	26	30	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	1850	1850	1140	992	62	54	70-130	14	30	
Isophorone	ug/kg	ND	1850	1850	1050	770	57	42	70-130	31	30	R1
N-Nitroso-di-n-propylamine	ug/kg	ND	1850	1850	1080	818	59	44	70-130	28	30	
N-Nitrosodimethylamine	ug/kg	ND	1850	1850	903	682	49	37	70-130	28	30	
N-Nitrosodiphenylamine	ug/kg	ND	1850	1850	1130	902	61	49	70-130	22	30	
Naphthalene	ug/kg	ND	1850	1850	1030	810	56	44	70-130	24	30	
Nitrobenzene	ug/kg	ND	1850	1850	997	756	54	41	70-130	28	30	
Pentachlorophenol	ug/kg	ND	3700	3700	2090	1870	57	51	70-130	11	30	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406784 1406785

Parameter	Units	92240289019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phenanthrene	ug/kg	ND	1850	1850	1070	877	58	47	70-130	19	30	
Phenol	ug/kg	ND	1850	1850	1160	902	62	49	70-130	25	30	1g,4g, M0
Pyrene	ug/kg	ND	1850	1850	1070	885	58	48	70-130	19	30	
2,4,6-Tribromophenol (S)	%						62	52	27-110			
2-Fluorobiphenyl (S)	%						54	39	30-110			
2-Fluorophenol (S)	%						54	41	13-110			
Nitrobenzene-d5 (S)	%						53	40	23-110			
Phenol-d6 (S)	%						57	42	22-110			
Terphenyl-d14 (S)	%						67	54	28-110			

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: OEXT/33439 Analysis Method: EPA 8270
QC Batch Method: EPA 3510 Analysis Description: 8270 Water CPAH by SIM 3510 SC
Associated Lab Samples: 92240289038, 92240289039, 92240289040, 92240289041

METHOD BLANK: 1406230 Matrix: Water
Associated Lab Samples: 92240289038, 92240289039, 92240289040, 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1-Methylnaphthalene	ug/L	ND	2.0	03/12/15 16:27	
2-Methylnaphthalene	ug/L	ND	2.0	03/12/15 16:27	
Acenaphthene	ug/L	ND	2.0	03/12/15 16:27	
Acenaphthylene	ug/L	ND	1.5	03/12/15 16:27	
Anthracene	ug/L	ND	0.050	03/12/15 16:27	
Benzo(a)anthracene	ug/L	ND	0.10	03/12/15 16:27	
Benzo(a)pyrene	ug/L	ND	0.20	03/12/15 16:27	
Benzo(b)fluoranthene	ug/L	ND	0.20	03/12/15 16:27	
Benzo(g,h,i)perylene	ug/L	ND	0.20	03/12/15 16:27	
Benzo(k)fluoranthene	ug/L	ND	0.20	03/12/15 16:27	
Chrysene	ug/L	ND	0.10	03/12/15 16:27	
Dibenz(a,h)anthracene	ug/L	ND	0.20	03/12/15 16:27	
Fluoranthene	ug/L	ND	0.30	03/12/15 16:27	
Fluorene	ug/L	ND	0.31	03/12/15 16:27	
Indeno(1,2,3-cd)pyrene	ug/L	ND	0.20	03/12/15 16:27	
Naphthalene	ug/L	ND	1.5	03/12/15 16:27	
Phenanthrene	ug/L	ND	0.20	03/12/15 16:27	
Pyrene	ug/L	ND	0.10	03/12/15 16:27	
2-Fluorobiphenyl (S)	%	63	70-130	03/12/15 16:27	2g,S0
Nitrobenzene-d5 (S)	%	78	70-130	03/12/15 16:27	
Terphenyl-d14 (S)	%	87	70-130	03/12/15 16:27	

LABORATORY CONTROL SAMPLE & LCSD: 1406231 1406232

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1-Methylnaphthalene	ug/L	1	ND	ND	83	83	70-130		30	
2-Methylnaphthalene	ug/L	1	ND	ND	83	81	70-130		30	
Acenaphthene	ug/L	1	ND	ND	95	94	70-130		30	
Acenaphthylene	ug/L	1	ND	ND	93	92	70-130		30	
Anthracene	ug/L	1	0.86	0.88	86	88	70-130	2	30	
Benzo(a)anthracene	ug/L	1	0.89	0.90	89	90	70-130	1	30	
Benzo(a)pyrene	ug/L	1	0.86	0.88	86	88	70-130	2	30	
Benzo(b)fluoranthene	ug/L	1	0.84	0.86	84	86	70-130	3	30	
Benzo(g,h,i)perylene	ug/L	1	0.52	0.45	52	45	70-130	14	30	2g,L0
Benzo(k)fluoranthene	ug/L	1	0.73	0.78	73	78	70-130	7	30	
Chrysene	ug/L	1	0.92	0.92	92	92	70-130	0	30	
Dibenz(a,h)anthracene	ug/L	1	0.59	0.49	59	49	70-130	18	30	2g,L0
Fluoranthene	ug/L	1	0.90	0.91	90	91	70-130	1	30	
Fluorene	ug/L	1	0.89	0.88	89	88	70-130	1	30	
Indeno(1,2,3-cd)pyrene	ug/L	1	0.66	0.65	66	65	70-130	0	30	2g,L0

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE & LCSD: 1406231 1406232

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Naphthalene	ug/L	1	ND	ND	91	89	70-130		30	
Phenanthrene	ug/L	1	0.94	0.94	94	94	70-130	1	30	
Pyrene	ug/L	1	0.89	0.90	89	90	70-130	1	30	
2-Fluorobiphenyl (S)	%				71	68	70-130			2g,S0
Nitrobenzene-d5 (S)	%				87	83	70-130			
Terphenyl-d14 (S)	%				90	89	70-130			

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: OEXT/33446 Analysis Method: EPA 8270
QC Batch Method: EPA 3510 Analysis Description: 8270 Water MSSV SC
Associated Lab Samples: 92240289038, 92240289039, 92240289040, 92240289041

METHOD BLANK: 1406486 Matrix: Water
Associated Lab Samples: 92240289038, 92240289039, 92240289040, 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trichlorobenzene	ug/L	ND	10.0	03/11/15 12:33	
1,2-Dichlorobenzene	ug/L	ND	10.0	03/11/15 12:33	
1,3-Dichlorobenzene	ug/L	ND	10.0	03/11/15 12:33	
1,4-Dichlorobenzene	ug/L	ND	10.0	03/11/15 12:33	
1-Methylnaphthalene	ug/L	ND	10.0	03/11/15 12:33	
2,4,5-Trichlorophenol	ug/L	ND	10.0	03/11/15 12:33	
2,4,6-Trichlorophenol	ug/L	ND	10.0	03/11/15 12:33	
2,4-Dichlorophenol	ug/L	ND	10.0	03/11/15 12:33	
2,4-Dimethylphenol	ug/L	ND	10.0	03/11/15 12:33	
2,4-Dinitrophenol	ug/L	ND	50.0	03/11/15 12:33	
2,4-Dinitrotoluene	ug/L	ND	10.0	03/11/15 12:33	
2,6-Dinitrotoluene	ug/L	ND	10.0	03/11/15 12:33	
2-Chloronaphthalene	ug/L	ND	10.0	03/11/15 12:33	
2-Chlorophenol	ug/L	ND	10.0	03/11/15 12:33	
2-Methylnaphthalene	ug/L	ND	10.0	03/11/15 12:33	
2-Methylphenol(o-Cresol)	ug/L	ND	10.0	03/11/15 12:33	
2-Nitroaniline	ug/L	ND	50.0	03/11/15 12:33	
2-Nitrophenol	ug/L	ND	10.0	03/11/15 12:33	
3&4-Methylphenol(m&p Cresol)	ug/L	ND	10.0	03/11/15 12:33	
3,3'-Dichlorobenzidine	ug/L	ND	50.0	03/11/15 12:33	
3-Nitroaniline	ug/L	ND	50.0	03/11/15 12:33	
4,6-Dinitro-2-methylphenol	ug/L	ND	20.0	03/11/15 12:33	
4-Bromophenylphenyl ether	ug/L	ND	10.0	03/11/15 12:33	
4-Chloro-3-methylphenol	ug/L	ND	20.0	03/11/15 12:33	
4-Chloroaniline	ug/L	ND	50.0	03/11/15 12:33	
4-Chlorophenylphenyl ether	ug/L	ND	10.0	03/11/15 12:33	
4-Nitroaniline	ug/L	ND	50.0	03/11/15 12:33	
4-Nitrophenol	ug/L	ND	50.0	03/11/15 12:33	
Acenaphthene	ug/L	ND	10.0	03/11/15 12:33	
Acenaphthylene	ug/L	ND	10.0	03/11/15 12:33	
Aniline	ug/L	ND	10.0	03/11/15 12:33	
Anthracene	ug/L	ND	10.0	03/11/15 12:33	
Benzo(a)anthracene	ug/L	ND	10.0	03/11/15 12:33	
Benzo(a)pyrene	ug/L	ND	10.0	03/11/15 12:33	
Benzo(b)fluoranthene	ug/L	ND	10.0	03/11/15 12:33	
Benzo(g,h,i)perylene	ug/L	ND	10.0	03/11/15 12:33	
Benzo(k)fluoranthene	ug/L	ND	10.0	03/11/15 12:33	
Benzoic Acid	ug/L	ND	50.0	03/11/15 12:33	
Benzyl alcohol	ug/L	ND	20.0	03/11/15 12:33	
bis(2-Chloroethoxy)methane	ug/L	ND	10.0	03/11/15 12:33	
bis(2-Chloroethyl) ether	ug/L	ND	10.0	03/11/15 12:33	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

METHOD BLANK: 1406486 Matrix: Water

Associated Lab Samples: 92240289038, 92240289039, 92240289040, 92240289041

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
bis(2-Chloroisopropyl) ether	ug/L	ND	10.0	03/11/15 12:33	
bis(2-Ethylhexyl)phthalate	ug/L	ND	6.0	03/11/15 12:33	
Butylbenzylphthalate	ug/L	ND	10.0	03/11/15 12:33	
Chrysene	ug/L	ND	10.0	03/11/15 12:33	
Di-n-butylphthalate	ug/L	ND	10.0	03/11/15 12:33	
Di-n-octylphthalate	ug/L	ND	10.0	03/11/15 12:33	
Dibenz(a,h)anthracene	ug/L	ND	10.0	03/11/15 12:33	
Dibenzofuran	ug/L	ND	10.0	03/11/15 12:33	
Diethylphthalate	ug/L	ND	10.0	03/11/15 12:33	
Dimethylphthalate	ug/L	ND	10.0	03/11/15 12:33	
Fluoranthene	ug/L	ND	10.0	03/11/15 12:33	
Fluorene	ug/L	ND	10.0	03/11/15 12:33	
Hexachloro-1,3-butadiene	ug/L	ND	10.0	03/11/15 12:33	
Hexachlorobenzene	ug/L	ND	10.0	03/11/15 12:33	
Hexachlorocyclopentadiene	ug/L	ND	10.0	03/11/15 12:33	
Hexachloroethane	ug/L	ND	10.0	03/11/15 12:33	
Indeno(1,2,3-cd)pyrene	ug/L	ND	10.0	03/11/15 12:33	
Isophorone	ug/L	ND	10.0	03/11/15 12:33	
N-Nitroso-di-n-propylamine	ug/L	ND	10.0	03/11/15 12:33	
N-Nitrosodimethylamine	ug/L	ND	10.0	03/11/15 12:33	
N-Nitrosodiphenylamine	ug/L	ND	10.0	03/11/15 12:33	
Naphthalene	ug/L	ND	10.0	03/11/15 12:33	
Nitrobenzene	ug/L	ND	10.0	03/11/15 12:33	
Pentachlorophenol	ug/L	ND	50.0	03/11/15 12:33	
Phenanthrene	ug/L	ND	10.0	03/11/15 12:33	
Phenol	ug/L	ND	10.0	03/11/15 12:33	
Pyrene	ug/L	ND	10.0	03/11/15 12:33	
2,4,6-Tribromophenol (S)	%	88	27-110	03/11/15 12:33	
2-Fluorobiphenyl (S)	%	78	27-110	03/11/15 12:33	
2-Fluorophenol (S)	%	41	12-110	03/11/15 12:33	
Nitrobenzene-d5 (S)	%	77	21-110	03/11/15 12:33	
Phenol-d6 (S)	%	27	10-110	03/11/15 12:33	
Terphenyl-d14 (S)	%	100	31-107	03/11/15 12:33	

LABORATORY CONTROL SAMPLE: 1406487

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trichlorobenzene	ug/L	50	27.8	56	70-130	
1,2-Dichlorobenzene	ug/L	50	32.8	66	70-130	
1,3-Dichlorobenzene	ug/L	50	29.9	60	70-130	
1,4-Dichlorobenzene	ug/L	50	32.6	65	70-130	
1-Methylnaphthalene	ug/L	50	33.1	66	70-130	
2,4,5-Trichlorophenol	ug/L	50	43.7	87	70-130	
2,4,6-Trichlorophenol	ug/L	50	44.0	88	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1406487

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2,4-Dichlorophenol	ug/L	50	33.7	67	70-130	
2,4-Dimethylphenol	ug/L	50	32.4	65	70-130	
2,4-Dinitrophenol	ug/L	250	219	88	70-130	
2,4-Dinitrotoluene	ug/L	50	48.6	97	70-130	
2,6-Dinitrotoluene	ug/L	50	51.1	102	70-130	
2-Chloronaphthalene	ug/L	50	49.0	98	70-130	
2-Chlorophenol	ug/L	50	37.8	76	70-130	
2-Methylnaphthalene	ug/L	50	30.3	61	70-130	
2-Methylphenol(o-Cresol)	ug/L	50	32.1	64	70-130	
2-Nitroaniline	ug/L	100	92.6	93	70-130	
2-Nitrophenol	ug/L	50	36.1	72	70-130	
3&4-Methylphenol(m&p Cresol)	ug/L	50	24.2	48	70-130	
3,3'-Dichlorobenzidine	ug/L	100	93.0	93	70-130	
3-Nitroaniline	ug/L	100	87.3	87	70-130	
4,6-Dinitro-2-methylphenol	ug/L	100	107	107	70-130	
4-Bromophenylphenyl ether	ug/L	50	48.3	97	70-130	
4-Chloro-3-methylphenol	ug/L	100	63.7	64	70-130	
4-Chloroaniline	ug/L	100	67.6	68	70-130	
4-Chlorophenylphenyl ether	ug/L	50	46.2	92	70-130	
4-Nitroaniline	ug/L	100	89.5	89	70-130	
4-Nitrophenol	ug/L	250	81.3	33	70-130	
Acenaphthene	ug/L	50	44.0	88	70-130	
Acenaphthylene	ug/L	50	44.0	88	70-130	
Aniline	ug/L	50	29.5	59	70-130	
Anthracene	ug/L	50	45.7	91	70-130	
Benzo(a)anthracene	ug/L	50	45.4	91	70-130	
Benzo(a)pyrene	ug/L	50	47.3	95	70-130	
Benzo(b)fluoranthene	ug/L	50	52.7	105	70-130	
Benzo(g,h,i)perylene	ug/L	50	47.6	95	70-130	
Benzo(k)fluoranthene	ug/L	50	47.6	95	70-130	
Benzoic Acid	ug/L	250	41.1J	16	70-130	
Benzyl alcohol	ug/L	100	73.0	73	70-130	
bis(2-Chloroethoxy)methane	ug/L	50	47.7	95	70-130	
bis(2-Chloroethyl) ether	ug/L	50	48.8	98	70-130	
bis(2-Chloroisopropyl) ether	ug/L	50	43.2	86	70-130	
bis(2-Ethylhexyl)phthalate	ug/L	50	44.3	89	70-130	
Butylbenzylphthalate	ug/L	50	44.2	88	70-130	
Chrysene	ug/L	50	47.6	95	70-130	
Di-n-butylphthalate	ug/L	50	48.5	97	70-130	
Di-n-octylphthalate	ug/L	50	42.1	84	70-130	
Dibenz(a,h)anthracene	ug/L	50	49.4	99	70-130	
Dibenzofuran	ug/L	50	46.2	92	70-130	
Diethylphthalate	ug/L	50	45.9	92	70-130	
Dimethylphthalate	ug/L	50	45.9	92	70-130	
Fluoranthene	ug/L	50	44.4	89	70-130	
Fluorene	ug/L	50	47.2	94	70-130	
Hexachloro-1,3-butadiene	ug/L	50	24.6	49	70-130	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

LABORATORY CONTROL SAMPLE: 1406487

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Hexachlorobenzene	ug/L	50	46.6	93	70-130	
Hexachlorocyclopentadiene	ug/L	50	33.1	66	70-130	
Hexachloroethane	ug/L	50	32.5	65	70-130	
Indeno(1,2,3-cd)pyrene	ug/L	50	50.6	101	70-130	
Isophorone	ug/L	50	35.8	72	70-130	
N-Nitroso-di-n-propylamine	ug/L	50	44.4	89	70-130	
N-Nitrosodimethylamine	ug/L	50	25.3	51	70-130	
N-Nitrosodiphenylamine	ug/L	50	47.4	95	70-130	
Naphthalene	ug/L	50	31.0	62	70-130	
Nitrobenzene	ug/L	50	34.4	69	70-130	
Pentachlorophenol	ug/L	100	84.4	84	70-130	
Phenanthrene	ug/L	50	44.8	90	70-130	
Phenol	ug/L	50	21.8	44	70-130	1g,3g,L0
Pyrene	ug/L	50	43.0	86	70-130	
2,4,6-Tribromophenol (S)	%			96	27-110	
2-Fluorobiphenyl (S)	%			90	27-110	
2-Fluorophenol (S)	%			46	12-110	
Nitrobenzene-d5 (S)	%			65	21-110	
Phenol-d6 (S)	%			31	10-110	
Terphenyl-d14 (S)	%			100	31-107	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: PMST/7596 — Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 — Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 92240289017, 92240289018, 92240289019, 92240289020, 92240289021, 92240289022, 92240289023, 92240289024, 92240289025, 92240289026, 92240289027, 92240289028, 92240289029

SAMPLE DUPLICATE: 1406446

Parameter	Units	92240273001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	15.8	14.0	12	25	

SAMPLE DUPLICATE: 1406447

Parameter	Units	92240297004 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	14.6	13.3	9	25	

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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: PMST/7598 | Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 | Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 92240289001, 92240289002, 92240289003, 92240289004, 92240289005, 92240289006, 92240289007, 92240289008, 92240289009, 92240289010, 92240289011, 92240289012, 92240289013

SAMPLE DUPLICATE: 1406450

Parameter	Units	92239870001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	20.4	21.8	6	25	

SAMPLE DUPLICATE: 1406451

Parameter	Units	92240289013 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	19.7	20.1	2	25	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical
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QUALITY CONTROL DATA

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

QC Batch: PMST/7599
Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 92240289014, 92240289015, 92240289016, 92240289030, 92240289031, 92240289032, 92240289033, 92240289034

SAMPLE DUPLICATE: 1406455

Parameter	Units	92239470001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	12.1	12.1	0	25	

SAMPLE DUPLICATE: 1406456

Parameter	Units	92240301008 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	19.0	23.8	23	25	

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QUALIFIERS

Project:	US Hwy 21/SC51 - 20120285.A12
Pace Project No.:	92240289

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether, Styrene, and Vinyl chloride.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-A	Pace Analytical Services - Asheville
PASI-C	Pace Analytical Services - Charlotte

ANALYTE QUALIFIERS

1g	Passes inhouse limits.
2g	Recovery meets in-house limits.
3g	These comments apply to all compounds with percent recovery less than 70%.
4g	These comments apply to all compounds with pescent recovery less than 70%.
B	Analyte was detected in the associated method blank.
D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
L0	Analyte recovery in the laboratory control sample (LCS) was outside QC limits.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
R1	RPD value was outside control limits.
S0	Surrogate recovery outside laboratory control limits.
S1	Surrogate recovery outside laboratory control limits (confirmed by re-analysis).
S3	Surrogate recovery exceeded laboratory control limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92240289020	**SB-23**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289021	**SB-24**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289022	**SB-23A**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289023	**SB-24A**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289024	**SB-25**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289025	**SB-25A**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289026	**SB-26**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289027	**SB-26A**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289028	**SB-33**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289029	**SB-34**	EPA 3050	MPRP/18045	EPA 6010	ICP/16219
92240289040	**TW-5**	EPA 3010	MPRP/18042	EPA 6010	ICP/16221
92240289041	**TW-6**	EPA 3010	MPRP/18042	EPA 6010	ICP/16221
92240289040	**TW-5**	EPA 7470	MERP/7648	EPA 7470	MERC/7338
92240289041	**TW-6**	EPA 7470	MERP/7662	EPA 7470	MERC/7347
92240289020	**SB-23**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289021	**SB-24**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289022	**SB-23A**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289023	**SB-24A**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289024	**SB-25**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289025	**SB-25A**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289026	**SB-26**	EPA 7471	MERP/7650	EPA 7471	MERC/7340
92240289027	**SB-26A**	EPA 7471	MERP/7652	EPA 7471	MERC/7342
92240289028	**SB-33**	EPA 7471	MERP/7652	EPA 7471	MERC/7342
92240289029	**SB-34**	EPA 7471	MERP/7652	EPA 7471	MERC/7342
92240289017	**SB-18**	EPA 3546	OEXT/33588	EPA 8270 by SIM	MSSV/10418
92240289018	**SB-20**	EPA 3546	OEXT/33485	EPA 8270 by SIM	MSSV/10405
92240289019	**SB-22**	EPA 3546	OEXT/33485	EPA 8270 by SIM	MSSV/10405
92240289020	**SB-23**	EPA 3546	OEXT/33485	EPA 8270 by SIM	MSSV/10405
92240289021	**SB-24**	EPA 3546	OEXT/33485	EPA 8270 by SIM	MSSV/10405
92240289017	**SB-18**	EPA 3546	OEXT/33453	EPA 8270	MSSV/10398
92240289018	**SB-20**	EPA 3546	OEXT/33453	EPA 8270	MSSV/10398
92240289019	**SB-22**	EPA 3546	OEXT/33453	EPA 8270	MSSV/10398
92240289020	**SB-23**	EPA 3546	OEXT/33453	EPA 8270	MSSV/10398
92240289021	**SB-24**	EPA 3546	OEXT/33453	EPA 8270	MSSV/10398
92240289038	**TW-3**	EPA 3510	OEXT/33439	EPA 8270	MSSV/10400
92240289039	**TW-4**	EPA 3510	OEXT/33439	EPA 8270	MSSV/10400
92240289040	**TW-5**	EPA 3510	OEXT/33439	EPA 8270	MSSV/10400
92240289041	**TW-6**	EPA 3510	OEXT/33439	EPA 8270	MSSV/10400
92240289038	**TW-3**	EPA 3510	OEXT/33446	EPA 8270	MSSV/10396
92240289039	**TW-4**	EPA 3510	OEXT/33446	EPA 8270	MSSV/10396
92240289040	**TW-5**	EPA 3510	OEXT/33446	EPA 8270	MSSV/10396
92240289041	**TW-6**	EPA 3510	OEXT/33446	EPA 8270	MSSV/10396
92240289035	**MW-6**	EPA 8260	MSV/30684		

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92240289036	TW-1	EPA 8260	MSV/30684		
92240289037	TW-2	EPA 8260	MSV/30694		
92240289038	TW-3	EPA 8260	MSV/30684		
92240289039	TW-4	EPA 8260	MSV/30684		
92240289040	TW-5	EPA 8260	MSV/30666		
92240289041	TW-6	EPA 8260	MSV/30666		
92240289001	SB-1	EPA 8260	MSV/30656		
92240289002	SB-2	EPA 8260	MSV/30656		
92240289003	SB-3	EPA 8260	MSV/30656		
92240289004	SB-4	EPA 8260	MSV/30656		
92240289005	SB-5	EPA 8260	MSV/30656		
92240289006	SB-6	EPA 8260	MSV/30656		
92240289007	SB-7	EPA 8260	MSV/30656		
92240289008	SB-8	EPA 8260	MSV/30656		
92240289009	SB-9	EPA 8260	MSV/30656		
92240289010	SB-10	EPA 8260	MSV/30674		
92240289011	SB-11	EPA 8260	MSV/30657		
92240289012	SB-12	EPA 8260	MSV/30657		
92240289013	SB-13	EPA 8260	MSV/30657		
92240289014	SB-14	EPA 8260	MSV/30657		
92240289015	SB-15	EPA 8260	MSV/30674		
92240289016	SB-16	EPA 8260	MSV/30661		
92240289017	SB-18	EPA 8260	MSV/30674		
92240289018	SB-20	EPA 8260	MSV/30661		
92240289019	SB-22	EPA 8260	MSV/30661		
92240289020	SB-23	EPA 8260	MSV/30661		
92240289021	SB-24	EPA 8260	MSV/30661		
92240289030	SB-31	EPA 8260	MSV/30674		
92240289031	SB-32	EPA 8260	MSV/30674		
92240289032	SB-38	EPA 8260	MSV/30674		
92240289033	SB-39	EPA 8260	MSV/30674		
92240289034	SB-40	EPA 8260	MSV/30674		
92240289001	SB-1	ASTM D2974-87	PMST/7598		
92240289002	SB-2	ASTM D2974-87	PMST/7598		
92240289003	SB-3	ASTM D2974-87	PMST/7598		
92240289004	SB-4	ASTM D2974-87	PMST/7598		
92240289005	SB-5	ASTM D2974-87	PMST/7598		
92240289006	SB-6	ASTM D2974-87	PMST/7598		
92240289007	SB-7	ASTM D2974-87	PMST/7598		
92240289008	SB-8	ASTM D2974-87	PMST/7598		
92240289009	SB-9	ASTM D2974-87	PMST/7598		
92240289010	SB-10	ASTM D2974-87	PMST/7598		
92240289011	SB-11	ASTM D2974-87	PMST/7598		

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: US Hwy 21/SC51 - 20120285.A12
Pace Project No.: 92240289

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92240289012	**SB-12**	ASTM D2974-87	PMST/7598		
92240289013	**SB-13**	ASTM D2974-87	PMST/7598		
92240289014	**SB-14**	ASTM D2974-87	PMST/7599		
92240289015	**SB-15**	ASTM D2974-87	PMST/7599		
92240289016	**SB-16**	ASTM D2974-87	PMST/7599		
92240289017	**SB-18**	ASTM D2974-87	PMST/7596		
92240289018	**SB-20**	ASTM D2974-87	PMST/7596		
92240289019	**SB-22**	ASTM D2974-87	PMST/7596		
92240289020	**SB-23**	ASTM D2974-87	PMST/7596		
92240289021	**SB-24**	ASTM D2974-87	PMST/7596		
92240289022	**SB-23A**	ASTM D2974-87	PMST/7596		
92240289023	**SB-24A**	ASTM D2974-87	PMST/7596		
92240289024	**SB-25**	ASTM D2974-87	PMST/7596		
92240289025	**SB-25A**	ASTM D2974-87	PMST/7596		
92240289026	**SB-26**	ASTM D2974-87	PMST/7596		
92240289027	**SB-26A**	ASTM D2974-87	PMST/7596		
92240289028	**SB-33**	ASTM D2974-87	PMST/7596		
92240289029	**SB-34**	ASTM D2974-87	PMST/7596		
92240289030	**SB-31**	ASTM D2974-87	PMST/7599		
92240289031	**SB-32**	ASTM D2974-87	PMST/7599		
92240289032	**SB-38**	ASTM D2974-87	PMST/7599		
92240289033	**SB-39**	ASTM D2974-87	PMST/7599		
92240289034	**SB-40**	ASTM D2974-87	PMST/7599		

Client Name: Fuss + Oneil

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☑ Commercial ☐ Pace Other________

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Optional
Proj. Due Date:
Proj. Name:

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other________

Thermometer Used: IR Gun T1401 **Type of Ice:** Wet Blue None ☑ Samples on ice, cooling process has begun

Temp Correction Factor **T1401** No Correction

Corrected Cooler Temp.: 3.8 °C **Biological Tissue is Frozen:** Yes No N/A

Temp should be above freezing to 6°C

Date and Initials of person examining contents: AP 3-9-15

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☐Yes ☑No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix:________	AP 3-9-15 ~~☐Yes~~ ☑No ☐N/A	12. 4 TB included not on COC
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☑Yes ☐No	
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14. AP 3-9-15
Headspace in VOA Vials (>6mm):	☐Yes ☑No ☐N/A	15.
Trip Blank Present:	☑Yes ☐No ☐N/A	16.
Trip Blank Custody Seals Present	☑Yes ☐No ☐N/A	
Pace Trip Blank Lot # (if purchased):________		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: C. CAFTAGNA Date/Time: 3/10 + 3/11/15

Comments/ Resolution: VOC Full- SB-19, SB-20, SB-22, TB, TW-3, TW-4, SB-25, ~~SB-23~~ SB-24, RCRA 8 FOR METALS, SVOCS INC. PAH BY SIM. (MB)

SCURF Review: [signature] Date: 030915

SRF Review: [signature] Date: 3/10/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

WO# : 92240289

92240289

Revised 3/11/15

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 4

Section A
Required Client Information:

Company:	Fuss & O'Neill
Address:	717 Lady St, Ste E
	Columbia, SC
Email To:	rbutler@fando.com
Phone: 803-311-3621	Fax: 803-771-6055
Requested Due Date/TAT:	

Section B
Required Project Information:

Report To:	rbutler@fando.com
Copy To:	adorrick@fando.com
Purchase Order No.:	
Project Name:	US Highway 21/SC51
Project Number:	20120383.A12

Section C
Invoice Information:

Attention:	SAME
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

- [ ] NPDES
- [ ] GROUND WATER
- [ ] DRINKING WATER
- [ ] UST
- [ ] RCRA
- [x] OTHER

Site Location STATE: SC

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes	MATRIX / CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

Requested Analysis Filtered (Y/N)

Pace Project No./ Lab I.D.: 92240289

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test: BTEXMN	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	SB-1	SL	G			3/3/15	1040		6	1	2					1	2	X		001
2	SB-2						1100											X		002
3	SB-3						1115											X		003
4	SB-4						1130											X		004
5	SB-5						1200											X		005
6	SB-6	SL					1220											X		006
7	MW-6 *	WT					1130		3				3					X		035
8	SB-7	SL					1245		6	X	X					X	X	X		007
9	SB-8	SL					1305		6	X	X					X	X	X		008
10	TW-1	WT					1330		3				3					X		036
11	SB-9	SL					1400		6	X	X					X	X	X		009
12	TW-2	WT					1430		3				3					X		037

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Reginald Butler / F&O	3/6/15	1330	Pace						
		3/9/15	1425	Pace	3.9.15	1425	3.8	Y	N	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

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CHAIN-OF-CUSTODY / Analytical Request Document

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Page: 2 of 4

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Fuss & O'Neill	Report To: Chuthan Funderburk	Attention: SAME
Address: 717 Lady St, Ste E	Copy To: adenrix@fandoneill	Company Name:
Columbia SC		Address:
Email To: chutha@fandoneill	Purchase Order No.:	Pace Quote Reference:
Phone: 803-312-3672 Fax: 803-356-6025	Project Name: US Bishop 21 / SCSI	Pace Project Manager:
Requested Due Date/TAT:	Project Number: 20130285.A10	Pace Profile #:

REGULATORY AGENCY

- NPDES
- GROUND WATER
- DRINKING WATER
- UST
- RCRA
- OTHER ______

Site Location STATE: ______

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BTEX MN	SVOC	Full VO											Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 92240289
1	SB-10	SL	G			1430	3/2/15		6	X	X						X		X														010
2	SB-11					0845	3/4/15		6																								011
3	SB-12					0910																											012
4	SB-13					0950																											013
5	SB-14					1020																											014
6	SB-15					1035																											015
7	SB-16	✓	✓			1050	✓		✓	✓						✓	✓																016
8	SB-18					1330			3	2										X	X												017
9	SB-20					1400			7	2										X	X												018
10	SB-22	✓	✓			1425	✓		✓	✓	✓					✓	✓			X	X												019
11	TW-3	WT	G			1440			5	2			3						X	X	X												038
12	TW-4	WT				1444	✓		5	2			3						X	X	X												039

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Reginald Butler / Exo	3/6/15	1330	Brewer						
				Ajax Pace/Pace	3-9-15	1:25	2.8	Y	N	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

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CHAIN-OF-CUSTODY / Analytical Request Document

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Page: 3 of 4

Section A Required Client Information:

Company:	
Address:	
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	

Section B Required Project Information:

Report To:	mth@Fando.com
Copy To:	mderrick@Fando.com
Purchase Order No.:	
Project Name:	GS21 / SCS1
Project Number:	20126285.A12

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☑ OTHER

Site Location STATE: SC

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

Pace Project No./ Lab I.D.: 92240289

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	Composite Start DATE	Composite Start TIME	Composite End/Grab DATE	Composite End/Grab TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Metals	VOCs	SVOCs		Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	SB-23	SL	G			3/4/15	1720		5	2		1				1	2		X	X	X			020
2	SB-23D	|	G			|	1735		1										X	~~X~~				022
3	SB-24	|	|			|	1630		5	2	2	1				1	2		X	X	X			021
4	SB-24A	|	|			|	1635		1	1									X					023
5	SB-25	|	|			|	1615		1	1									X					024
6	SB-25A	|	|			|	1626		1	1									X					025
7	SB-26	|	|			|	1600		1	1									X					026
8	SB-26M	|	|			|	1605		1	1									X					027
9	TW-5	WT	|			|	1750		1	1									X	X	X			040
10	TW-6	WT	|			|	1630		1	1									X	X	X			041
11	SB-31	SL	|			3/5/15	0915		6	1	2					1	2			X	BTEX MN			030
12	SB-32	SL	|			3/5/15	0930		6	1	2					1	2			X	BTEX MN			031

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Reginald Butler / F&O	3/6/15	1330	Amy Parp / Pace	3-9-15	1125	2.8	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

CHAIN-OF-CUSTODY / Analytical Request Document

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Page: 4 of 4

Section A Required Client Information:

Company:	F&O
Address:	717 Lady St. Ste F
	Columbia SC 29201
Email To:	rbutler@fando.com
Phone: 803-376-4554	Fax: 803-376-4603
Requested Due Date/TAT:	

Section B Required Project Information:

Report To:	rbutler@fando.com
Copy To:	adlarick@fando.com
Purchase Order No.:	
Project Name:	US21 / SC51
Project Number:	2017 0385.A12

Section C Invoice Information:

Attention:	SAME
Company Name:	SAME
Address:	SAME
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER | UST | RCRA | ✓ OTHER

Site Location STATE: SC

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Metals	VOCs	BTEX, MTBE, Naph	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 92240289
1	SB-33	SL	G			3/5/15	0940		1	1									X				028
2	SB-34	SL	G				0945		1	1									X				029
3	SB-38	SL					1115		6	1	2					1	2				X		032
4	SB-39	SL					1120		6	1	2					1	2				X		033
5	SB-40	SL					1135		6	1	2					1	2				X		034
6																							
7																							TBs - 042
8																							
9																							
10																							
11																							
12																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Reginald Butler / F&O	3/6/15	1330	R... rex						
				[illegible] / Pace	3-9-15	1525	3.8	Y	N	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

FUSS & O'NEILL

Appendix B

SCDHEC Water Well Records

DHEC
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name:
(last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Fort Mill Zip:
Latitude: 35.071658 Longitude: -80.935052

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 17 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum

*Indicate Water Bearing Zones
(Use a 2nd sheet if needed)

5. REMARKS:
TW-1

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-3-15
17 ft. Date Completed: 3-3-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 13 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 13 ft. and 17 ft. **NOTE: MULTIPLE SCREENS**
ft. and ft. **USE SECOND SHEET**
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 17 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine
☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-3-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

DHEC
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name:
(last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Fort Mill Zip:
Latitude: 35.071521 Longitude: -80.935076

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 19 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum

*Indicate Water Bearing Zones
(Use a 2nd sheet if needed)

5. REMARKS:
TW-2

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-3-15
19 ft. Date Completed: 3-3-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 15 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 15 ft. and 19 ft. **NOTE: MULTIPLE SCREENS**
ft. and ft. **USE SECOND SHEET**
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 19 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine
☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-3-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name:
(last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Fort Mill Zip:
Latitude: 35.088207 Longitude: -80.925655

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 8 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum

*Indicate Water Bearing Zones
(Use a 2nd sheet if needed)

5. REMARKS:
TW-3

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored
☐ Dug ☐ Air Rotary ☑ Driven
☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-4-15
8 ft. Date Completed: 3-4-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized
☐ Steel ☐ Other
0 in. to 4 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 4 ft. and 8 ft. **NOTE: MULTIPLE SCREENS**
ft. and ft. **USE SECOND SHEET**
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 8 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine
☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-4-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

DHEC
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: (last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Fort Mill Zip:
Latitude: 35.088242 Longitude: -80.925176

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 8 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum

*Indicate Water Bearing Zones
(Use a 2nd sheet if needed)

5. REMARKS:
TW-5

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 8 ft.
Date Started: 3-4-15
Date Completed: 3-4-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 4 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 4 ft. and 8 ft. **NOTE: MULTIPLE SCREENS**
ft. and ft. **USE SECOND SHEET**
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 8 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-4-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

DHEC 1903 (07/2003)

COPY 1 MAIL TO: S.C. DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (ADDRESS ABOVE)

DHEC
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name:
(last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Fort Mill Zip:
Latitude: 35,088357 Longitude: -80.925719

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 6 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum

*Indicate Water Bearing Zones
(Use a 2nd sheet if needed)

5. REMARKS:
TW-5

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-4-15
6 ft. Date Completed: 3-4-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 2 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 2 ft. and 6 ft.
ft. and ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 6 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine
☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-4-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

DHEC 1903 (07/2003)

COPY 1 MAIL TO: S.C. DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (ADDRESS ABOVE)

DHEC
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name:
(last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Fort Mill Zip:
Latitude: 35.088413 Longitude: -80.925457

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 15 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum

*Indicate Water Bearing Zones
(Use a 2nd sheet if needed)

5. REMARKS:
TW-6

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-4-15
15 ft. Date Completed: 3-4-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 11 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 11 ft. and 15 ft. **NOTE: MULTIPLE SCREENS**
ft. and ft. **USE SECOND SHEET**
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 15 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-4-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

DHEC 1903 (07/2003) **COPY 1 MAIL TO: S.C. DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (ADDRESS ABOVE)**

FUSS & O'NEILL

Appendix C

Temporary Well Approval

DHEC

PROMOTE PROTECT PROSPER

South Carolina Department of Health
and Environmental Control

Temporary Monitoring Well Approval

Approval is hereby granted to:	Reginald Butler/Fuss & O'Neill
on behalf of:	Mike Barbee/SCDOT
Facility:	US 21 & SC 51 Corridor
County:	York

This approval is for the installation of 50 temporary groundwater-monitoring wells. The temporary wells are to be installed in the locations as illustrated on the submitted map and per the proposed construction details provided by your correspondence dated 2/23/15. The temporary wells are to be installed following all of the applicable requirements of R.61-71.

Please note that R.61-71 requires the following:

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller per R.61-71.D.1.

2. A Water Well Record Form or other form provided or approved by the Department shall be completed and submitted to the Department within 30 days after well completion or abandonment unless the Department has approved another schedule. The form should contain the "as-built" construction details and all other information required by R.61-71.H.1.f

3. All analytical data and water levels obtained from each monitoring well shall be submitted to the Department within 30 days of receipt of laboratory results unless another schedule has been approved by the Department as required by R.61-71.H.1.d.

4. All temporary monitoring wells shall be abandoned within 5 days of borehole completion using appropriate methods as required by R.61-71.H.4.c.

5. If any of the information provided to the Department changes, Jonathan McInnis (803 896-4061, mcinnijg@dhec.sc.gov) shall be notified a minimum of twenty-four hours prior to well construction as required by R.61-71.H.1.a.

This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and R.61-71 of the South Carolina Well Standards and Regulations, dated April 26, 2002.

Date of Issuance: 2/24/15 **Approval #: MW-10023**

Jonathan McInnis

Jonathan G. McInnis, Program Manager
Federal & State Site Assessment
Site Assessment Remediation & Revitalization Division
Bureau of Land & Waste Management

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

February 24, 2015

Mike Barbee
SCDOT
955 Park St
Columbia, SC 29201

Re: Temporary Monitoring Well Approval Request received 2/23/15
York County Well ID: MW-10023

Dear Mr Barbee :

The South Carolina Department of Health and Environmental Control (SCDHEC) has reviewed and approved the referenced temporary monitoring well approval request submitted 2/23/15. The original temporary monitoring well approval has been sent to Reginald Butler/Fuss & O'Neill, Inc. and a copy is enclosed for your records. The analytical results from the groundwater samples should be submitted to my attention on or before 4/24/15. Please note the following:

- Well construction and sampling derived waste including but not limited to drill cuttings, drilling fluids, and development/purge water should be managed properly and in compliance with applicable requirements. If containerized, each vessel should be clearly labeled with regards to contents, source, and date of activity.

- Monitoring wells are to yield groundwater samples representative of the zone monitored per R.61-71 H.1.c of the South Carolina Well Standards and Regulations (e.g. low flow sampling techniques are recommended for samples to be analyzed for metals to reduce induced turbidity).

- If this investigation is conducted as part of a potential real estate transaction, the potential purchaser may want to contact SCDHEC's Brownfields Program before this work is performed. The Brownfields Program offers a mechanism to avoid liability for contamination that may be found during this investigation. The investigation proposed may satisfy part or all of the required assessment if pre-approved by the Brownfields Program. The Brownfields Program may be reached at 1-866-576-3432.

If you have any questions, please contact me at (803) 898-0802.

Sincerely,

Jonathan G. McInnis, Program Manager
Federal & State Site Assessment Section

enc: Monitor well approval

cc: SCDHEC EQC Region
Reginald Butler – Fuss & O'Neill
717 Lady St, Ste E – Columbia, SC 29201

DHEC

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

February 24, 2015

Mike Barbee
SCDOT
955 Park St
Columbia, SC 29201

Re: Temporary Monitoring Well Approval Request received 2/23/15
York County Well ID: MW-10026

Dear Mr Barbee :

The South Carolina Department of Health and Environmental Control (SCDHEC) has reviewed and approved the referenced temporary monitoring well approval request submitted 2/23/15. The original temporary monitoring well approval has been sent to Reginald Butler/Fuss & O'Neill, Inc. and a copy is enclosed for your records. The analytical results from the groundwater samples should be submitted to my attention on or before 4/24/15. Please note the following:

- Well construction and sampling derived waste including but not limited to drill cuttings, drilling fluids, and development/purge water should be managed properly and in compliance with applicable requirements. If containerized, each vessel should be clearly labeled with regards to contents, source, and date of activity.
- Monitoring wells are to yield groundwater samples representative of the zone monitored per R.61-71 H.1.c of the South Carolina Well Standards and Regulations (e.g. low flow sampling techniques are recommended for samples to be analyzed for metals to reduce induced turbidity).
- If this investigation is conducted as part of a potential real estate transaction, the potential purchaser may want to contact SCDHEC's Brownfields Program before this work is performed. The Brownfields Program offers a mechanism to avoid liability for contamination that may be found during this investigation. The investigation proposed may satisfy part or all of the required assessment if pre-approved by the Brownfields Program. The Brownfields Program may be reached at 1-866-576-3432.

If you have any questions, please contact me at (803) 898-0802.

Sincerely,

Jonathan G. McInnis, Program Manager
Federal & State Site Assessment Section

enc: Monitor well approval

cc: SCDHEC EQC Region
Reginald Butler – Fuss & O'Neill
717 Lady St, Ste E – Columbia, SC 29201

Appendix D

Limitations of Work Product

LIMITATIONS OF WORK PRODUCT

This document was prepared for the sole use of STV, Inc. the only intended beneficiaries of our work. Those who may use or rely upon the report and the services (hereafter "work product") performed by Fuss & O'Neill, Inc. and/or its subsidiaries or independent professional associates, subconsultants and subcontractors (collectively the "Consultant") expressly accept the work product upon the following specific conditions.

1. Consultant represents that it prepared the work product in accordance with the professional and industry standards prevailing at the time such services were rendered.

2. The work product may contain information that is time sensitive. The work product was prepared by Consultant subject to the particular scope limitations, budgetary and time constraints and business objectives of the Client which are detailed therein or in the contract between Consultant and Client. Changes in use, tenants, work practices, storage, Federal, state or local laws, rules or regulations may affect the work product.

3. The observations described and upon which the work product was based were made under the conditions stated therein. Any conclusions presented in the work product were based solely upon the services described therein, and not on scientific or engineering tasks or procedures beyond the scope of described services.

4. In preparing its work product, Consultant may have relied on certain information provided by state and local officials and information and representations made by other parties referenced therein, and on information contained in the files of state and/or local agencies made available at the time of the project. To the extent that such files which may affect the conclusions of the work product are missing, incomplete, inaccurate or not provided, Consultant is not responsible. Although there may have been some degree of overlap in the information provided by these various sources, Consultant did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this project. Consultant assumes no responsibility or liability to discover or determine any defects in such information which could result in failure to identify contamination or other defect in, at or near the site. Unless specifically stated in the work product, Consultant assumes no responsibility or liability for the accuracy of drawings and reports obtained, received or reviewed.

5. If the purpose of this project was to assess the physical characteristics of the subject site with respect to the presence in the environment of hazardous substances, waste or petroleum and chemical products and wastes as defined in the work product, unless otherwise noted, no specific attempt was made to check the compliance of present or past owners or operators of the subject site with Federal, state, or local laws and regulations, environmental or otherwise.

6. If water level readings have been made, these observations were made at the times and under the conditions stated in the report. However, it must be noted that fluctuations in water levels may occur due to variations in rainfall, passage of time and other factors

and such fluctuations may effect the conclusions and recommendations presented herein.

7. Except as noted in the work product, no quantitative laboratory testing was performed as part of the project. Where such analyses have been conducted by an outside laboratory, Consultant has relied upon the data provided, and unless otherwise described in the work product has not conducted an independent evaluation of the reliability of these tests.

8. If the conclusions and recommendations contained in the work product are based, in part, upon various types of chemical data, then the conclusions and recommendations are contingent upon the validity of such data. These data (if obtained) have been reviewed and interpretations made by Consultant. If indicated in the work product, some of these data may be preliminary or screening-level data and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors.

9. Chemical analyses may have been performed for specific parameters during the course of this project, as described in the work product. However, it should be noted that additional chemical constituents not included in the analyses conducted for the project may be present in soil, groundwater, surface water, sediments or building materials at the subject site.

10. Ownership and property interests of all documents, including reports, electronic media, drawings and specifications, prepared or furnished by Consultant pursuant to this project are subject to the terms and conditions specified in the contract between the Consultant and Client, whether or not the project is completed.

11. Unless otherwise specifically noted in the work product or a requirement of the contract between the Consultant and Client, any reuse, modification or disbursement of documents to third parties will be at the sole risk of the third party and without liability or legal exposure to Consultant.

12. In the event that any questions arise with respect to the scope or meaning of Consultant's work product, immediately contact Consultant for clarification, explanation or to update the work product. In addition, Consultant has the right to verify, at the party's expense, the accuracy of the information contained in the work product, as deemed necessary by Consultant, based upon the passage of time or other material change in conditions since conducting the work.

13. Any use of or reliance on the work product shall constitute acceptance of the terms hereof.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SC 29403-5107

November 23, 2021

Regulatory Division

Mr. Sean Connolly
South Carolina Department of Transportation
955 Park Street
Columbia, South Carolina 29202
ConnollyMS@scdot.org

Dear Mr. Connolly:

This is in response to your request for a preliminary jurisdictional determination (PJD) that is part of an overall project known as SCDOT US 21& SC 51 Intersection Improvements in York County (SCDOT PIN 42332), **Area #1**. Based on information submitted to the U.S. Army Corps of Engineers (Corps) we have determined there may be waters of the United States, including wetlands on your parcel located at the following:

Project Number:	SAC-2015-00812
County:	York County
Project/Site Size:	183 acres
Latitude:	35.076988°
Longitude:	-80.932637°
Project/Site Location:	US 21 & SC 51 Intersection Improvements in York County, Area #1
Waters (Acreage/Linear Feet):	Total: 1,175 lf tributaries & 0.506 ac wetlands

A copy of the PJD form and the depictions, Area-1 Figure 5A-5E, titled “US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 Approximated Waters of the U.S. and Wetlands Boundary Map” dated October 11, 2021, is enclosed. Please carefully read this form, then sign and return a copy to me at the following Stephen.A.Brumagin@usace.army.mil within 30 days from the date of this notification.

Please be advised a Department of the Army permit will be required for regulated work in all areas which may be waters of the United States, as indicated in this PJD. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a PJD will treat all waters and wetlands, which would be affected in any way by the permitted activity on the site, as if they are jurisdictional waters of the United States. Should you desire an approved Corps determination, one will be issued upon request.

You are cautioned that work performed in areas which may be waters of the United States, as indicated in the PJD, without a Department of the Army permit could subject you to enforcement action.

The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work.

If you submit a permit application as a result of this PJD, include a copy of this letter and the depiction as part of the application. Not submitting the letter and depiction will cause a delay while we confirm a PJD was performed for the proposed permit project area. Note that some or all of these areas may be regulated by other state or local government entities, and you should contact the South Carolina Department of Health and Environmental Control, Bureau of Water, to determine the limits of their jurisdiction.

In all future correspondence, please refer to file number SAC-2015-00812. A copy of this letter is forwarded to State and/or Federal agencies for their information. If you have any questions, please contact me at (803) 253-3445, or by email at Stephen.A.Brumagin@usace.army.mil.

Sincerely,

Stephen A. Brumagin
Project Manager

Enclosures:

Preliminary Jurisdictional Determination Form
Notification of Appeal Options
Area-1 Figure 5A-5E, “US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 Approximated Waters of the U.S. and Wetlands Boundary Map”

Copies Furnished:

Ms. Jackie Galloway
South Carolina Department of Transportation
955 Park Street
Columbia, SC 29202
GallowayJA@scdot.org

Mr. Joshua Kotheimer, PWS
STV Incorporated
900 West Trade St., Suite 715
Charlotte, NC 28202
joshua.kotheimer@stvinc.com

SC DHEC - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201
WQCWetlands@dhec.sc.gov

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PJD:** November 23, 2021

B. **NAME AND ADDRESS OF PERSON REQUESTING PJD:**

Agent:

Ms. Jackie Galloway
South Carolina Department of Transportation
955 Park Street
Columbia, SC 29202
GallowayJA@scdot.org

Consultant:

Mr. Joshua Kotheimer, PWS
STV Incorporated
900 West Trade St., Suite 715
Charlotte, NC 28202
joshua.kotheimer@stvinc.com

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:** Charleston District, SCDOT US 21& SC 51 Intersection in York County (SCDOT PIN 42332), SAC-2015-00812

D. **PROJECT LOCATION(S) AND BACKGROUND INFORMATION: (USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)**

State: South Carolina County: York County City: Fort Mill
Center coordinates of site (lat/long in degree decimal format):
Lat.: 35.076989° Long.: -80.932638°
Universal Transverse Mercator: 17
Name of nearest waterbody: Steele Creek

E. **REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**
F.

X Office (Desk) Determination. Date: November 23, 2021
X Field Determination. Date(s): August 2, 2021

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Non-wetland Water A	35.087959	-80.925706	392 feet	Non-wetland waters	Section 404
Non-wetland Water B	35.064674	-80.935632	12 feet	Non-wetland waters	Section 404
Non-wetland Water C	35.063728	-80.936619	434 feet	Non-wetland waters	Section 404
Non-wetland Water D	35.061556	-80.93688	259 feet	Non-wetland waters	Section 404
Non-wetland Water E	35.086392	-80.934445	78 feet	Non-wetland waters	Section 404
Wetland A	35.086709	-80.930377	0.114 acre	Wetland	Section 404
Wetland B	35.087488	-80.925539	0.001 acre	Wetland	Section 404
Wetland C	35.08801	-80.923097	0.044 acre	Wetland	Section 404
Wetland E	35.086436	-80.934311	0.014 acre	Wetland	Section 404
Wetland F	35.06181	-80.937576	0.222 acre	Wetland	Section 404
Wetland G	35.058751	-80.937869	0.111 acre	Wetland	Section 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the.JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can

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be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there "may be" waters of the U.S. and/or that there "may be" navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

_X_ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor: SCDOT Map: Area-1 Figure 5A-5E, titled "US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 Approximated Waters of the U.S. and Wetlands Boundary Map".
_X_ Data sheets prepared/submitted by or on behalf of the PJD requestor.
  _X_ Office concurs with data sheets/delineation report. The Corps agrees with the boundaries of aquatic resources represented in the drawings and based on the information provided.
  ___ Office does not concur with data sheets/delineation report. Rationale: ____________________.
___ Data sheets prepared by the Corps: ___________________________.
_X_ Corps navigable waters' study: Charleston District Navigability Study 1977.
_X_ U.S. Geological Survey Hydrologic Atlas: HA 730-G, 1990.
  ___ USGS NHD data.
  _X_ USGS 8 and 12 digit HUC maps. 030501030103 Upper Sugar Creek, 030501030108 Steele Creek and 03050103 Lower Catawba River.
_X_ U.S. Geological Survey map(s). Cite scale & quad name: 1:24,000 Fort Mill, SC quadrangle.
_X_ Natural Resources Conservation Service Soil Survey. Citation: As provided by the Consultant in depictions, US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004, NRCS Soil Series Map Figures 3, 3A-3c: Amenia, Brewback, Cecil, Chewacla, Enon, Iredell, Mecklenburg, Mecklenburg-Wynott, Pacolet, Wynott-Brewback & Wynott-Winnsboro series.
_X_ National wetlands inventory map(s). Cite name: As provided by Consultant in depiction US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 National Wetland Inventory Map Figure 4 and the Corps Reg Viewer: R4SBC and PUBHh.
___ State/local wetland inventory map(s): ___________________________.
___ FEMA/FIRM maps: ___________________________
___ 100-year Floodplain Elevation is: _______________. (National Geodetic Vertical Datum of 1929)
  _X_ Photographs: _X_ Aerial (Name & Date): As provided by Consultant in JD request.
  ___ or _X_ Other (Name & Date): As provided by Consultant in JD request.
_X_ Previous determination(s). File no. and date of response letter: SAC 2015-00812 Approved Jurisdictional Determination dated July 1, 2016.
_X_ Other information (please specify): Field view on August 2, 2021.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

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Signature and date of Regulatory staff member completing PJD

Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

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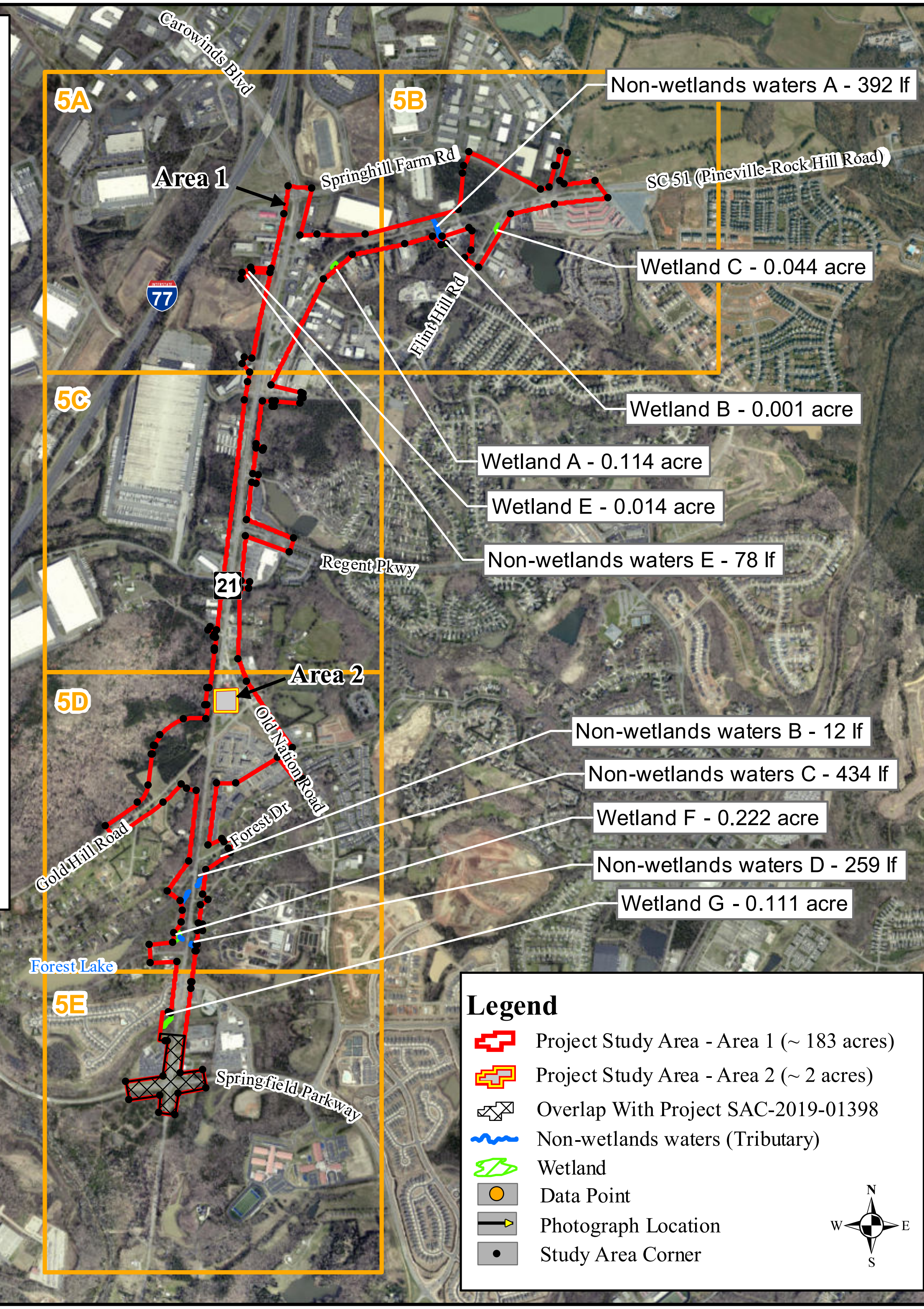
Study Area Boundary Coordinates - Area 1

Corner	Latitude	Longitude	Corner	Latitude	Longitude	Corner	Latitude	Longitude
C1	35.089674	-80.932483	C55	35.076099	-80.932444	C109	35.061539	-80.938796
C2	35.089593	-80.931433	C56	35.076675	-80.934425	C110	35.061628	-80.937725
C3	35.087825	-80.931937	C57	35.075029	-80.934643	C111	35.061980	-80.937680
C4	35.087873	-80.931196	C58	35.075004	-80.934227	C112	35.062358	-80.937350
C5	35.087882	-80.929004	C59	35.074731	-80.934269	C113	35.062808	-80.937277
C6	35.088790	-80.924797	C60	35.074736	-80.934682	C114	35.063170	-80.937392
C7	35.090130	-80.924630	C61	35.072143	-80.934764	C115	35.063530	-80.937978
C8	35.090425	-80.924545	C62	35.071309	-80.934368	C116	35.064647	-80.937002
C9	35.090914	-80.924307	C63	35.068843	-80.932315	C117	35.067240	-80.936630
C10	35.089553	-80.921094	C64	35.068717	-80.932559	C118	35.067311	-80.937067
C11	35.089641	-80.920701	C65	35.067693	-80.931809	C119	35.067507	-80.937337
C12	35.090428	-80.920471	C66	35.067538	-80.932085	C120	35.066829	-80.938131
C13	35.090407	-80.920373	C67	35.068498	-80.932984	C121	35.065512	-80.940364
C14	35.090953	-80.920218	C68	35.067523	-80.934878	C122	35.065962	-80.940748
C15	35.090884	-80.919894	C69	35.067527	-80.935742	C123	35.066801	-80.939298
C16	35.089873	-80.920206	C70	35.065244	-80.936108	C124	35.067435	-80.938836
C17	35.089730	-80.920018	C71	35.065475	-80.935512	C125	35.068612	-80.938654
C18	35.089862	-80.918642	C72	35.065339	-80.935406	C126	35.068619	-80.938703
C19	35.089227	-80.918045	C73	35.065504	-80.935037	C127	35.068918	-80.938605
C20	35.089006	-80.920447	C74	35.065263	-80.934877	C128	35.068902	-80.938553
C21	35.088627	-80.922421	C75	35.065108	-80.935224	C129	35.069300	-80.938286
C22	35.086630	-80.923904	C76	35.064942	-80.935093	C130	35.069897	-80.937222
C23	35.087010	-80.924509	C77	35.064332	-80.936238	C131	35.069923	-80.936217
C24	35.087283	-80.924209	C78	35.063401	-80.936381	C132	35.070409	-80.936144
C25	35.087989	-80.924202	C79	35.063216	-80.936142	C133	35.070420	-80.936250
C26	35.088102	-80.924334	C80	35.063011	-80.936441	C134	35.071064	-80.936154
C27	35.087791	-80.925514	C81	35.062347	-80.936544	C135	35.071053	-80.936048
C28	35.087541	-80.925343	C82	35.062308	-80.936365	C136	35.072461	-80.935838
C29	35.087469	-80.925598	C83	35.062035	-80.936345	C137	35.072462	-80.935851
C30	35.087820	-80.925945	C84	35.062038	-80.936591	C138	35.072535	-80.935841
C31	35.087515	-80.927239	C85	35.061539	-80.936668	C139	35.072534	-80.935827
C32	35.087132	-80.929573	C86	35.061537	-80.936623	C140	35.072924	-80.935769
C33	35.086214	-80.930886	C87	35.061318	-80.936656	C141	35.072976	-80.935856
C34	35.082295	-80.933276	C88	35.061318	-80.936702	C142	35.073040	-80.935845
C35	35.082023	-80.931918	C89	35.060135	-80.936843	C143	35.073192	-80.936098
C36	35.081985	-80.931795	C90	35.059907	-80.936877	C144	35.073309	-80.936011
C37	35.081807	-80.931806	C91	35.059911	-80.936919	C145	35.073212	-80.935726
C38	35.081818	-80.931934	C92	35.060142	-80.936881	C146	35.074842	-80.935484
C39	35.081601	-80.931951	C93	35.056778	-80.937403	C147	35.074898	-80.935569
C40	35.081677	-80.933063	C94	35.056900	-80.936357	C148	35.075162	-80.935511
C41	35.081484	-80.933094	C95	35.056206	-80.936226	C149	35.075169	-80.935435
C42	35.081499	-80.933226	C96	35.056031	-80.937485	C150	35.081747	-80.934471
C43	35.081686	-80.933196	C97	35.055222	-80.937609	C151	35.082413	-80.934317
C44	35.081698	-80.933640	C98	35.055298	-80.938371	C152	35.082757	-80.934238
C45	35.080098	-80.933941	C99	35.055950	-80.938286	C153	35.083083	-80.934546
C46	35.079961	-80.933618	C100	35.055772	-80.939694	C154	35.083308	-80.934456
C47	35.079858	-80.933634	C101	35.056467	-80.939845	C155	35.083271	-80.934119
C48	35.079966	-80.933961	C102	35.056667	-80.938175	C156	35.086438	-80.933295
C49	35.079003	-80.934103	C103	35.057964	-80.937982	C157	35.086501	-80.934124
C50	35.078961	-80.933861	C104	35.057984	-80.938071	C158	35.086210	-80.934628
C51	35.078641	-80.933954	C105	35.059020	-80.937917	C159	35.086439	-80.934562
C52	35.078668	-80.934153	C106	35.059010	-80.937826	C160	35.086666	-80.934165
C53	35.077308	-80.934354	C107	35.060908	-80.937544	C161	35.086597	-80.933250
C54	35.076596	-80.932256	C108	35.060868	-80.938739	C162	35.088641	-80.932666



STV 100 Years

Client:

SCDOT South Carolina Department of Transportation

In Cooperation With

York County south carolina

Project:

US 21 NORTH PHASE I AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3 PROJECT # 11149-004

Title:

APPROXIMATE WATERS OF THE U.S. AND WETLANDS BOUNDARY MAP

Notes:

1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

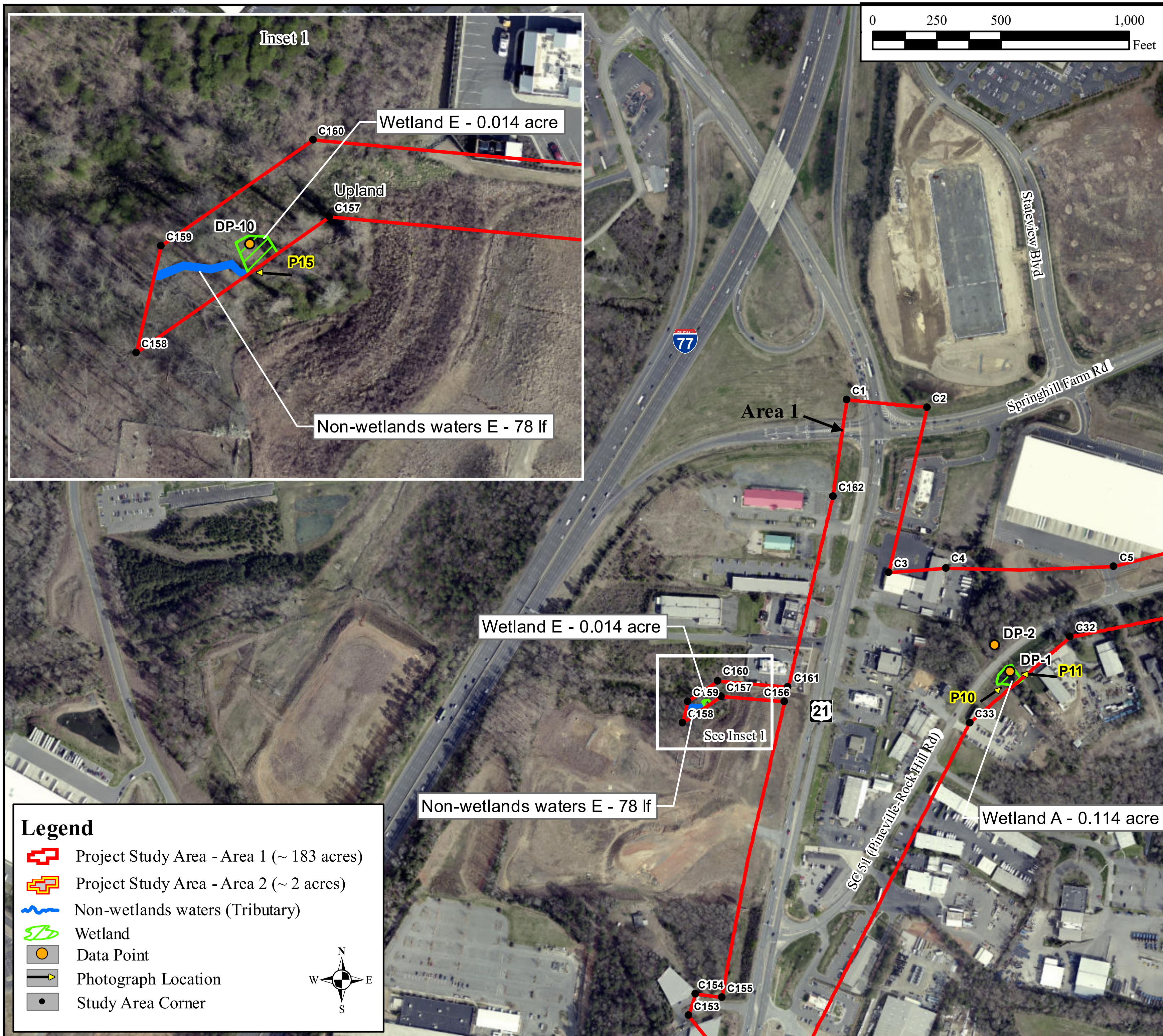
2. Jurisdictional boundaries of the waters of the U.S. have not been verified by the U.S. Army Corps of Engineers and are subject to change following verification.

Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.

2515776

AREA - 1
FIGURE 5
OVERVIEW



STV 100 Years

Client:

SCDOT
South Carolina Department of Transportation

In Cooperation With

York County
south carolina

Project:

US 21 NORTH PHASE I
AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3
PROJECT # 11149-004

Title:

APPROXIMATE
WATERS OF THE U.S.
AND WETLANDS
BOUNDARY MAP

Sources: ESRI - Aerial Imagery (2019)

Notes:
1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

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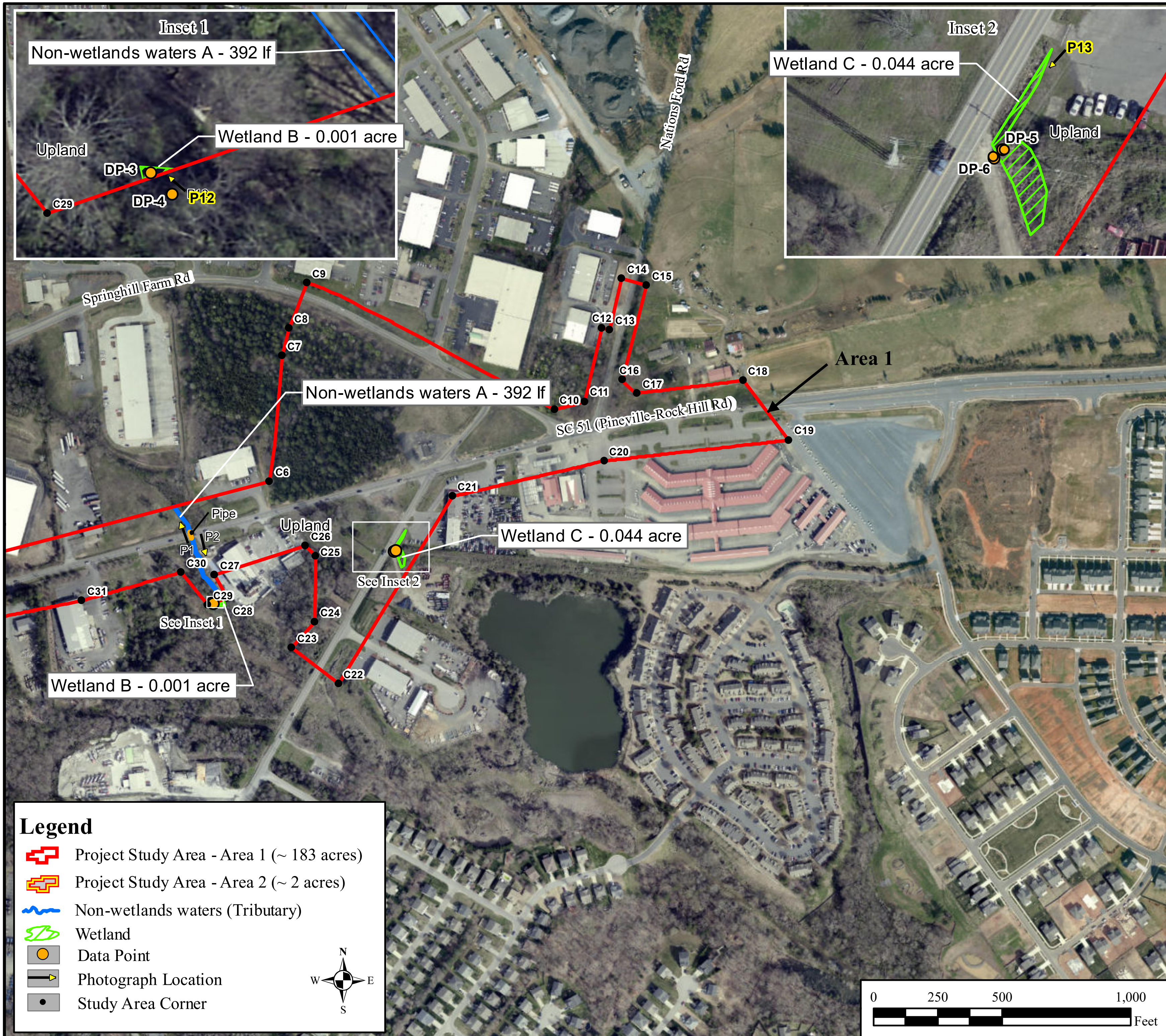
Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.

2515776

AREA - 1
FIGURE 5A



STV 100 Years

Client:

SCDOT South Carolina Department of Transportation

In Cooperation With

York County south carolina

Project:

US 21 NORTH PHASE I AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3 PROJECT # 11149-004

Title:

APPROXIMATE WATERS OF THE U.S. AND WETLANDS BOUNDARY MAP

Sources: ESRI - Aerial Imagery (2019)

Notes:

1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

2. Jurisdictional boundaries of the waters of the U.S. have not been verified by the U.S. Army Corps of Engineers and are subject to change following verification.

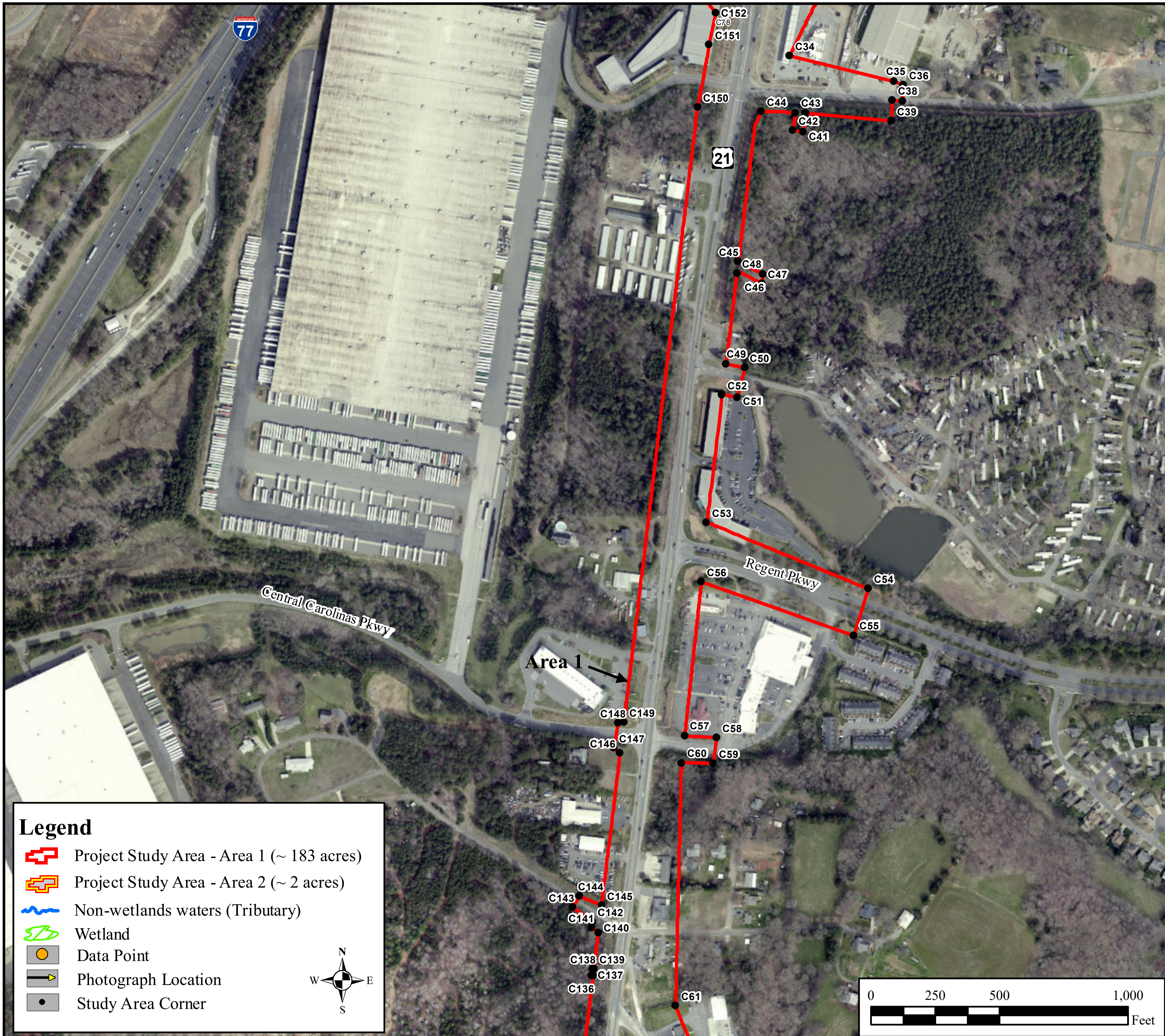
Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.

2515776

AREA - 1

FIGURE 5B



STV 100 Years

Client:

SCDOT South Carolina Department of Transportation

In Cooperation With

York County south carolina

Project:

US 21 NORTH PHASE I AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3 PROJECT # 11149-004

Title:

APPROXIMATE WATERS OF THE U.S. AND WETLANDS BOUNDARY MAP

Sources: ESRI - Aerial Imagery (2019)

Notes:

1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

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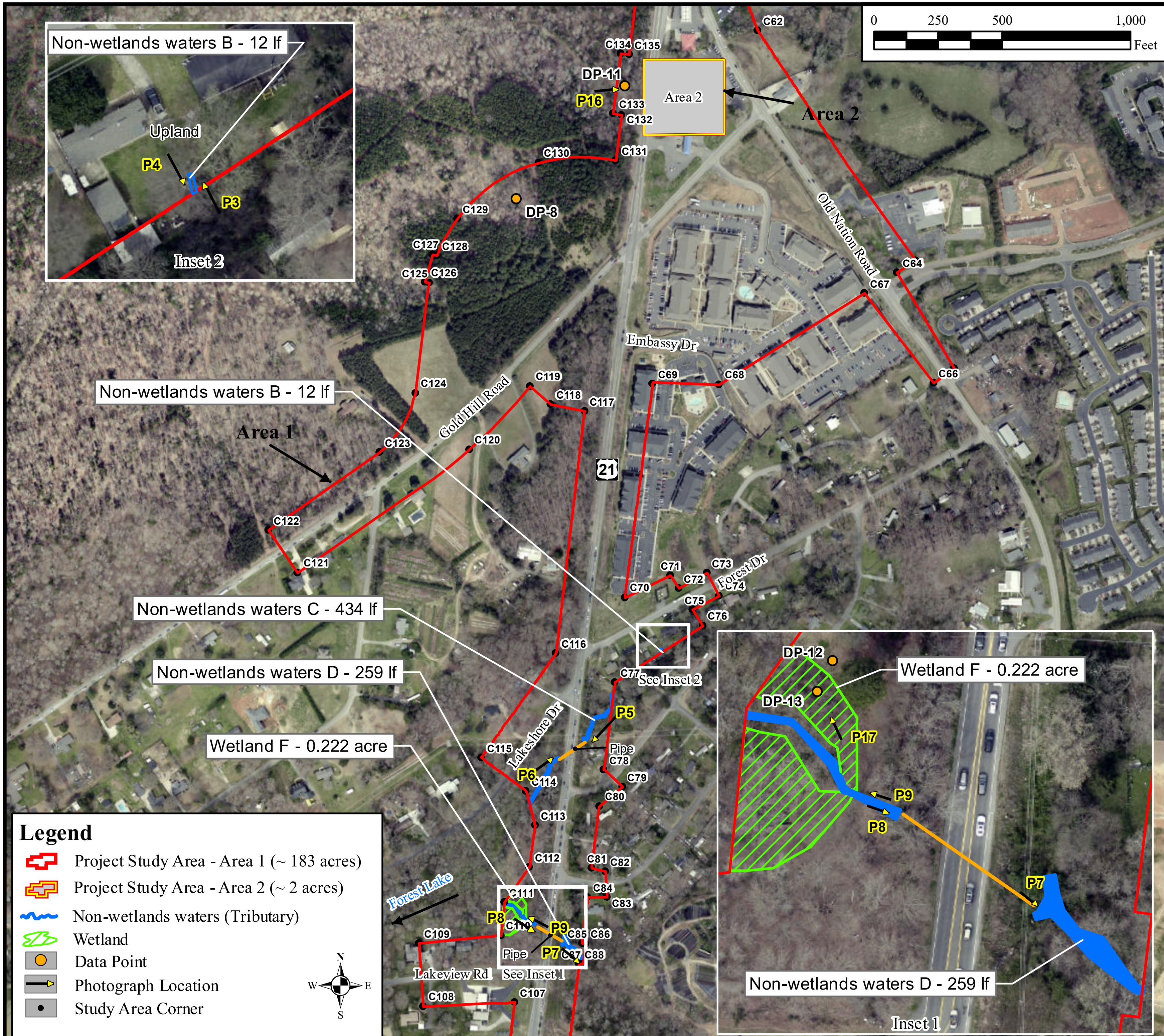
Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.

2515776

AREA - 1
FIGURE 5C



STV 100 Years

Client:

SCDOT
South Carolina Department of Transportation

In Cooperation With

York County
south carolina

Project:

US 21 NORTH PHASE I
AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3
PROJECT # 11149-004

Title:

APPROXIMATE
WATERS OF THE U.S.
AND WETLANDS
BOUNDARY MAP

Sources: ESRI - Aerial Imagery (2019)

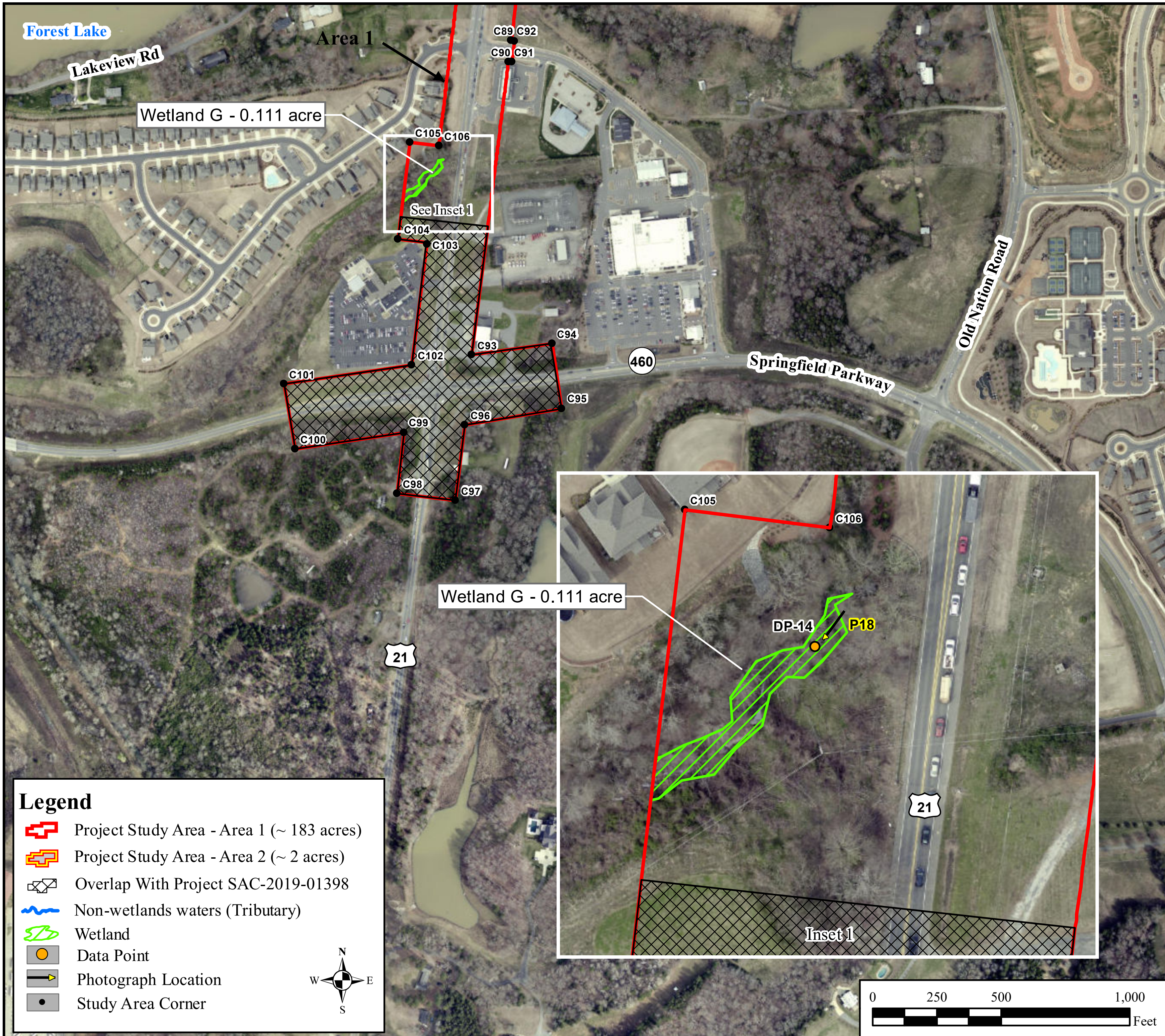
Notes:
1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

2. Jurisdictional boundaries of the waters of the U.S. have not been verified by the U.S. Army Corps of Engineers and are subject to change following verification.

Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.
2515776

AREA - 1
FIGURE 5D



STV 100 Years

Client:

SCDOT
South Carolina Department of Transportation

In Cooperation With

York County south carolina

Project:

US 21 NORTH PHASE I AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3 PROJECT # 11149-004

Title:

APPROXIMATE WATERS OF THE U.S. AND WETLANDS BOUNDARY MAP

Sources: ESRI - Aerial Imagery (2019)

Notes:
1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

2. Jurisdictional boundaries of the waters of the U.S. have not been verified by the U.S. Army Corps of Engineers and are subject to change following verification.

Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.
2515776

AREA - 1
FIGURE 5E

Waters_Name	State	Cowardin_Code	HGM_Code	Meas_Type	Amount	Units	Waters_Type	Latitude	Longitude	Local_Waterway
Non-wetlands waters A (non-tidal)	SOUTH CAROLINA	R3		Linear	392	FOOT		35.08795900	-80.92570600	
Non-wetlands waters B (non-tidal)	SOUTH CAROLINA	R4		Linear	12	FOOT		35.06467400	-80.93563200	
Non-wetlands waters C (non-tidal)	SOUTH CAROLINA	R3		Linear	434	FOOT		35.06372800	-80.93661900	
Non-wetlands waters D (non-tidal)	SOUTH CAROLINA	R3		Linear	259	FOOT		35.06155600	-80.93688000	
Non-wetlands waters E (non-tidal)	SOUTH CAROLINA	R3		Linear	78	FOOT		35.08639200	-80.93444500	
Wetland A	SOUTH CAROLINA	PFO		Area	0.114	ACRE		35.08670900	-80.93037700	
Wetland B	SOUTH CAROLINA	PFO		Area	0.001	ACRE		35.08748800	-80.92553900	
Wetland C	SOUTH CAROLINA	PEM		Area	0.044	ACRE		35.08801000	-80.92309700	
Wetland E	SOUTH CAROLINA	PFO		Area	0.014	ACRE		35.08643600	-80.93431100	
Wetland F	SOUTH CAROLINA	PFO		Area	0.222	ACRE		35.06181000	-80.93757600	
Wetland G	SOUTH CAROLINA	PEM		Area	0.111	ACRE		35.05875100	-80.93786900	
Non-jurisdictional Water D (Area 2)	SOUTH CAROLINA			Area	0.017	ACRE		35.07058200	-80.93556100	

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant:		File Number:	Date:
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer, South Atlantic Division, 60 Forsyth St, SW, Atlanta, GA 30308-8801. This form must be received by the Division Engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD **is not appealable**. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact the Corps biologist who signed the letter to which this notification is attached. The name and telephone number of this person is given at the end of the letter.	If you only have questions regarding the appeal process you may also contact: Mr. Philip A. Shannin Administrative Appeals Review Officer CESAD-PDS-O 60 Forsyth St, SW, Floor M9 Atlanta, GA 30308-8803 (404) 562-5136

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_______________________________ Signature of appellant or agent.	Date:	Telephone number:

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SC 29403-5107

November 23, 2021

Regulatory Division

Mr. Sean Connolly
South Carolina Department of Transportation
955 Park Street
Columbia, South Carolina 29202
ConnollyMS@scdot.org

Dear Mr. Connolly:

This is in response to your request for an Approved Jurisdictional Determination (AJD) (SAC-2015-00812) received in our office on June 9, 2021 and revised on October 18, 2021, for a 2-acre site known as SCDOT US 21& SC 51 Intersection Improvements in York County (SCDOT PIN 42332), **Area #2** which is located east of US 21 approximately 575 feet northeast of the intersection of US 21 and S-98 (Gold Hill Road) in Fort Mill, York County, South Carolina (Latitude: 35.076988°, Longitude: -80.932637°). An AJD is used to indicate the Corps has identified the presence or absence of wetlands and/or other aquatic resources on a site, including their accurate location(s) and boundaries, as well as their jurisdictional status pursuant to Section 404 of the Clean Water Act (CWA) (33 U.S.C. § 1344) and/or navigable waters of the United States pursuant to Section 10 of the Rivers and Harbors Act of 1899 (RHA) (33 U.S.C. § 403).

The site is shown on the attached depictions Area-2 Figure 5 and 5A, titled "US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 Approximated Waters of the U.S. and Wetlands Boundary Map" dated October 11, 2021 prepared by STV. Based on an on-site inspection, a review of aerial photography, topographic maps, National Wetlands Inventory maps, soil survey information, and Wetland Determination Data Forms, we conclude the site, as shown on the referenced depictions, do not contain any aquatic resources subject to regulatory jurisdiction under Section 404 of the CWA or Section 10 of the RHA.

Attached is a form describing the basis of jurisdiction for the delineated area(s). Note that some or all of these areas may be regulated by other state or local government entities and you should contact the South Carolina Department of Health and Environmental Control, Bureau of Water, to determine the limits of their jurisdiction.

Attached is a form describing the basis of jurisdiction for the delineated area(s). Note that some or all of these areas may be regulated by other state or local government entities and you should contact the South Carolina Department of Health and Environmental Control, Bureau of Water, or Department of Ocean and Coastal Resource Management, to determine the limits of their jurisdiction.

Attached is a form describing the basis of jurisdiction for the delineated area(s). Note that a Department of the Army (DA) permit may be required for certain activities in the areas subject to regulatory jurisdiction of the Corps of Engineers, and these areas may be further subject to restrictions or requirements of other state or local government entities.

If you submit a permit application as a result of this AJD, include a copy of this letter and the depictions as part of the application. Not submitting the letter and depiction will cause a delay while we confirm an AJD was performed for the proposed permit project area. Note that some or all of these areas may be regulated by other state or local government entities, and you should contact the South Carolina Department of Health and Environmental Control, Bureau of Water, to determine the limits of their jurisdiction.

This AJD is valid for five (5) years from the date of this letter unless new information warrants revision before the expiration date. This AJD is an appealable action under the Corps of Engineers administrative appeal procedures defined at 33 CFR Part 331. The administrative appeal options, process and appeals request form is attached for your convenience and use.

This AJD was conducted pursuant to Corps of Engineers' regulatory authority to identify the limits of Corps of Engineers' jurisdiction for the particular site identified in this request. This AJD may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

In all future correspondence, please refer to file number SAC-2015-00812, US 21& SC 51 Intersection Improvements in York County (SCDOT PIN 42332), **Area #2**. A copy of this letter is forwarded to State and/or Federal agencies for their information. If you have any questions, please contact me at (803) 253-3445, or by email at Stephen.A.Brumagin@usace.army.mil.

Sincerely,

Stephen A. Brumagin
Project Manager

Attachments:
Approved Jurisdictional Determination Form
Notification of Appeal Options

Area-2 Figure 5 and 5A, titled "US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 Approximated Waters of the U.S. and Wetlands Boundary Map"

Copies Furnished:

Ms. Jackie Galloway
South Carolina Department of Transportation
955 Park Street
Columbia, SC 29202
GallowayJA@scdot.org

Mr. Joshua Kotheimer, PWS
STV Incorporated
900 West Trade St., Suite 715
Charlotte, NC 28202
joshua.kotheimer@stvinc.com

SCDHEC – Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201
WQCWetlands@dhec.sc.gov

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): November 23, 2021

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: JD Form 1 of 1; SAC-2015-00812 SCDOT US 21& SC 51 Intersection Improvements Project Area #2 in York County (SCDOT PIN 42332)

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: South Carolina County: York County City: Fort Mill
Center coordinates of site (lat/long in degree decimal format): Lat. 35.0769887699411 °, Long. -80.9326378928917 °.
Universal Transverse Mercator:
Name of nearest waterbody: Sugar creek and Steele Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 030501030103 Upper Sugar Creek & 030501030108 Steele Creek
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: November 23, 2021
☒ Field Determination. Date(s): August 2, 2021

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0.017 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Pick List**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **As was previously identified and confirmed by the Corps in the July 1, 2016 Approved Jurisdictional Determination (AJD) for this project, there is a feature identified as "Non-jurisdictional Water D 0.017 acre" within Area #2 of the SCDOT US 21 & SC 51 Phase I project in York County South Carolina. This feature is located east of**

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

US 21 approximately 575 feet northeast of the intersection of US 21 and S-98 (Gold Hill Road) in Fort Mill, York County, S.C.

In the previous AJD the consultant had identified this feature as an unmaintained stormwater feature that may have some hydrophytic vegetation and saturated soils. However, on further investigation by the Corps with a field view on November 17, 2015, the Corps confirmed the presence of a concrete block wall that is located on the north site of the feature with the presence of sediment deposits and debris within the feature. At that time, it was observed there were limited hydrophytic plants present with areas of unvegetated sediment deposits and the substrate was saturated.

On August 2, 2021, the situation is very similar to the previous field view, however the accumulated sediments were moist in some location within the feature and other areas were quite dry. A sample of the accumulated sediments had some stratification of soil with matrix color of 10 YR 4/3 with s few remnant faint redox concentration only in a few select areas that had the most soil moisture. There may be more hydrophytic vegetation present than during the previous field view, but these were predominantly plants one would expect to move into a disturbed area such as Sweet Gum, Poison Ivy and Green Ash. Also, the condition of the concrete wall has not changed dramatically since the previous field view, other than some deterioration from age. As was previously determined by the Corps, this wall may have been constructed in the past as some type of low retaining wall with the idea of keeping storm water flows away from the placed fill. Due to development within the immediate area and within the drainage area above this feature, it appears, due to limited soil moisture, that some of the flows that formerly went through this feature have been diverted or intercepted and this area did not exhibit characteristics of tributaries beyond what would be expected for areas that receive stormwater directly related to precipitation events.

Based upon this field view, the feature identified in this delineation as Non-Jurisdictional Water D 0.017 acre, may be some type of un-maintained stormwater conveyance feature that does not meet the criteria for consideration as a wetland, nor does it have flow characteristics that meet the definition of a tributary. Therefore, the Corps has determined that this feature is not subject to jurisdiction under the Clean Water Act.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately (   ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☒ Other: (explain, if not covered above): **As was described above in Section B.2, the identified feature, Non-Jurisdictional Water D 0.017 acre, has been determined by the Corps to be a linear storm water conveyance features that does not meet the criteria of wetlands nor does it exhibit characteristics of tributary. Therefore, this feature is not subject to jurisdiction under the Clean Water Act.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: depictions Area-2 Figure 5 and 5A, titled "US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 Approximated Waters of the U.S. and Wetlands Boundary Map" dated October 11, 2021 prepared by STV.
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☒ Office concurs with data sheets/delineation report. The Corps agrees with the boundaries features represented in the drawings and based on the information provided
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☒ Corps navigable waters' study: Charleston District Navigability Study, 1977.
☒ U.S. Geological Survey Hydrologic Atlas: HA 730-G, 1990.
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps. 030501030103 Upper Sugar Creek, 030501030108 Steele Creek and 03050103 Lower Catawba River.
☒ U.S. Geological Survey map(s). Cite scale & quad name: 1:24,000 Fort Mill, SC quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: As provided by the Consultant in depictions, US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004, NRCS Soil Series Map Figures 3, 3B: Cecil, Mecklenburg-Wynott, Pacolet & Wynott-Winnsboro series.
☒ National wetlands inventory map(s). Cite name: As provided by Consultant in depiction US 21 North Phase I and SC 51 York County, SC SCDOT PIN 42332 York County PFP3 Project # 11149-004 National Wetland Inventory Map Figure 4 and the Corps Reg Viewer: Uplands.
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): As provided by the consultant in the JD request.

or ☒ Other (Name & Date): As provided by the consultant in the JD request.

☒ Previous determination(s). File no. and date of response letter: SAC 2015-00812 AJD dated July 1, 2016.

☐ Applicable/supporting case law: .

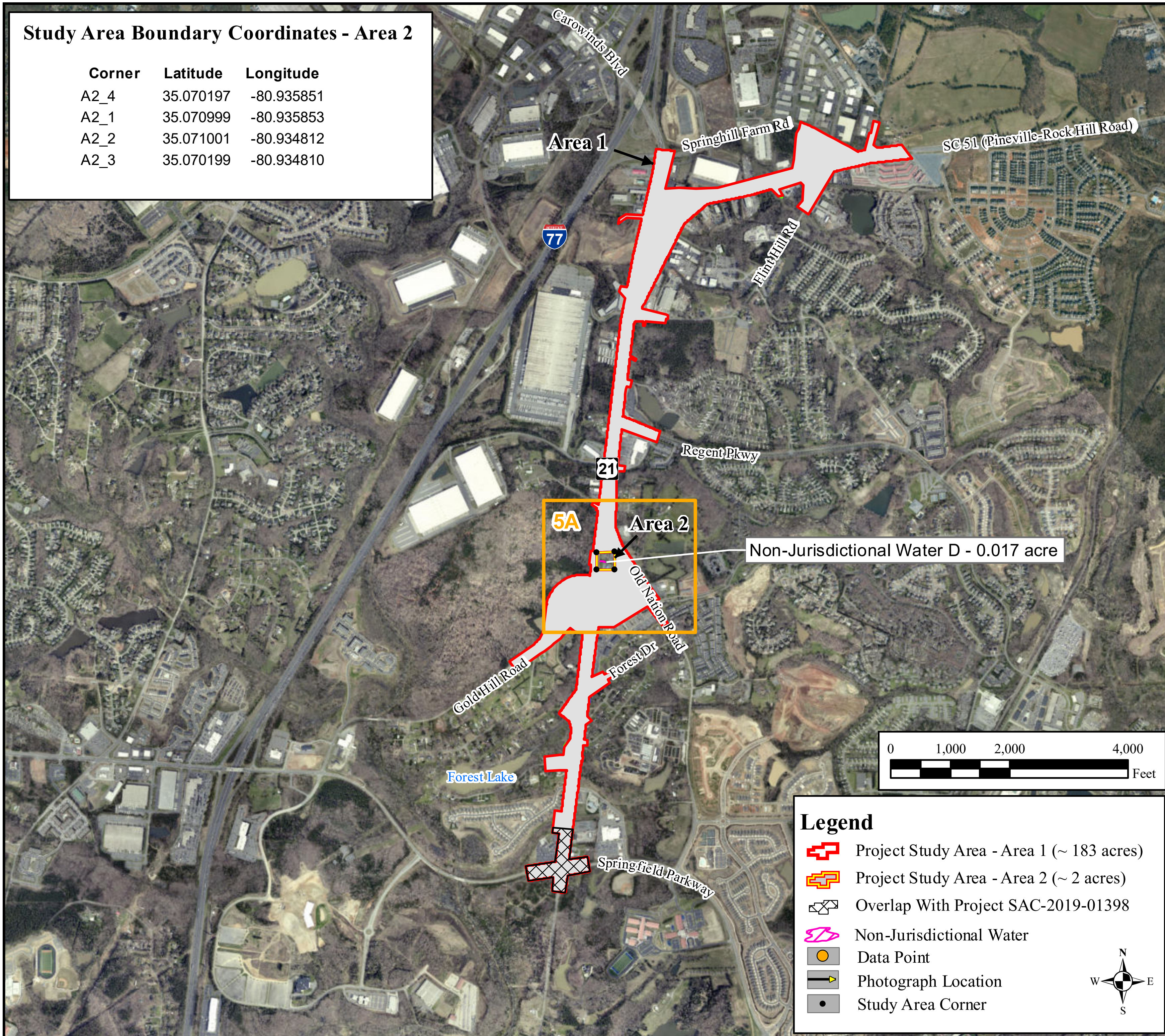
☐ Applicable/supporting scientific literature: .

☒ Other information (please specify): field view on August 2, 2021.

B. ADDITIONAL COMMENTS TO SUPPORT JD: As was described above in Section B.2, the identified feature, Non-Jurisdictional Water D 0.017 acre, has been determined by the Corps to be a linear storm water conveyance features that does not meet the criteria of wetlands nor does it exhibit characteristics of tributary. Therefore, this feature is not subject to jurisdiction under the Clean Water Act.

Study Area Boundary Coordinates - Area 2

Corner	Latitude	Longitude
A2_4	35.070197	-80.935851
A2_1	35.070999	-80.935853
A2_2	35.071001	-80.934812
A2_3	35.070199	-80.934810



STV 100 Years

Client:

SCDOT
South Carolina Department of Transportation

In Cooperation With

York County
south carolina

Project:

US 21 NORTH PHASE I
AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3
PROJECT # 11149-004

Title:

APPROXIMATE
WATERS OF THE U.S.
AND WETLANDS
BOUNDARY MAP

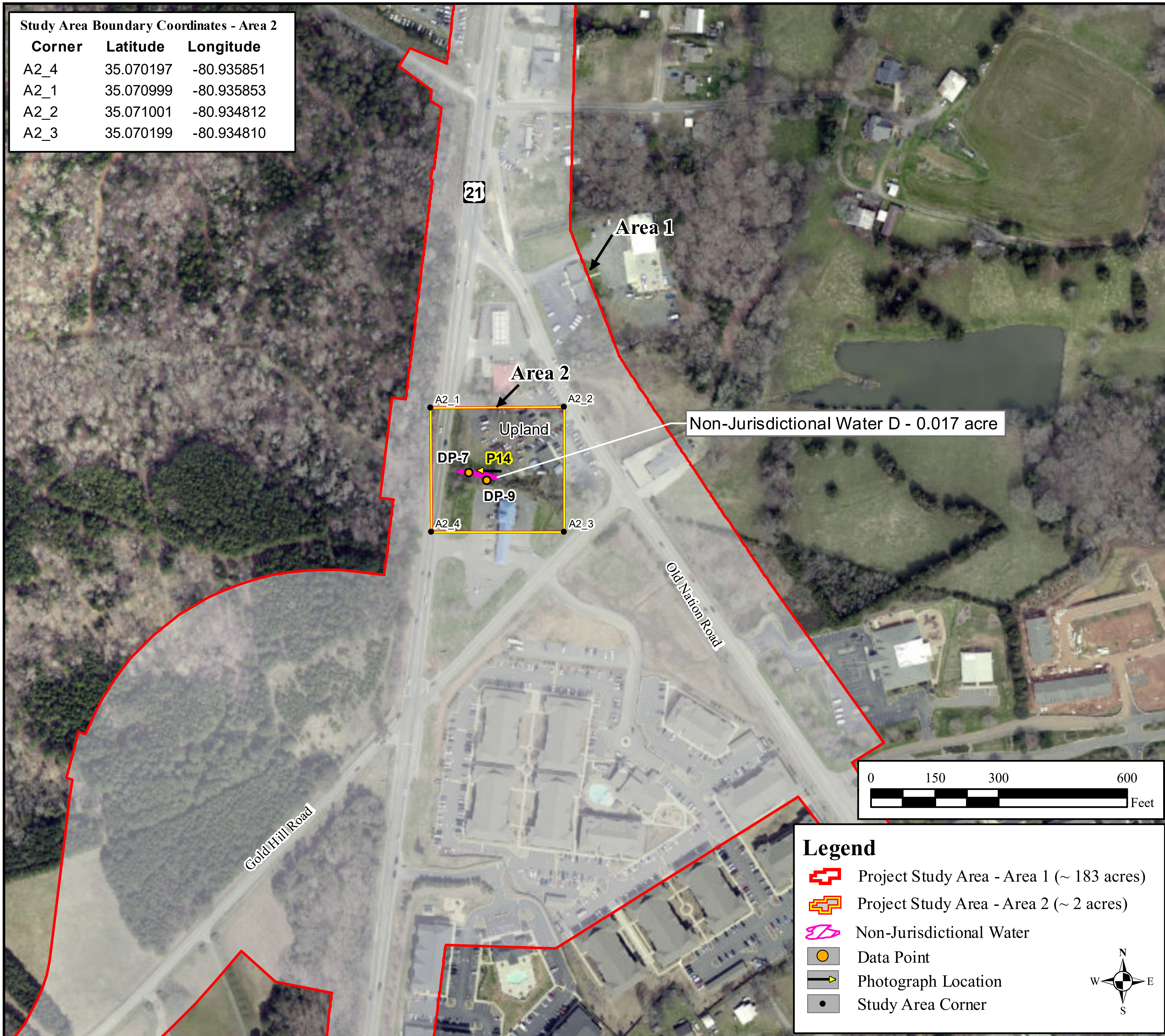
Notes:
1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

2. Jurisdictional boundaries of the waters of the U.S. have not been verified by the U.S. Army Corps of Engineers and are subject to change following verification.

Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.
2515776

**AREA - 2
FIGURE 5
OVERVIEW**



Study Area Boundary Coordinates - Area 2

Corner	Latitude	Longitude
A2_4	35.070197	-80.935851
A2_1	35.070999	-80.935853
A2_2	35.071001	-80.934812
A2_3	35.070199	-80.934810

Legend

- Project Study Area - Area 1 (~ 183 acres)
- Project Study Area - Area 2 (~ 2 acres)
- Non-Jurisdictional Water
- Data Point
- Photograph Location
- Study Area Corner

STV 100 Years

Client:

SCDOT South Carolina Department of Transportation

In Cooperation With

York County south carolina

Project:

US 21 NORTH PHASE I AND SC 51

YORK COUNTY, SC

SCDOT PIN 42332

YORK COUNTY PFP3 PROJECT # 11149-004

Title:

APPROXIMATE WATERS OF THE U.S. AND WETLANDS BOUNDARY MAP

Notes:

1. Jurisdictional waters of the U.S. were delineated by STV, Inc. during field reviews conducted on November 27-28, 2012, June 3-4, 2014, March 31, 2016, February 10 2017, June 12, 2020, May 24, 2021, and August 13, 2021. Jurisdictional boundaries have been marked in the field with blue and white striped tape and surveyed by a professional licensed surveyor.

2. Jurisdictional boundaries of the waters of the U.S. have not been verified by the U.S. Army Corps of Engineers and are subject to change following verification.

Drawn By:	Checked By:
JLK	TPO
Approved By:	Date:
MAI	10/11/2021

STV Project No.

2515776

AREA - 2
FIGURE 5A

Waters_Name	State	Cowardin_Code	HGM_Code	Meas_Type	Amount	Units	Waters_Type	Latitude	Longitude	Local_Waterway
Non-wetlands waters A (non-tidal)	SOUTH CAROLINA	R3		Linear	392	FOOT		35.08795900	-80.92570600	
Non-wetlands waters B (non-tidal)	SOUTH CAROLINA	R4		Linear	12	FOOT		35.06467400	-80.93563200	
Non-wetlands waters C (non-tidal)	SOUTH CAROLINA	R3		Linear	434	FOOT		35.06372800	-80.93661900	
Non-wetlands waters D (non-tidal)	SOUTH CAROLINA	R3		Linear	259	FOOT		35.06155600	-80.93688000	
Non-wetlands waters E (non-tidal)	SOUTH CAROLINA	R3		Linear	78	FOOT		35.08639200	-80.93444500	
Wetland A	SOUTH CAROLINA	PFO		Area	0.114	ACRE		35.08670900	-80.93037700	
Wetland B	SOUTH CAROLINA	PFO		Area	0.001	ACRE		35.08748800	-80.92553900	
Wetland C	SOUTH CAROLINA	PEM		Area	0.044	ACRE		35.08801000	-80.92309700	
Wetland E	SOUTH CAROLINA	PFO		Area	0.014	ACRE		35.08643600	-80.93431100	
Wetland F	SOUTH CAROLINA	PFO		Area	0.222	ACRE		35.06181000	-80.93757600	
Wetland G	SOUTH CAROLINA	PEM		Area	0.111	ACRE		35.05875100	-80.93786900	
Non-jurisdictional Water D (Area 2)	SOUTH CAROLINA			Area	0.017	ACRE		35.07058200	-80.93556100	

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant:		File Number:	Date:
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer, South Atlantic Division, 60 Forsyth St, SW, Atlanta, GA 30308-8801. This form must be received by the Division Engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD **is not appealable**. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact the Corps biologist who signed the letter to which this notification is attached. The name and telephone number of this person is given at the end of the letter.	If you only have questions regarding the appeal process you may also contact: Mr. Philip A. Shannin Administrative Appeals Review Officer CESAD-PDS-O 60 Forsyth St, SW, Floor M9 Atlanta, GA 30308-8803 (404) 562-5136

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

______________________ Signature of appellant or agent.	Date:	Telephone number:

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

March 22, 2023

Regulatory Division

Ms. Jackie Galloway
South Carolina Department of Transportation
955 Park Street
Columbia, South Carolina 29202
galloway.ja@dot.state.sc.us

Dear Ms. Galloway:

Enclosed is your Department of the Army Permit SAC-2015-00812 for the project known as SCDOT US 21& SC 51 Intersection in York County (SCDOT PIN 42332). It authorizes you to perform the work specified in the attached drawings. This permit is issued under provision of Federal laws for the protection and preservation of waters of the United States.

Please notify this office promptly, in writing or via email to Jeremy M. Kinney, Project Manager, when you start and complete work. Be aware a special condition is included in this permit requiring a copy of the permit and drawings be available at the work site during the entire time of construction.

FOR THE CHIEF, REGULATORY DIVISION Sincerely,

Ronnie Smith

Ronnie D. Smith
Chief, Northeast Branch

Attachments
DA Permit SAC-2015-00812
Notice of Commencement or Completion

DEPARTMENT OF THE ARMY PERMIT

Permittee: **SC Department of Transportation**
C/O Mr. Sean Connolly
955 Park Street
Columbia, South Carolina 29201

Permit No: **SAC-2015-00812**

Issuing Office: **CHARLESTON DISTRICT**

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:
The authorized work consists of widening of approximately 5.7 miles of roadway including US 21 from the intersection of US 21 and SC 160/North White Street to the intersection of US 21 and SC 51 and approximately one mile of SC 51 to the state boundary to improve traffic safety, traffic efficiency to meet current design criteria and to improve stormwater drainage. This project will include impacts to a total of 1,378 linear feet of tributaries and 0.984 acres of wetland areas. Specifically, this project will include placement of fill and piping in 1,019 linear feet of tributaries, placement of rock armor rip rap in 359 linear feet of tributaries, placement of fill (including cut/fill) in 0.832 acres of wetlands and mechanical clearing of 0.152 acre of wetlands.

All work is to be completed in accordance with attached drawings entitled: "US 21 North Phase I and SC 51 & US 21 North Phase II" sheets 1 through 21, and dated December 6, 2021.

Project Location:
The project is located along a 5.7-mile-long segment of roadway including US 21 from the intersection of US 21 and SC 160/North White Street to the intersection of US 21 and SC 51 and approximately one mile of SC 51 to the state boundary near Fort Mill in York County, South Carolina (Latitude: 35.056328 °, Longitude: -80.937939 °)

General Permit Conditions:

1. The time limit for completing the work authorized ends on **<u>March 31, 2028</u>**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you

desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Permit Conditions:

See Appendix A, pages 5 and 6.

Further information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

☐ Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403)

☒ Section 404 of the Clean Water Act (33 USC 1344)

☐ Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 USC 1413)

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume liability for:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. The Corps may reevaluate its decision on this permit any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to:

a. Failure to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which the Corps did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by the Corps, and if you fail to comply with such directive, the Corps may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Jackie Galloway 3/22/2023

(PERMITTEE) **(DATE)**

For **SC Department of Transportation**
C/O Mr. Sean Connolly

Jackie Galloway

PRINT NAME

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Ronnie Smith 3/24/2023

(DISTRICT ENGINEER) **(DATE)**
Andrew C. Johannes, PhD PE PMP
or their Designee
Ronnie Smith
Chief, Northeast Branch

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (PRINT NAME) **(DATE)**

APPENDIX A
SPECIAL CONDITIONS FOR PERMIT SAC-2015-00812

a. **The permittee agrees to provide all contractors associated with construction of the authorized activity a copy of the permit and drawings.**

b. **A copy of the permit must be available at the construction site at all times.**

c. **The permittee shall submit a signed compliance certification to the Corps within 60 days following completion of the authorized work and any required mitigation. The certification will include:**

   1. **A copy of this permit.**

   2. **A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions.**

   3. **A statement that any required mitigation was completed in accordance with the permit conditions.**

   4. **The signature of the permittee certifying the completion of the work and mitigation.**

d. **That as compensatory mitigation for impacts to aquatic resources, the permittee agrees to purchase a total of 7,175.5 stream mitigation credits from the following mitigation banks: Eagle House Mitigation Bank, Sandy Fork Mitigation Bank, and Turner's Branch Mitigation Bank. Specifically, the permittee will purchase 3,267.6 stream restoration credits and 253.37 stream preservation credits from Eagle House Mitigation Bank, 320.15 stream restoration credits and 283.15 stream preservation credits from Sandy Fork Mitigation Bank, and 3,051.23 stream preservation credits from Turner's Branch Mitigation Bank. In addition, the permittee agrees to purchase a total of 3.18 compensatory wetland credits from Eagle House Mitigation Bank and Rocky Creek Mitigation Bank. Specifically, the permittee will purchase 1.26 wetland restoration credits and 0.62 wetland preservation credits from Eagle House Mitigation Bank and 0.7 wetland restoration credits and 0.6 wetland preservation credits from Rocky Creek Mitigation Bank. Also, the permittee will debit a total of 1.905 acres from the Black River Mitigation Bank.**

e. **In order to fulfill your responsibility to complete the required compensatory mitigation as set forth in Special Condition d, the permittee must submit evidence of the purchase of required mitigation credits to both the Corps of Engineers and SCDHEC prior to commencement of the authorized work.**

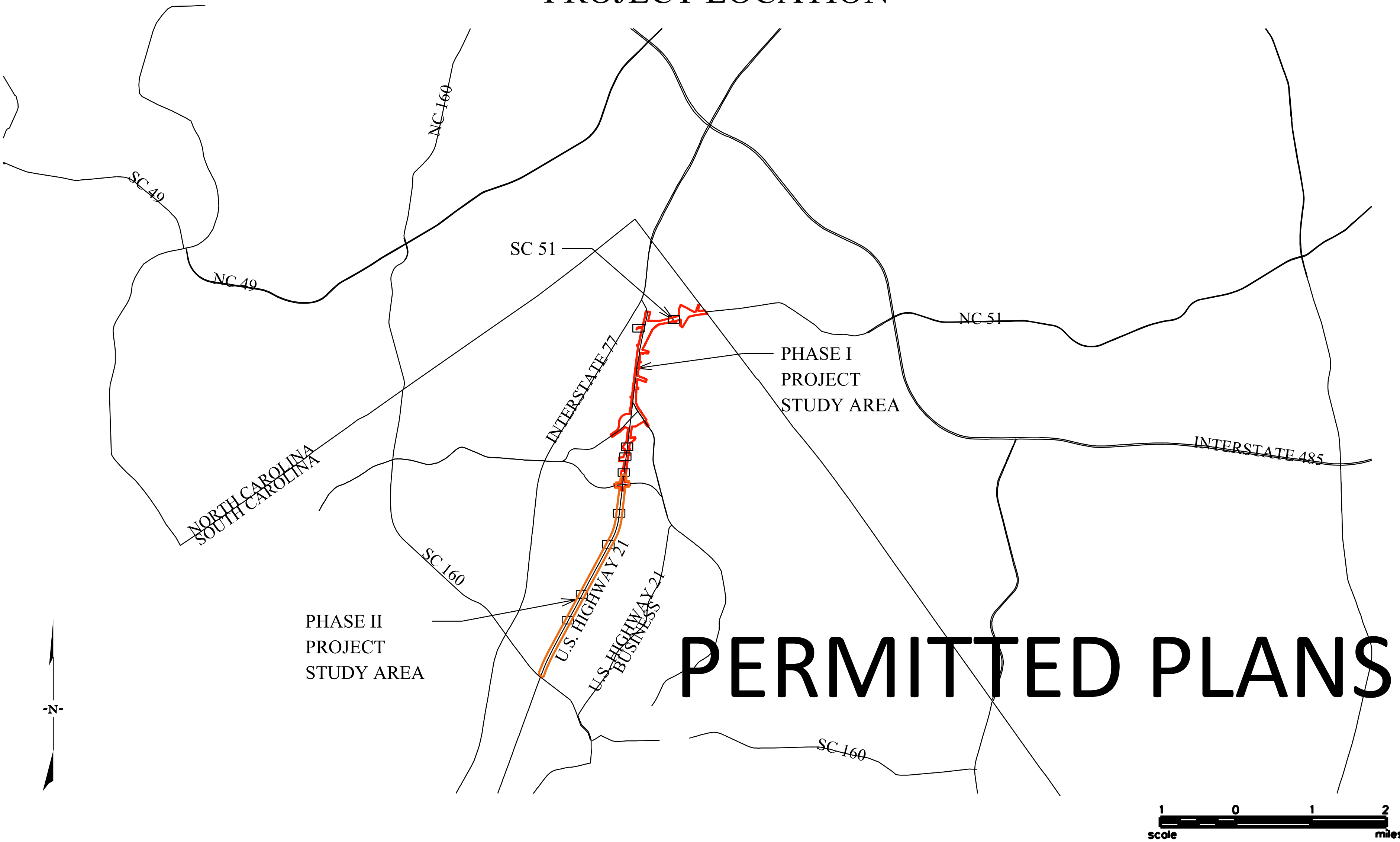
f. That the permittee shall utilize clean fill materials for the construction of the US 21 and SC 51 Roadway Widening project that are free of potential sources of pollution to protect the water quality of the tributaries to Blankmanship Branch, tributaries to Jackson Branch or Steele Creek.

g. The permittee must implement appropriate best management practices that will minimize erosion and migration of sediments on and off the project site during and after construction. These practices should include the use of appropriate grading and sloping techniques, mulches, silt fences, or other devices capable of preventing erosion, migration of sediments, and bank failure. All disturbed land surfaces and sloped areas affected by the project must be stabilized upon project completion. This will include all requirements of the Water Quality Certification as approved by SCDHEC on January 5, 2023.

h. Prior to beginning the authorized work, the permittee must coordinate with the local NFIP flood plain manager and comply with FEMA requirements. A list of NFIP floodplain managers may be found at: https://www.dnr.sc.gov/water/flood/index.html.

i. The permittee shall clearly plot the Steele Creek ARP Church Cemetery/Blackstock Cemetery (SHPO Site No. 3799) on all construction plans and the permittee shall agree to place a 40-meter buffer area around this site with an exception being along Tributary E within the proposed right-of-way which will have the fencing placed along the north side of the channel. This buffer zone would be clearly marked in the field using orange fencing during construction and all ground disturbance, construction, and staging activities shall be conducted outside of this buffer area. If activities associated with the construction of this project enter into this site or the area within the protective fencing, the permittee will immediately cease these activities and directly contact the Corps to determine why this occurred. The Corps will initiate the Federal, Tribal, and state coordination required and will determine what actions would be required to mitigate these impacts

US 21 NORTH PHASE I AND US 21 NORTH PHASE II PROJECT LOCATION



PERMITTED PLANS

US 21 NORTH PHASE I PROJECT STUDY AREA

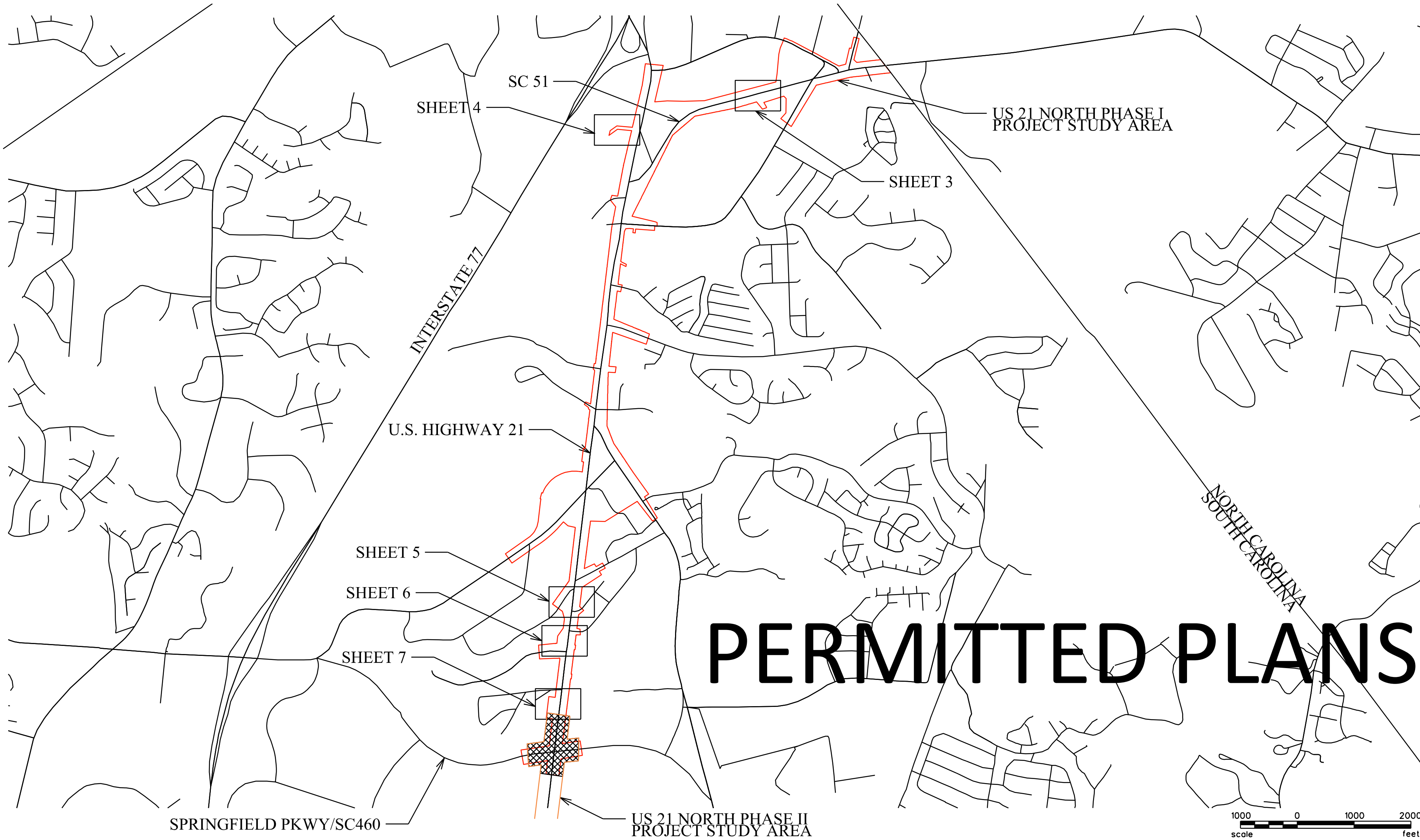
US 21 NORTH PHASE II PROJECT STUDY AREA

STV Incorporated
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, South Carolina 29730
(803) 980-4970 fax: (803) 980-4099

Campco Engineering Inc
156 Oakland Avenue
Rock Hill, South Carolina 29730
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 1 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
PROJECT OVERVIEW



US 21 NORTH PHASE I PROJECT STUDY AREA

US 21 NORTH PHASE II PROCECT STUDY AREA

OVERLAP BETWEEN PHASE I & II

PHASE I IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	166	0.024
PERMANANT TRIBUTARY PIPE IMPACT	469	0.074
PERMANANT WETLAND FILL IMPACT		0.054
TEMPORARY WETLAND CLEARING IMPACT		0.045
TOTAL PERMANENT TRIBUTARY IMPACTS	635	0.098
TOTAL TEMPORARY WETLAND IMPACTS		0.045
TOTAL PERMANENT WETLAND IMPACTS		0.054

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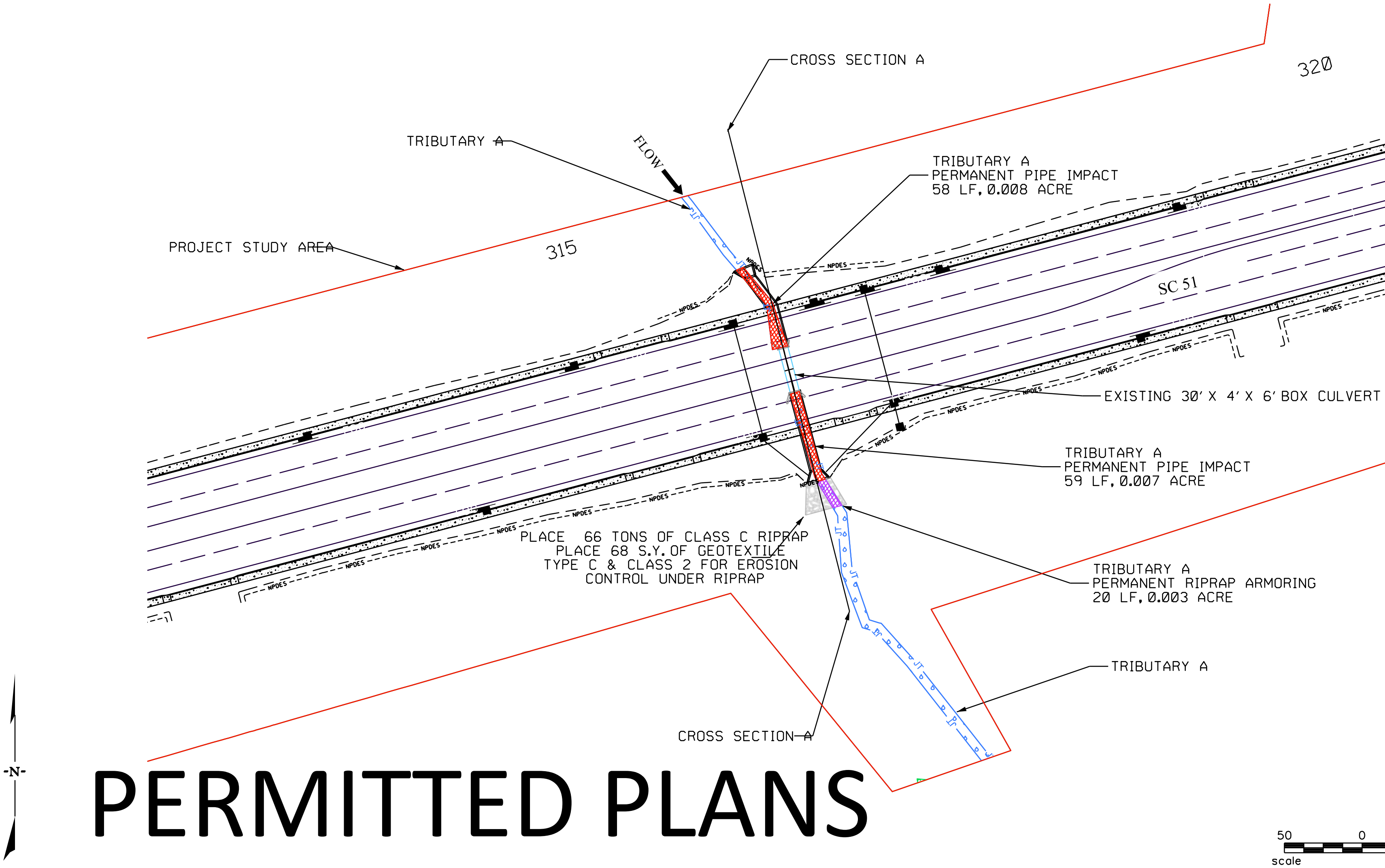
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 2 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



PERMITTED PLANS

WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	20	0.003
PERMANANT TRIBUTARY PIPE IMPACT	117	0.015
TOTAL PERMANENT TRIBUTARY IMPACTS	137	0.018

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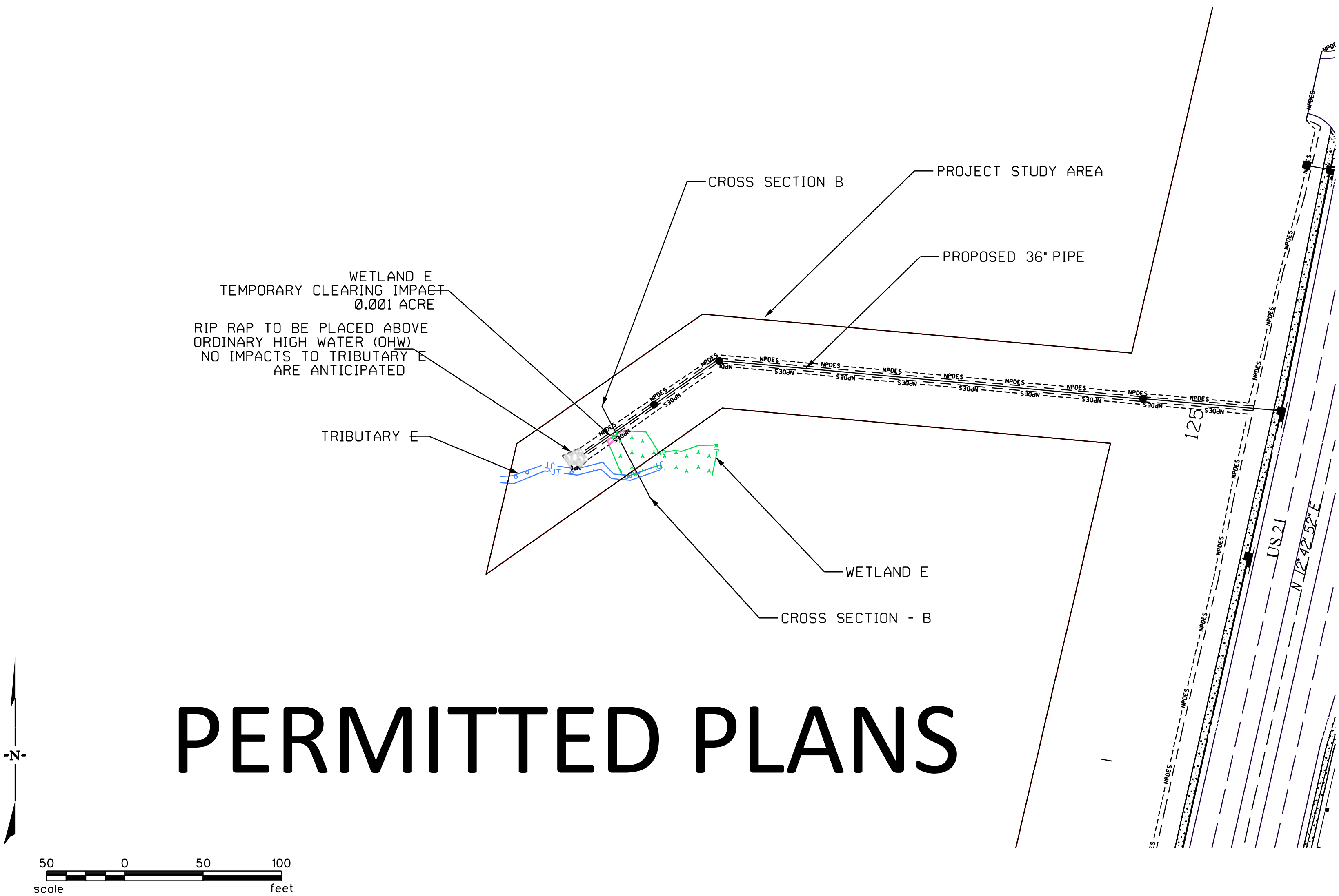
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 3 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



PERMITTED PLANS

WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
TEMPORARY WETLAND CLEARING IMPACT		0.001

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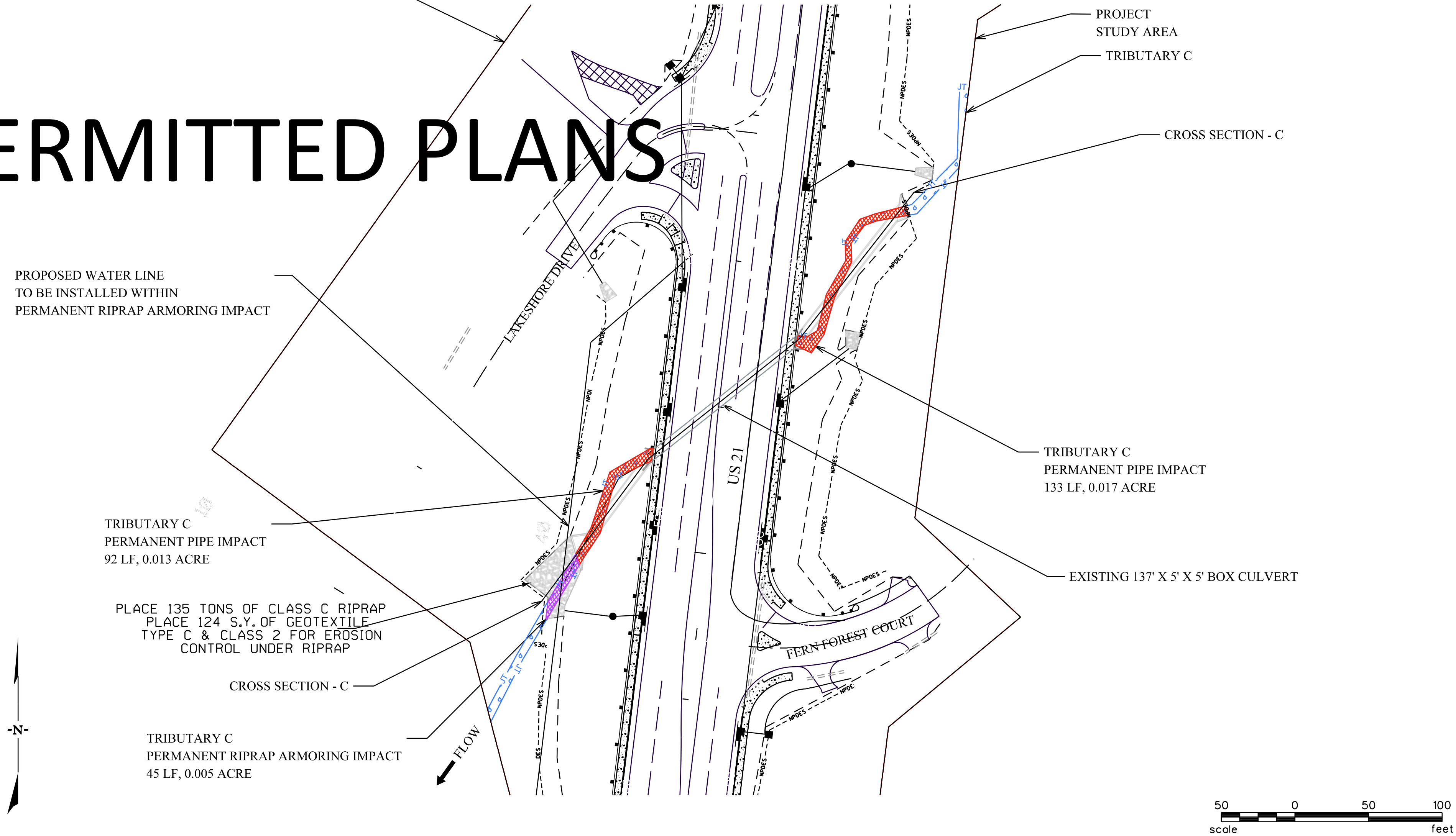
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 4 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	45	0.005
PERMANANT TRIBUTARY PIPE IMPACT	225	0.030
TOTAL PERMANENT TRIBUTARY IMPACTS	270	0.035

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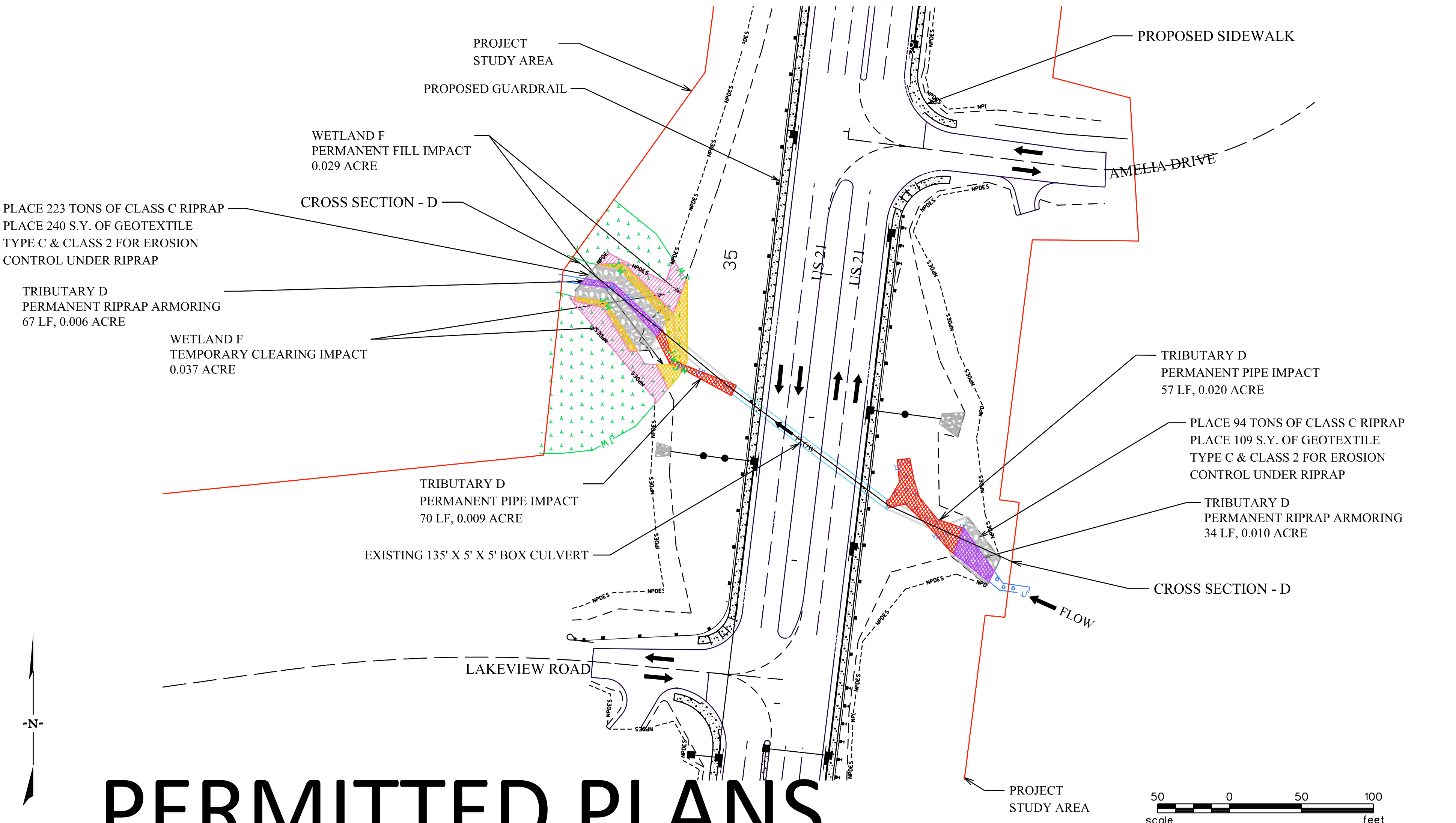
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 5 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



PERMITTED PLANS

WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	101	0.016
PERMANANT TRIBUTARY PIPE IMPACT	127	0.029
PERMANANT WETLAND FILL IMPACT		0.029
TEMPORARY WETLAND CLEARING IMPACT		0.037
TOTAL PERMANENT TRIBUTARY IMPACTS	228	0.045
TOTAL PERMANANT WETLAND IMPACTS		0.029
TOTAL TEMPORARY WETLAND IMPACTS		0.037

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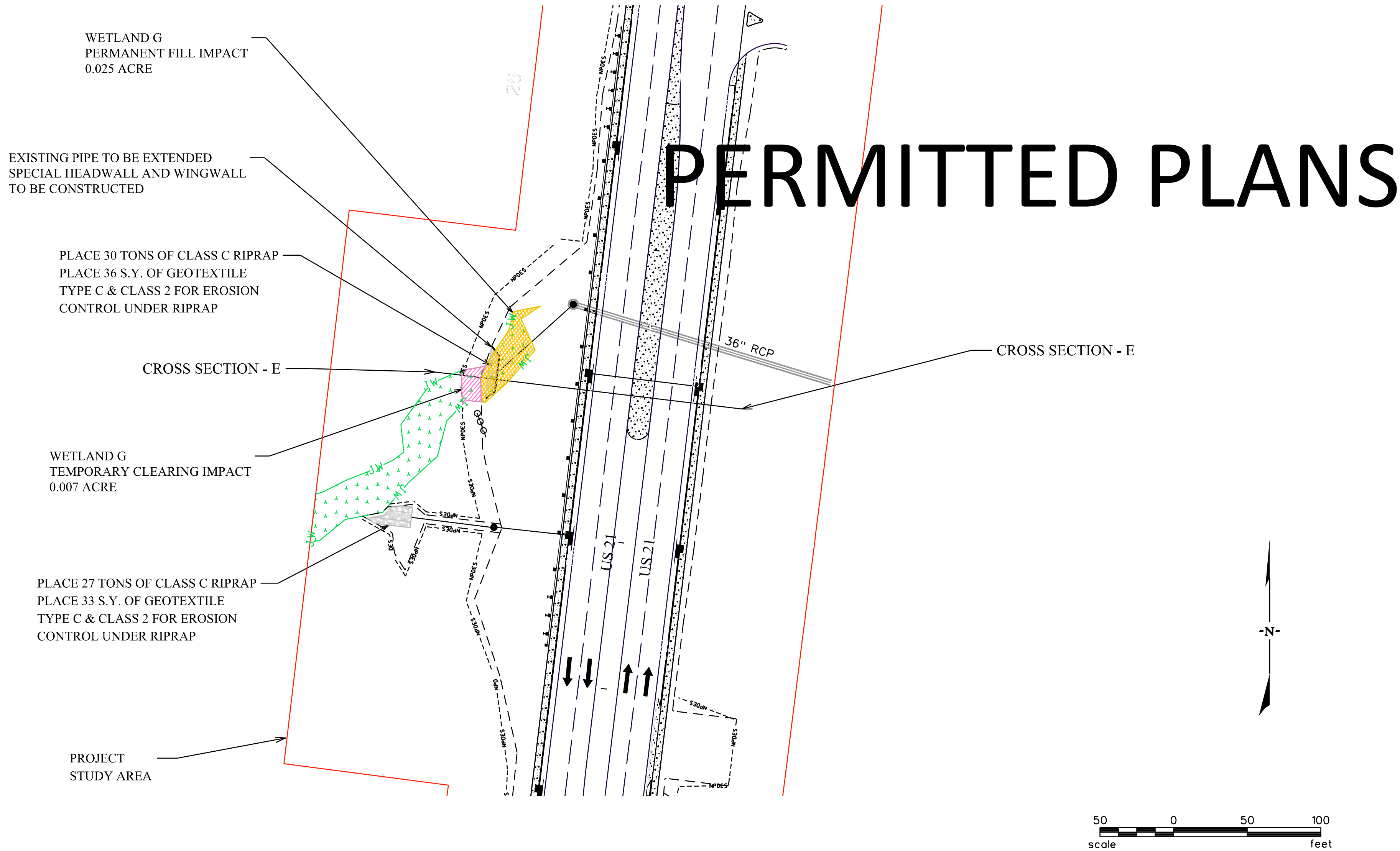
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 6 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT WETLAND FILL IMPACT		0.025
TEMPORARY WETLAND CLEARING IMPACT		0.007
TOTAL PERMANENT WETLAND IMPACTS		0.025
TOTAL TEMPORARY WETLAND IMPACTS		0.007

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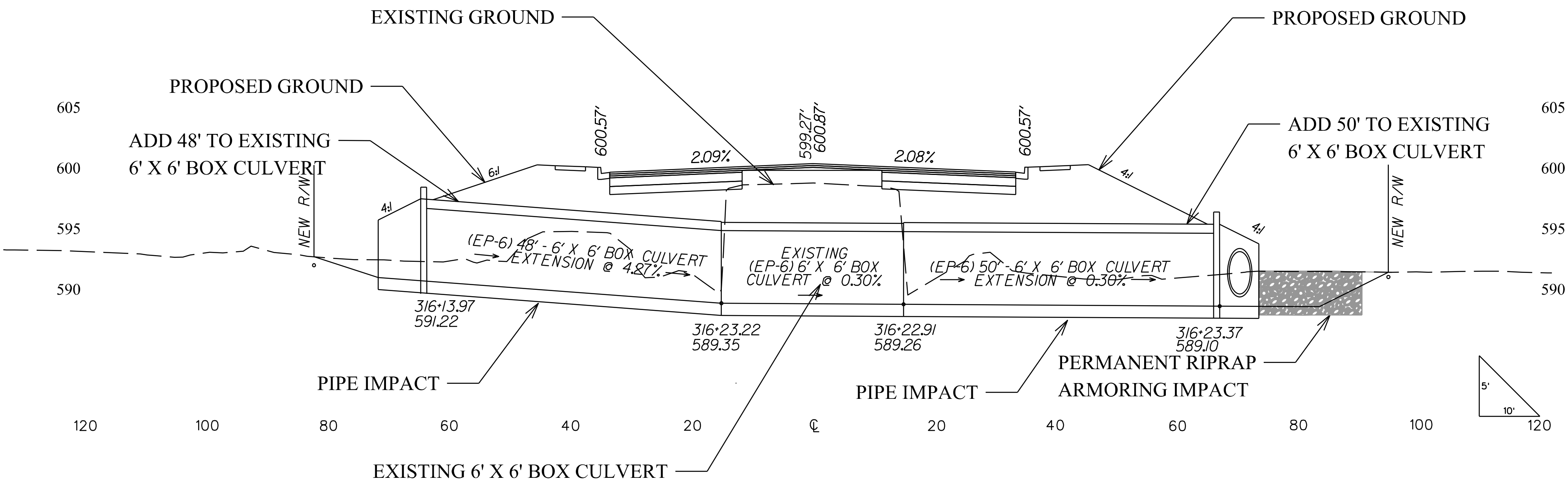
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 7 OF 21	DATE: 12-6-2021

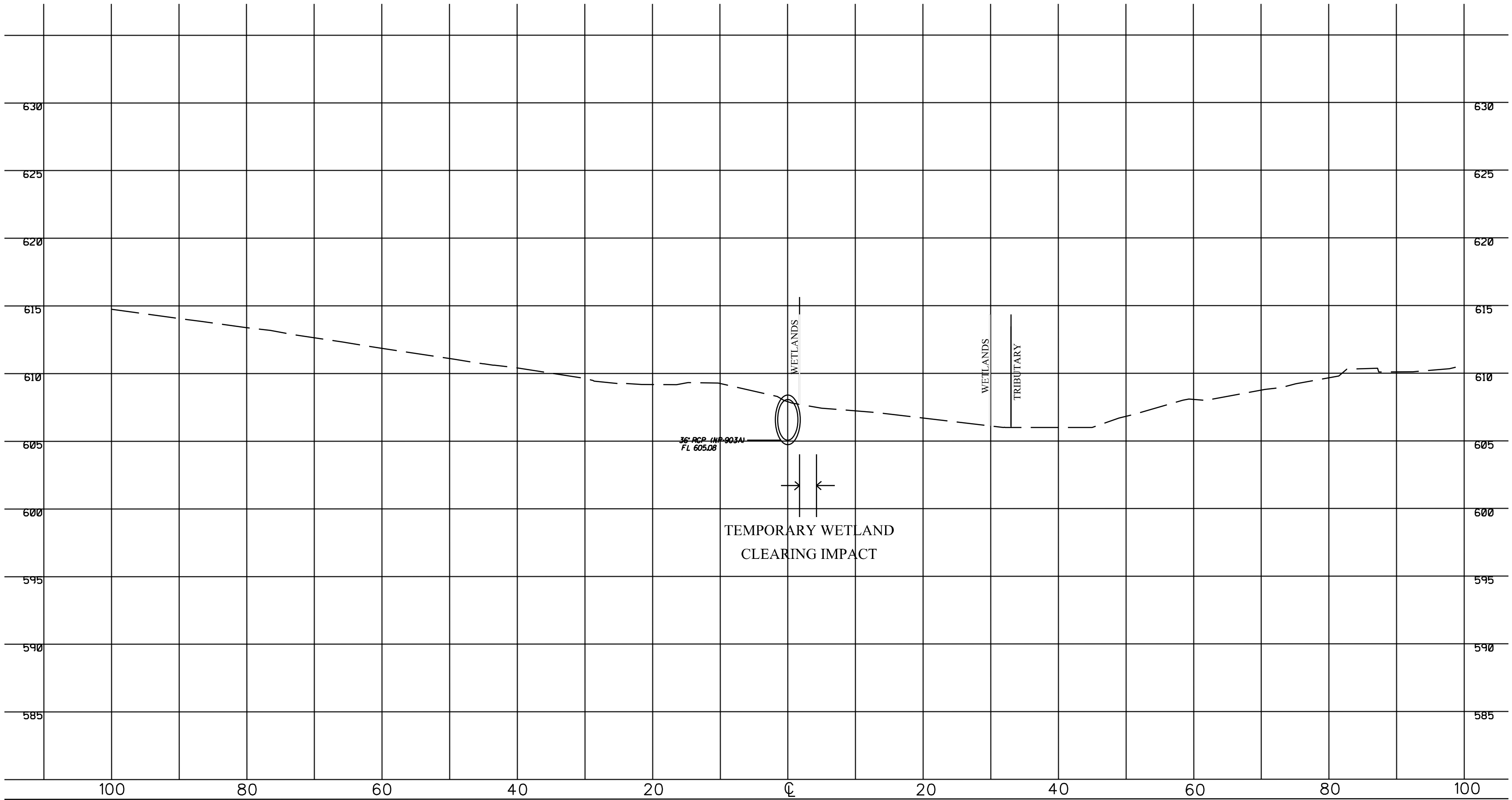
US 21 NORTH PHASE I AND SC 51
CROSS SECTION A - STA 316+23.05

PERMITTED PLANS



STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730 (803) 980-4970 fax: (803) 980-4099 **Campco Engineering Inc** 156 Oakland Avenue Rock Hill, South Carolina 29730 (803) 327-7121	APPLICANT: SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION PROJECT: US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II LOCATION: YORK COUNTY, SOUTH CAROLINA YORK COUNTY PROJECTS 11149-004 & 17228-015 SCDOT PROJECT ID 42332 & 39235 SHEET: 8 OF 21 DATE: 12-6-2021

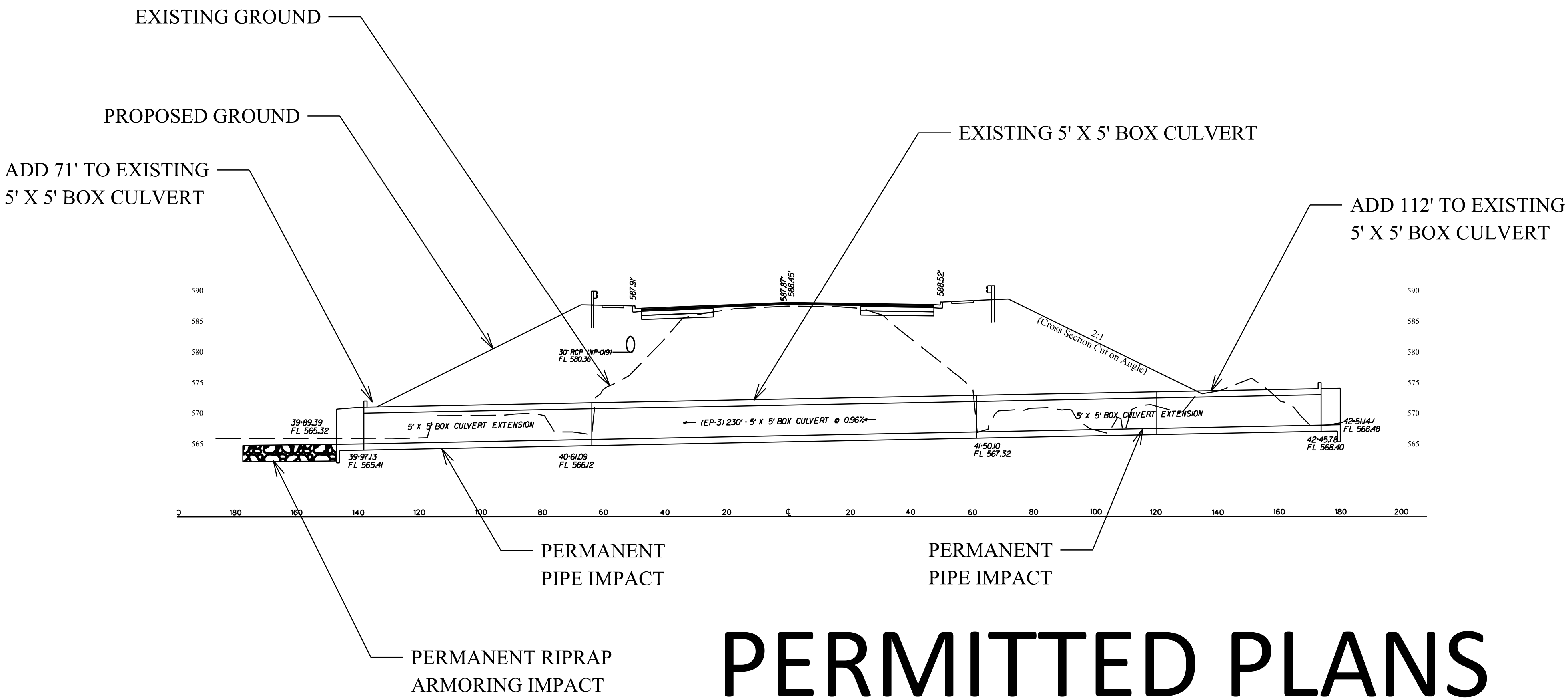
US 21 NORTH PHASE I AND SC 51
CROSS SECTION B - STA 124+7.00



PERMITTED PLANS

STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730 (803) 980-4970 fax: (803) 980-4099 **Campco Engineering Inc** 156 Oakland Avenue Rock Hill, South Carolina 29730 (803) 327-7121	APPLICANT: SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION PROJECT: US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II LOCATION: YORK COUNTY, SOUTH CAROLINA YORK COUNTY PROJECTS 11149-004 & 17228-015 SCDOT PROJECT ID 42332 & 39235 SHEET: 9 OF 21 DATE: 12-6-2021

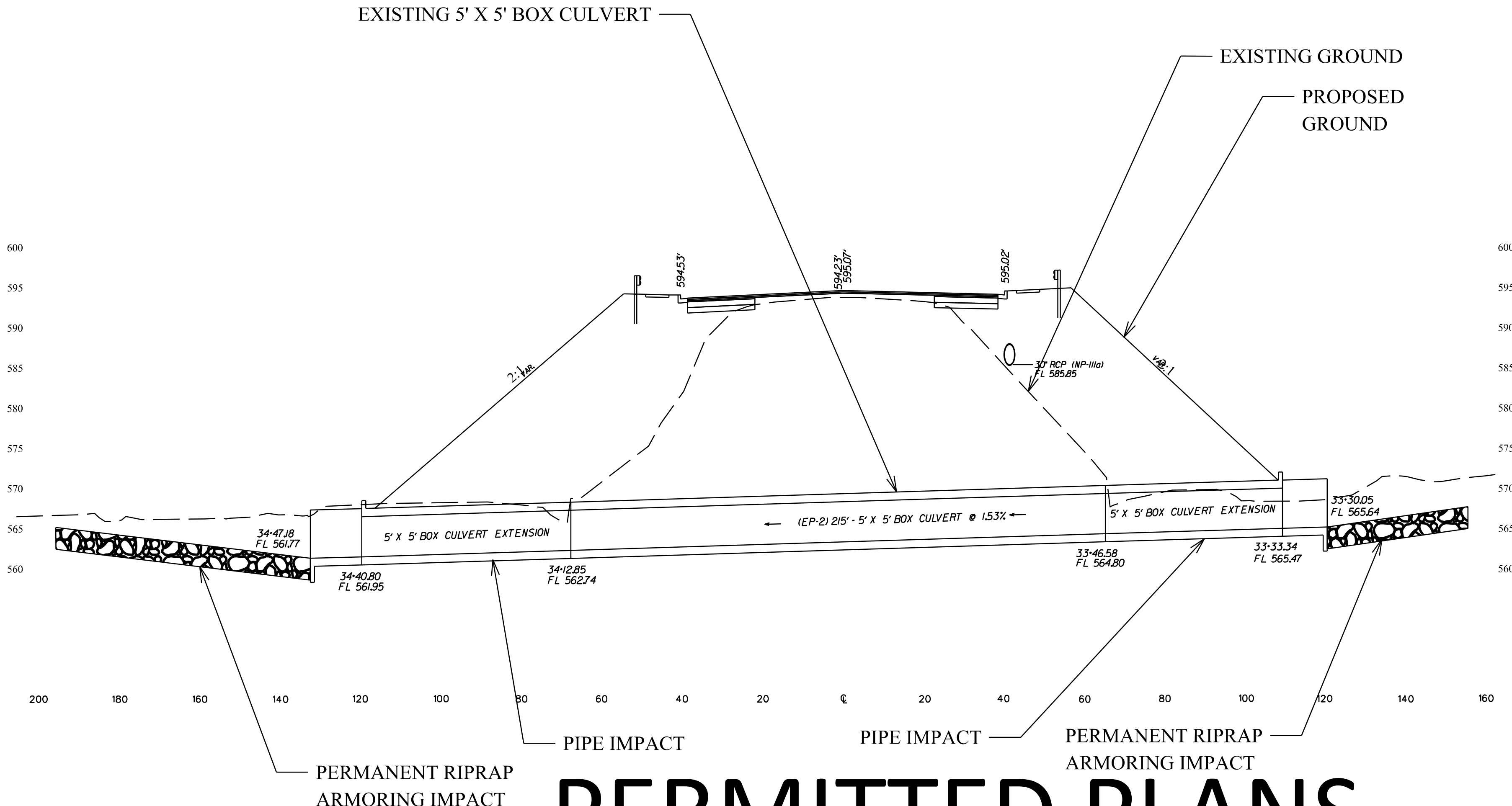
US 21 NORTH PHASE I AND SC 51
CROSS SECTION C - STA 41+06.45



PERMITTED PLANS

STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730 (803) 980-4970 fax: (803) 980-4099 **Campco Engineering Inc** 156 Oakland Avenue Rock Hill, South Carolina 29730 (803) 327-7121	APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
	PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
	LOCATION:	YORK COUNTY, SOUTH CAROLINA
	YORK COUNTY PROJECTS 11149-004 & 17228-015	
	SCDOT PROJECT ID 42332 & 39235	
	SHEET: 10 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE I AND SC 51
CROSS SECTION D - STA 33+79.00



PERMITTED PLANS

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 11 OF 21	DATE: 12-6-2021

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Campco Engineering Inc
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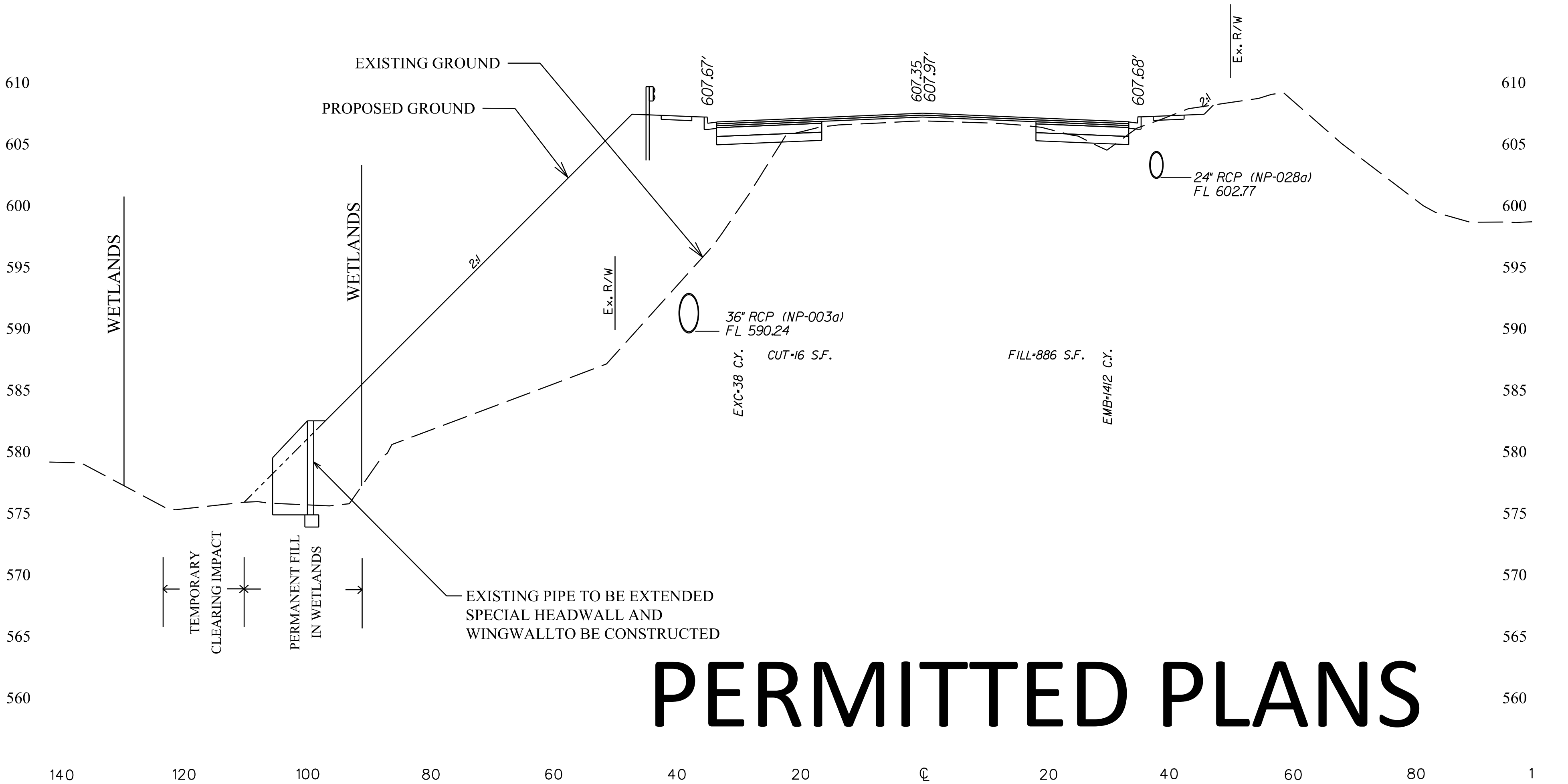
US 21 NORTH PHASE I AND SC 51
CROSS SECTION E - STA 23+00.00



PERMITTED PLANS

STV Incorporated
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Rock Hill, South Carolina 29730
(803) 980-4970 fax: (803) 980-4099

Campco Engineering Inc
156 Oakland Avenue
Rock Hill, South Carolina 29730
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 12 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
PROJECT SEGMENT OVERVIEW

PERMITTED PLANS

US 21 NORTH PHASE I PROJECT STUDY AREA

US 21 NORTH PHASE II PROCECT STUDY AREA

OVERLAP BETWEEN PHASE I & II

PHASE II IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	193	0.028
PERMANANT TRIBUTARY PIPE IMPACT	559	0.082
PERMANANT WETLAND FILL IMPACT		0.882
TOTAL PERMANENT TRIBUTARY IMPACTS	752	0.110
TOTAL PERMANENT WETLAND IMPACTS		0.882

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Rock Hill, South Carolina 29730
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PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 13 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
PLAN VIEW

PERMITTED PLANS

50 0 50 100
scale feet

WETLAND	
JURISDICTIONAL TRIBUTARY	
JURISDICTIONAL OPEN WATER	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	77	0.007
PERMANANT TRIBUTARY PIPE IMPACT	85	0.007
PERMANANT WETLAND FILL IMPACT		0.093
TOTAL PERMANENT TRIBUTARY IMPACTS	162	0.014
TOTAL PERMANANT WETLAND IMPACTS		0.093

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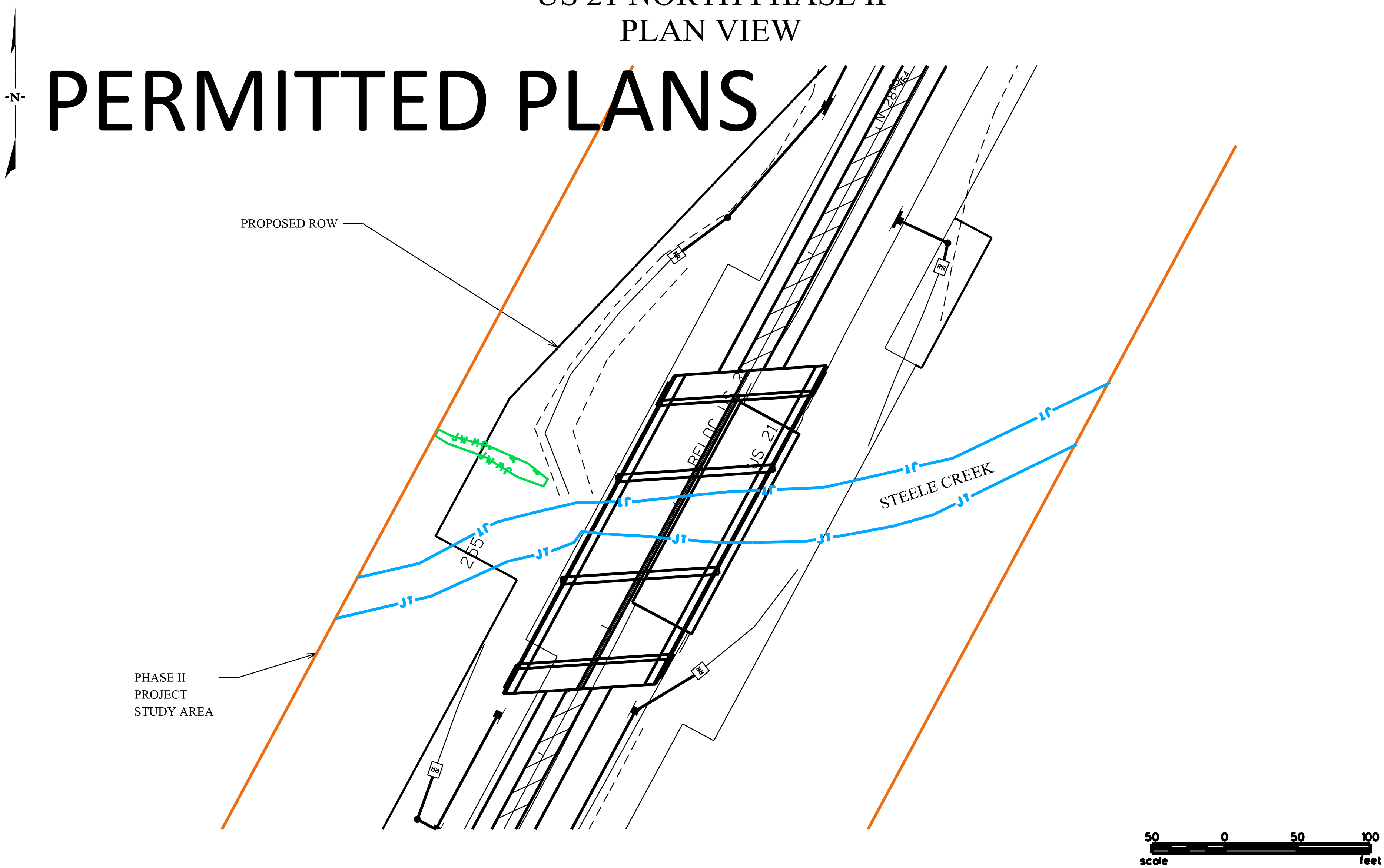
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 14 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
PLAN VIEW

PERMITTED PLANS



WETLAND	
JURISDICTIONAL TRIBUTARY	

SHEET IMPACT TOTALS LF ACRE

NO IMPACTS

STV Incorporated
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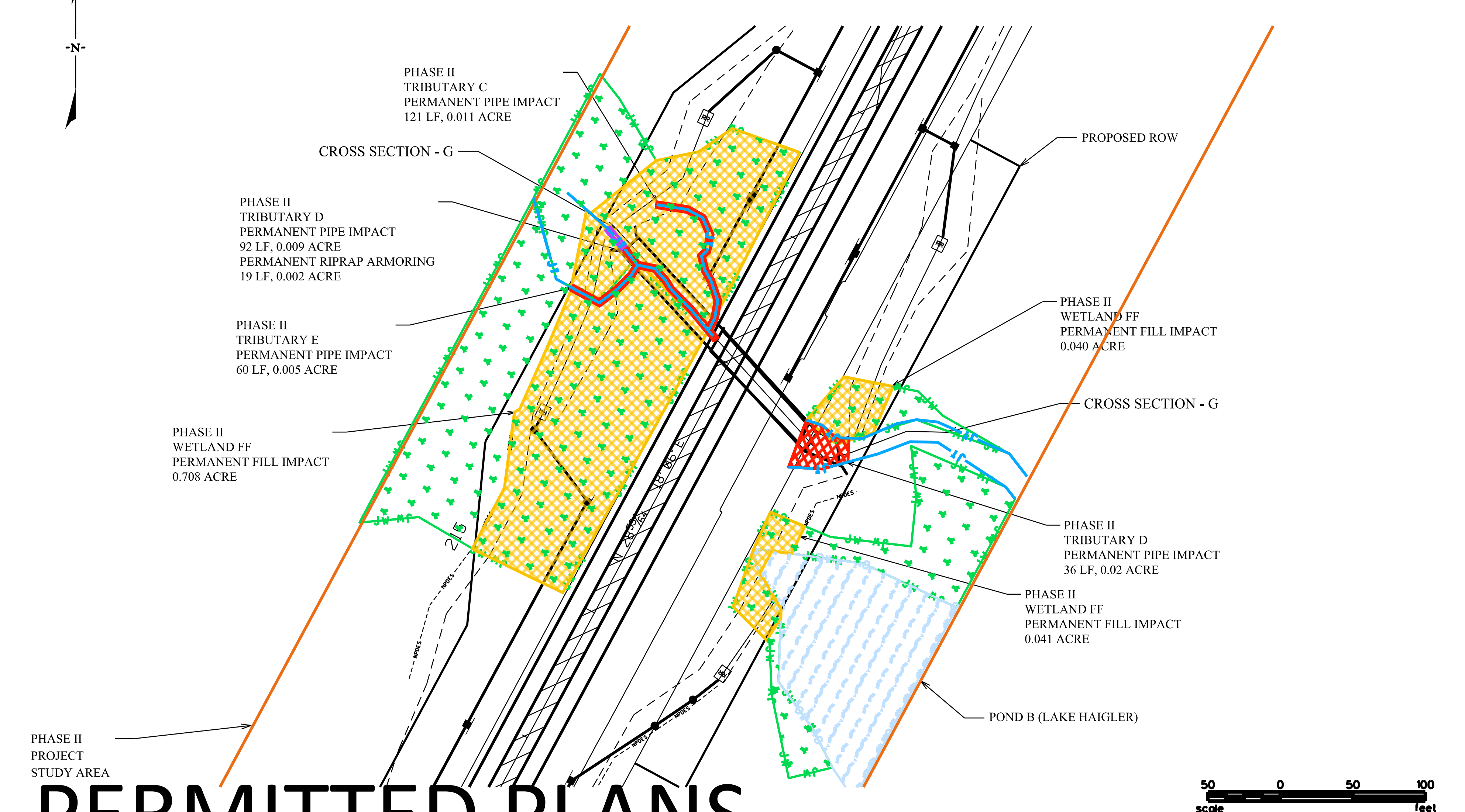
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 15 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
PLAN VIEW



PERMITTED PLANS

WETLAND	
JURISDICTIONAL TRIBUTARY	
JURISDICTIONAL OPEN WATER	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	19	0.002
PERMANANT TRIBUTARY PIPE IMPACT	309	0.045
PERMANANT WETLAND FILL IMPACT		0.789
TOTAL PERMANENT TRIBUTARY IMPACTS	328	0.047
TOTAL PERMANANT WETLAND IMPACTS		0.789

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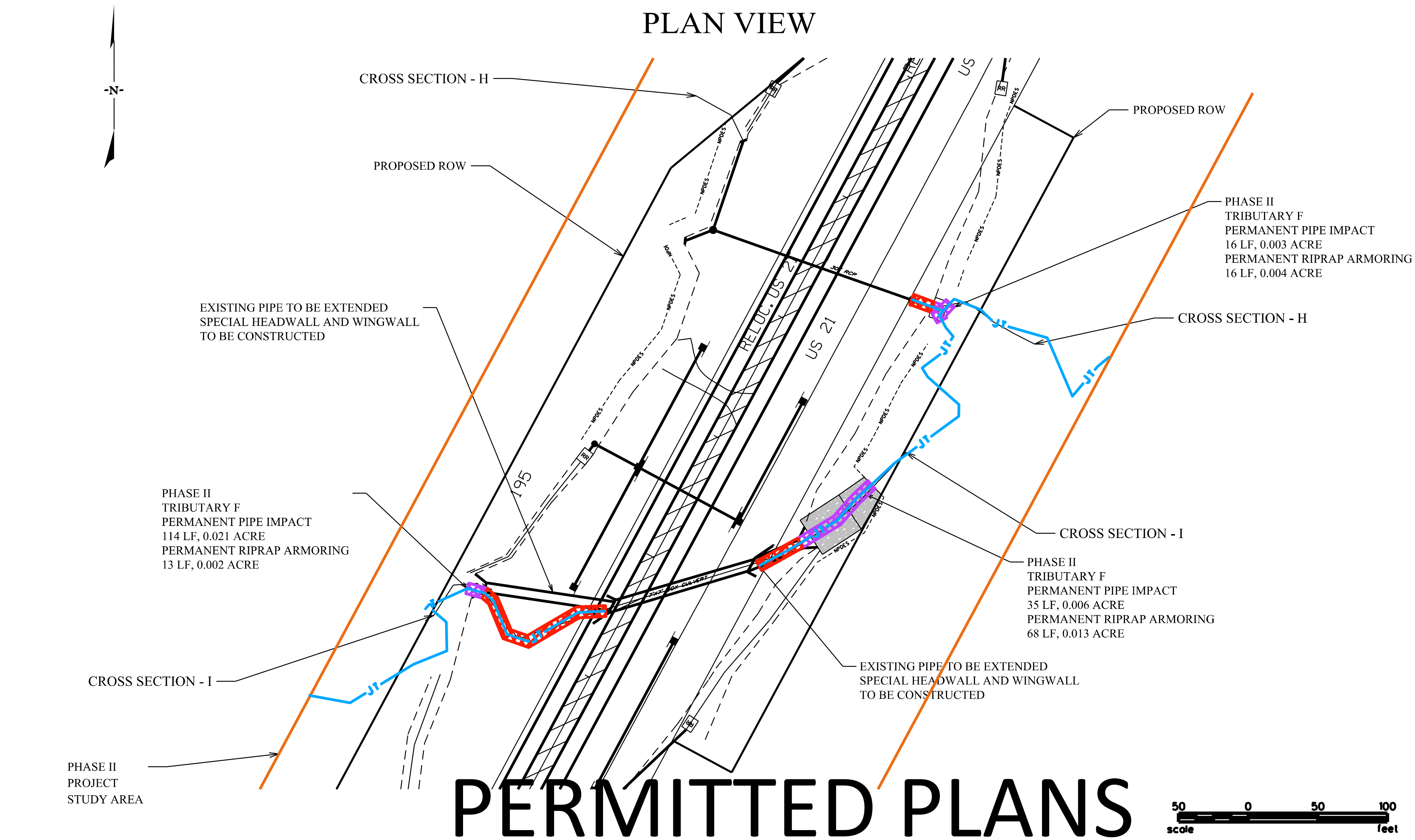
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 16 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
PLAN VIEW



JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANANT TRIBUTARY ARMORING IMPACT	97	0.019
PERMANANT TRIBUTARY PIPE IMPACT	165	0.030
TOTAL PERMANENT TRIBUTARY IMPACTS	262	0.049

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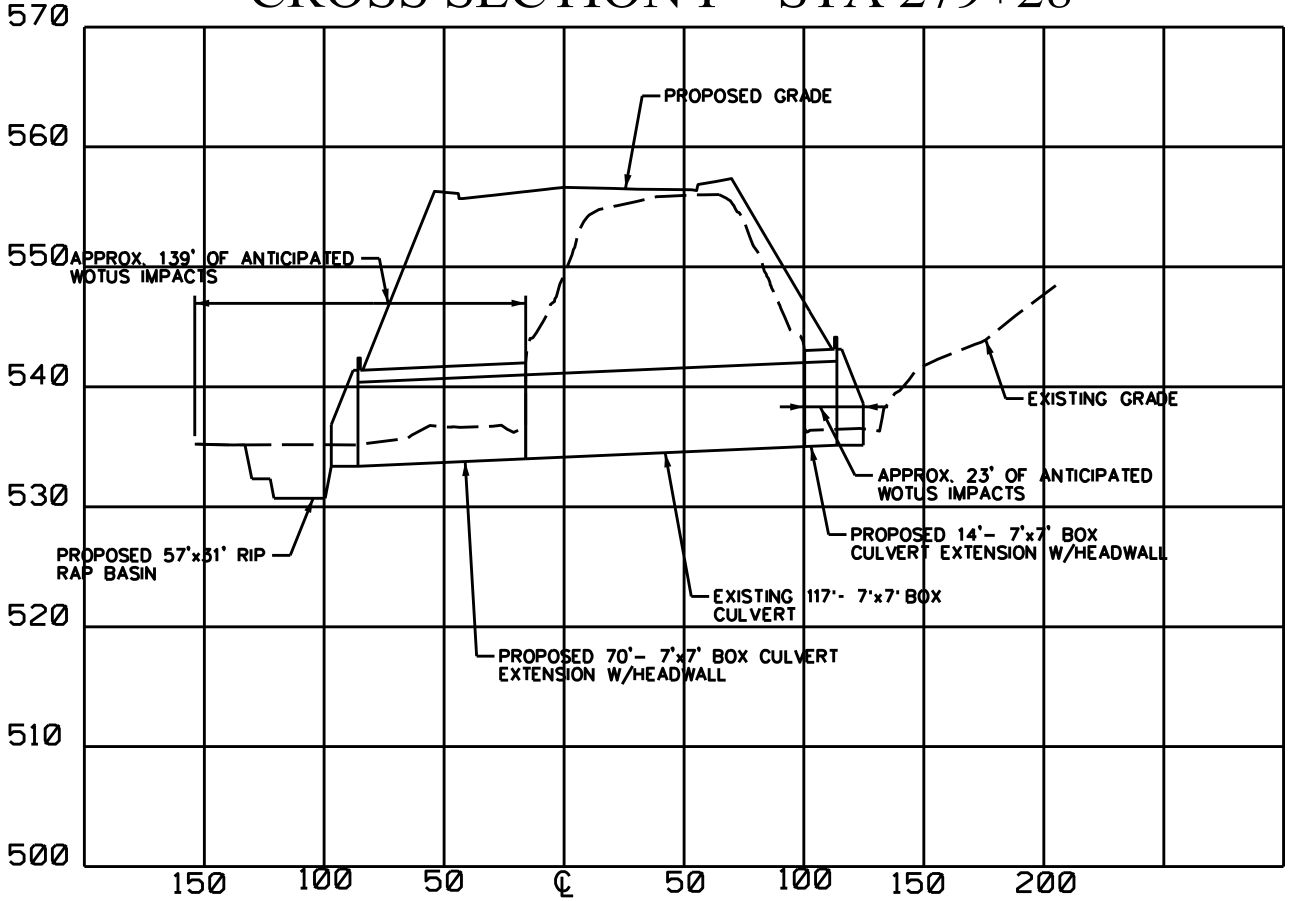
SCDOT PROJECT ID 42332 & 39235	
SHEET: 17 OF 21	DATE: 12-6-2021

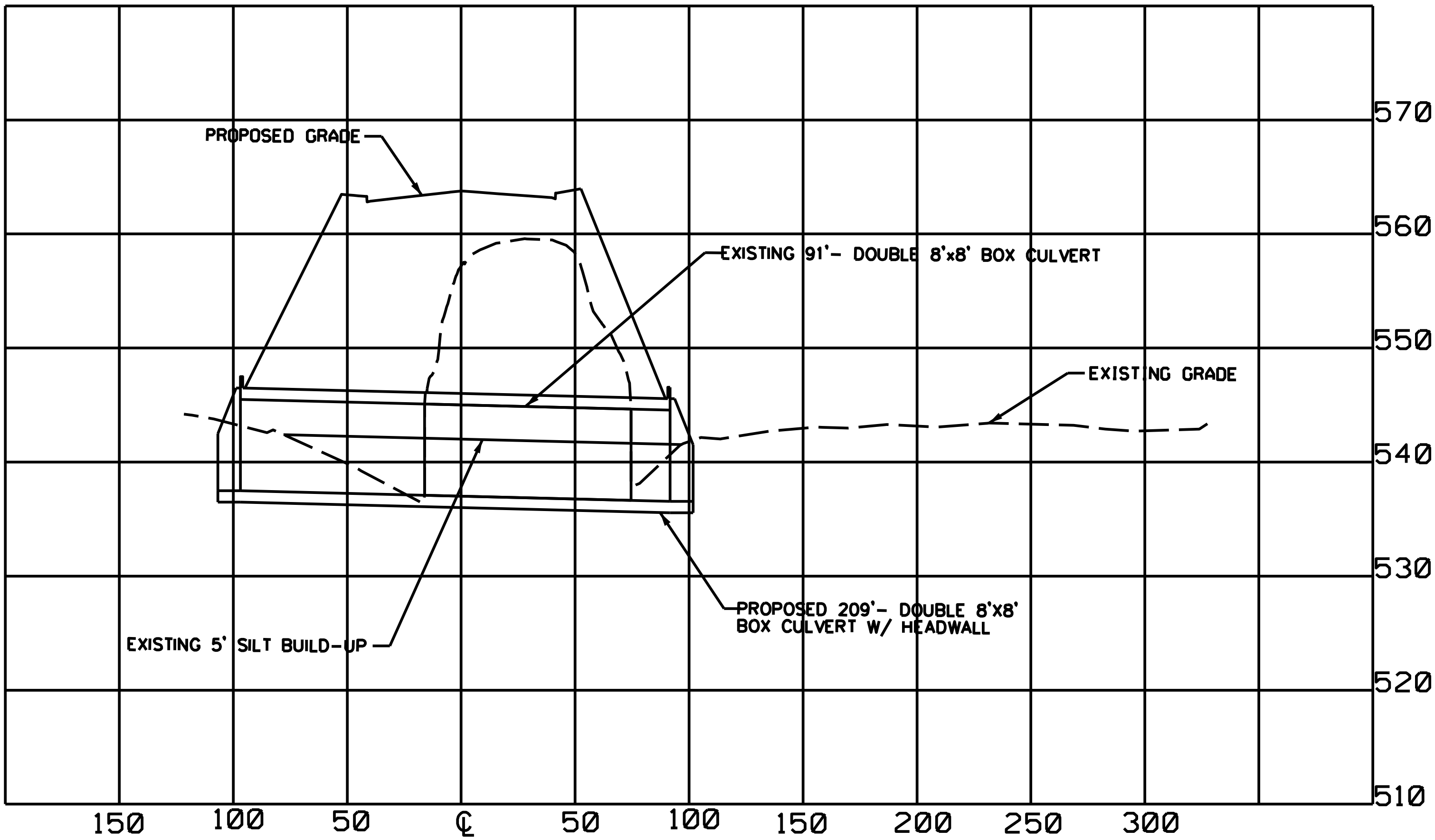
US 21 NORTH PHASE II
CROSS SECTION F - STA 279+28



PERMITTED PLANS

		STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730 (803) 980-4970 fax: (803) 980-4099 Campco Engineering Inc 156 Oakland Avenue Rock Hill, South Carolina 29730 (803) 327-7121	APPLICANT: SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION PROJECT: US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II LOCATION: YORK COUNTY, SOUTH CAROLINA YORK COUNTY PROJECTS 11149-004 & 17228-015 SCDOT PROJECT ID 42332 & 39235 SHEET: 18 OF 21 DATE: 12-6-2021

US 21 NORTH PHASE II
CROSS SECTION G - STA 217+06



PERMITTED PLANS

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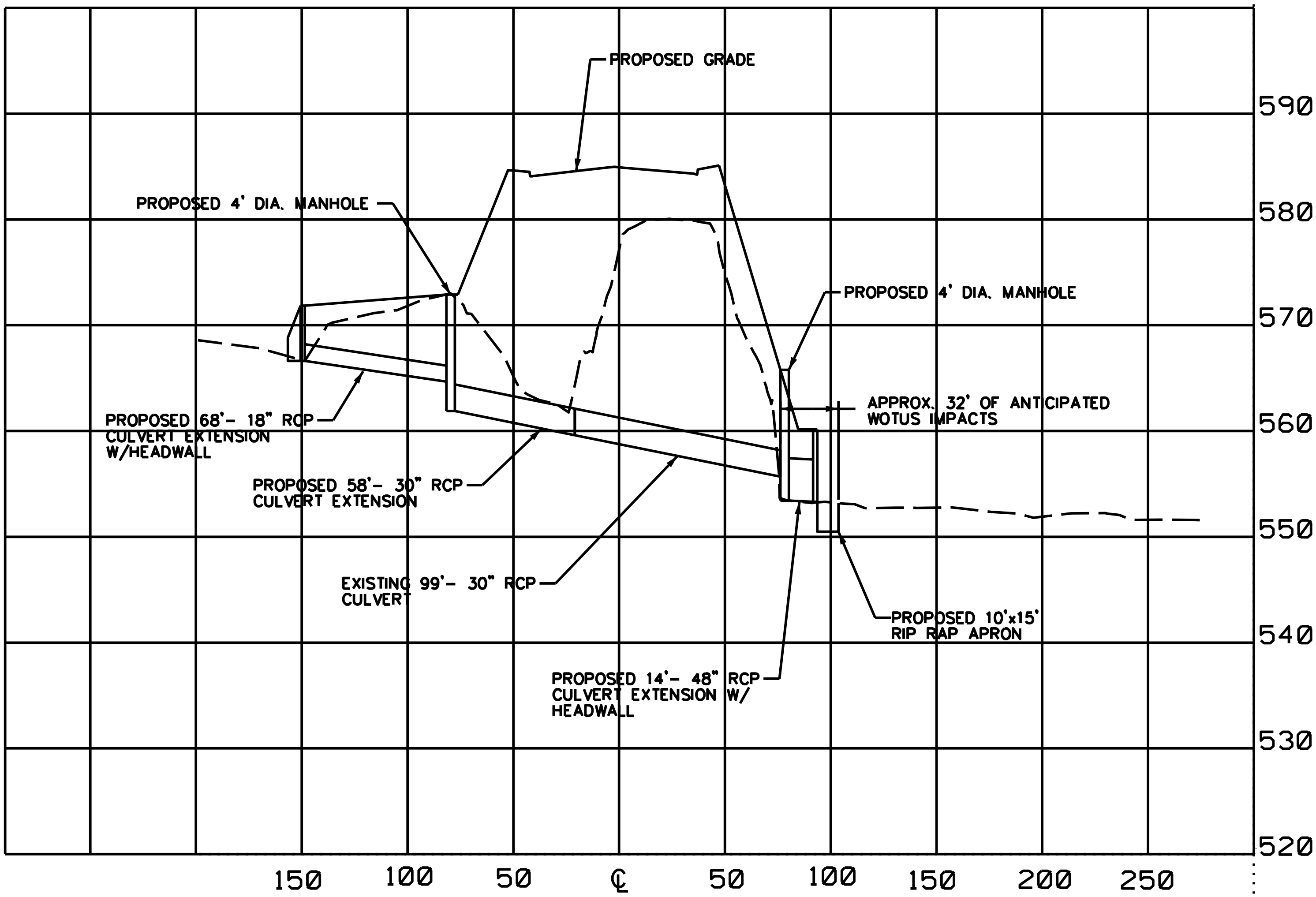
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, South Carolina 29730
(803) 980-4970 fax: (803) 980-4099

Campco Engineering Inc
156 Oakland Avenue
Rock Hill, South Carolina 29730
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 19 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
CROSS SECTION H - STA 197+46



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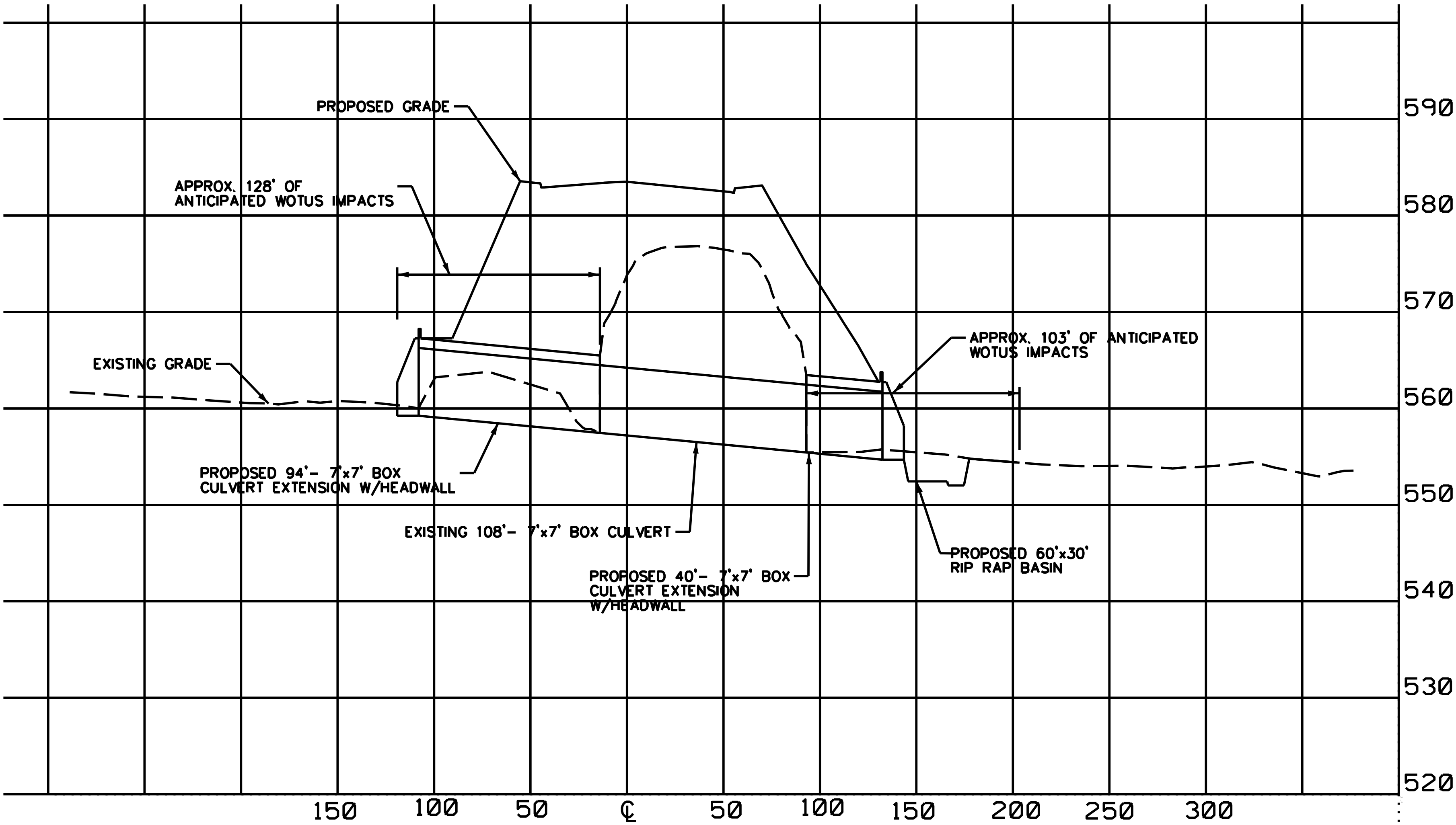
Rock Hill, South Carolina 29730
(803) 980-4970 fax: (803) 980-4099

Campco Engineering Inc
156 Oakland Avenue
Rock Hill, South Carolina 29730
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 20 OF 21	DATE: 12-6-2021

US 21 NORTH PHASE II
CROSS SECTION L - STA 194+87



PERMITTED PLANS

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454 South Anderson Road, Suite 3, BTC 517
Rock Hill, South Carolina 29730
(803) 980-4970 fax: (803) 980-4099

Campco Engineering Inc
156 Oakland Avenue
Rock Hill, South Carolina 29730
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 21 OF 21	DATE: 12-6-2021

Healthy People. Healthy Communities.

January 5, 2023

Jackie Galloway, SCDOT
PO BOX 191
COLUMBIA, SC 29202

Re: Certification in Accordance with Section 401 of the Clean Water Act, as amended.

SC DOT
Jackie Galloway, SCDOT
US 21 & SC 51 Interchange
Steele Creek
York County
P/N: SAC-2015-00812 Revised

Dear Sir or Madam:

South Carolina Department of Health and Environmental Control (DHEC) staff have reviewed plans for this project and determined there is a reasonable assurance that the proposed project will be conducted in a manner consistent with the Certification requirements of Section 401 of the Federal Clean Water Act, as amended. In accordance with the provisions of Section 401, we certify that this project, subject to the indicated conditions, is consistent with applicable provisions of Section 303 of the Federal Clean Water Act, as amended. We also hereby certify that there are no applicable effluent limitations under Sections 301(b) and 302, and that there are no applicable standards under Sections 306 and 307.

This certification is subject to the following conditions:

401 Water Quality Certification Conditions:

1. The applicant must implement appropriate best management practices that will minimize erosion and migration of sediments on and off the project site during and after construction. These practices should include the use of appropriate grading and sloping techniques, mulches, silt fences, or other devices capable of preventing erosion, migration of sediments, and bank failure. All disturbed land surfaces and sloped areas affected by the project must be stabilized. Customize Text

2. Prior to beginning any land disturbing activity, appropriate erosion and siltation control measures (i.e., silt fences or barriers) must be in place and maintained in a functioning capacity until the area is permanently stabilized.

3. Materials used for erosion control (e.g., hay bales or straw mulch) will be certified as weed free by the supplier.

4. All necessary measures must be taken to prevent petroleum products, tar, trash, construction debris, and other pollutants from entering the adjacent offsite areas/wetlands/waters.

5. Once the project is initiated, it must be carried to completion in an expeditious manner to minimize the period of disturbance to the environment.

6. Upon project completion, all disturbed areas must be permanently stabilized with vegetative cover (preferable), riprap or other erosion control methods as appropriate.

7. The project must comply with any applicable floodplain, stormwater, land disturbance, or riparian buffer ordinances.

8. As compensatory mitigation for unavoidable impacts, the applicant must purchase 7,175.5 stream mitigation credits and 3.18 freshwater wetland credits from the USACE-approved mitigation banks as described in the November 9, 2022 revised mitigation plan in the quantities and types specified (restoration and preservation) in the revised mitigation plan. The applicant must also purchase 1.905 acres of freshwater wetland mitigation (representing a 3:1 ratio of compensatory mitigation to impacts due to watershed location) from the SCDOT Black River Mitigation Bank as specified in the same plan.

9. The applicant must submit evidence to the USACE and to the SCDHEC that the number and type of stream and wetland mitigation credits and wetland acres have been purchased from the specified approved banks as referenced above in condition number eight and in the revised mitigation plan dated November 9, 2022, within 60 days of permit issuance or prior to beginning work authorized by the Department of the Army permit.

DHEC reserves the right to impose additional conditions on the Certification to respond to unforeseen, specific problems that might arise and to take any enforcement action to ensure compliance with State water quality standards.

Sincerely,

Nathan Haber, Director
Division of Water Quality
Bureau of Water

cc: US Army Corps of Engineers
Charleston District Office
Midlands-York County-Environmental Affairs District Office

NOTICE OF COMMENCEMENT OR COMPLETION
OF WORK AUTHORIZED BY PERMIT

____________ __________________
DATE

*WORK AUTHORIZED BY DEPARTMENT OF THE ARMY PERMIT*____

*DATED*__ ___________________________

TO PERFORM WORK IN ____ _______________________________
(WATERBODY NAME)

WAS COMMENCED
*ON*__________________________
WAS COMPLETED *(DATE)*
(circle appropriate response)

____
(SIGNATURE)

FL 130
5 MAR 79

- -

NOTICE OF COMMENCEMENT OR COMPLETION
OF WORK AUTHORIZED BY PERMIT

____
DATE

WORK AUTHORIZED BY DEPARTMENT OF THE ARMY PERMIT_________________________

DATED_____________________________

TO PERFORM WORK IN ____
(WATERBODY NAME)

WAS COMMENCED
ON__________________________
WAS COMPLETED (DATE)
(circle appropriate response)

____
(SIGNATURE)

FL 130
5 MAR 79

dhec

Healthy People. Healthy Communities.

January 5, 2023

Jackie Galloway, SCDOT
PO BOX 191
COLUMBIA, SC 29202

Re: Certification in Accordance with Section 401 of the Clean Water Act, as amended.

SC DOT
Jackie Galloway, SCDOT
US 21 & SC 51 Interchange
Steele Creek
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5. Once the project is initiated, it must be carried to completion in an expeditious manner to minimize the period of disturbance to the environment.

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Sincerely,

Nathan Haber, Director
Division of Water Quality
Bureau of Water

cc: US Army Corps of Engineers
Charleston District Office
Midlands-York County-Environmental Affairs District Office

Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) For Construction Activities:

Project/Site Name:

US 21 & SC 46-48 (SC 51) Widening

Project Address/Location:
US 21 from SC 460 to SC 46-48
Fort Mill, South Carolina 29715

Primary Permittee:

York County
6 South Congress Street
Box 148
York, South Carolina 29745

Permittee/Owner Contact:
Lisa W. Hagood, PE
County Engineer
P.O. Box 148
York, South Carolina 29745

SWPPP Preparer:

STV Incorporated
Guy P. Peters, PE, CFM
454 South Anderson Road Ste. 3, BTC 517
Rock Hill, South Carolina 29730-3392
803 207 2025
guy.peters@stvinc.com

Day-to-Day Operator:

Steven Moss
Construction Inspector
6 South Congress Street
P.O. Box 148
York, South Carolina 29745

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS
22Dec23

C-SWPPP Preparation Date:

17 February 2023
22 December 2023 r1

Modification Dates:
Modification I: __ __ / __ __ / __ __ __ __
Modification II: __ __ / __ __ / __ __ __ __

SOUTH CAROLINA
STV INCORPORATED
NO. C03318
CERTIFICATE OF AUTHORIZATION

Table of Contents

Section 1 — *PROJECT OVERVIEW*

Section 2 — *SITE FEATURES AND SENSITIVE AREAS*

Section 3 — *COMPLIANCE REQUIREMENTS*

Appendices — *REFERENCE MATERIAL*

**C-SWPPP is acronym for Comprehensive Storm Water Pollution Prevention Plan*
***OS-SWPPP is acronym for On-Site Storm Water Pollution Prevention Plan*

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS
22Dec23

SOUTH CAROLINA
STV INCORPORATED NO. C03318
CERTIFICATE OF AUTHORIZATION

2

Section 1 *PROJECT OVERVIEW*

1.1 Narrative (CGP Section 3.2.1)

Construction Activities and BMP Summary

York County has contracted STV Incorporated to provide professional engineering services for the proposed US 21 and SC 51 improvement project. The project extends along US 21 from SC 460 north to the newly aligned SC 51 and extends along SC 51 to the North Carolina / South Caroline state line. The project area is noted in Figure 1.1, shown below.

The sediment and erosion control structures for this project consist of silt fence, sediment tubes, sediment basins, inlet filters, and outlet protection. Proposed stormwater conveyances, consisting of grass lined channels and ditch berms will address permanent water quality.

The project will widen US 21 for approximately 12,000 feet, disturbing existing pavement and grading shoulders within the proposed construction limits. The approximate total disturbed area is 49.0 acres. Proposed construction along the route will affect wetlands in the area.

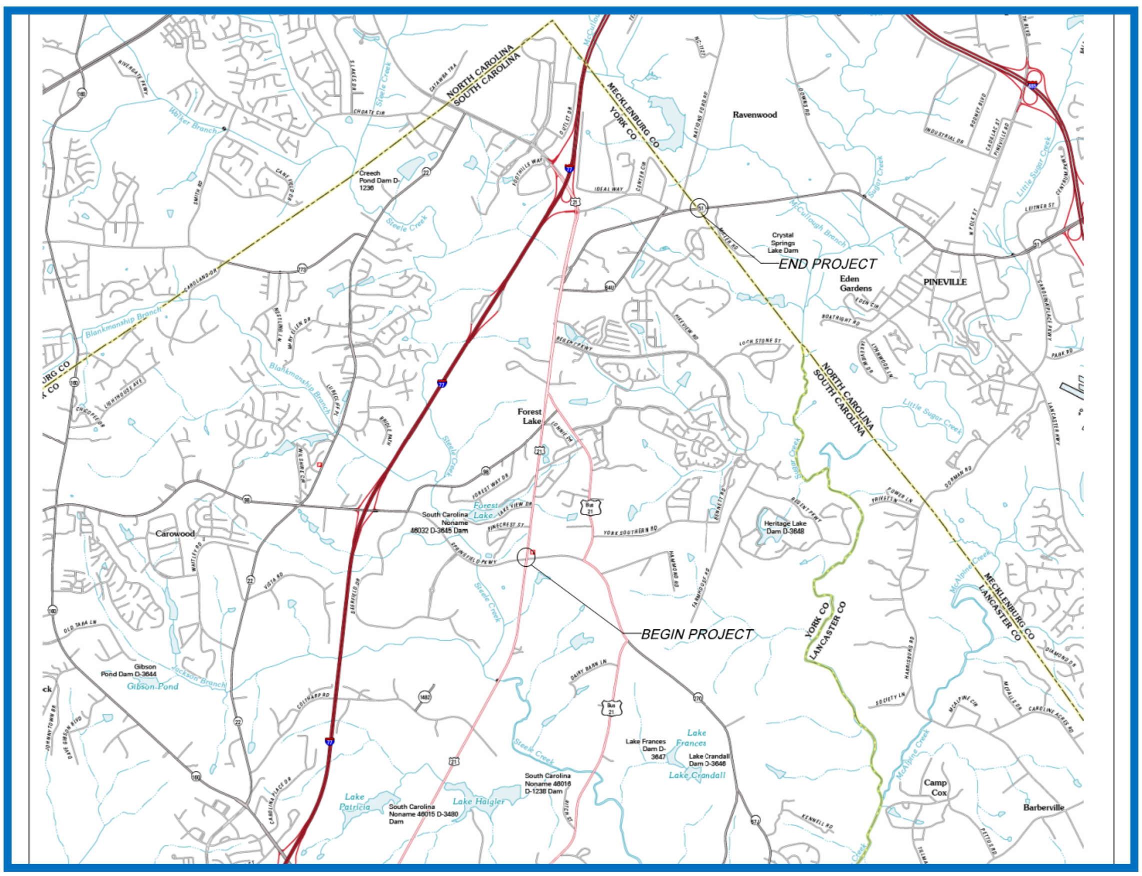

Figure 1.1: Project Location

Pre-Development Conditions

The project is located north of the town of Fort Mill in York County, South Carolina. The project area is rolling terrain with elevations ranging from 583 to 671 feet above sea level. The existing ground gradients typically range from 0.1 to 14 percent. The existing site soil features, as identified by The United States Department of Agriculture NRCS Web Soil Survey of York County, South Carolina, consist predominantly of loamy sands and clay loam. Additional soils information and a soils map are in Appendix E, Stormwater Management Design Study.

The existing on-site drainage is predominantly collected in roadside ditches that drain toward Steele Creek to the west and Sugar Creek to the east. Both Steele and Sugar Creeks are the project's ultimate outfalls and are located directly to the west and east respectively of the project. In general, runoff flows north and south along this state road and then is directed to either of these two creeks via existing channels.

Post-Development Conditions

Post-development conditions will closely mimic existing conditions. Minor widening of existing roadway will technically increase peak runoff, but the amount is negligible when compared to runoff from the existing pavement. The existing outfalls will be maintained and will accept the proposed project's drainage. Existing grass lined channels will be utilized where feasible and permanent vegetation will be established on disturbed soil areas after the construction has been completed. Peak discharge increases will not impose any adverse impacts to Steele Creek or adjoining properties. Please also refer to Section 1.6 – Certification Statement and Detention Waiver.

Pre vs. Post Development Peak Discharges Comparison Table

Outfall ID	2-Yr Pre (cfs)	2-Yr Post (cfs)	10-Yr Pre (cfs)	10-Yr Post (cfs)
Outfall 1	40	86	75	145
Outfall 2	45	30	108	84
Outfall 3	106	112	220	227
Outfall 4	3	4	8	9
Outfall 5	2	2	6	7
Outfall 6	24	18	45	35
Outfall 7	11	7	18	13
Outfall 8	1	1	3	2
Outfall 9	8	8	15	15
Outfall 10	7	9	20	22
Outfall 11	83	86	177	182
Outfall 14	36	50	82	102

Outfall 15	2	1	4	3
Outfall 16	4	1	8	3
Outfall 17	2	1	4	3
Outfall 18	1	1	2	2
Outfall 19	28	17	57	33
Outfall 20	2	2	5	5

Please see Appendix E of the Stormwater Management Design Study for further information. *The Stormwater Management Design Study is wholly contained in Appendix E of this SWPPP.*

As shown in SCDOT and consultant correspondence contained in Appendix E, York County and the designer were urged in the strongest terms by SCDHEC to design the project such that peak flows at outfalls draining to Forest Lake - a private man-made lake/dam/residential development - will not be increased in the post-development condition. The design meets that objective by reallocating discharges from Outfall 2 and 3 to Outfalls 1 and 6 respectively.

Flooding Issues

The existing overall topography will not be modified and there is no anecdotal evidence of flooding issues on – or adjoining – the project. The drainage paths through the watershed are well-established. The project is located outside the FEMA mapped floodplain as shown on Federal Government Emergency Management Agency Flood Insurance Rate Maps (FEMA FIRM). See Appendix E, Stormwater Management Design Study for further information. There are no foreseeable flooding issues that would arise due to the proposed road widening.

1.2 Stormwater Management and Sediment Control (CGP Section 3.2.2)

Erosion Prevention BMPs

As the existing site is cleared, grubbed, and graded to the proposed elevations shown on the construction plans, erosion prevention BMPs shall be placed throughout the construction site to aid in the prevention of sediment-laden stormwater runoff. These BMPs shall be focused in areas with high potential of erosion, areas preceding infiltration practices, and shall be applied to all steep slopes (i.e., slopes equal to or greater than 3H:1V).

Each erosion prevention measure shall be selected on a site-specific basis and details have been provided on the construction plans (see Appendix J). The plans identify all proposed Erosion Prevention BMPs and the recommended installation, maintenance and inspection procedures.

Examples of Erosion Prevention BMPs are, but are not limited to, surface roughening, temporary seeding, erosion control blankets, turf reinforcement mats, sodding, riprap, outlet protection, dust control and polyacrylamide (PAM). Information on the design and proper use of Erosion Prevention BMPs can be located in the SC DHEC's BMP Handbook, and Standard Drawings. The primary erosion control devices employed for Stage 1 of the project are rolled erosion control blankets, sediment basins, rock check dams (ditch checks), silt fence and inlet protection.

Sediment Control BMPs

Sediment Control BMPs are designed to remove some of the sediment accumulated within stormwater runoff, to the best extent practicable. These BMPs help prevent sediment impacts to adjacent properties and water bodies from stormwater discharges originating from construction sites.

Typically, these BMPs are placed near each of the site's outfalls and are installed prior to clearing and grubbing of the site (before large areas of soil are exposed). However, these BMPs can also be located throughout the construction site and, in these circumstances, are installed after mass grading has occurred. Placement, sizing and modifications of Sediment Control BMPs should be left to the SWPPP preparer and/or the Site Engineer. Contractors must consult the SWPPP Preparer as listed at the front of this SWPPP before making any significant changes to these BMPs.

Each sediment control BMP shall be selected on a site-specific basis. Examples of Sediment Control BMPs are, but are not limited to sediment traps, sediment basins, silt fence, rock check dams, rock sediment dikes, sediment tubes and inlet protection. Please consult SC DHEC's BMP Handbook for more information on Sediment Control BMPs.

Structural Control BMPs and Floodplain Placement

This site-specific SWPPP utilizes the following structural control BMPs: permanent vegetated swales and storm sewer systems. These practices have been designed to either divert flows from exposed soils to retain/detain flows, and to otherwise limit the runoff and the discharge of pollutants from disturbed areas of the construction site.

Throughout the lifespan of the construction project these BMPs will be installed and maintained, as required by the SWPPP and the construction plans, until final stabilization has been achieved for the areas draining to each BMP. Upon final stabilization, each structural control BMP must be modified to the post-construction conditions shown within the approved construction site plans or removed, if the structural BMP was a temporary structure.

No Structural Control BMPs are proposed within any 100-yr floodplains for the project.

Construction Entrances and Dust Control

Each access area into and out of the limits of disturbance, will incorporate a construction entrance. Access locations will be determined in the field by the contractor. The use of this BMP will limit the amount of sediment being transported by construction vehicles onto existing roadways or other impervious areas. Any tracked sediment, along with any attached pollutants, deposited on impervious areas could be washed downstream during the next rain event. Each construction entrance must be installed as shown in the details section of the construction plans.

If a new entrance or exit is required, that is not shown on the plans, install the construction entrance as noted by the construction entrance detail, mark the location on the plans and make a record of this minor modification in the SWPPP's modification log, which is located within one of the appendices of the On-site SWPPP.

Roads where vehicles are utilizing construction accesses will be monitored for sediment tracking and accumulated sediments will be removed from the road surface. Maintenance of roads shall be conducted as needed throughout shiftwork and at the end of each shift.

During extremely dry conditions, drought, and/or excessive winds, the construction site should be treated for dust control to prevent the suspension of fine sediment particles into the air, being carried offsite, and deposited on adjacent properties or surface waters. This practice may not be directly called out for on the construction plans. A water tanker used to spray the soil down may be an effective way to prevent excessive dust at a construction site.

Water Quality BMPs During Construction

Site-specific water quality BMPs (e.g., sediment basins, sediment traps, rock check dams, and rock sediment dikes) must be installed prior to the mass clearing, grubbing and grading of the site, and must be kept in functioning order throughout the lifespan of all construction activities. Each of these BMPs must be maintained and inspected until all areas draining to these BMPs have reached final stabilization, approved by the construction site inspector or the SWPPP Preparer and recorded within the stabilization log located as an appendix of the On-site SWPPP.

The location, installation procedures, and maintenance procedures for each water quality BMP can be found within the approved construction site plans.

Post-Construction Water Quality

All construction sites disturbing 5 acres or more, including construction activities associated with Larger Common Plans disturbing 5 acres or more (for sites located within an MS4 this may be 1 acre or more), must be designed to treat water quality post-construction. These water quality controls must be installed and stabilized prior to terminating coverage under the CGP. These controls will require routine maintenance to remain functional. This is to be conducted by the Primary Permittee or the entity that accepts responsibility for these structures once construction has been completed. Additional information, including permanent maintenance and inspection procedures, can be found in Appendix E of the OS-SWPPP or within the construction site plans.

Upon final stabilization, each construction site will have to make the transition from temporary BMPs to permanent BMPs. This transition may include the conversion of a sediment basin to a detention basin, a sediment trap to a bioretention area, or diversion swales to permanently vegetated swales. All post-construction (permanent) water quality and water quantity BMPs are identified in the final phase of the Erosion and Sediment Control or drainage sheets located within the construction plans.

Other Stormwater Management Procedures

Based on the nature, conditions, and/or procedures associated with this construction site, the following items must be followed and adopted by all those conducting land disturbing activities at this site:

- All construction debris must be stockpiled in designated areas, which have been provided with the proper BMPs to prevent the discharge of pollutants through stormwater runoff from building or other similar materials off-site or into surface waters.
- Any additional waste material or stockpile material (i.e., soil and mulch) must also be stored in the designated areas as shown on the Construction Site Plans or as the contractor, responsible for day-day activities at this site, deems appropriate. Silt fence or an approved equal shall surround all stockpiled materials.
- All parties conducting work at this construction site must be informed of and make note of pollutant sources, both industrial and construction, at this site, and be informed of all controls and measures the will be implemented to prevent the discharge of these pollutants in stormwater runoff.
- Any additional non-stormwater discharges, as referenced in the CGP, should be eliminated or reduced to the maximum extent feasible. All unpreventable non-stormwater discharges shall be treated through the approved stormwater management system before release off-site. Following is a list of allowable non-stormwater discharges:
    - Fire hydrant flushing
    - Wash water without detergents
    - Water used for dust control
    - Potable water
    - Building wash down water without detergents
    - Uncontaminated pavement wash water
    - Uncontaminated condensation from mechanical equipment
    - Uncontaminated ground or spring water
    - Water from foundation of footing drains
    - Uncontaminated excavation dewatering
    - Landscape irrigation.

1.3 Sequence of Construction

The construction sequence for this project has been provided on the construction site plans, provided in Appendix J. Each item/step of that construction sequence has been listed is the sequence that they should be implemented.

For additional information or questions on the sequencing please contact the SWPPP Preparer or the Permittee referenced on the cover of this SWPPP.

1.4 Non-Numeric Effluent Limits

Stormwater Volume and Velocity Control

During the implementation of construction activities, all parties performing work at this construction site whose work may affect the implementation of the SWPPP must be informed of and directed on how to comply with this non-numeric effluent limit, which requires the management of stormwater runoff <u>within</u> the construction site and at <u>each outfall</u>. The purpose of this requirement is to control the stormwater volume and velocity at these locations to minimize erosion.

Specifically, each responsible party should be made aware of the practices that have been or should be implemented at the construction site to accomplish these stormwater management practices. Below is a list of practices that may be utilized within the disturbed area and at each outfall at construction sites to control stormwater volume and velocity:

<u>Volume Control</u>

- Limiting the amount of disturbed area and exposed soils
- Staging and/or phasing of the construction sequence.
- Sediment basins and sediment traps
- Diverting off-site flow around the construction site.
- Controlling the drainage patterns within the construction site.
- Temporary stabilization of disturbed areas.

<u>Velocity Control</u>

- Surface roughening and/or another slope stabilization practice.
- Level spreaders, riprap plunge pools and/or other velocity dissipation BMPS located at the construction site and sediment basin outfalls.
- Use of rock checks, sediment tubes, etc. in temporary diversions swales and ditches.
- Use of erosion control blankets, turf reinforcement mats, and other non-vegetative BMPs that can be used to quickly stabilize disturbed areas.

The SWPPP Preparer/Engineer should approve any modifications (Additional BMPs or changes to existing BMPs) to address the management of stormwater volume and velocity prior to implementation. All approved SWPPPs that were issued coverage under the CGP should include ample BMPs and other control measures to address this specific non-numeric effluent Limit.

Soil Exposure, Compaction and Preservation

Throughout construction activities, the amount of soil exposed during construction should be kept to a minimum. This may be accomplished by minimizing the amount the disturbed area within the permitted Limits of Disturbance (shown on the approved construction site plans) to only that which is necessary to complete the proposed work. For areas that have already been disturbed and where construction activities will not begin for a period of 14 days or more, temporary stabilization techniques must be implemented.

Prior to implementation of any major grading activities, topsoil is to be preserved by placing it in areas designated for stockpiling until final grades are reached. Each stockpile must be equipped with proper sediment and erosion controls to preserve the topsoil and protect adjacent areas from impacts. Once final grades have been reached, the preserved topsoil should be utilized to apply to areas identified for stabilization. Topsoil contains nutrients and organisms that aid in the growth of vegetation.

Soil compaction should also be minimized to the degree practicable during grading activities. This is especially important during the replacement of topsoil to aid in a quick establishment of vegetative cover. Soil compaction may also reduce rainfall's ability to infiltrate into the soil, increasing the amount of stormwater runoff.

Soil Stabilization

Throughout construction activities, soil stabilization techniques are to be initiated as soon as practicable whenever any clearing, grading, excavating, or other land-disturbing activities have permanently or temporarily ceased on any portion of the construction site and will not resume for a period exceeding 14 calendar days. For areas where initiating stabilization measures is infeasible, (e.g., where snow cover, frozen ground, or drought conditions preclude stabilization), initiate vegetative or non-vegetative stabilization measures as soon as practicable.

Steep Slopes (Slopes of 30% grade or greater)

All disturbed steep slopes (30% grade, ~3H:1V, or greater), and steep slopes to be created through grading activities must be managed in a fashion that limits the potential of erosion along the slopes. All parties whose work is/was responsible for the creation/disturbance of steep slopes must comply with the following items:

- Minimize the disturbance of all steep slopes, when possible.
- Divert concentrated or channelized flows of stormwater away from and around steep slope disturbances.
- Use specialized BMP controls including temporary and permanent seeding with soil binders, erosion control blankets, surface roughening, reducing continuous slope length with terracing or diversions, gradient terraces, interceptor dikes and swales, grass-lined channels, pipe slope drains, subsurface drains, level spreaders, check

dams, seep berms, and triangular silt dikes to minimize erosion.

- Initiate stabilization measures as soon as practicable on any disturbed steep slope areas where construction activities have permanently or temporarily ceased and will not resume for a period exceeding 7 calendar days.
- A vegetative and/or non-vegetative cover must be established within 3 working days from the time that stabilization measures were initiated.

Stabilization of steep slopes should be a priority for those performing work at the construction site. At the very least, runoff control BMPs should be implemented to transport stormwater runoff from the top of the slope to the toe of the slope. An example of this is to install diversion swales along the top of slope and direct the runoff towards pipe slopes drains to transports the runoff to the toe of the slope. All pipe slope drain outlets are to be equipped proper outlet protection.

Sediment Discharge Minimization

Permittees, contractors, and all other parties responsible for conducting land-disturbing activities are required to install and maintain all erosion and sediment BMPs that are identified on the approved construction site plans. These BMPs have been designed and approved to address such factors as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soils particle sizes expected to be present on the construction site. Proper installation, inspection, and maintenance will allow these BMPs to operate at maximum efficiencies in order to minimize sediment discharges to the maximum extent practical.

Pollutant Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, the following items must be implemented:

- Minimize the discharge of pollutants from dewatering trenches and excavations by managing runoff with the appropriate controls. Otherwise these discharges are prohibited;
- Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
- Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater; and
- Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

Prohibited Discharges

Permittees, Contractors, and all other responsible parties for conducting land-disturbing activities are prohibited to discharges, from the construction site, the following items:

- Wastewater from washout of concrete, unless managed by an appropriate control;
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
- Soaps or solvents used in vehicle and equipment washing.

1.5 Buffer Zone Management

There are no buffer zones to be located or maintained associated with this project.

1.6 Certification Statements & Detention Waivers - following

Detention Waiver – Outfall 1

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

The 2-year and 10-year storm event pre- and post-development peak flows were compared at the Mimosa Lane (OP 010) outfall for this project. Pre and post development flows were computed by the SCS peak flow estimation method. Because post-development flows equal pre-development flows in both the 2- and 10-year storms, the post-development discharge will not result in adverse impacts to the downstream receiving waterbody and/or downstream properties.

SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change*
40	86	115	75	145	93

**refer to narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 2

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change*
45	30	-33	108	84	-22

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 3

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
106	112	5.7	220	227	3.2

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 4

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
3	4	33	8	9	13

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 5

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
2	*2*	*0*	*6*	*7*	*17*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 6

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change*
24	18	-25	45	35	-22

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 7

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
11	*7*	*-36*	*18*	*13*	*-28*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 8

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
1	1	0	3	2	-33

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 9

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
8	*8*	*0*	*15*	*15*	*0*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 10

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
7	9	29	20	22	10

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 11

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
83	*86*	*3.6*	*177*	*182*	*2.8*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 14

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
36	*50*	*39*	*82*	*102*	*24*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 15

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
2	1	-50	4	3	-25

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 16

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
4	1	-75	8	3	-63

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 17

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
2	*1*	*-50*	*4*	*3*	*-25*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 18

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
1	1	0	2	2	0

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 19

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			*10-year (10% AEP, cfs)*		
Pre	*Post*	*% change**	*Pre*	*Post*	*% change*
28	*17*	*-39*	*57*	*33*	*-42*

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Detention Waiver – Outfall 20

I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.

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SUMMARY OF DISCHARGES					
2-year (50% AEP, cfs)			10-year (10% AEP, cfs)		
Pre	Post	% change*	Pre	Post	% change
40	86	115	75	145	0

**see narrative section 1.1 for explanation*

Following this statement are supporting calculations for runoff estimation by the SCS method.

Name: Guy P. Peters, PE, CFM

Title: Senior Engineer

Date: 22 December 2023

A copy of this certification statement and detention waiver has been included under a separate cover as requested by SCDHEC.

Section 2

SITE FEATURES AND SENSITIVE AREAS

2.1 Sources of Pollution

Throughout construction activities, each permittee, contractor, and person responsible for conducting work will need to ensure that sources of pollution are managed to prevent their discharge from the construction site. Expected pollution sources during construction have been identified in Table 2.1, but due to the nature of construction activities, it is often tough to predict all pollution sources that may appear throughout the life of a construction project. For that reason, the following table has also been provided to help all those performing work at this construction site identify possible sources of pollution

Stormwater runoff subjected to the identified pollution sources must be treated by the appropriate BMPs as directed by this SWPPP.

In the event that any additional sources of pollution are identified during construction, the person(s) with day-to-day operational control at the site is to add the new source(s) to Table 2.1 and consult with the SWPPP Preparer to properly address this source and to prevent the discharge of its pollutant through stormwater runoff.

Table 2.1: Potential Sources of Pollution

Source	Material or Chemical	Location*	Appropriate Control Measures
Loose soil exposed/disturbed during clearing, grubbing and grading activities	Sediment	All areas within the Limits of Disturbance	As directed by the construction Plans. This includes Silt Fence, sediment tubes, sediment basins, and sediment traps.
Areas where construction equipment are cleaned, a.k.a. concrete washout	Heavy Metals & pH	Selected locations as needed	Concrete Washout Basin.
Water encountered during trenching	Nutrients & Sediment	In and around any trenching activities.	Direct water into filter bags and/or impoundments such as basins or traps to allow for the sedimentation of the listed pollutants.
Material Delivery and Storage Areas	Nutrients, pH, Sediment, Heavy Metals, oils & grease	All areas used as storage areas	Silt fence and/or sediment dikes
Equipment fueling and maintenance areas	Metals, hydrocarbons, oils and greases	Areas surrounding fuel tanks	Provide secondary containments, locate in upland areas. Repair leaking and broken hoses.
Paints	Metal oxides, solvents, talc, calcium-carbonate, arsenic	Throughout site, primarily in areas of building construction	Wash-water should be contained and is prohibited from being discharged

*Area where material/chemical is used on site.

2.2 Surface Waters

Stormwater runoff from the proposed construction site will discharge into existing drainage systems as identified in Section 1. These outfalls discharge to both Steele Creek to the west and Sugar Creek to the east. Ultimately, both these waterways make their way to the Catawba River. The overall general flow paths are shown below in Figure 2.1 with dark blue arrows and the project area shown in red.

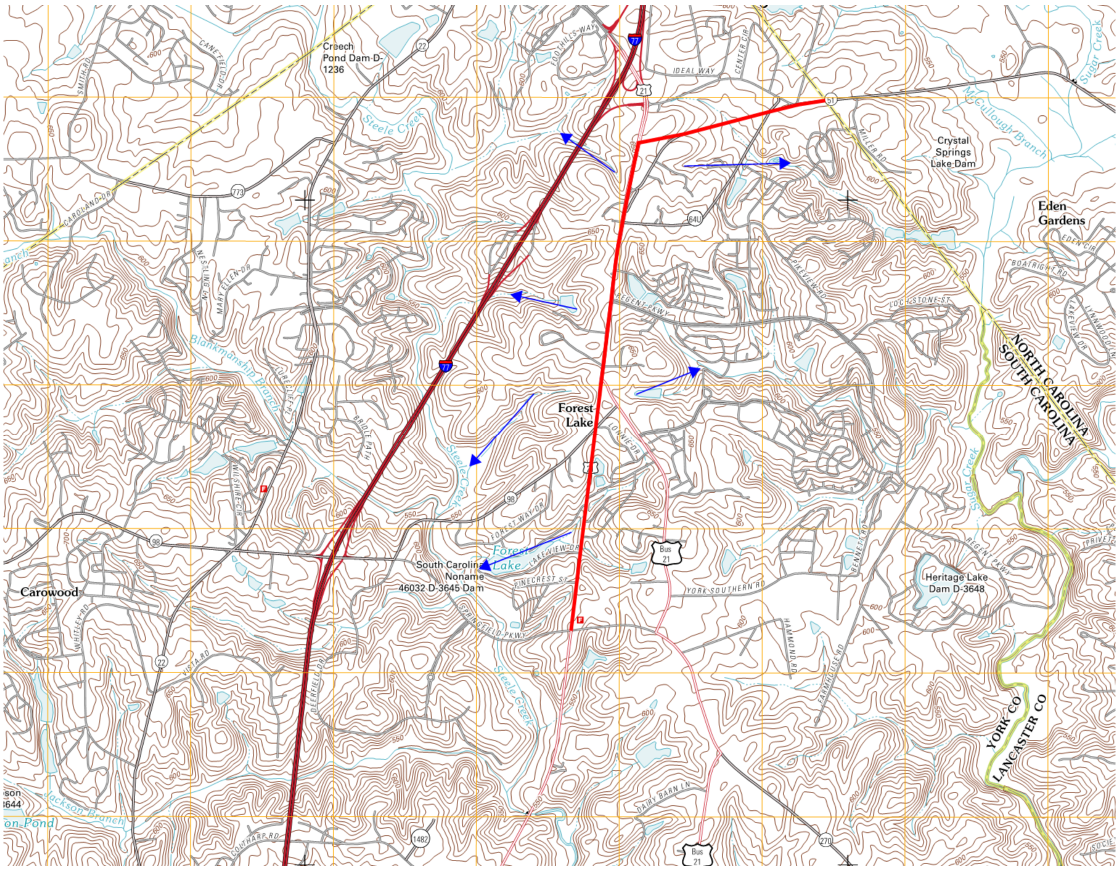


Figure 2.1: Stormwater Runoff Route

2.3 Impairments and TMDLs

Some Waters of the State (WoS) have been identified as not meeting the State's water quality standards for recreational swimming, fish consumption aquatic life use, and/or shellfish harvesting for one or more pollutants even after controls for point and nonpoint source pollution have been put in place. These waterbodies have been classified as "impaired." Once these waterbodies have been identified they are listed on the State's 303(d) List of Impaired Waterbodies. South Carolina lists impairments as "stations" where samples were taken along a waterbody.

The most recently-approved 303(d) list can be found at the following webpage:

https://scdhec.gov/bow/south-carolina-303d-list-impaired-waters-tmdls

After a pre-determined period of time, SCDHEC is obliged to develop a Total Maximum Daily Load (TMDL) for the pollutant of concern for each impaired station listed on the

303(d) List. A TMDL is the amount of a single pollutant (such as bacteria, nutrients, or metals) that can enter a waterbody on a daily basis and that waterbody still meet water quality standards. "TMDL" refers to both a calculation of a pollutant entering a waterbody as well as the document containing this calculation along with source assessments, watershed, and land use information, reductions and allocations information, implementation and other relevant information, maps, figures, and pictures.

Once a TMDL has been developed and approved by the EPA, the impaired WoS is removed from the 303(d) list. A separate list is maintained for WoS with approved TMDLs.

Any construction site whose discharges are released in a WoS listed on the 303(d) List or for which an EPA-approved TMDL has been developed must address the specific pollutant set forth in the TMDL and/or potential pollutants for the impairment. The SWPPP must include a description of BMPs to address these pollutants.

The primary permittee and/or contractor must ensure that the construction site discharges remain in compliance with the State's water quality standards. To do so, these parties will have to ensure the function of all approved BMPs to handle the specific pollutant.

Construction Stormwater Discharges are expected to contain pollutants that contribute and/or can caused the following impairments to receiving water bodies: BIO (Macroinvertebrate Community), Turbidity, TP (Total Phosphorus), TN (Total Nitrogen), CHLA (Chlorophyll-a), and Fecal Coliform in waters classified for Shellfish Harvesting in the coastal zone. The presence of any of these impairments in receiving waters will require approval control of the site's construction stormwater discharges. Information on each of these impairments and how to treat stormwater runoff for these impairments has been provided below.

Impairments Effected by Construction Site Discharges and Methods to Control Potential Pollutants Causing or Contributing to the Impairments

1. BIO (Macroinvertebrate Community): A balanced and varied group of Macroinvertebrate organisms is an indicator of a healthy stream that supports aquatic life. A balanced community can be defined as a natural, diverse group of organisms (including Macroinvertebrate) characterized by the ability to sustain itself through season changes, presence of food chain species and a lack of domination by pollutant tolerant or invasive species. If these conditions do not exist, then the site may be considered impaired due to the presence of an undesirable or non-existent Macroinvertebrate community. Sediment from construction sites may further threaten the propagation of these organisms.

   Address by: Examples include limiting the amount of disturbed area, designing sediment control BMPs to remove the maximum amount of sediment possible, immediate stabilization of disturbed areas, and other practices may be utilized to control the discharge of sediment from construction sites.

2. Turbidity: Turbidity can be generally defined as the "cloudiness" of a waterbody and may be caused by the growth of aquatic phytoplankton and the presence of

suspended solids in the water column. In SC, a water quality standard for turbidity is applicable to all waters of the State (see R. 61-68 D. 11. for numeric targets by waterbody classification). Turbidity levels that exceed the water quality standard may reduce light penetration, thereby inhibiting aquatic flora growth, **and may reduce the ability of fauna, such as fish, to absorb oxygen across their gills.**

Address by: Examples include limiting the amount of disturbed area, designing sediment control BMPs to remove the maximum amount of sediment possible, immediate stabilization of disturbed areas, and other practices may be utilized to control the discharge of sediment from construction sites.

3. TP (Total Phosphorus): Similar to total nitrogen, TP is an essential nutrient for the propagation of aquatic life. In SC, a water quality standard for TP is applicable to lakes greater than 40 acres (see R. 61-68 D. 11. for numeric and narrative targets). At acceptable levels, TP is assimilated by aquatic flora ensures the propagation of an overall balanced, indigenous aquatic community. TP levels that exceed the water quality standard are considered impaired and may cause negative impacts to the overall health of the aquatic community by promoting excessive algal growth in lakes. Phosphorous may enter a site's stormwater when excess amounts of the nutrient are applied to the site during temporary or final stabilization.

   Address by: To prevent this soil should be tested to determine the quantity of the nutrient present in the soil and the correct amount that needs to be added so that it is absorbed by the vegetation.

   TN (Total Nitrogen): Similar to total phosphorus, TN is an essential nutrient for the propagation of aquatic life. In SC, a water quality standard for TN is applicable to lakes greater than 40 acres (see R. 61-68 D. 11. for numeric and narrative targets). At acceptable levels, TN is assimilated by aquatic flora and ensures the propagation of an overall balanced, indigenous aquatic community. TN levels that exceed the water quality standard are considered impaired and may cause negative impacts to the overall health of the aquatic community by promoting excessive algal growth in lakes. Nitrogen may enter a site's stormwater when excess amounts of the nutrient are applied to the site during temporary or final stabilization

   Address by: Examples include that the soil should be tested to determine the quantity of the nutrient present in the soil and the correct amount that needs to be added so that it is absorbed by the vegetation.

4. Chlorophyll-a (CHLA): CHLA is a pigment present in the cells of photosynthetic flora and some algal species. The presence of CHLA in an aquatic environment is a water quality indicator of the overall productivity in the aquatic system. CHLA is linked to the levels of TP, TN and light penetration in the water column. In SC, a water quality standard for CHLA is applicable to lakes greater than 40 acres (see R. 61-68 D. 11. for numeric and narrative targets). CHLA levels that exceed the water quality standard may suggest that other undesirable water quality impacts are present as the aquatic system may be too productive to support the propagation of an overall balanced, indigenous aquatic community. Excess nutrients may discharge from a construction site during temporary and final stabilization. Limiting the amount of phosphorus and

nitrogen applied while **establishing vegetation will prevent excessive levels of CHLA in receiving waters.**

Address by: Examples include that the soil should be tested to determine the quantity of the nutrients present in the soil and the correct amount that needs to be added so that it is absorbed by the vegetation.

5. Fecal Coliform (FC) in Shellfish Harvesting waters: Fecal Coliform is an indicator bacteria for other pathogens which may be present in a waterbody. Shellfish Harvesting Waters are tidal salt-waters protected for shellfish harvesting and must be protected to a higher standard than other waters because of the risk to human health posed by ingesting shellfish from areas with high levels of bacteria. Bacteria levels increase following rain events. Potential sources of bacteria on construction sites include improperly located porta-johns and litter that may attract rodents and other animals.

   Address by: Porta-johns should be placed away from WoS and not placed on catch basins and other drainage structures. Litter and construction debris should be placed in identified areas and emptied on a routine basis.

Impairment Sources and Prevention

Construction sites can contribute to these impairments directly through the release of excess soil and/or nutrients within stormwater runoff. For this reason, proper sediment and erosion control BMPs should be implemented and the design of the stormwater management systems, during both construction and post-construction, should address the control of stormwater runoff. A reduction in the volume released or the rate at which this volume is released can significantly improve the quality of stormwater runoff and limit the amount of the pollutants that contribute to the above listed impairments.

As an example, sediment basins and/or traps should be used during construction to allow for sedimentation of soils/nutrients, and to control the release of stormwater into the impaired water body. Vegetated Detention and Infiltration structures should be implemented as post-construction BMPs to control stormwater volumes. Caution is advised when using fertilizers to reach Final Stabilization; excess fertilizer can contribute to each of the above listed impairments.

Site-Specific Requirements

This construction site's discharges drain into Sugar Creek, which currently has only a BIO impairment designation. Due to the possibility of pollutants in construction stormwater discharges from this site creating an impairment, the following must be conducted throughout the lifespan of all land-disturbing activities at this site:

- Bi-weekly inspections of all the primary sediment control BMPs;
- Employee training/acknowledgement during the Pre-Construction Meeting;
- Installation of additional BMPs to meet the water quality standards (as directed by the SWPPP preparer and as approved by the regulating agency); and

- All sediment control BMPs have been designed to meet or exceed an 80% trapping efficiency.

2.4 Critical Areas

There are no Critical Areas located within or directly adjacent to the disturbed areas.

Section 3 *Compliance Requirements*

3.1 SWPPP Availability

Section 3.1.6 of the CGP requires that a copy of the On-Site SWPPP (OS-SWPPP), as defined by Section 3.1.1.H of the CGP, must be retained at the locations where the OS-SWPPP can be easily accessed during normal business hours from the date of commencement to the date that final stabilization is reached. Due to the nature of this project, the OS-SWPPP will be retained at the construction site. The OS-SWPPP must be made available upon request and at the time of a construction site inspection by the EPA, SCDHEC, local government officials, and the Operator of the Municipal Separate Storm Sewer System (MS4).

3.2 Pre-Construction Conferences

A pre-construction conference must be held for this construction project and its approved On-Site Stormwater Pollution Prevention Plan (OS-SWPPP). Each contractor, subcontractor, utility provider, etc., who will work at a site must attend this conference in person. The primary purpose of this conference is for:

- The preparer of the SWPPP or someone with a registration equivalent to that of the preparer of the SWPPP; and/or
- The person with operational control of the plans and specifications (the Primary or Secondary Permittee) or their duly authorized representative (as defined in Section 122.22(b) of SC Regulation 61-9) to review and explain the On-Site SWPPP (OS-SWPPP) so that all are aware of the requirements before they start performing construction-related (land disturbing) activities that may affect the implementation of the approved OS-SWPPP. This conference may be held simultaneously with all contractors and builders present or may be conducted separately with one or more contractors, subcontractors, etc. present.

The conference must be held on-site and must specifically address Section 3.1.7 of the CGP detailing how each type of modification, Major and Minor, will be addressed and processed at the construction site to maintain compliance. The persons conducting the conference must document each contractor, subcontractor, utility provider, etc. attending the conference, and include the date, time, location, and identification of the attendees. These records must be maintained with the OS-SWPPP.

3.3 Inspection Requirements

Section 4.2 of the CGP requires that inspections be conducted on a routine basis of all areas disturbed by construction activity. These areas include perimeter BMPs and material storage areas exposed to precipitation. The purpose of the inspections is to look for evidence of, or potential for, inefficiencies within the On-Site SWPPP (OS-SWPPP), whether they are a direct result of improper design, installation, or maintenance. At a minimum, the inspections shall include the following:

- All areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation.
- All stormwater conveyance systems for any evidence of, or the potential for, pollutants entering these systems.
- All BMPs identified in the OS-SWPPP.
- All discharge locations to ascertain whether the implemented BMPs are effective in preventing the discharge of sediment from the site. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable.
- Locations where vehicles enter or exit the site must be inspected for evidence of the off-site sediment tracking.

The Permittee shall provide qualified personnel and be responsible for inspections of the construction activity and performance of BMPs.

Frequency

The frequency of the inspections shall be at least bi-weekly after the date of commencement until the date that final stabilization is reached. The frequency may be increased based on the frequency of storm events of 0.5 inches or greater and under the direction of SCDHEC. The frequency of inspections may be reduced to at least once every month for areas that have reached and maintain temporary or final stabilization with no additional disturbance. If a definable area reaches final stabilization, this may be marked on the inspection reports of the OS-SWPPP, and no further inspections of the area will be required

Rainfall Data

Rainfall data for the days of inspection and rainfall events of 0.5 inches or greater must be maintained in the OS-SWPPP. The Permittee may maintain an on-site rain gauge or use data from a certified weather record within a reasonable proximity of the construction site to record the rainfall amounts.

Inspector Qualifications

“Qualified personnel” means a person knowledgeable in the principles and practice of erosion and sediment control who possesses the skills to assess conditions at the construction site that could impact Stormwater quality and to assess the effectiveness of any BMPs selected to control the quality of stormwater discharges from the construction site, This person must be either the preparer of the approved C-SWPPP or an individual who is under the direct supervision of the preparer or the approved C-SWPPP and who meets the requirements of qualified personnel as described below or an individual who has been certified through a Constructions Site Inspector Certification Course that has been approved by SCDHEC. Inspections may also be conducted by a person with a registration equivalent to the registration of the preparer of the C-SWPPP and who meets the qualifications listed below or an individual who is under the direct supervision of the person with an equivalent registration and who meets the requirements listed below.

Inspection Reports

For each inspection required above, the Permittee, or designated personnel, must complete an inspection report. At a minimum, the inspection report must include:

- The inspection data.
- Names, titles, and if not previously given in an inspection report, the qualifications of personnel making the inspection, unless those qualifications change.
- Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any additional discharges have occurred. At the very least, the total rainfall (in inches) since the time of the last inspection must be recorded.
- Weather information and a description of any discharges occurring at the time of the inspection.
- Location(s) of discharges of sediment of other pollutants form the site.
- Location(s) of BMPs that need maintenance.
- Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location.
- Location(s) where additional BMPs are needed that did not exist at the time of inspection.
- Corrective action required including any changes to the OS-SWPPP necessary and implementation dates.
- Site Name, Operator Name and permit number.
- Verification that all BMPs and stormwater controls identified in the OS-SWPPP have been installed and are operating as designed.

A record of each inspection and of any actions taken in accordance with the Permit must be retained as part of the OS-SWPPP for at least three years from the date that permit coverage expires or is terminated and must be signed by the qualified inspector(s).

3.4 Maintenance Requirements

Construction Maintenance

While conducting construction activities, the BMPs and other protective measures identified on the plans and in the OS-SWPPP must remain in effective operating condition. If inspections find BMP's that are not operating effectively, maintenance must be performed before the next scheduled inspection or as soon as reasonably possible before the next storm event, whenever practicable.

If inspections reveal that a BMP has been used inappropriately or incorrectly, the Permittee must address the necessary replacement or modification required to correct the issue within 48 hours of identification of the issue. If existing BMPs need to modified or additional BMPs are necessary to comply with the requirements of the General Construction Permit, the implementation must be before the next storm even whenever practicable. If implementation before the next storm event is impracticable, the situation bust be documented in the inspection report in the OS-SWPPP, and alternatives implemented as soon as reasonable possible.

Sediment collected by Silt Fence and other sediment control measures must be removed once the deposited sediment reaches 1/3 the height of the above ground portion of the BMP or lower height as specified by the manufacturer.

Permanent Maintenance

After construction activities have been terminated, the Permittee shall be responsible for maintaining the stormwater management items located within the site. The maintenance of these items shall include the following:

- Moving grass
- Removal of trash and sediment within the ditches
- Cleaning and unclogging pipes
- Inspecting for and addressing erosion of side slopes, if present

The frequency of completing the maintenance activities will be based on an as-needed basis.

3.5 Record Keeping

In addition to and in accordance with Section 3.1.1.H.V. of the CGP, the OS-SWPPP must contain appendices with the following documents:

- SCDHEC Construction General Permit. Provisions may be made for the copy of general permit to be accessed electronically as long as a hard copy can be made available by the end of the working day when required.
- Stamped and Approved Notice of Intent
- NPDES Coverage Approval
- CZC Certification
- North Charleston Municipal Separate Storm Sewer System (MS4) Approval
- Any and all logs as deemed necessary to comply with the Permit which includes, but is not limited to, preconstruction attendance, inspections reports, and rainfall data.

3.6 Final Stabilization

As the final grades for the site are established, the site will be transitioned to final stabilization. The Project Area will be stabilized by permanent seeding. Once temporary BMPs have been removed or converted to post construction BMP's and final stabilization has been reached on all disturbed areas, the Notice of Termination shall be submitted.

Appendix A

Completed NOI Form and Checklist

NOTICE OF INTENT (NOI)
For Coverage(s) of Primary Permittees
Under South Carolina NPDES General Permit
For Stormwater Discharges From Construction Activities SCR100000
(Maintain As Part of On-Site SWPPP)

For Official Use Only
File Number: ______________________
Permit Number: SCR10_____________
Submittal Package Complete: ___________________

*Submission of this Notice of Intent constitutes notice that the Applicant identified in Section II intends to be authorized as a Primary Permittee in the state of South Carolina under NPDES General Permit SCR1000000. **Fees required for review and NPDES coverage of each application type are as listed on page 2 of the Instructions.***

Date: 01/24/2023
Project/Site Name: US 21 North Phase 1 and SC51 Widening **County:** York
(Modification or Change of Information Only) **Prior Approved NPDES Permit or File Number:** ______________________________

Do you want this project to be considered for the Expedited Review Program (ERP)? ☐ Yes or ☑ No (See instructions)

I. Notice of Intent (NOI) Application Type(s)

A. **Project (Application/Review) Type(s)** (Select **ALL** that apply):
☑ New Project (Initial Notification) Ongoing Project: ☐ Permitted or ☐ Un-Permitted
☐ Late Notification ☐ Low Impact Development (LID) or Project Design Above Regulatory Requirements
☐ New Owner/Operator or Company Name Change **(see instructions, attach Form A (Transfer of Ownership))**
☐ Major Modification: **(see instructions, attach Form B (Major Modifications))**
☐ MS4 Project Review
☐ Ocean and Coastal Resource Management (OCRM) Review
☐ Change of Information/Other (Specify): ______________________________

B. If Applicable, identify the entity designated as **MS4 Reviewer and MS4 Operator** (i.e., Lexington County, City of Greer, etc.): **MS4 Reviewer** ____________________ **MS4 Operator** ____________________

II. Primary Permittee Information ☐ Change of Information

☐ Person or ☑ Company	If a Company, are you a ☐ Lending Institution or ☑ Government Entity? Company EIN **(If applicable):** EIN: ____________________

A. **Primary Permittee Name:** York County
Mailing Address: P.O. Box 148 City: York State: SC Zip: 29745
Phone: 803 818 5733 Fax: ____________ Email Address: engineering@yorkcountygov.com

B. **Contact /ODSA Name** (If different from above OR if owner is a company): Lisa W. Hagood, PE
Mailing Address: P.O. Box 148 City: York State: SC Zip: 29745
Phone: 803 684 8571 Fax: 803 684 8596 Email Address: penniesforprogress@yorkcountygov.com

C. **Property Owner Name** (If different from above): South Carolina Department of Transportation
Mailing Address: 338 Robertson Road West City: Rock Hill State: SC Zip: 29730
Phone: 803 324 3545 Fax: ____________ Email Address: JohnstonCJ@scdot.org

III. Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) Preparer Information ☐ Change of Information

A. **C-SWPPP Preparer Name:** Guy P. Peters, PE, CFM
B. **Registered Professional** ☑ Engineer ☐ Landscape Architect ☐ Tier B Land Surveyor **S. C. Registration #:** 21220
C. **Company/Firm Name:** STV Incorporated **S. C. COA # :** C03318
Mailing Address: 454 S. Anderson Rd Ste 3 BTC 517 City: Rock Hill State: SC Zip: 29730
Phone: 803 656 2014 Fax: 803 980 4099 Email Address: guy.peters@stvinc.com

IV. Project/Site Information ☐ Change of Information

A. **Type of Construction Activity(ies)** (Select **ALL** that apply):
☐ Commercial ☐ Industrial ☐ Institutional ☐ Mass Grading ☑ Linear ☐ Utility/Infrastructure
☐ Residential: Single-family ☐ Residential: Multi-family ☐ Multi-use (Commercial & Residential)
☐ Site Preparation (No New Impervious Area) ☐ Other (Specify) ____________________

B. **Site Address/Location** (street address, nearest intersection, etc.) SC51 fr NC border to intx US21; US21 fr intx US21 to SC460
City/Town (If in limits): ______________________________ Zip Code: ____________
Latitude: 35 ° 05 ' 02 " N Longitude: - 80 ° 56 ' 00 " W (Source): ☐ GPS ☑ Web Site: Google Earth Pro
Tax Map Number (s) (List all): SCDOT right of way

C. Is this site located on **Indian Land**? ☐ Yes ☑ No

D. **Proposed Start Date**: 10/01/2022 **Proposed Completion Date**: 03/31/2024

E. **Disturbed Area** (nearest tenth of an acre): 52.6 **Total Area** (acres): 55.6

F. **Modification Only:**(nearest tenth of an acre)**: Disturbed Area: Current (Approved) Area:** ______
Disturbed Area Change (Increase Only): ______ **Total Disturbed Area (After Change):** ______

G. Is this project part of a **Larger Common Plan for Development or Sale (LCP)**? ☐ Yes ☑ No
LCP/ Overall Development Name: ______ Check here if this is the **First Phase**. ☐

Previous State Permit/File Number: ______ **Previous NPDES Coverage Number**: SCR10 ______

H. Any **Flooding Problems** exist downstream of or adjacent to this site? ☐ Yes ☑ No (If yes, provide detailed description of flooding problems and applicable floodway/flood zone information in the C-SWPPP).

I. Active **S.C. DHEC Warning Notice**, **Notice to Comply or Notice of Violation** for this site or LCP? ☐ Yes ☑ No

J. List Relevant **State and Federal Environmental Permits or Approvals** applied for or obtained for this site (e.g., **RCRA, USACOE, Nationwide**, etc.). **If None, list None**.
SAC-2015-00812

K. **Any Waiver(s)/Variances/Exceptions Requested for this Project**? (If yes, identify below and include **Waiver Request and Justifications** in the C-SWPPP for each proposed request).

1. Small Construction Activity Waiver(s) From NPDES permitting **(Section 1.4 & Appendix B)**? ☐ Yes ☑ No If yes, Identify requested waiver: ☐ Rainfall Erosivity Waiver ☐ TMDL Waiver ☐ Equivalent Analysis Waiver	
2. Detention Waiver **(72-302(B)**? ☑ Yes ☐ No	3. Other (Specify): ______

V. Waterbody Information (Attach additional sheet(s) as needed)

☐ **Change of Information**

A. **Receiving Waterbody(s) (RWB) Information** (List the nearest and next nearest receiving waterbodies to which the sites stormwater discharges will drain. If stormwater discharges drain to multiple waterbodies, list all such waterbodies).

1. Name of Receiving Waterbodies (RWB)	**2. Distance to RWB (feet)**	**3. Classification of RWB**
a. Nearest: UT Steele Creek	380	FW
b. Next Nearest: Steele Creek	700	FW
c. Coastal Zone ONLY: Coastal Receiving Water (CRW): ______		Not Applicable
d. Other Waterbodies: ______		

B. **Waters of the U.S. / State Information** (Attach additional sheet(s) as needed)

Waters of the U.S./ State	1. On the site?	2. Delineated/ Identified?	3. Impacts?	4. Amount of impacts
a. Jurisdictional wetlands	☑ Yes ☐ No	☑ Yes ☐ No	☑ Yes ☐ No	0.099 Ac
b. Non-jurisdictional wetlands	☑ Yes ☐ No	☑ Yes ☐ No	☐ Yes ☐ No	____ Ac
c. Other Water(s): jurisdictional streams	☑ Yes ☐ No	☑ Yes ☐ No	☑ Yes ☐ No	____ Ac 635 Feet
d. Coastal Zone ONLY: Direct Critical Area	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	____ Ac ____ Feet

5. If yes for impacts in B.3, describe each impact and activity, and list all permits (e.g., USACOE Nationwide Permit, DHEC General Permit) and certifications that have been applied for or obtained for each impact:
Storm drain pipe extensions in jurisdictional streams authorized by USACOE NWP SAC-2015-00812 attached

C. **S.C. Navigable Waters (SCNW) Information (Section 2.6.5)** The Department will address any issues related to State Navigable Waters' Program under SC Regulation 19-450 during the review of the C-SWPPP for activities that will **NOT** require a 404 permit or a 401 certification. (Attach additional sheet(s) as needed).

1. Are S. C. Navigable Waters (SCNW) on the site: ☐ Yes ☑ No
a. If **no**, do not complete this question. Proceed to Section D (Impaired Waterbodies).
b. If **yes**, provide the name of S.C. Navigable Waters (SCNW) on the site: ______

2. If **yes for C.1**, will construction activities cross over or occur in, under, or thru the SCNW? ☐ Yes ☐ No
If yes, describe SCNW activities (e.g., road crossing, sub-aqueous utility line, temporary or permanent structures, etc.) and proceed to Section C.3: ______

3. Identify permits providing coverage of SCNW activities proposed for your site. If NONE, list none.

Permits/Certifications	**Permit or Certification No.**	**Corresponding Covered SCNW Activity(ies)**
a. DHEC General/ Other DHEC Permit		
b. USACOE **404 Permit or 401 Certification**		
c. SCNW Permit If applied for or issued, identify **Date applied for or issued:** ______		☐ **All Activities** or ☐ **Some Activities (Describe):**

d. If a SCNW Permit has NOT been applied for provide an additional plan sheet that shows plan and profile views (drawn to scale) of the SCNW and associated activities. Include a description of all proposed activities on this plan.

D. **Impaired Waterbodies Information** (Attach additional sheet(s) as needed)

1. 303(d) Listed Impaired Waterbodies

a. Name of **Nearest DHEC Water Quality Monitoring Stations (WQMS)(s)** that receives stormwater from your construction site and/or thru an MS4 and the **Name of the Corresponding Waterbody?**		b. **Is this WQMS(s) listed on the most current 303(d) List? If No, proceed to Section 2 of this table. If Yes, complete items c thru f.**	c. List the pollutant(s) identified as **"CAUSES"** of the impairment	d. Will any pollutants causing the impairment be present in your site's construction stormwater discharges?	e. If **yes for d**, list the **"USE SUPPORT"** impairment(s) affected by the pollutant(s) identified in c.
Nearest DHEC WQMS(s)	**Corresponding Waterbody**				
CW-681	Steele Creek	☐ Yes ☑ No		☐ Yes ☑ No	
		☐ Yes ☑ No		☐ Yes ☑ No	
		☐ Yes ☐ No		☐ Yes ☐ No	

f. If **yes for d** above, **will use of the BMPs proposed for your project ensure the site's discharges will NOT contribute to or cause further WQS violations for the impairment(s) listed in c?** ☐ Yes ☐ No
(NOTE: If no for f, this site is NOT eligible for coverage under the CGP). See Instructions.

2. TMDL Impaired Waterbodies

a. Name of **Nearest DHEC Water Quality Monitoring Stations (WQMS)(s)** that receives stormwater from your construction site and/or thru an MS4?	b. Has a TMDL(s) been developed for this WQMS(s)? **If No, identify as such below and proceed to Section VI. If Yes, complete items c thru f of this table.**	c. If **yes for b**, what pollutants are listed as "CAUSES" or causing the impairment?	d. If **yes for b**, has the standard been **"ATTAINED" or "Fully Supported"** for the impairment(s)?	e. If **no for d (Not Attained)**, will any pollutants causing the impairment be present in your site's construction stormwater discharges?
CW-203	☐ Yes ☑ No	fecal coliform	☐ Yes ☐ No	☐ Yes ☐ No
	☐ Yes ☑ No		☐ Yes ☐ No	☐ Yes ☐ No
	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No

f. If **yes for e** above, **are your discharges consistent with the assumptions and requirements of the TMDL(s)?** ☐ Yes ☐ No
(NOTE: If no for f, this site is NOT eligible for coverage under the CGP). See Instructions.

VI. Signatures and Certifications DO **NOT** SIGN IN BLACK INK! **Read the Certifications below (in entirety). Provide date, printed name, and signatures below.** If you are a **New Owner/Operator**, as Primary Permittee you must also sign and date the applicable Comprehensive SWPPP Acceptance & Compliance Agreement below.

C-SWPPP PREPARER: "One copy of the C-SWPPP, all specifications and supporting calculations, forms, and reports are herewith submitted and made a part of this application. I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000." **(This should be the person identified in Section III).**

Guy P. Peters, PE, CFM	Guy P. Peters	21220
Printed Name of C-SWPPP Preparer	**Signature of C-SWPPP Preparer**	**S. C. Registration #**

PRIMARY PERMITTEE: "I or I (on behalf of my company and its contractors and agents), as the case may be, certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I understand that DHEC enforcement actions may be taken if the terms and conditions of the C-SWPPP are not met and I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

"I or I (on behalf of my company and its contractors and agents), as the case may be, also hereby certify that all land-disturbing construction and associated activity pertaining to this site shall be accomplished pursuant to and in keeping with the terms and conditions of the approved plans and SCR100000. I also certify that a responsible person will be assigned to the project for day-to-day control. I hereby grant authorization to the to S. C. Department of Health and Environmental Control (DHEC) and/or the local implementing agency the right of access to the site at all times for the purpose of on site inspections during the course of construction and to perform maintenance inspections following the completion of the land-disturbing activity." **(See Section 122.22 of S.C. Reg. 61-9 for signatory authority information.)** Having understood the above information, I am signing this certification as Primary Permittee to the aforementioned NPDES general permit."

Lisa W. Hagood, PE	County Engineer
Printed Name of Primary Permittee	**Title/Position**
Signature of Primary Permittee	**Date Signed**

NPDES CGP FEE SCHEDULE A

(All Counties EXCEPT Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper)

The schedule should be attached to DHEC Form 2617. Do not send payment in window envelope. **DO NOT MAIL CASH**. DHEC will notify the Project Owner/ Operator if the submitted check or credit card payment cannot be processed. **The review clock will start when acceptable payment is received.**

1. Identify (√) the Project Review Type(s) Enter NPDES Coverage Fee of $125 in the right-hand column if any of the following project/review types apply to this application. Proceed to Item 2.	(√)	NPDES Coverage Fee
a. Project or LCP (Item IV.G) that will ultimately disturb one (1) acre or more Note: If your project will ultimately disturb less than one (1) acre **AND** is NOT a part of a Larger Common Plan, coverage under SCR100000 is not required; see http://www.scdhec.gov/administration/library/d-2628.pdf (Notification Form for Sites Disturbing Less Than 1-Acre Not Part of a Larger Common Plan, Non-Coastal County"	☑	$ ______. 00
b. New Owner/Operator (Transfer of Ownership)/Company Name Change ($125 NPDES Coverage fee is required by the Department for Transfers of Ownership and Company Name Changes)	☐	
c. Unpermitted Ongoing Project or Late Notification	☐	
d. MS4 Project Review (Item I.A and I.B) ($125 payable to Department thru MS4 Reviewer)	☐	
e. Other (Specify): Linear project - PfP Program roadway improvements	☑	

2. Determine the Project Review Fees (Review fees cannot exceed $2000 for a project)		
PROJECT OR LCP THAT WILL ULTIMATELY DISTRUB ONE (1) ACRE OR MORE	**(√)**	**Review Fees**
a. Enter the disturbed area (Item IV.E) for this project. Proceed to Items 2.b and 2.c.	52.6	(Nearest tenth of an acre)
b. Will this project or LCP (Item IV.G) ultimately disturb more than 1.0 acres	☑Yes ☐No	
c. Is this project exempt from S. C. Reg. 72-300 et seq.?	☐Yes ☑No	
1. If this project will **not** ultimately disturb more than 1.0 acre, and is not part of an LCP, **your project is automatically covered under this permit and the NPDES coverage fee and review fee are not required.** See the **BOW-SPWS** for "Less Than 1-Acre of Land Disturbance – Non-Coastal Counties". 2. If this project will ultimately disturb more than 1.0 acre, proceed to Item 2.d.		
d. Enter the project review fees (based on $100/disturbed area) in the right-hand column. (Multiply the disturbed area (Item 2.a) by $100/disturbed area). If the disturbed area for this project (Item 2.a.) totals 20.0 acres or more, enter $2000 in the right-hand column. Review fees cannot exceed $2000 for a project.		$ 2000 . 00

3. Total Required Fees Add the values in the right-hand columns of Items 1 and 2.d. Proceed to Item 4. (The Department will not review this project until all required fees are received).	$ 2000 . 000

4. Identify the Method of Payment:

☐ **Payment by Check:**
Attach a **signed and dated check payable to S.C. DHEC** to the **front** of this Fee Schedule.
Please note that all checks must be **less than 30 days old** and must be for the **entire required fees**.

☑ **Payment by Credit Card:** **(Check here if you wish to pay via credit card using the on-line payment system).**
The Department will contact you to provide instructions and the invoice number necessary for online payment.
Please provide an e-mail address where the invoice number may be sent: penniesforprogress@yorkcountygov.com

For official use only: **Invoice Number** ____________________

Appendix B

Additional Permits, Approvals, & Certifications

Joint Federal and State Application Form For Activities Affecting Waters of the United States Or Critical Areas of the State of South Carolina	**This Space for Official Use Only** Application No.________ Date Received________ Project Manager________ Watershed # ________

Authorities: 33 USC 401, 33 USC 403, 33 USC 407, 33 USC 408, 33 USC 1341, 33 USC 1344, 33 USC 1413 and Section 48-39-10 et. Seq of the South Carolina Code of Laws. These laws require permits for activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. The Corps of Engineers and the State of South Carolina have established a joint application process for activities requiring both Federal and State review or approval. Under this joint process, you may use this form, together with the required drawings and supporting information, to apply for both the Federal and/or State permit(s).

Drawings and Supplemental Information Requirements: In addition to the information on this form, you must submit a set of drawings and, in some cases, additional information. A completed application form together with all required drawings and supplemental information is required before an application can be considered complete. See the attached instruction sheets for details regarding these requirements. You may attach additional sheets if necessary to provide complete information.

1. Applicant Last Name: Galloway	11. Agent Last Name (agent is not required): Kotheimer
2. Applicant First Name: Jackie	12. Agent First Name: Joshua
3. Applicant Company Name: SCDOT	13. Agent Company Name: STV Incorporated
4. Applicant Mailing Address: P.O. Box 191	14. Agent Mailing Address: 900 West Trade Street, Suite 715
5. Applicant City: Columbia	15. Agent City: Charlotte
6. Applicant State: South Carloina — 7. Applicant Zip: 29202-0191	16. Agent State: North Carolina — 17. Agent Zip: 28202-1444
8. Applicant Area Code and Phone No.: (803) 737-1337	18. Agent Area Code and Phone No.: (704) 816-2519
9. Applicant Fax No.: (803) 737-1078	19. Agent Fax No.: (704) 372-3393
10. Applicant E-mail: GallowayJA@scdot.org	20. Agent E-mail: joshua.kotheimer@stvinc.com

21. Project Name: US 21 North Phase I and II	22. Project Street Address: N/A
23. Project City: Fort Mill (nearest town) — 24. Project County: York	25. Project Zip Code: 29715 — 26. Nearest Waterbody: Steele Creek
27. Tax Parcel ID: Various	28. Property Size (acres): ~ 332 acres
29. Latitude: 35.07424° N	30. Longitude: -80.93534° W

31. Directions to Project Site (Include Street Numbers, Street Names, and Landmarks and attach additional sheet if necessary):
From Charleston, take I-26 West to I-77 North. Take I-77 North to SC 460 (Exit 88). Take Exit 88 and proceed on SC 460 East to its intersection with US 21. From the intersection, the Phase I section of the project extends to the north along US 21 to its intersection with SC 51 (Pineville-Rock Hill Road). From the SC 460 (Springfield Parkway) and US 21 intersection south along US 21 to SC 160 (White St) is the Phase II section of the project.

32. Description of the Overall Project and of Each Activity in or Affecting U.S. Waters or State Critical Areas (attach additional sheets if needed)
See Supplemental Information

33. Overall Project Purpose and the Basic Purpose of Each Activity In or Affecting U.S. Waters (attach additional sheets if needed):
See Supplemental Information

34. Type and quantity of Materials to Be Discharged

Material	Quantity	Unit
Dirt or Topsoil:		☐ cubic yards
Clean Sand:		☐ cubic yards
Mud:		☐ cubic yards
Clay:		☐ cubic yards
Gravel, Rock, or Stone:		☐ cubic yards
Concrete:		☐ cubic yards
Other (describe):		☐ cubic yards
TOTAL:		cubic yards

35. Type and Quantity of Impacts to U.S. Waters (including wetlands).

Impact	Quantity	acres	sq.ft.		cubic yards
Filling:	0.893	■ acres	☐ sq.ft.		☐ cubic yards
Backfill & Bedding:		☐ acres	☐ sq.ft		☐ cubic yards
Landclearing:	0.152	■ acres	☐ sq.ft		☐ cubic yards
Dredging:		☐ acres	☐ sq.ft.		☐ cubic yards
Flooding:		☐ acres	☐ sq.ft.		☐ cubic yards
Draining/Excavation:	0.147	☐ acres	☐ sq.ft.		☐ cubic yards
Shading:		☐ acres	☐ sq.ft.		☐ cubic yards
TOTALS:	1.192	acres	sq.ft.		cubic yards

36. Individually list wetland impacts including mechanized clearing, fill, excavation, flooding, draining, shading, etc. and attach a site map with location of each impact (attach additional sheets if needed).

Impact No.	Wetland Type	Distance to Receiving Water body (LF)	Purpose of Impact (road crossing, impoundment, flooding, etc)	Impact Size (acres)
See Supplemental Information				
			Total Wetland Impacts (acres)	

37. Individually list all seasonal and perennial stream impacts and attach a site map with location of each impact (attach additional sheets)

Impact No.	Seasonal or Perennial Flow	Average Stream Width (LF)	Impact Type (road crossing, impoundment, flooding, etc)	Impact Length (LF)
See Supplemental Information				
			Total Stream Impacts (Linear Feet)	

38. Have you commenced work on the project site? ☐ YES ■ NO If yes, describe all work that has occurred and provide dates.

39. Describe measures taken to avoid and minimize impacts to Waters of the United States:

See Supplemental Information

40. Provide a brief description of the proposed mitigation plan to compensate for impacts to aquatic resources or provide justification as to why mitigation should not be required (Attach a copy of the proposed mitigation plan for review).

See Supplemental Information

41. See the attached sheet to list the names and addresses of adjacent property owners.

See Supplemental Information

42. List all Corps Permit Authorizations and other Federal , State, or Local Certifications, Approvals, Denials received for work described in this application.

See Supplemental Information

43. Authorization of Agent. I hereby authorize the agent whose name is given on page one of this application to act in my behalf in the processing of this application and to furnish supplemental information in support of this application. [1]

Jackie Gallaway 2/17/2022

Applicant's Signature Date

44. Certification. Application is hereby made for a permit or permits to authorize the work and uses of the work as described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent for the applicant. [1]

Jackie Gallaway 2/17/2022

Applicant's Signature Date Agent's Signature Date

[1]The application must be signed by the person who desires to undertake the proposed activity or it may be signed by a duly authorized agent if the authorization statement in blocks 11 and 43 have been completed and signed. 18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Supplemental Information

32. Description of the Overall Project and of Each Activity in or Affecting U.S. Waters or State Critical Areas

Project Description

The South Carolina Department of Transportation (SCDOT), in cooperation with York County, proposes to widen approximately 5.4 miles of US 21 and approximately one mile of SC 51 (Pineville-Rock Hill Road) located within the Town of Fort Mill. US 21 would be widened from two to four lanes, with a center turn lane/median, from its intersection with White St (SC 160) north to its intersection with Springhill Farm Road (S-48). SC 51 would be widened from two to four lanes, with a center turn lane/median, from its intersection with US 21 east to the North Carolina state line. The proposed project also includes improvements to existing intersections along US 21. The project would require modifications to the existing stormwater drainage infrastructure and would require the relocation of existing utilities including sanitary sewer, water, power, and telecommunications located within the project construction limits. There were no additional impacts associated with utilities as part of this project. One water line will be located within the limits of a proposed permanent riprap armoring impact to Tributary C and will not require additional impacts to be installed.

The project is included in the Rock Hill-Fort Mill Area Transportation Study (RFATS) 2035 Long Range Transportation Plan and is being funded by the RFATS FY 2017-2022 Transportation Improvement Program (TIP) and York County ‘Pennies for Progress 3’ Program (PFP3 Project #11149-004) and ‘Pennies for Progress 4’ (PFP4 Project #17228-015); therefore, the preparation of a National Environmental Policy Act (NEPA) environmental document and review by the Federal Highway Administration (FHWA) is not necessary.

Existing Facility

The existing US 21 roadway facility within the southern portion of the PSA consists of two 11-foot wide travel lanes. Within the northern portion of the PSA, the existing US 21 roadway transitions from two to four lanes varying in width from 11 to 12 feet.

Stormwater drainage from the existing roadways is stored and/or conveyed through a combination of roadside ditches, pipes/culverts, curb and gutter, and detention ponds. One bridge within the PSA will be replaced. No impacts are anticipated for the replacement of the bridge.

Proposed Facility

The proposed typical section includes four travel lanes (12-foot wide inside lanes and 14-foot wide outside lanes), a center 15-foot median for left turns, 10-foot shoulders (two-foot paved and eight-foot grassed), and corresponding lane tapers. The proposed improvements to the US 21 roadway from Mercantile Place extending to the northern project limits would also include curb and gutter, a grassed strip, and sidewalk. Drainage ditches would be constructed alongside US 21 within the southern portion of the proposed roadway improvements.

Construction of the project would require the extension of seven existing drainage structures located on jurisdictional stream features. There will be a total of 0.099 acre of total wetland impacts with 0.054 acre being permanent in Phase I and 0.885 acre of total wetland impacts with 0.778 acre being permanent in Phase II for a combined project total of 0.832 acre of permanent wetland impacts (See Table 1).There will be a total of 635 linear feet of permanent stream impacts in the Phase I section and 743 linear feet of permanent impacts in the Phase II section for a combined project total of 1,378 linear feet of permanent stream impacts (See Table 2).

Construction of the Phase I project is anticipated to begin in 2022 with Phase II beginning in 2025. The project would be constructed utilizing staged construction methods in order to keep the existing roadways open to traffic during construction.

33. Overall Project Purpose and the Basic Purpose of Each Activity In or Affecting U.S. Waters

The purpose of the project is to improve US 21 and SC 51 and associated intersecting roadways to current SCDOT design standards to accommodate existing and future traffic loads and provide safer, more efficient travel ways for vehicles traveling on these roadways. US 21 serves as a primary route for vehicular traffic between the Town of Fort Mill and I-77, while SC 51 serves as a primary route for motorists traveling between US 21 and townships and cities in North Carolina.

The project as proposed is a single complete project with independent utility. The realignment and modifications to the roadways are not dependent on any larger actions for justification and the proposed work does not require prior or simultaneous actions to be taken for the project to be complete and successful.

36. Individually list wetland impacts including mechanized clearing, fill, excavation, flooding, draining, shading, etc. and attach a site map with location of each impact

Table 1. Summary of Impacts to Jurisdictional Wetlands

Impact No.	Wetland Type	Distance to Receiving Water body (LF)	Purpose of Impact (road crossing, impoundment, flooding, etc)	Impact Size (acres)
Phase I				
Wetland E	Freshwater wetland	0	drainage pipe installation	0.001
Wetland F	Freshwater wetland	0	roadway widening/culvert	0.066
Wetland G	Freshwater wetland	0	roadway widening	0.002
			Phase I Total	**0.099**
Phase II				
Wetland BB	Freshwater wetland	0	roadway widening/culvert	0.007
Wetland CC	Freshwater wetland	0	roadway widening/culvert	0.087

Impact No.	Wetland Type	Distance to Receiving Water body (LF)	Purpose of Impact (road crossing, impoundment, flooding, etc)	Impact Size (acres)
Wetland FF	Freshwater wetland	0	roadway widening/culvert	0.791
			Phase II Total	**0.885**
			Combined Project Total	**0.984**

37. Individually list all seasonal and perennial stream impacts and attach a site map with location of each impact

Table 2. Summary of Impacts to Jurisdictional Non-wetlands Waters

Impact No.	Seasonal or Perennial Flow	Average Stream Width (LF)	Impact Type (road crossing, impoundment, flooding, etc)	Length (LF)
Phase I				
Tributary A	Perennial	5	roadway widening/culvert	137
Tributary C	Perennial	6	roadway widening/culvert	270
Tributary D	Perennial	6	roadway widening/culvert	228
			Phase I Total	**635**
Phase II				
Tributary B	Perennial	7	roadway widening/culvert	162
Tributary C	Perennial	5	roadway widening/culvert	121
Tributary D	Perennial	8	roadway widening/culvert	147
Tributary E	Perennial	5	roadway widening/culvert	51
Tributary F	Perennial	7	roadway widening/culvert	262
			Phase II Total	**743**
			Combined Project Total	**1,378**

39. Describe measures taken to avoid and minimize impacts to Waters of the United States

The proposed project was designed to minimize adverse impacts to the human and natural environment, including jurisdictional waters of the U.S., to the maximum extent practicable; however, impacts to jurisdictional waters of the U.S. are unavoidable and necessary for construction of the project.

Efforts to avoid and/or minimize project impacts include the following:

- Fill slopes for the new roadways at the stream crossings along US 21 have been designed at 2:1 thereby reducing the length necessary of the proposed drainage structures and minimizing the impact footprint
- The extent (amount) of riprap proposed within the jurisdictional streams at the outfalls of the culverts and pipes has been determined through detailed hydraulic analyses and is the minimum amount necessary to adequately dissipate water flows and prevent scouring and bank failure during significant rainfall events. The placement of the riprap will not result in the loss of overall stream function or disrupt downstream hydrologic connectivity.
- Sediment and erosion control measures consistent with state-approved BMPs would be installed and monitored/maintained prior to, during, and immediately following project construction to prevent runoff and sedimentation of jurisdictional waters.
- Orange barrier fencing will be installed along the boundaries of jurisdictional waters (streams and wetlands) located outside the project limits but within the right-of-way as an additional form of protection and impact avoidance.
- Phase II alignment was shifted to avoid impacts to Schweinitz's sunflowers

40. Provide a brief description of the proposed mitigation plan to compensate for impacts to aquatic resources or provide justification as to why mitigation should not be required

Per the U.S. Army Corps of Engineers (USACE) Charleston District's guidance document entitled 'Guidelines for Preparing a Compensatory Mitigation Plan' (October 2010), it has been determined that the proposed project would require 6969.8 stream credits and 9.8042 freshwater wetland credits to compensate for impacts to jurisdictional waters of the U.S.

As compensatory mitigation for the impacts, York County will purchase 6969.8 stream credits and 9.8042 wetland credits from a USACE-approved mitigation banks. The County is currently in the process of reserving the required stream and wetland credits from multiple banks that service the area. At least half of the credits will be in the form of restoration credits and the remaining will be in the form of preservation credits. All required mitigation credits will be purchased and documentation of said purchase(s) provided to the USACE before the project begins construction.

41. See the attached sheet to list the names and addresses of adjacent property owners.

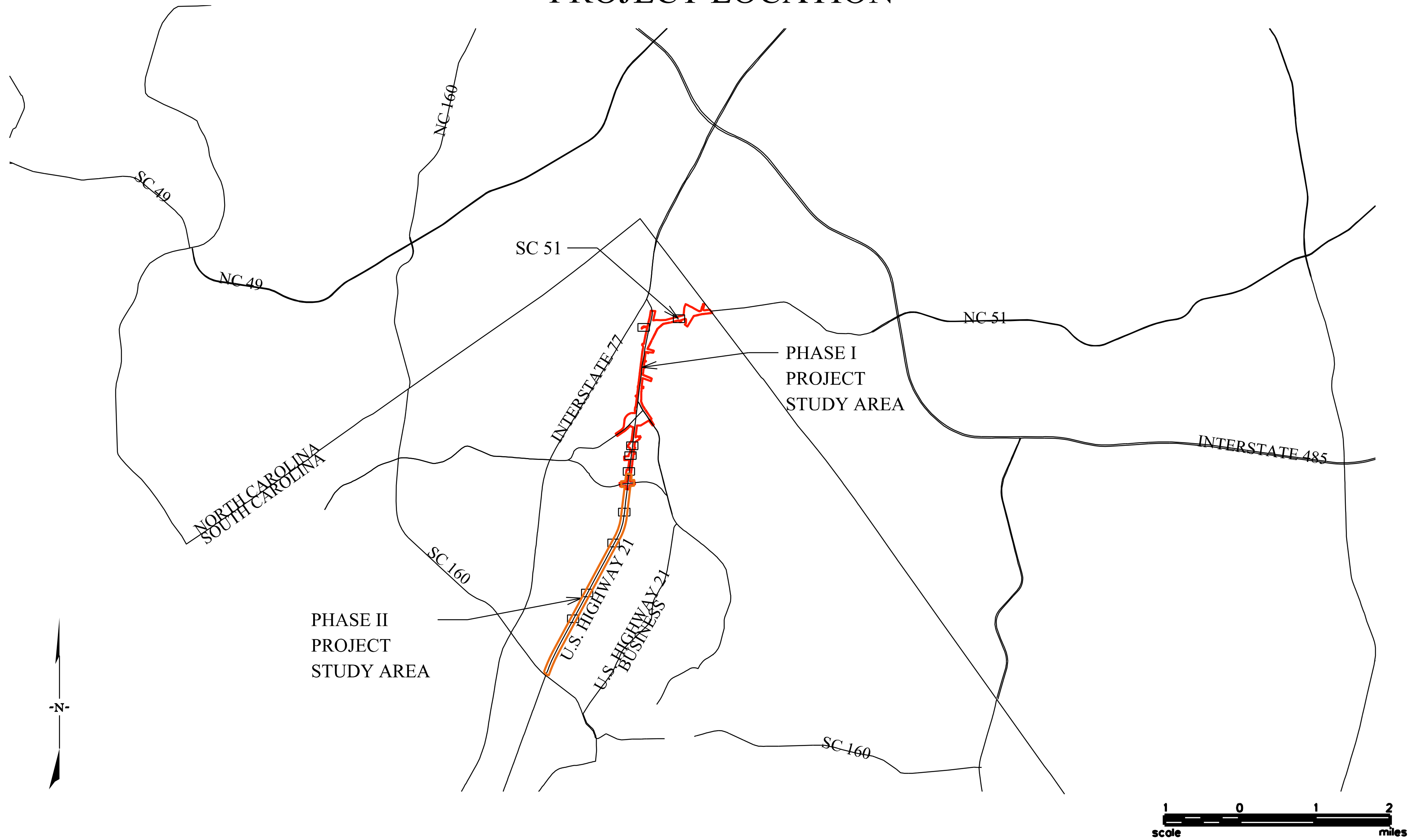
42. List all Corps Permit Authorizations and other Federal, State, or Local Certifications, Approvals, Denials received for work described in this application.

A Jurisdictional Determination (SAC 2015-00812-DS) for the Phase I project study area was issued on July 1, 2016. A revision to the Phase I Jurisdictional Determination (SAC 2015-00812-DS) was issued on November 23, 2021. A Jurisdictional Determination for Phase II (SAC 2019-013980 was issued on was received on January 23, 2020.

February 17, 2022

SCDOT Authorized Agent's Signature **Date**

US 21 NORTH PHASE I AND US 21 NORTH PHASE II
PROJECT LOCATION



US 21 NORTH PHASE I
PROJECT STUDY AREA

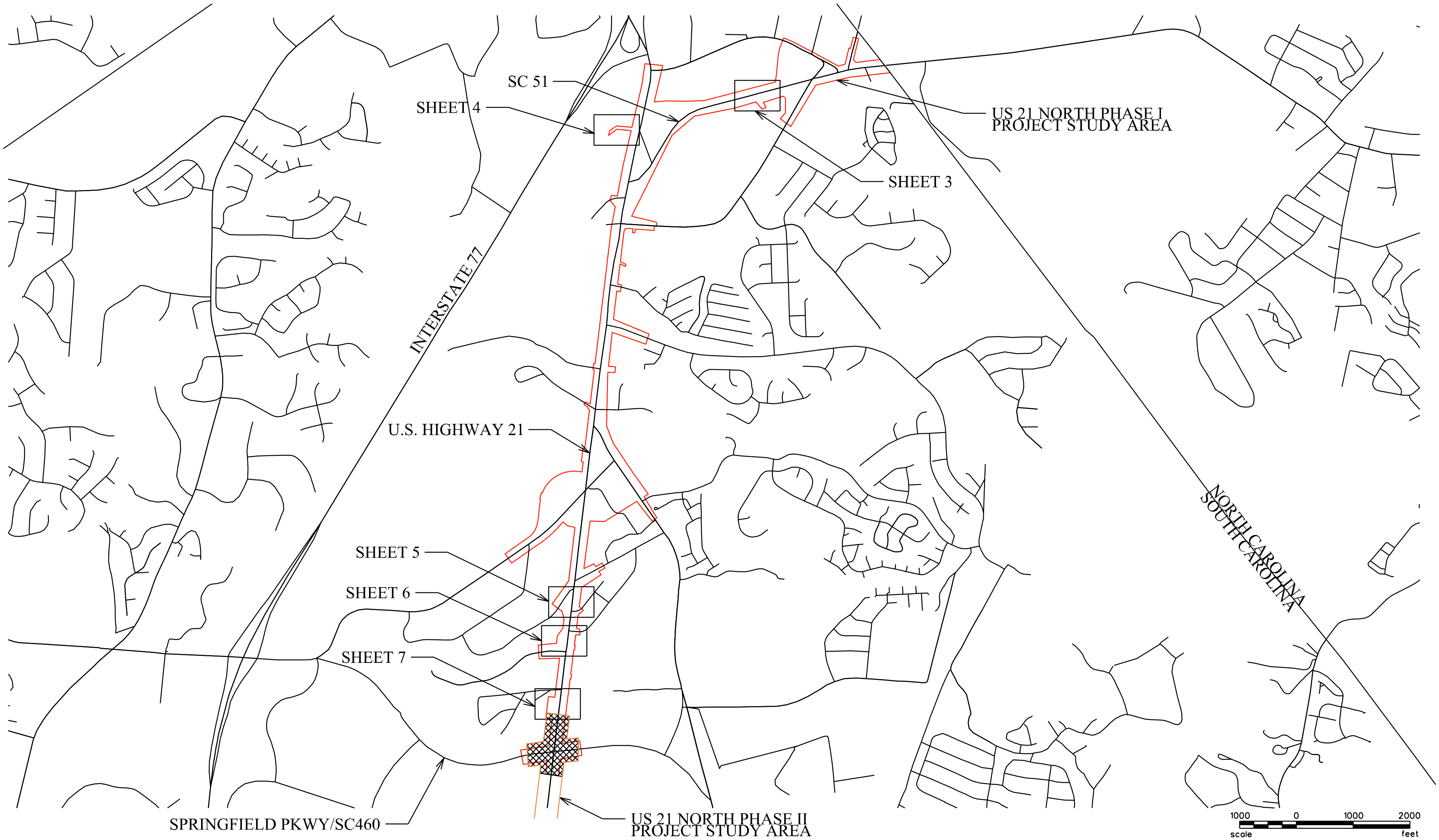
US 21 NORTH PHASE II
PROJECT STUDY AREA

STV Incorporated
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, South Carolina 29730
(803) 980-4970 fax: (803) 980-4099

Campco Engineering Inc
156 Oakland Avenue
Rock Hill, South Carolina 29730
(803) 327-7121

APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 1 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
PROJECT OVERVIEW



US 21 NORTH PHASE I PROJECT STUDY AREA

US 21 NORTH PHASE II PROCECT STUDY AREA

OVERLAP BETWEEN PHASE I & II

PHASE I IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	166	0.024
PERMANENT TRIBUTARY PIPE IMPACT	469	0.074
PERMANENT WETLAND FILL IMPACT		0.054
TEMPORARY WETLAND CLEARING IMPACT		0.045
TOTAL PERMANENT TRIBUTARY IMPACTS	635	0.098
TOTAL TEMPORARY WETLAND IMPACTS		0.045
TOTAL PERMANENT WETLAND IMPACTS		0.054

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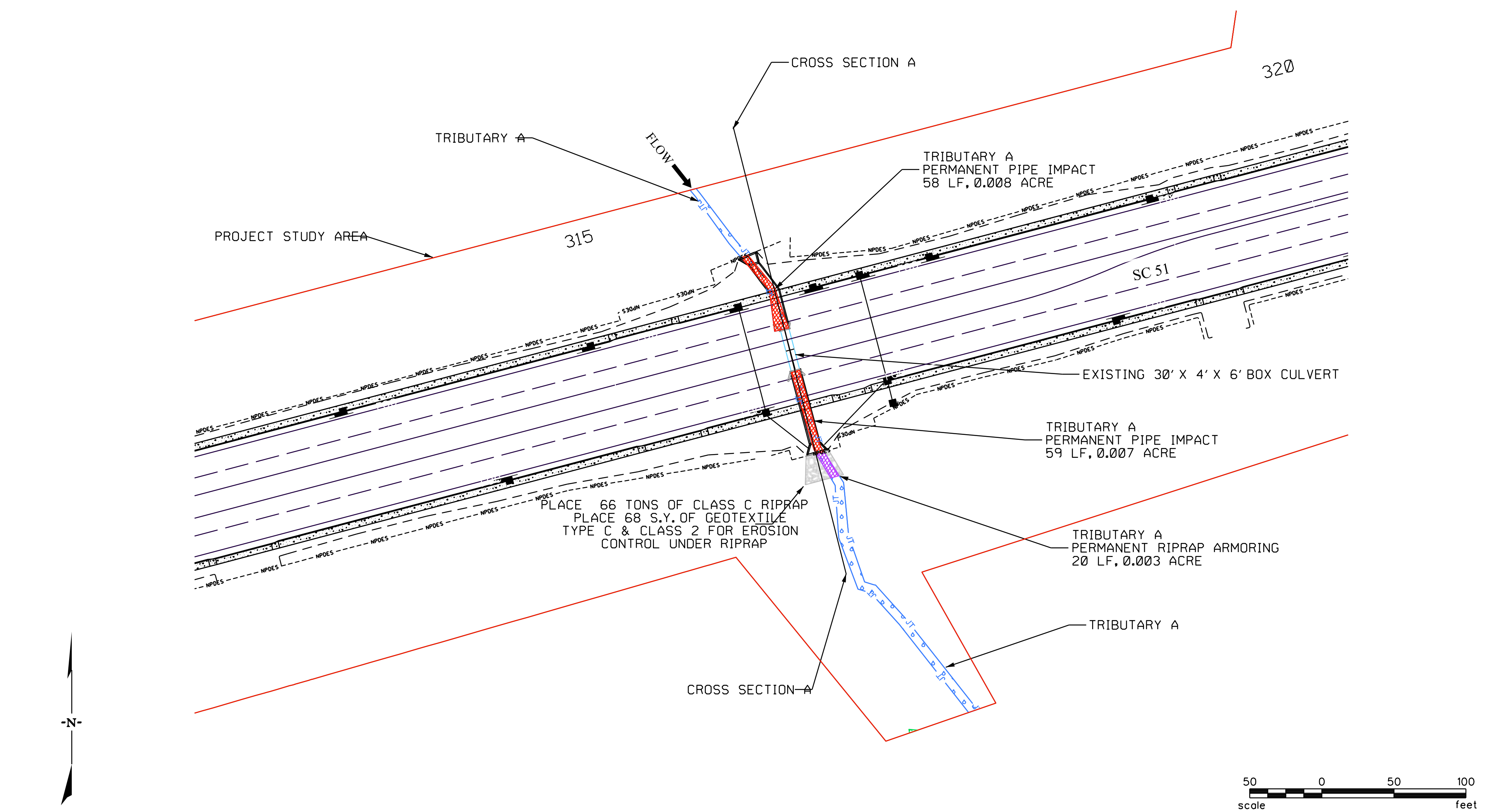
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 2 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND
JURISDICTIONAL TRIBUTARY
RIPRAP
PERMANENT RIPRAP ARMORING IMPACT
PERMANENT PIPE/CULVERT IMPACT
PERMANENT FILL IMPACT
TEMPORARY IMPACT

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	20	0.003
PERMANENT TRIBUTARY PIPE IMPACT	117	0.015
TOTAL PERMANENT TRIBUTARY IMPACTS	137	0.018

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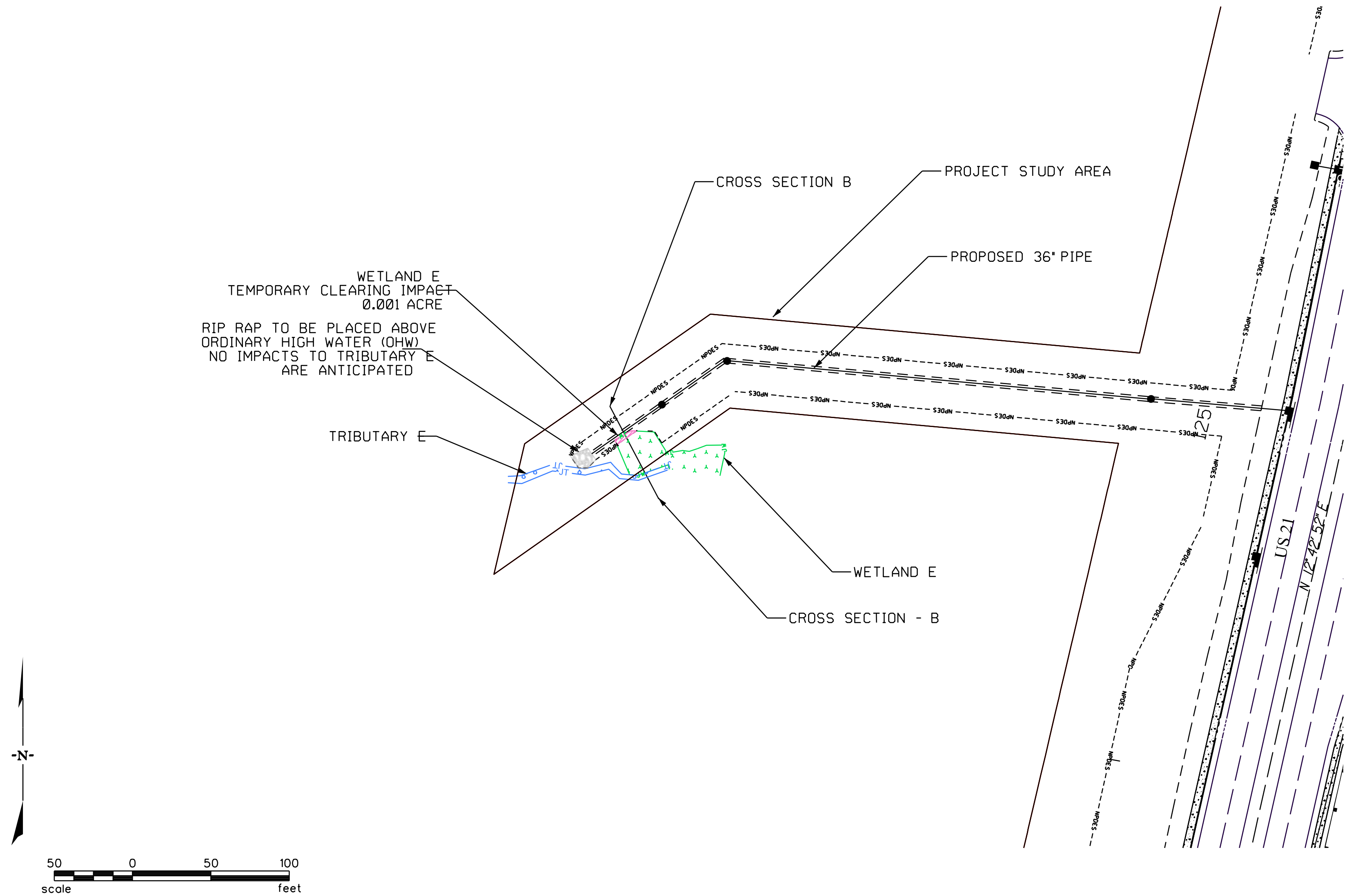
APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 3 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
TEMPORARY WETLAND CLEARING IMPACT		0.001

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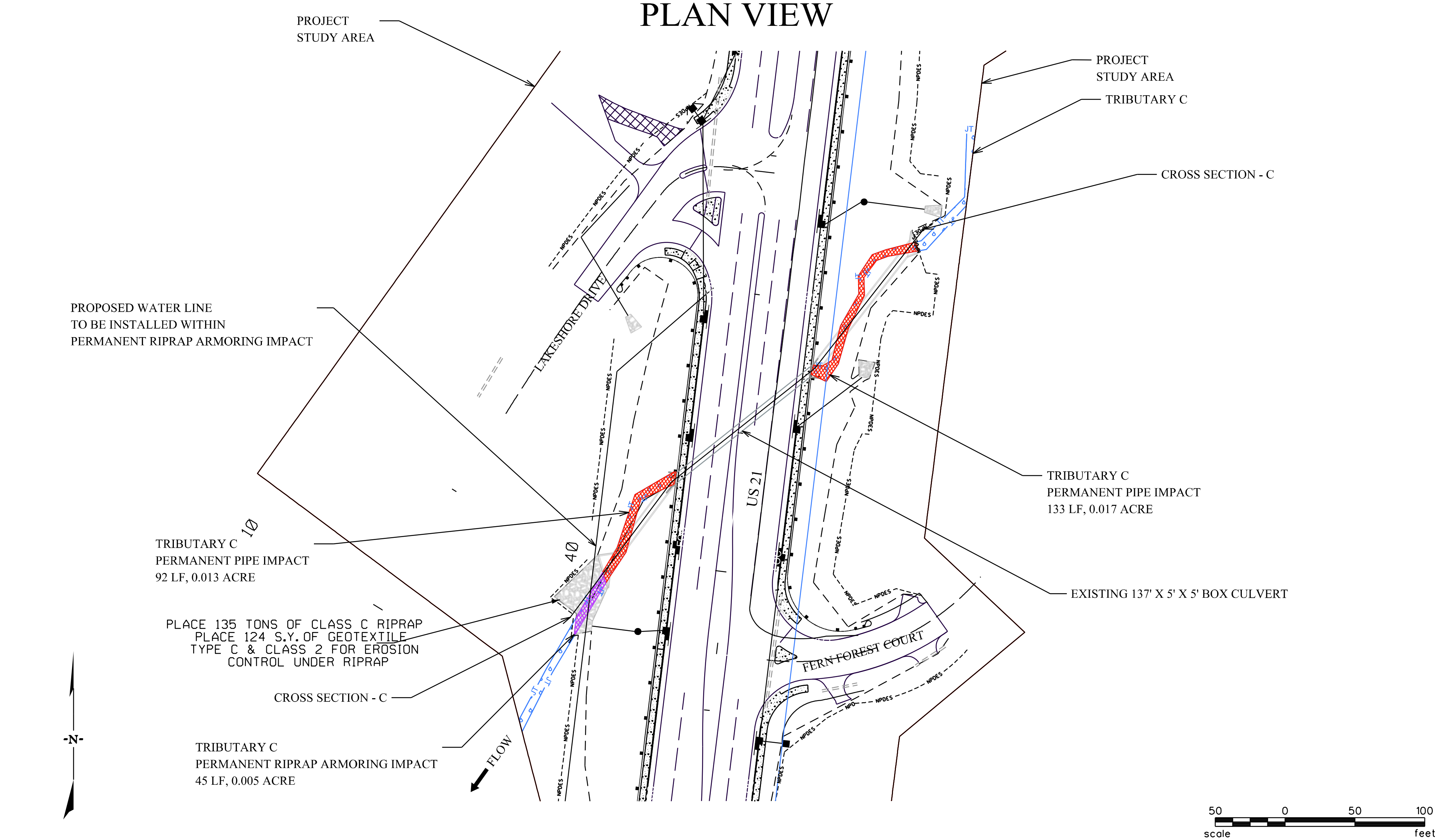
APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 4 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	45	0.005
PERMANENT TRIBUTARY PIPE IMPACT	225	0.030
TOTAL PERMANENT TRIBUTARY IMPACTS	270	0.035

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APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
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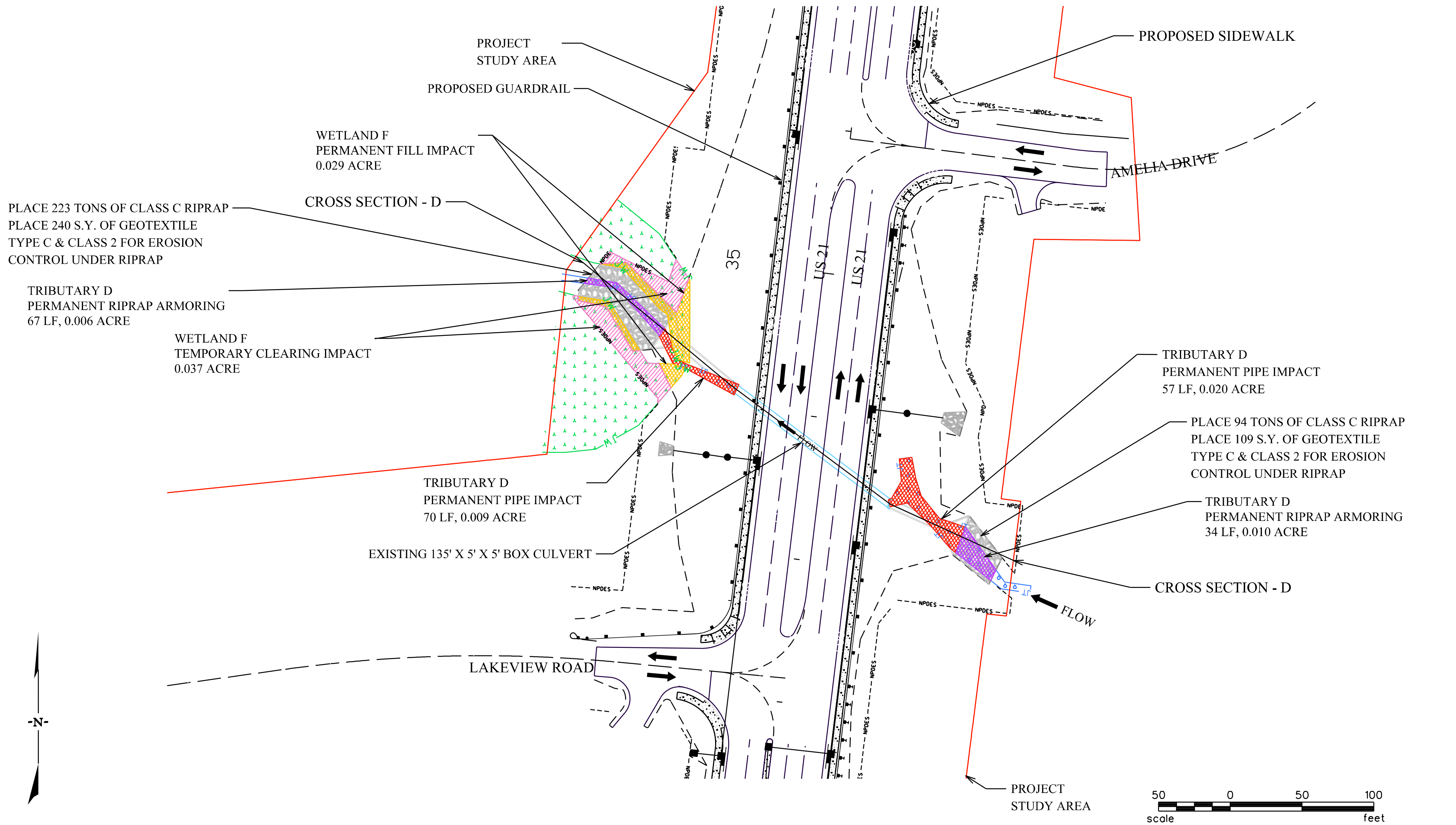
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 5 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	101	0.016
PERMANENT TRIBUTARY PIPE IMPACT	127	0.029
PERMANENT WETLAND FILL IMPACT		0.029
TEMPORARY WETLAND CLEARING IMPACT		0.037
TOTAL PERMANENT TRIBUTARY IMPACTS	228	0.045
TOTAL PERMANENT WETLAND IMPACTS		0.029
TOTAL TEMPORARY WETLAND IMPACTS		0.037

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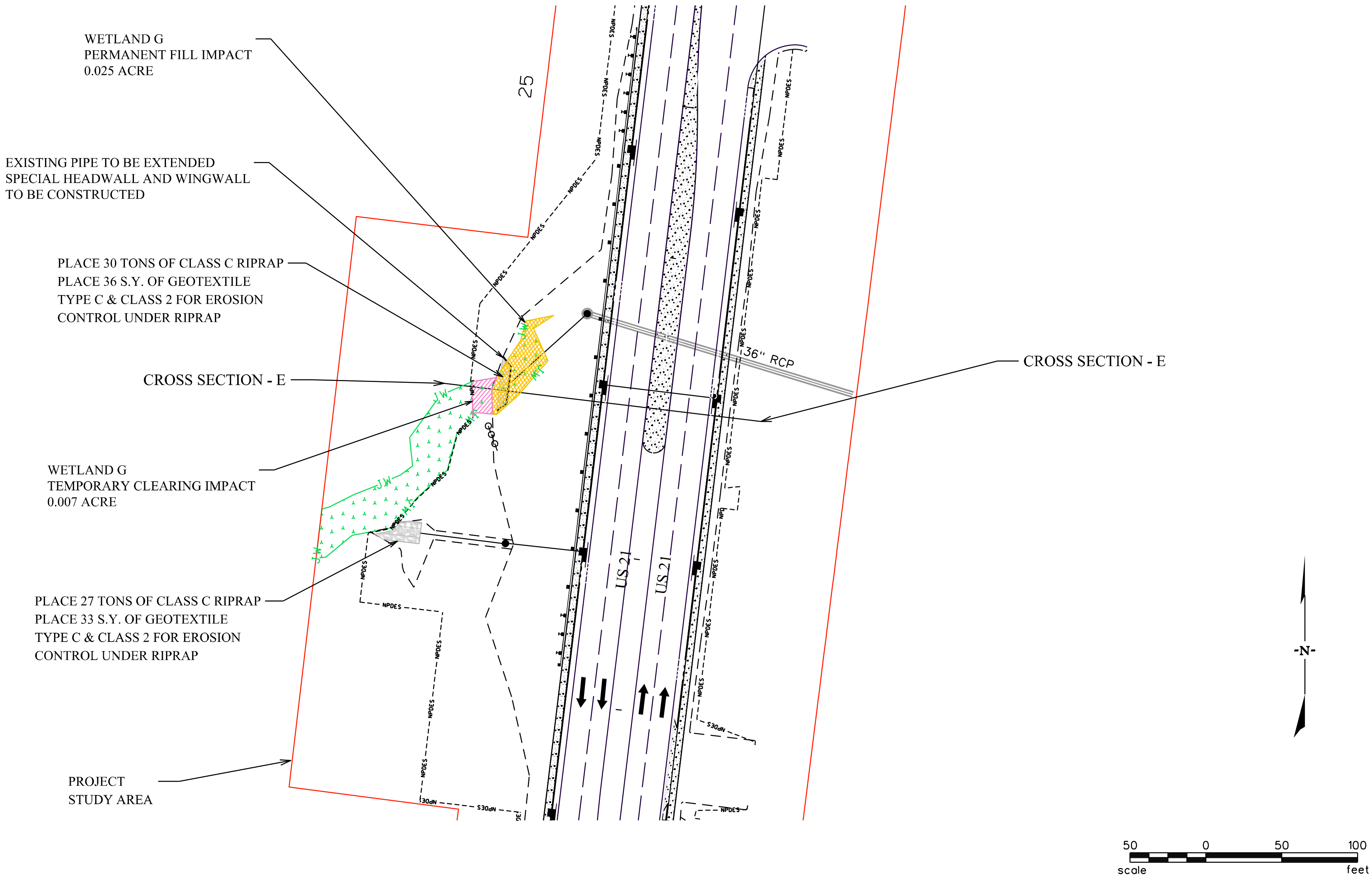
APPLICANT:	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT:	US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 6 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
TEMPORARY IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT WETLAND FILL IMPACT		0.025
TEMPORARY WETLAND CLEARING IMPACT		0.007
TOTAL PERMANENT WETLAND IMPACTS		0.025
TOTAL TEMPORARY WETLAND IMPACTS		0.007

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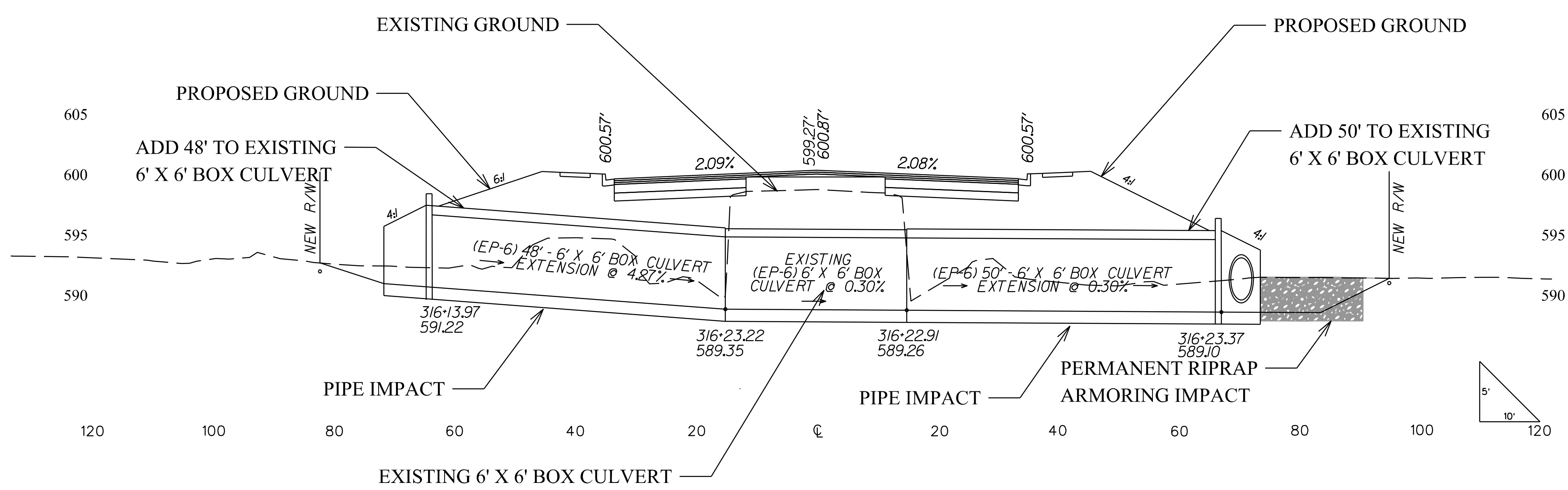
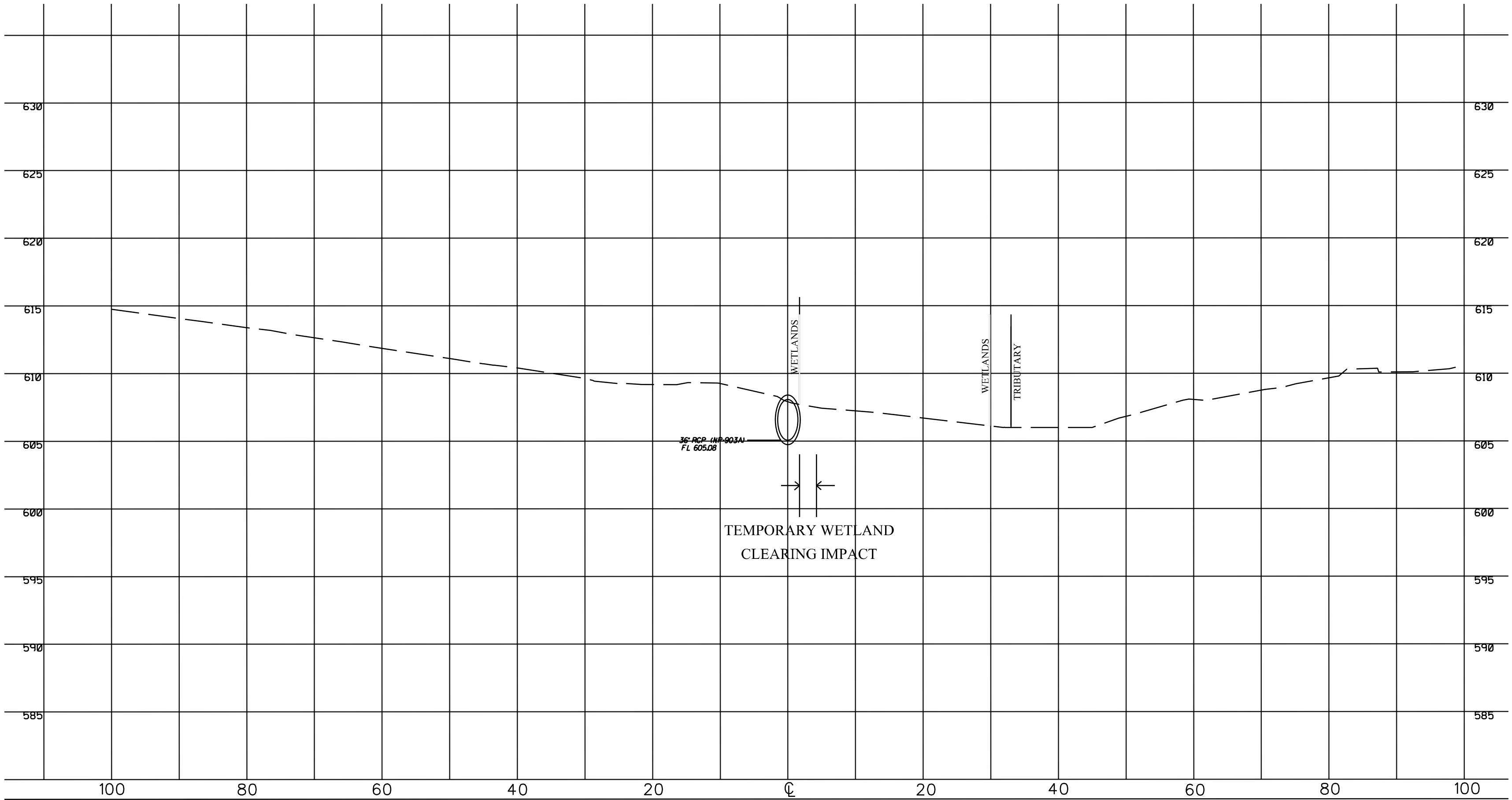
SCDOT PROJECT ID 42332 & 39235	
SHEET: 7 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
CROSS SECTION A - STA 316+23.05



STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730 (803) 980-4970 fax: (803) 980-4099 Campco Engineering Inc 156 Oakland Avenue Rock Hill, South Carolina 29730 (803) 327-7121	APPLICANT: SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION PROJECT: US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II LOCATION: YORK COUNTY, SOUTH CAROLINA YORK COUNTY PROJECTS 11149-004 & 17228-015 SCDOT PROJECT ID 42332 & 39235 SHEET: 8 OF 21 DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
CROSS SECTION B - STA 124+7.00



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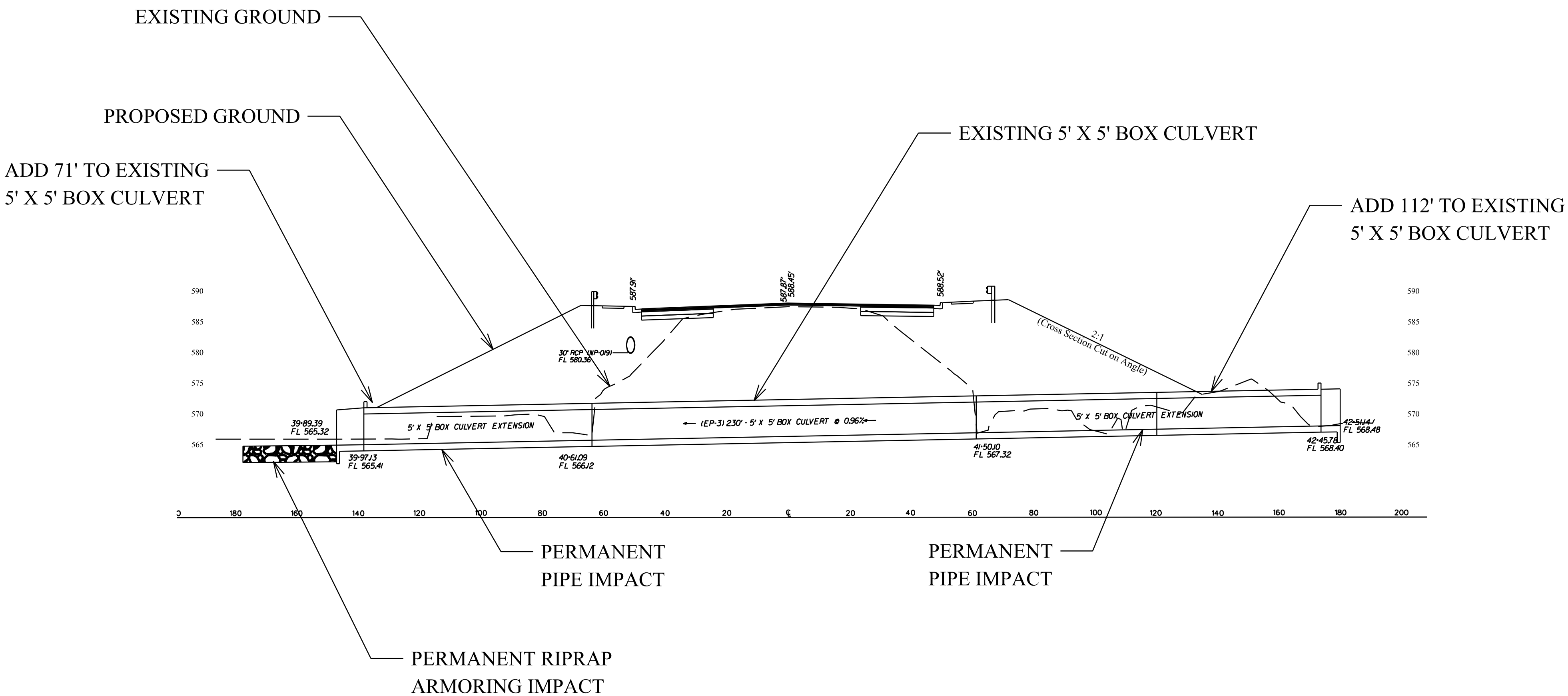
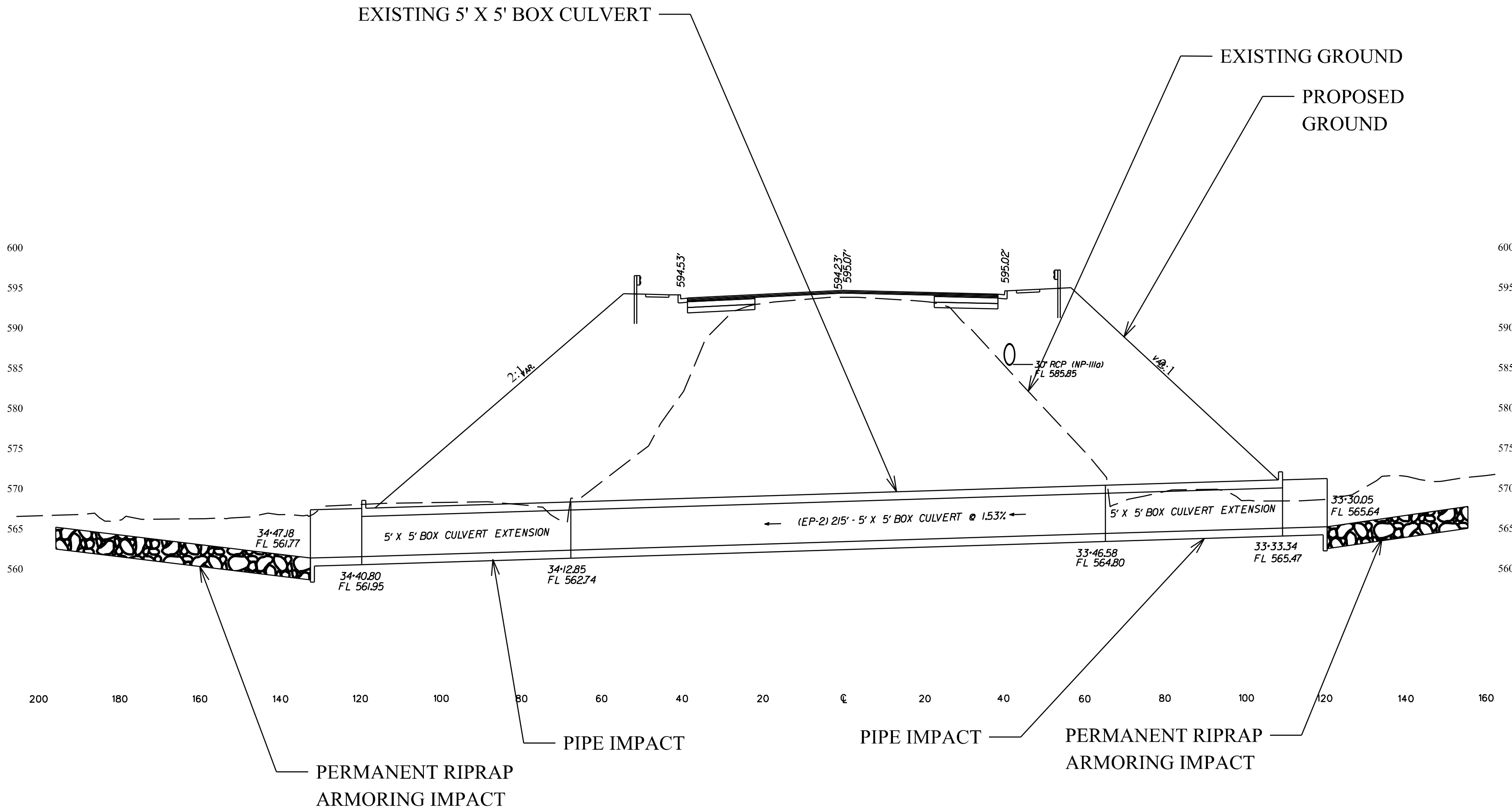
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 9 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
CROSS SECTION C - STA 41+06.45



STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730 (803) 980-4970 fax: (803) 980-4099 **Campco Engineering Inc** 156 Oakland Avenue Rock Hill, South Carolina 29730 (803) 327-7121	APPLICANT: SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION PROJECT: US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II LOCATION: YORK COUNTY, SOUTH CAROLINA YORK COUNTY PROJECTS 11149-004 & 17228-015 SCDOT PROJECT ID 42332 & 39235 SHEET: 10 OF 21 DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
CROSS SECTION D - STA 33+79.00



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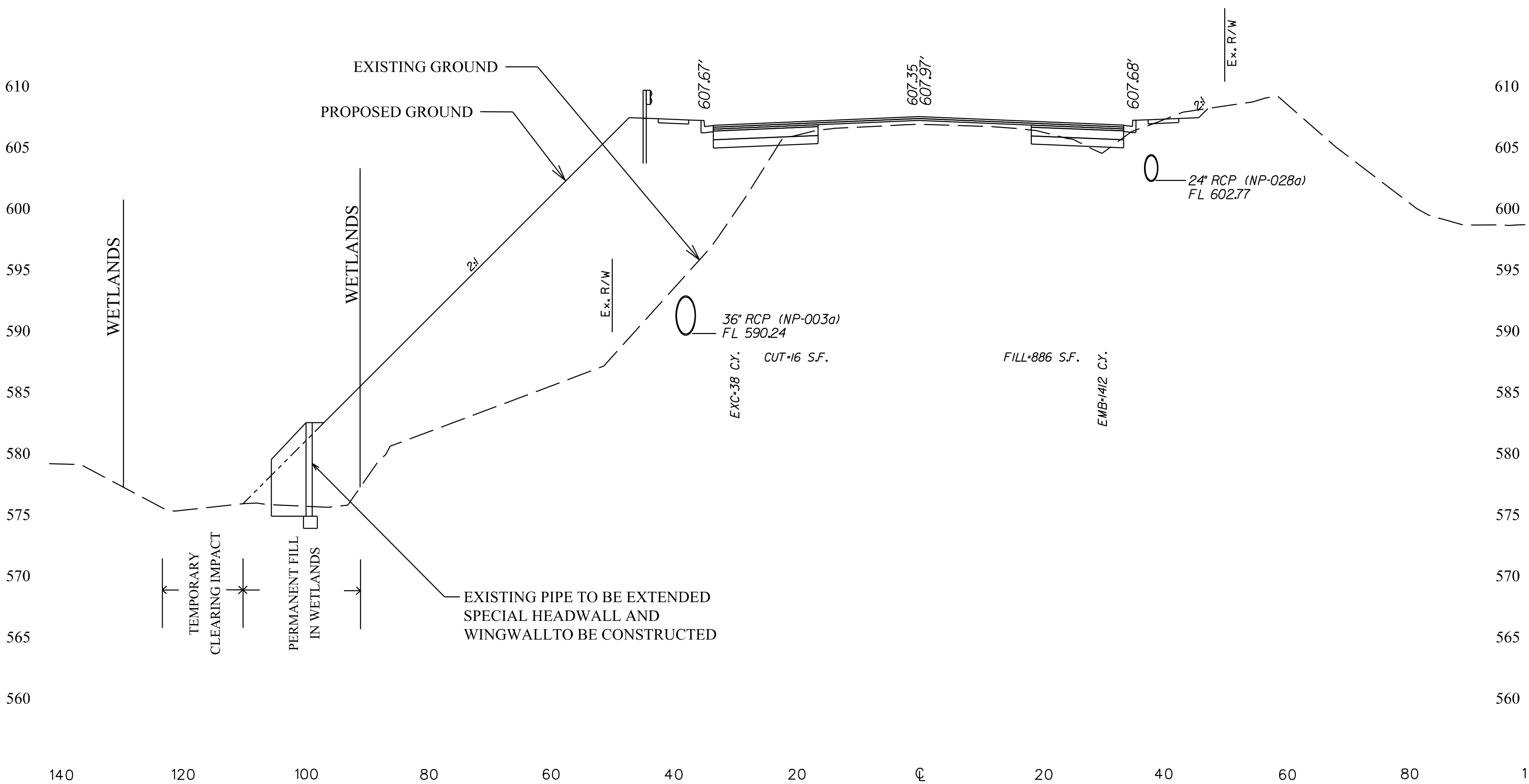
LOCATION:	YORK COUNTY, SOUTH CAROLINA
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 11 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE I AND SC 51
CROSS SECTION E - STA 23+00.00



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APPLICANT: SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

PROJECT: US 21 NORTH PHASE I AND SC 51 & US 21 NORTH PHASE II

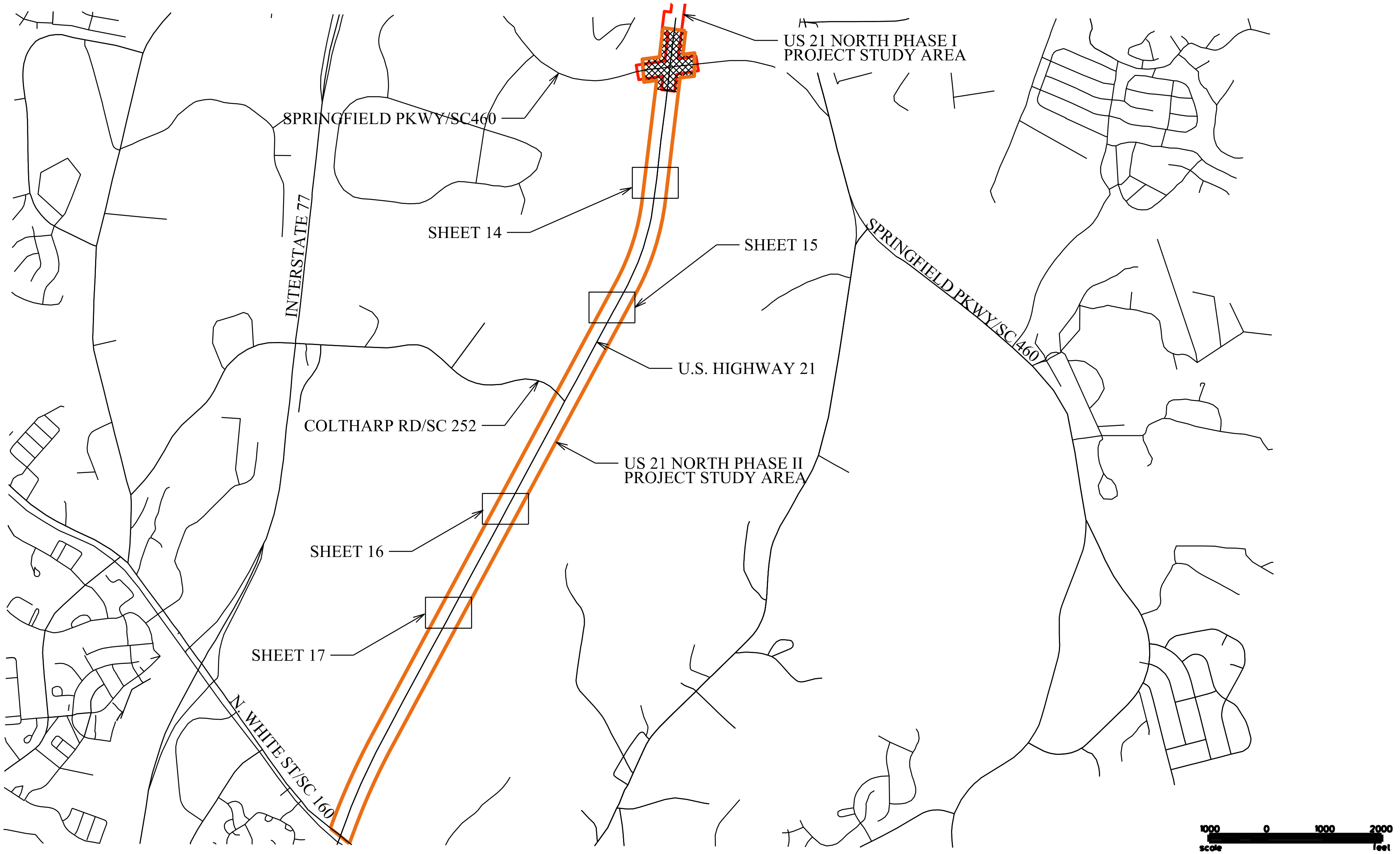
LOCATION: YORK COUNTY, SOUTH CAROLINA

YORK COUNTY PROJECTS 11149-004 & 17228-015

SCDOT PROJECT ID 42332 & 39235

SHEET: 12 OF 21 DATE: Revised 12-17-2021

US 21 NORTH PHASE II
PROJECT SEGMENT OVERVIEW



US 21 NORTH PHASE I PROJECT STUDY AREA

US 21 NORTH PHASE II PROCECT STUDY AREA

OVERLAP BETWEEN PHASE I & II

PHASE II IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	193	0.028
PERMANENT TRIBUTARY PIPE IMPACT	550	0.082
PERMANENT WETLAND FILL IMPACT		0.631
PERMANENT WETLAND CUT IMPACT		0.147
TEMPORARY WETLAND CLEARING IMPACT		0.107
TOTAL PERMANENT TRIBUTARY IMPACTS	743	0.110
TOTAL PERMANENT WETLAND IMPACTS		0.778
TOTAL TEMPORARY WETLAND IMPACTS		0.107

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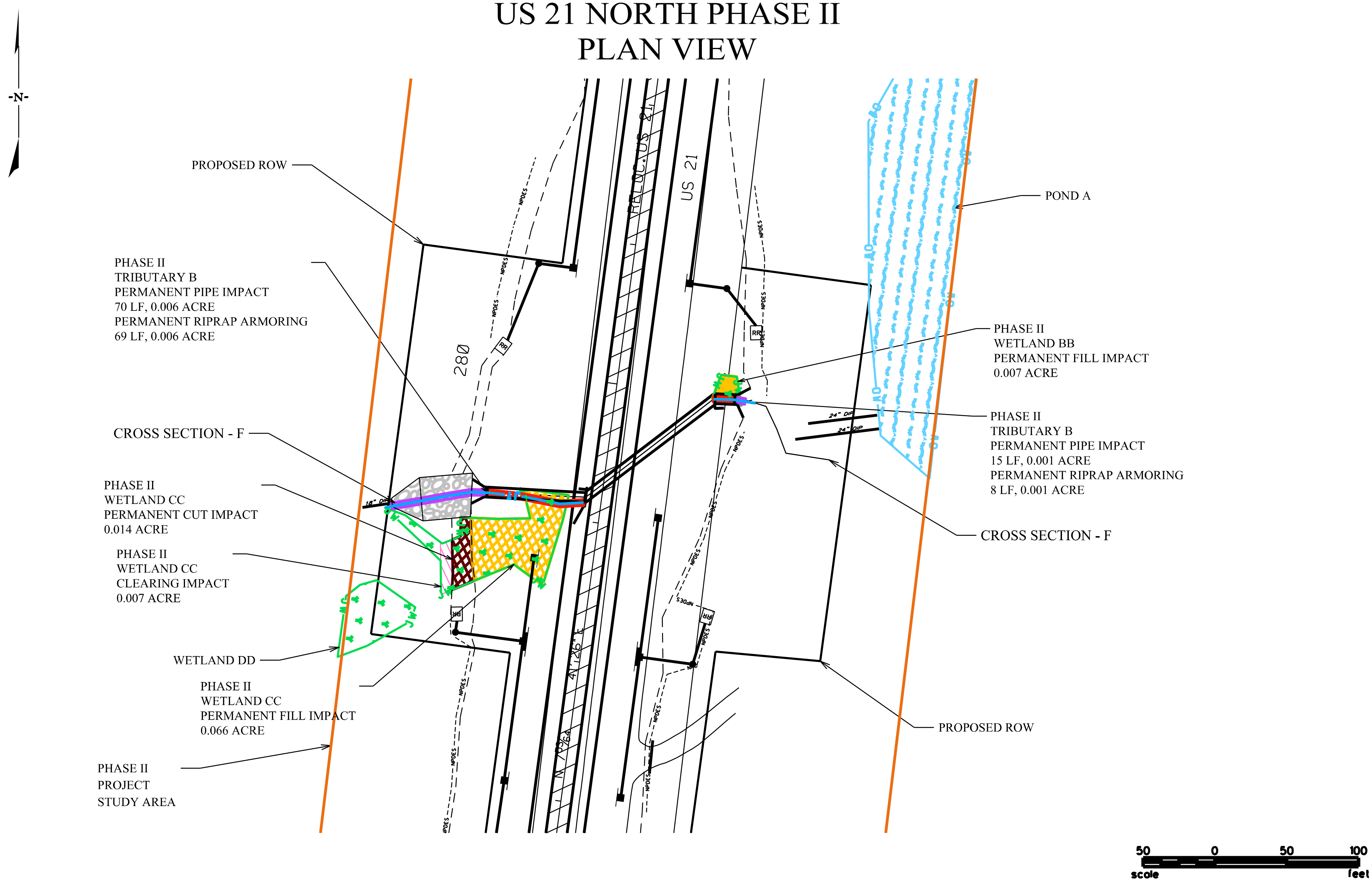
SCDOT PROJECT ID 42332 & 39235	
SHEET: 13 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
PLAN VIEW



WETLAND
JURISDICTIONAL TRIBUTARY
JURISDICTIONAL OPEN WATER
RIPRAP
PERMANENT RIPRAP ARMORING IMPACT
PERMANENT PIPE/CULVERT IMPACT
PERMANENT FILL IMPACT
PERMANENT CUT IMPACT
TEMPORARY CLEARING IMPACT

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	77	0.007
PERMANENT TRIBUTARY PIPE IMPACT	85	0.007
PERMANENT WETLAND FILL IMPACT		0.073
PERMANENT WETLAND CUT IMPACT		0.014
TEMPORARY WETLAND CLEARING IMPACT		0.007
TOTAL PERMANENT TRIBUTARY IMPACTS	162	0.014
TOTAL PERMANENT WETLAND IMPACTS		0.087
TOTAL TEMPORARY WETLAND IMPACTS		0.007

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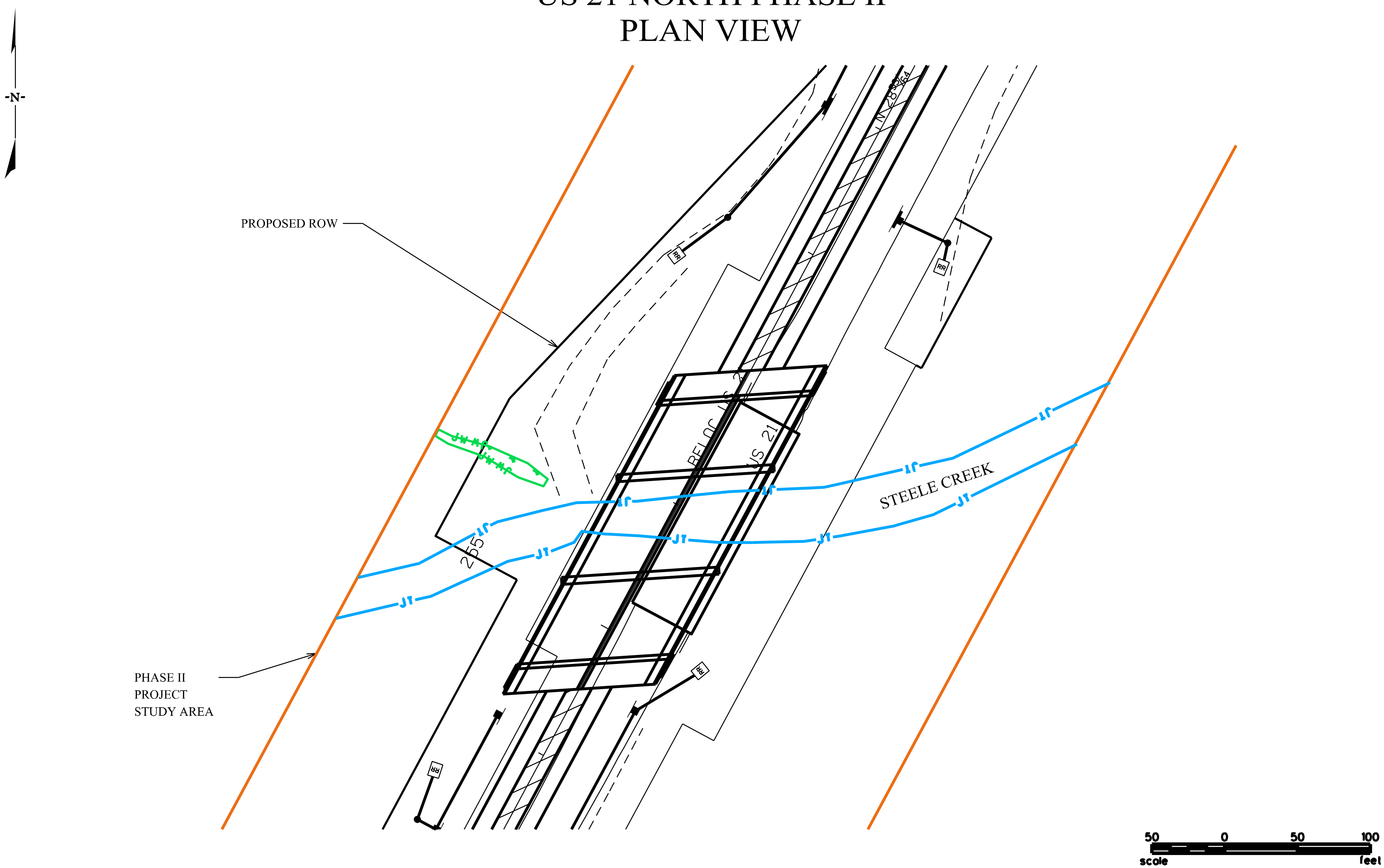
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 14 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	

SHEET IMPACT TOTALS LF ACRE

NO IMPACTS

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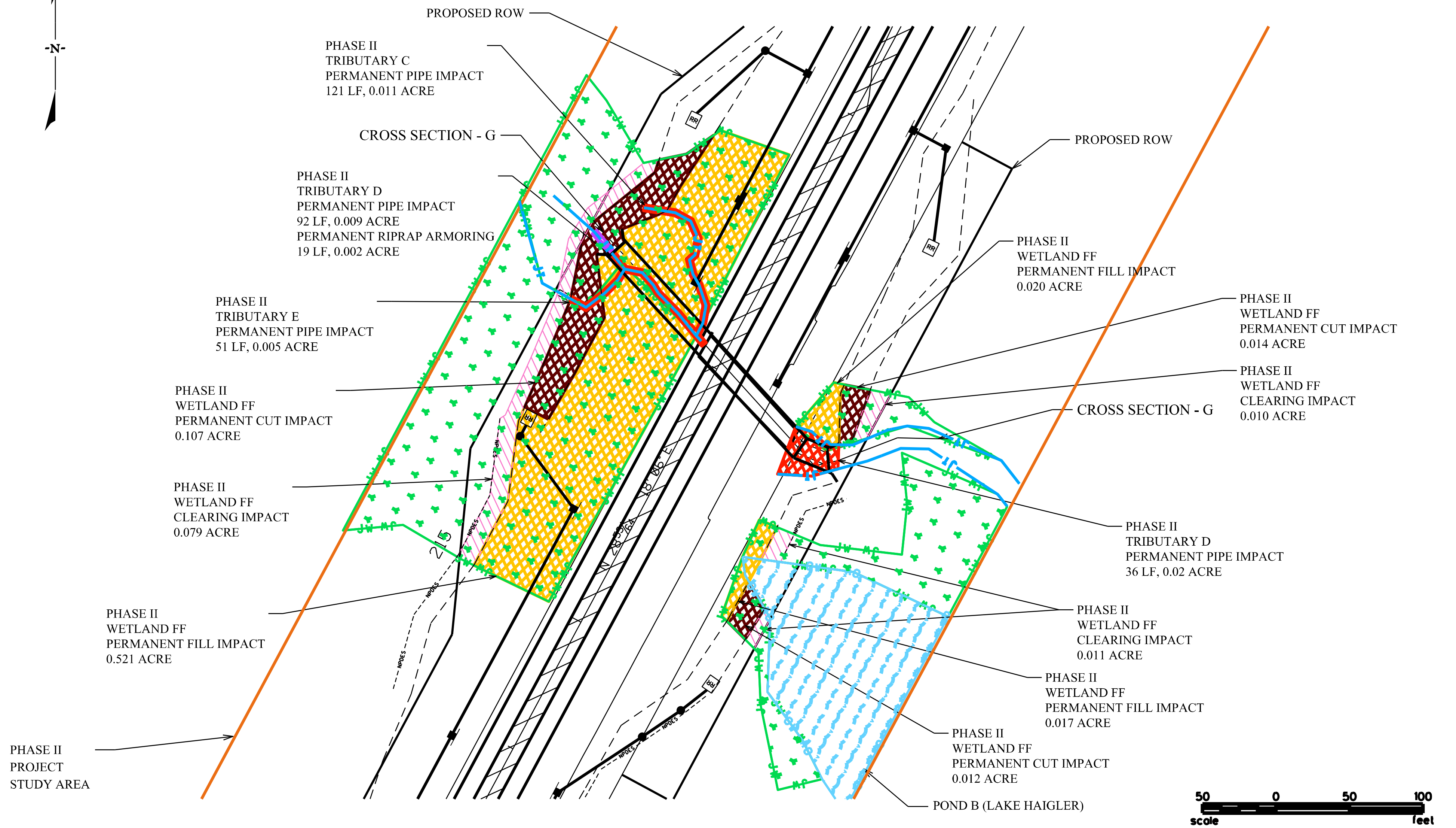
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 15 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
PLAN VIEW



WETLAND	
JURISDICTIONAL TRIBUTARY	
JURISDICTIONAL OPEN WATER	
RIPRAP	
PERMANENT RIPRAP ARMORING IMPACT	
PERMANENT PIPE/CULVERT IMPACT	
PERMANENT FILL IMPACT	
PERMANENT CUT IMPACT	
TEMPORARY CLEARING IMPACT	

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	19	0.002
PERMANENT TRIBUTARY PIPE IMPACT	300	0.045
PERMANENT WETLAND FILL IMPACT		0.558
PERMANENT WETLAND CUT IMPACT		0.133
TEMPORARY WETLAND CLEARING IMPACT		0.100
TOTAL PERMANENT TRIBUTARY IMPACTS	319	0.047
TOTAL PERMANENT WETLAND IMPACTS		0.691
TOTAL TEMPORARY WETLAND IMPACTS		0.100

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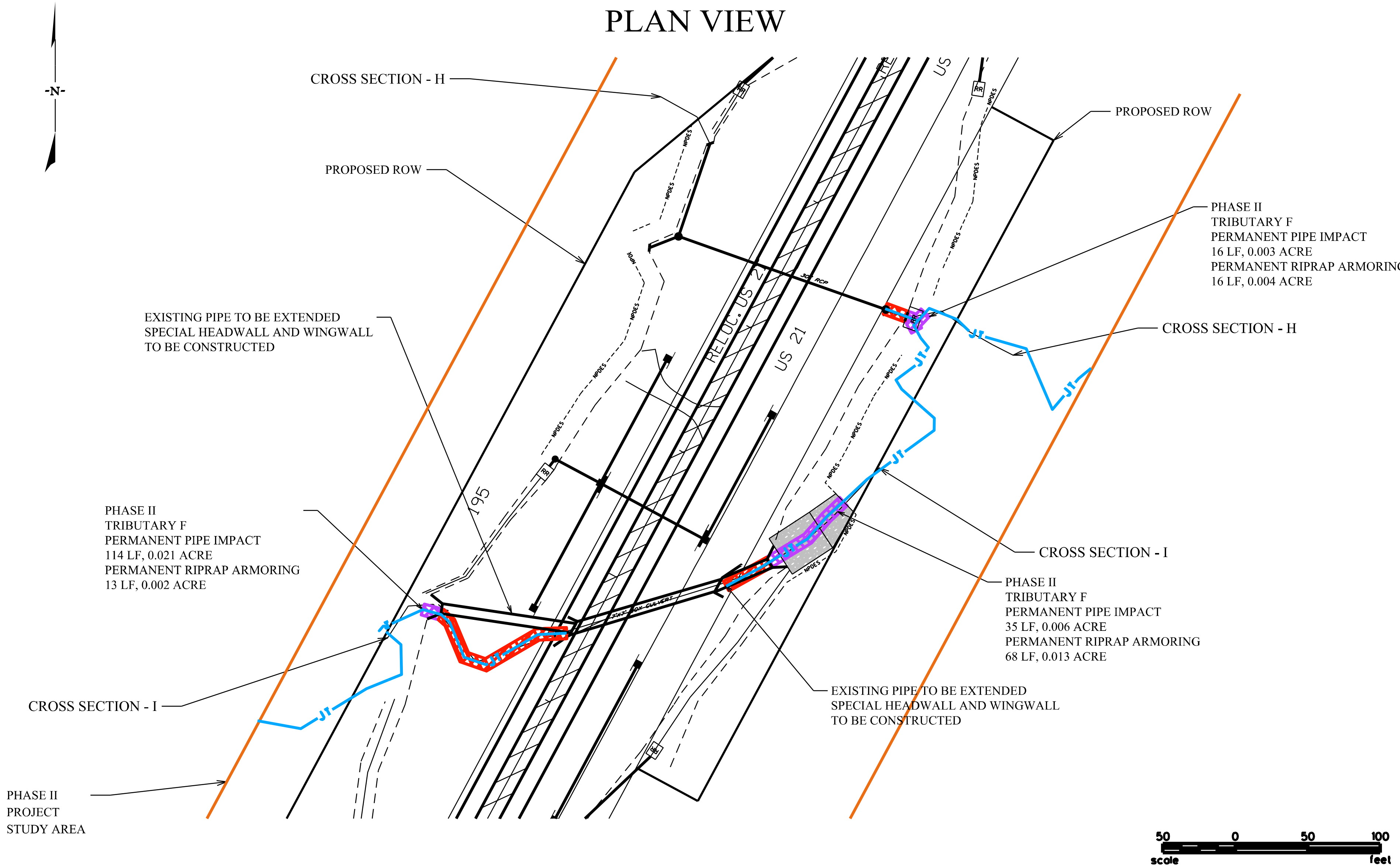
SCDOT PROJECT ID 42332 & 39235	
SHEET: 16 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
PLAN VIEW



JURISDICTIONAL TRIBUTARY
RIPRAP
PERMANENT RIPRAP ARMORING IMPACT
PERMANENT PIPE/CULVERT IMPACT

SHEET IMPACT TOTALS	LF	ACRE
PERMANENT TRIBUTARY ARMORING IMPACT	97	0.019
PERMANENT TRIBUTARY PIPE IMPACT	165	0.030
TOTAL PERMANENT TRIBUTARY IMPACTS	262	0.049

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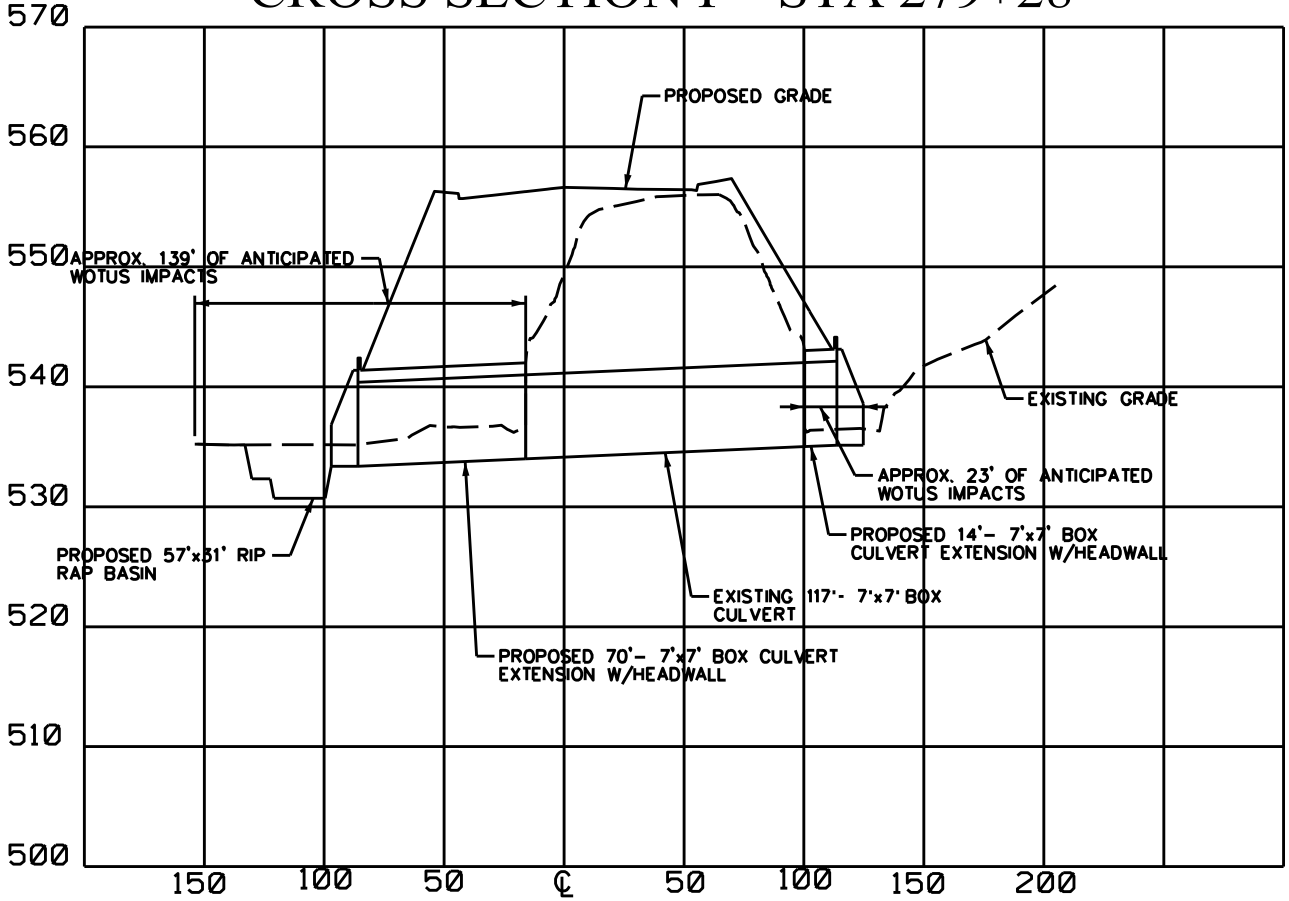
YORK COUNTY PROJECTS 11149-004 & 17228-015	
SCDOT PROJECT ID 42332 & 39235	
SHEET: 17 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
CROSS SECTION F - STA 279+28



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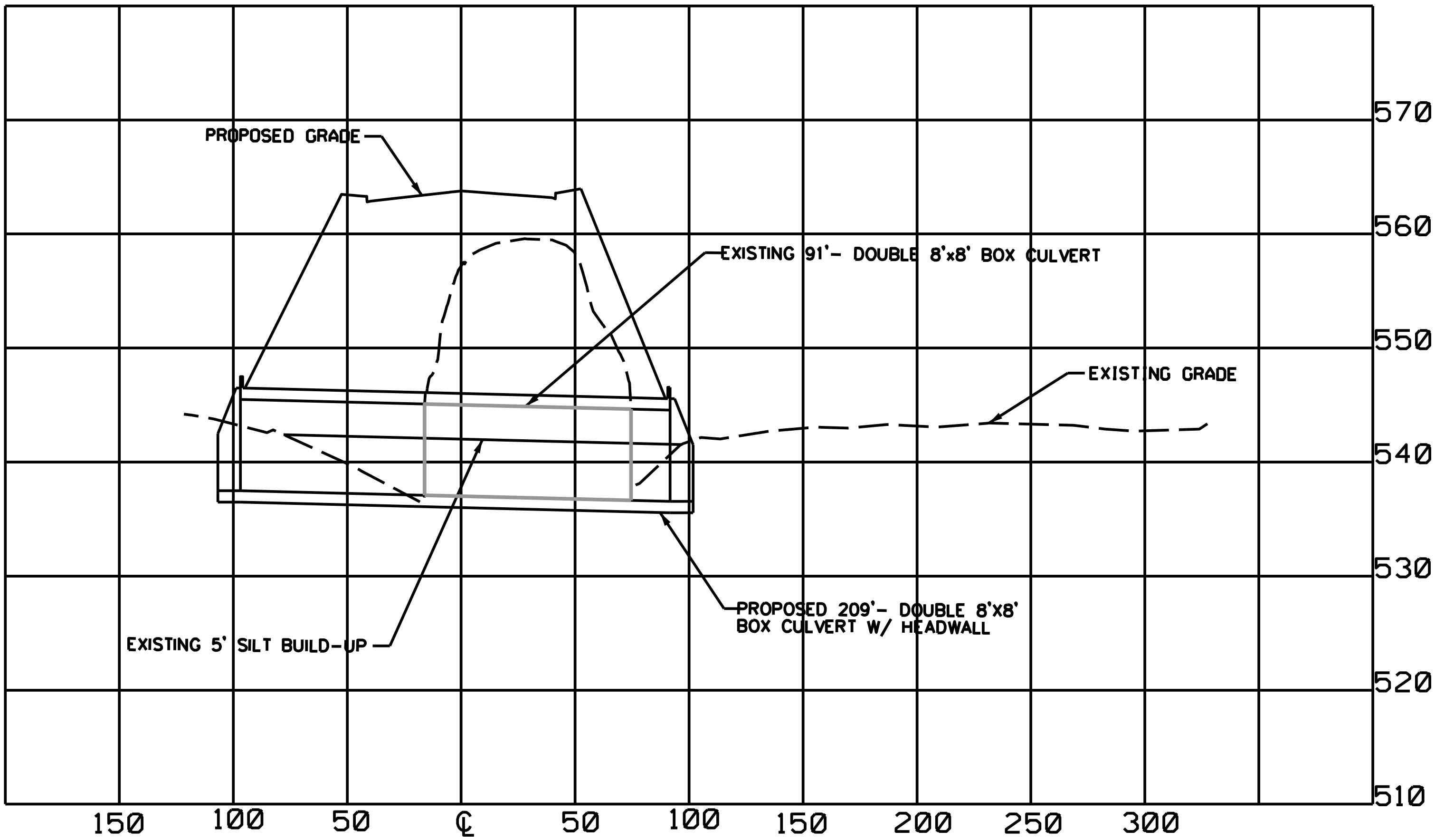
SCDOT PROJECT ID 42332 & 39235	
SHEET: 18 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
CROSS SECTION G - STA 217+06



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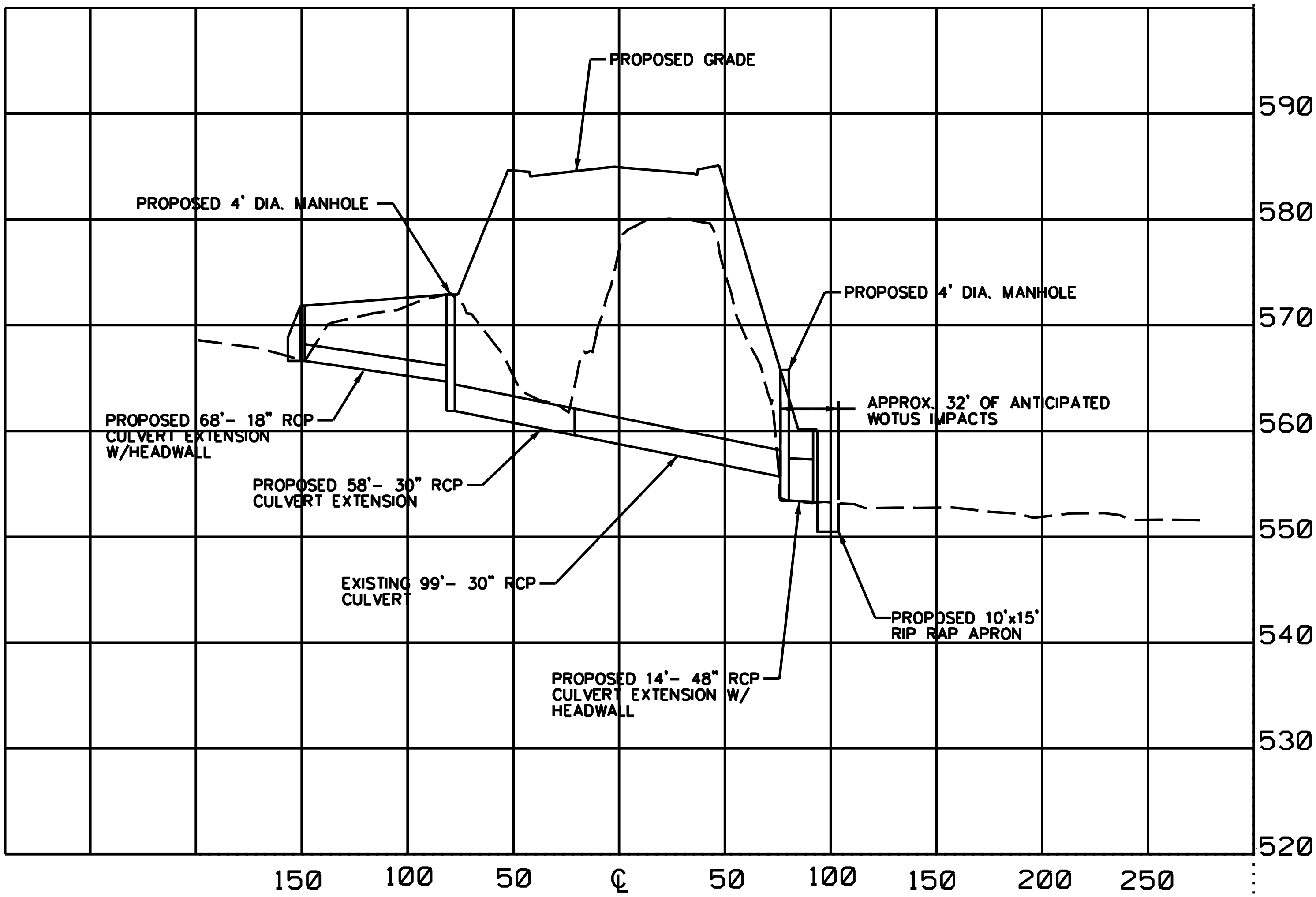
SCDOT PROJECT ID 42332 & 39235	
SHEET: 19 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
CROSS SECTION H - STA 197+46



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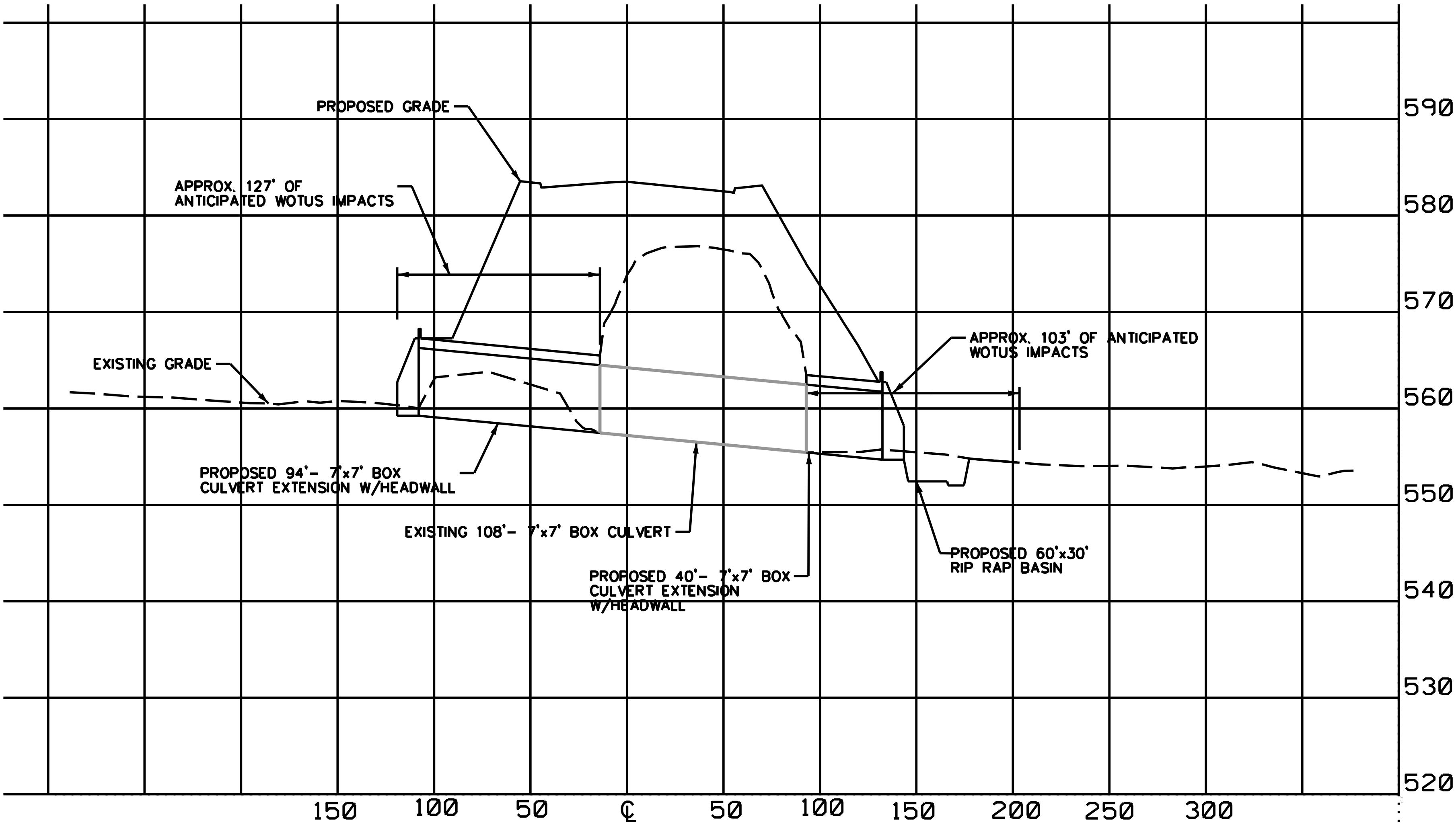
SCDOT PROJECT ID 42332 & 39235	
SHEET: 20 OF 21	DATE: Revised 12-17-2021

US 21 NORTH PHASE II
CROSS SECTION I - STA 194+87



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SCDOT PROJECT ID 42332 & 39235	
SHEET: 21 OF 21	DATE: Revised 12-17-2021

US 21 Phase I

ADVERSE IMPACT FACTORS FOR LINEAR SYSTEMS

Factor	Options								
Stream Type *	Non-RPW 0.1	1st and 2nd Order RPWs 0.8	All Other Streams 0.4						
Priority Category	Tertiary 0.1	Secondary 0.4	Primary 0.6						
Existing Condition	Very Impaired 0.1	Impaired 0.5	Partially Impaired 0.75	Fully Functional 1.5					
Duration	Temporary 0.05	Recurrent 0.1	Permanent 0.3						
Dominant Impact	Shade/Clear 0.05	Utility 0.15	Culvert 0.3	Armor 0.5	Dentention/Weir 0.75	Morphologic 1.5	Impound 2	Pipe 2.2	Fill 2.5
Cumulative Impact (lf)	< 50' 0.01	51-300' 0.1	301 - 500' 0.2	501 - 999' 0.4	1000 - 6000' 1.5	> 6000' 3			

Note: The cumulative impact factor for the __overall__ project must be used in each reach column on the Required Mitigation Credits Worksheet below.

* Stream type does not include man-made features. These streams will be evaluated on a case-by-case basis.

Required Mitigation Credits Worksheet US 21 Phase I

Factor	**Tributary A Riprap**	**Tributary A Pipe**	**Tributary C Riprap**	**Tributary C Pipe**	**Tributary D Riprap**	**Tributary D Pipe**
Stream Type	0.8	0.8	0.8	0.8	0.8	0.8
Priority Category	0.1	0.1	0.1	0.1	0.1	0.1
Existing Condition	0.75	0.75	0.75	0.75	0.75	0.75
Duration	0.3	0.3	0.3	0.3	0.3	0.3
Dominant Impact	0.5	2.2	0.5	2.2	0.5	2.2
Cumulative Impact	1.5	1.5	1.5	1.5	1.5	1.5
Sum of R Factors (R1)	**3.95**	**5.65**	**3.95**	**5.65**	**3.95**	**5.65**
Linear Feet Impact (LL1)	20	117	45	225	101	127
R x LL=	**79.0**	**661.1**	**177.8**	**1271.3**	**399.0**	**717.6**

Total Required Credits = (R x□LL) = **3305.6**

US 21 Phase I

ADVERSE IMPACT FACTORS FOR WETLANDS

Factor	Options					
Lost Type	Type C 0.2	Type B 2.0	Type A 3.0			
Priority Category	Tertiary 0.5	Secondary 1.5	Primary 2.0			
Existing Condition	Very Impaired 0.1	Impaired 1.0	Partially Impaired 2.0	Fully Functional 2.5		
Duration	0 to 1 year 0.2	1 to 3 years 0.5	3 to 5 years 1.0	5 to 10 years 1.5	Over 10 years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact (lf)	< 0.25 Acre 0.1	0.25 - 0.99 0.2	1.0 - 2.99 0.5	3.0 - 9.99 1.0	> 10.0 Acres 2.0	

Note: The cumulative impact factor for the <u>overall</u> project must be used in each reach column on the Required Mitigation Credits Worksheet below.

Required Mitigation Credits Worksheet US 21 Phase I

Factor	Wetland E	Wetland F	Wetland F	Wetland G	Wetland G	
Lost Type	3	3	3	3	3	
Priority Category	0.5	0.5	0.5	0.5	0.5	
Existing Condition	2.0	2.0	2.0	2.0	2.0	
Duration	0.2	0.2	2.0	0.2	2.0	
Dominant Impact	1.0	1.0	3.0	1.0	3.0	
Cumulative Impact	0.2	0.2	0.2	0.2	0.2	
Sum of R Factors (R1)	**6.9**	**6.9**	**10.7**	**6.9**	**10.7**	**0**
Impact Area (AA)	0.001	0.037	0.029	0.007	0.025	
R x AA=	**0.007**	**0.255**	**0.310**	**0.048**	**0.268**	**0.000**

Factor						
Lost Type						
Priority Category						
Existing Condition						
Duration						
Dominant Impact						
Cumulative Impact						
Sum of R Factors (R1)	**0**	**0**	**0**	**0**	**0**	**0**
Impact Area (AA)						
R x AA=	**0**	**0**	**0**	**0**	**0**	**0**

Total Required Credits = (R xLL) = 0.8883

US 21 Phase II

ADVERSE IMPACT FACTORS FOR LINEAR SYSTEMS

Factor	Options								
Stream Type *	Non-RPW 0.1	1st and 2nd Order RPWs 0.8	All Other Streams 0.4						
Priority Category	Tertiary 0.1	Secondary 0.4	Primary 0.6						
Existing Condition	Very Impaired 0.1	Impaired 0.5	Partially Impaired 0.75	Fully Functional 1.5					
Duration	Temporary 0.05	Recurrent 0.1	Permanent 0.3						
Dominant Impact	Shade/Clear 0.05	Utility 0.15	Culvert 0.3	Armor 0.5	Dentention/Weir 0.75	Morphologic 1.5	Impound 2	Pipe 2.2	Fill 2.5
Cumulative Impact (lf)	< 50' 0.01	51-300' 0.1	301 - 500' 0.2	501 - 999' 0.4	1000 - 6000' 1.5	> 6000' 3			

Note: The cumulative impact factor for the overall project must be used in each reach column on the Required Mitigation Credits Worksheet below.

* Stream type does not include man-made features. These streams will be evaluated on a case-by-case basis.

Required Mitigation Credits Worksheet US 21 Phase II

Factor	Tributary B Riprap	Tributary B Pipe	Tributary C Riprap	Tributary D Pipe	Tributary D Riprap	Tributary E Pipe
Stream Type	0.8	0.8	0.8	0.8	0.8	0.8
Priority Category	0.1	0.1	0.1	0.1	0.1	0.1
Existing Condition	0.75	0.75	0.75	0.75	0.75	0.75
Duration	0.3	0.3	0.3	0.3	0.3	0.3
Dominant Impact	0.5	2.2	0.5	2.2	0.5	2.2
Cumulative Impact	1.5	1.5	1.5	1.5	1.5	1.5
Sum of R Factors (R1)	**3.95**	**5.65**	**3.95**	**5.65**	**3.95**	**5.65**
Linear Feet Impact (LL1)	77	85	121	128	19	51
R x LL=	**304.2**	**480.3**	**478.0**	**723.2**	**75.1**	**288.2**

Factor	Tributary F Riprap	Tributary F Pipe				
Stream Type	0.8	0.8				
Priority Category	0.1	0.1				
Existing Condition	0.75	0.75				
Duration	0.3	0.3				
Dominant Impact	0.5	2.2				
Cumulative Impact	1.5	1.5				
Sum of R Factors (R1)	**3.95**	**5.65**	**0**	**0**	**0**	**0**
Linear Feet Impact (LL1)	97	165				
R x LL=	**383.2**	**932.3**	**0.0**	**0.0**	**0.0**	**0.0**

Total Required Credits = (R x □LL) = 3664.2

US 21 Phase II

ADVERSE IMPACT FACTORS FOR WETLANDS

Factor	Options					
Lost Type	Type C 0.2	Type B 2.0	Type A 3.0			
Priority Category	Tertiary 0.5	Secondary 1.5	Primary 2.0			
Existing Condition	Very Impaired 0.1	Impaired 1.0	Partially Impaired 2.0	Fully Functional 2.5		
Duration	0 to 1 year 0.2	1 to 3 years 0.5	3 to 5 years 1.0	5 to 10 years 1.5	Over 10 years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact (lf)	< 0.25 Acre 0.1	0.25 - 0.99 0.2	1.0 - 2.99 0.5	3.0 - 9.99 1.0	> 10.0 Acres 2.0	

Note: **The cumulative impact factor for the overall project must be used in each reach column on the Required Mitigation Credits Worksheet below.**

Required Mitigation Credits Worksheet US 21 Phase II

Factor	Wetland BB (Fill)	Wetland CC (Fill)	Wetland CC (Cut)	Wetland CC (Clearing)	Wetland FF (Fill)	Wetland FF (Cut)
Lost Type	3	3	3	3	3	3
Priority Category	0.5	0.5	0.5	0.5	0.5	0.5
Existing Condition	2.0	2.0	2.0	2.0	2.0	2.0
Duration	2.0	2.0	2.0	0.2	2.0	2.0
Dominant Impact	3.0	3.0	2.0	1.0	3.0	2.0
Cumulative Impact	0.2	0.2	0.2	0.2	0.2	0.2
Sum of R Factors (R1)	**10.7**	**10.7**	**9.7**	**6.9**	**10.7**	**9.7**
Impact Area (AA)	0.007	0.066	0.014	0.007	0.558	0.133
R x AA=	**0.075**	**0.706**	**0.136**	**0.048**	**5.971**	**1.290**

Factor	Wetland FF (Clearing)					
Lost Type	3					
Priority Category	0.5					
Existing Condition	2					
Duration	0.2					
Dominant Impact	1					
Cumulative Impact	0.2					
Sum of R Factors (R1)	**6.9**	**0**	**0**	**0**	**0**	**0**
Impact Area (AA)	0.1					
R x AA=	**0.69**	**0**	**0**	**0**	**0**	**0**

Total Required Credits = (R xLL) = 8.9159

OWNER NAME	MAILING ADDRESS	CITY/STATE	ZIP
JAMES ROSS MILLER JR	3685 HIGHWAY 51 N	FORT MILL SC	29715
MILLER CHARLES STEPHEN	3344 SCHOONER LN	CLOVER SC	29710
FAMILY LTD PARTNERSHIP	3685 HWY 51 N	FORT MILL SC	29715
MILLER JAMES ROSS &	3685 HWY 51	FORT MILL SC	29715
MILLER CHARLES STEPHEN ETAL	3344 SCHOONER LANE	CLOVER SC	29710
DFJ ENTERPRISES INC	1400 ROSEHILL DR	WAXHAW NC	28173
DAVIS DEIRDRE ANN & TRELLIS	7004 TEGA CAY DR	TEGA CAY SC	29708
DECOR-PRINT LLC	3581 ANDREW TUCKER RD UNIT 104	FORT MILL SC	29715
MIGHTY REALTY LLC	10915 DOWNS RD	PINEVILLE NC	28134
YANDINA HOLDINGS LLC	2764 PLEASANT RD #11405	FORT MILL SC	29708
HOLBEN PROPERTIES LLC	3581 ANDREW TUCKER RD STE 116	FORT MILL SC	29715
SHARON BUILDERS INC	PO BOX 2568	MATTHEWS NC	28106
LUNA INVESTMENTS LLC	3575 ANDREW L TUCKER RD STE100	FORT MILL SC	29715
LUNA INVESTMENTS LLC	3575 ANDREW L TUCKER RD	FORT MILL SC	29715
FMK MANAGEMENT LLC	3745 HIGHLAND CASTLE WAY	CHARLOTTE NC	28270
MONROE PROPERTY MANAGEMENT LLC	440 OCEANA WAY	CAROLINA BEACH NC	28428
WORLDWIDE VENTURES INC	3705 CENTER CIR	FORT MILL SC	29715
OMANRA INTERNATIONAL INC	6400 MORVEN LANE	CHARLOTTE NC	28270
FLEMING ANDREW ROBERT	481 FOREST WAY DR	FORT MILL SC	29715
SIMON & WATSON ENTERPRISES LLC	PO BOX 1327	FORT MILL SC	29716
CIRCLE B PROPERTIES LLC	PO BOX 607	FORT MILL SC	29716-0607
ENGLISH TRAILS HOMEOWNER ASSOC	PO BOX 4579 DEPT 207	HOUSTON TX	77210
TEAM PROPERTIES LP	2411 RIVER HILL RD	IRVING TEXAS	75061
RESOURCE PROPERTIES V ASSOC	1300 ALTURA RD	FORT MILL SC	29708
ZOLOTARYOV GENNADY & EMMA	14639 EAST GROVE DRIVE	PINEVILLE NC	28134
LATHAM CARL I III ETAL	PO BOX 10961	ROCK HILL SC	29731
3551 HWY 51 PROPERTY MGMT LLC	PO BOX 1325	PINEVILLE NC	28134-1325
YORK COUNTY	PO BOX 66	YORK SC	29745
VICK WILLIAM W	653 CARVERS FALLS RD	FAYETTEVILLE NC	28311
QUALITY POOLS GROUP INC	2508 DEVON DR	MONROE NC	28110
BROWN ENTERPRISES	PO BOX 7586	CHARLOTTE NC	28241
TAYLOR HORRY PROPERTIES LLC	411 WALNUT ST # 11779	GREEN CV SPGS FL	32043-3443
SILVER SPRINGHILL LLC	1805 SARDIS RD N STE 120	CHARLOTTE N C	28270
TAYLOR/YORK PROPERTIES LLC	411 WALNUT ST #11779	GREEN CV SPGS FL	32043-3443
194 SPRINGHILL FARMS RD LLC	400 PLAZA DR	SECAUCUS NJ	7096
CRUMP GEORGE	3500 HWY 51	FORT MILL SC	29715
MGD-SC REO LLC	2581 JUPITER PARK DR STE E16	JUPITER FL	33458
ATCF REO HOLDINGS LLC	150 S PINE ISLAND RD STE 430	PLANTATION FL	33324
CMJ FAIRFIELD RD LLC	4101 CHAIN BRIDGE RD #110	FAIRFAX VA	22030-4105
UNIQUE STONE CREATIONS INC	14315 DARIUS CT	CHARLOTTE NC	28273
SPARROW ROBERT CLAY	18341 ROYAL OAK RD	CHARLOTTE NC	28278-8719
GPT PARCEL C OWNER LLC	130 SOUTH JEFFERSON ST STE 300	CHICAGO IL	60661
S C DEPARTMENT OF TRANSPORTATION	955 PARK STREET	COLUMBIA SC	292011003
MCDONALDS REAL ESTATE COMPANY	PO BOX 182571	COLUMBUS OH	43218-2571
C&A PYRO LLC	5200 W 94TH TERRACE STE 114	PRAIRIE VILLAGE KS	66207
MONEYLINE PROPERTIES LLC	450 MEETING ST	CHARLESTON SC	72403-2107
CUTTER BRYANT W & NANCY L	123 BREVARD CT	CHARLOTTE NC	28202
HOF LLC	PO BOX 321	BLACKSBURG SC	29702
ARC PSFMLSC001	3473 US HWY 21	FORT MILL SC	29708
UNIQUE USA INC	104 WILLIAMSON ST	FORT MILL SC	29715
JUNG PROPERTIES LLC	2231 RICHARDSON DR	CHARLOTTE NC	28211
ALLSTATES CONSTRUCTION CO INC	6228 LAKE PROVIDENCE LN	CHARLOTTE NC	28277
PAPILLON LLC	1111 CENTRAL AVE STE 300	CHARLOTTE NC	28204
ALLSTATE CONSTRUCTION INC	PO BOX 78234	CHARLOTTE NC	28271
NARROWAY PRODUCTIONS INC	3386 HWY 21	FORT MILL SC	29715
NARROWAY PRODUCTIONS INC	3327 HWY 51	FORT MILL SC	29715
AUSTIN EUGENE TRUSTEE	238 CHAPMAN LOOP	PAWLEYS ISLAND SC	29585
COMPACT POWER EQUIPMENT INC	3326 HWY 51	FORT MILL SC	29715

OWNER NAME	MAILING ADDRESS	CITY/STATE	ZIP
HUDSON PROPERTY MANAGEMENT LLC	148 FLINT HILL RD	FORT MILL SC	29715
DAKA PROPERTIES LLC	12121 WILSHIRE BLVD STE 510	LOS ANGELES CA	90025
EXIT 68 LLC	PO BOX 3475 ATTN: LICENSING	TULSA OK	74101
COVINGTON DELANO BOYCE	449 FARM BRANCH RD	FORT MILL SC	29715
MSC CAROLINAS LLC	725 PARK CENTER DR	MATTHEWS NC	28105
ROSS DRESS FOR LESS INC	4440 ROSEWOOD DR	PLEASANTON CA	94588
STERLING YORK LLC	1616 CAMDEN RD STE 550	CHARLOTTE NC	28203
A & P CAR CARE CENTER INC	3215 HIGHWAY 21	FORT MILL SC	29715
WALKER CORP INC	3203 HWY 21	FORT MILL SC	29715
WALKER CORP INC	2026 GOLD HILL RD	FORT MILL SC	29708
WAL-MART TRS LLC	805 MOBERLY LN/PO BOX 8050	BENTONVILLE AR	72712-8050
RHODES JOSHUA C & SARAH ELLEN	3604 WHEAT ST	COLUMBIA SC	29205
CV HWY 21 LLC	PO BOX 36938	CHARLOTTE NC	28236
MCMEHAN GRADY E ETAL	3139 HWY 21 NORTH	FORT MILL SC	29715
GTA PROPERTIES LLC	2707 HUNTINGTOWNE FARMS LANE	CHARLOTTE NC	28210
FORT MILL CROWN PLAZA LLC	4707 SNAPDRAGON WAY	SAN LUIS OBISPO CA	93401
REGENT PARK COMM OWNERS ASSOC	4523 PARK RD SUITE 201A	CHARLOTTE NC	28237
HILLCREST FOODS INC	50 SATELLITE BLVD NW STE G	SUWANEE GA	30024-7105
CANBERRA HOLDINGS LLC &	600 GREEN VALLEY RD #202	GREENBORO NC	27408
NARRA NAGADURGAVANI	726 SOUTH CREEK RD	CHARLOTTE NC	28277
1ST PATRIOTS FEDERAL CREDIT	2760 HOME DEPOT BLVD	ROCK HILL SC	29730
TOWN SQUARE OWNERS ASSOC	PO BOX 38809	CHARLOTTE NC	28278
CITRO SALVATORE & PAULINE	3048 US 21	FORT MILL SC	29715
H & A ASSOCIATES LLC	3031 HWY 21	FORT MILL SC	29715
BAHERI MEHRDAD ALI	4323 APPLEGATE RD	CHARLOTTE NC	28209-2707
PATTERSON J WAYNE	3035 VERNON ST	FORT MILL SC	29715
WHITMIRE JAMES H ETAL	638 RELIANCE CT	FORT MILL SC	29708
NORRIS JOYCE G & JOHN L	3026 VERNON ST	FORT MILL SC	29715
AVANTI PROPERTIES LLC	358 GRINGLEY HILL RD	FORT MILL SC	29715
SONG SONGMIN & SANG HUI	5645 SAINT JAMES LN	YORK SC	29745
THE EUBANKS FAMILY LTD	4598 DEER RUN	ROCK HILL SC	29732
COLEY GRACE P AS TRUSTEE	PO BOX 85	BLACKSTOCK SC	29014
BWD INC	PO BOX 795	LINCOLNTON NC	28092
SHELDON CHRISTOPHER	12081 SPINNAKER DR	TEGA CAY SC	29708
AMERICAS FINEST CAR WASH II	1310 SOUTH TRYON ST STE 104	CHARLOTTE NC	28203
IVAC OF THE CAROLINAS REAL	2950 OLD NATION ROAD STE 4	FORT MILL SC	29715
IVAC OF THE CAROLINAS REAL	2950 OLD NATION RD	FORT MILL SC	29715
N & W SMITH PROPERTIES FAMILY	1452 MUSEUM RD	ROCK HILL SC	29732
CORBI MICHAEL	2910 OLD NATION RD	FORT MILL SC	29715
GARRISON HOMEPLACE FARM LLC	198 GARRISON FARM RD	FORT MILL SC	29715
CAHILL DAVID E	1729 CHANTILLY LANE	CHESTER SPRINGS PA	19425
STORE MASTER FUNDING V LLC	8800 N GAINEY CENTER DR STE300	SCOTTSDALE AZ	85258
YORK COUNTY	2833 OLD NATION RD	FORT MILL SC	29715
GATEWAY FORT MILL LLC	6701 CARMEL RD STE 118	CHARLOTTE NC	28226
FORT MILL TELEPHONE CO	2801 OLD NATION RD	FORT MILL SC	29715
FAIRWAY TOWNES OWNERS ASSOC	PO BOX 3340	FORT MILL SC	29716
EDWARDS RICHARD KENDRICK SR	251 GOLD HILL RD	FORT MILL SC	29715
FORT MILL SCHOOL DISTRICT NO.4	2233 DEERFIELD DR	FORT MILL SC	29715
EUBANKS DONNA D	1330 INDIA HOOK RD APT 529	ROCK HILL SC	29732
CORDELL WALTER LAWRENCE &	343 GOLD HILL RD	FORT MILL SC	29715
CORVAIA KATHLEEN	339 GOLD HILL RD	FORT MILL SC	29715
HALL RAYMOND C JR	291 GOLD HILL RD	FORT MILL SC	29715
TOON JASON	344 LAKESHORE DRIVE	FORT MILL SC	29715
MCCRAVEN CAROL W	300 LAKE SHORE DR	FORT MILL SC	29715
RP FM221 LLC	STE P-177	PHOENIX AZ	85028
GOMEZ JUAN ANTONIO SANCHEZ	221 FOREST DR	FORT MILL SC	29715
MEACHAM CASSANDRA MULLER	231 FOREST DR	FORT MILL SC	29715
SOTO-PICAZO CARLOS	674 BERNICE LN	RICHBURG SC	29729

OWNER NAME	MAILING ADDRESS	CITY/STATE	ZIP
WATFORD RUSSELL S & CLARA R	251 FOREST DRIVE	FORT MILL SC	29715
GONZALEZ MARIA DE LOURDES	261 FOREST DR	FORT MILL SC	29715
GARCIA SAMUEL JR	271 FOREST DR	FORT MILL SC	29715
NEWMAN MICHAEL D	281 FOREST DR	FORT MILL SC	29715
ASH BRYAN N	1503 WILLIAMS RD	FORT MILL SC	29715
BATES MARIE B & ROGER DENNIS	260 FERN FOREST COURT	FORT MILL SC	29715
FRANKLIN BRENDA C	4428 TURKEY LN	ROCK HILL SC	29730
BEAN DOROTHY J	271 FERN FOREST COURT	FORT MILL SC	29715
COALITION OF PRISON EVANGELIST	PO BOX 7404	CHARLOTTE NC	27242-7404
MACIAS ANTONIO & GREGORIA	270 AMELIA DR	FORT MILL SC	29715
HARLLEE MARY F & DAVID S	328 LAKEVIEW DR	FORT MILL SC	29715
HARLLEE DAVID STUART SR &	328 LAKEVIEW DRIVE	FORT MILL SC	29715
BUCHANAN MARK D TRUSTEE	343 LAKEVIEW DRIVE	FORT MILL SC	29715
YORK ELECTRIC COOPERATIVE INC	PO BOX 150	YORK SC	29745
TEBBS ALICE A	5212 SATTLER PL	SARASOTA FL	34232-2677
KEENAN ERMA JANE & BETTY JANE	109 AMELIA DR	FORT MILL SC	29715
SCOTT SHERRI LIFE ESTATE	279 AMELIA DR	FORT MILL SC	29715
SPRINGFIELD TOWN CENTER LLC	PO BOX 1777	FORT MILL SC	29716
SPRINGVIEW MEADOWS HOMEOWNERS	11121 CARMEL COMMONS BLVD	CHARLOTTE NC	28226
THORNE JONATHAN & CHELSEY L	1027 CRESCENT MOON DR	FORT MILL SC	29715
HUITT CHRISTINA B & JUSTIN D	1031 CRESCENT MOON DR	FORT MILL SC	29715
MARKUS DONNA M & WILLIAM PETER	1035 CRESCENT MOON DR	FORT MILL SC	29715
MANTEKAS SOTIRIOS & JANIE D	16622 ANSLEY WALK LN	CHARLOTTE NC	28277
MANTEKAS SOTIRIOS & JANICE	16622 ANSLEY WALK LANE	CHARLOTTE N C	28277
HARRIS TEETER PROPERTIES LLC	PO BOX 10100	MATTHEWS NC	28106-0100
NEW HORIZON ELECTRIC	PO BOX 1169	LAURENS SC	29360
FLINT HILL VOLUNTEER FIRE DEPT	1950 HWY 21 BYPASS	FORT MILL SC	29715
C4 HOLDINGS LLC	121 W TRADE ST STE 2550	CHARLOTTE NC	28202
RUTLEDGE LAND & REALTY LLC	1486 GREENWOOD LN	ROCK HILL SC	29730
HALL GEORGE H JR	1938 HWY 21 BY-PASS	FORT MILL SC	29715
HALL GEORGE H	1938 HWY 21 BY PASS	FORT MILL SC	29715
D & DG LLC	512 COOLEEWEE CT	FORT MILL SC	29715
BLACKSTOCK CEMETERY	3385 HWY 21	FORT MILL SC	29715

OWNER NAME	MAILING ADDRESS	CITY/STATE	ZIP
AMISUB OF SOUTH CAROLINA INC	PO BOX 92129	SOUTHLAKE TX	76092
BUCHANAN CLYDE E & JOHN T	1624 HWY 21 BYPASS	FORT MILL SC	29715
C4 HOLDINGS LLC	121 W TRADE ST STE 2550	CHARLOTTE NC	28202
CATO LAND DEVELOPMENT LLC	8100 DENMARK RD	CHARLOTTE NC	28273
CLEAR SPRINGS KINGSLEY LLC	PO BOX 1777	FORT MILL SC	29715
CLEAR SPRINGS LAND CO LLC	PO BOX 1777	FORT MILL SC	29715
CLEAR SPRINGS LAND CO LLC	951 MARKET ST STE 203	FORT MILL SC	29708
CLEAR SPRINGS SPRINGFIELD LLC	PO BOX 1777	FORT MILL SC	29716
CLOSE ANNE SPRINGS	PO BOX 1449	FORT MILL SC	29716
CLOSE FAMILY REAL ESTATE#2 LLC	PO BOX 1777	FORT MILL SC	29715
D & DG LLC	512 COOLEEWEE CT	FORT MILL SC	29715
FLINT HILL VOLUNTEER FIRE DEPT	1950 HWY 21 BYPASS	FORT MILL SC	29715
FORT MILL SCHOOL DIST# 4	2233 DEERFIELD DR	FORT MILL SC	29715
GASKIN JERALD E JR & OLIVA D	1718 HWY 21 BYPASS	FORT MILL SC	29715
HALL GEORGE H	1938 HWY 21 BYPASS	FORT MILL SC	29715
HART WILLIAM DEHLER	1750 HIGHWAY 21 BYPASS	FORT MILL SC	29715
LEROY SPRINGS & CO INC	PO BOX 1209	FORT MILL SC	29715
LEROY SPRINGS & CO INC	PO DRAWER 460	LANCASTER SC	29721
MANTEKAS SOTIRIOS & JANICE	16622 ANSLEY WALK LANE	CHARLOTTE NC	28277
MYERS RONALD R	1650 US HWY 21 N	FORT MILL SC	29715
NEW HORIZON ELECTRIC	PO BOX 1169	LAURENS SC	29360
RUTLEDGE LAND & REALTY LLC	1486 GREENWOOD LN	ROCK HILL SC	29730
SPRINGFIELD COMMERCIAL	PO BOX 1777	FORT MILL SC	29716
YORK ELECTRIC COOPERATIVE INC	PO BOX 150	YORK SC	29745
ZEK DEL CAUSAL LLC	9789 CHARLOTTE HWY	FORT MILL SC	29707

Appendix C

Receiving Waterbodies Map and Information

U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map
US Topo

FORT MILL QUADRANGLE
SOUTH CAROLINA-NORTH CAROLINA
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 17S
10 000-foot ticks: South Carolina Coordinate System of
1983, North Carolina Coordinate System of 1983

Imagery....NAIP, April 2009
Roads....©2006-2010 Tele Atlas
Names....GNIS, 2010
Hydrography....National Hydrography Dataset, 2009
Contours....National Elevation Dataset, 2011
Boundaries....Census, IBWC, IBC, USGS, 1972 - 2010

UTM GRID AND 2011 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID NU
Grid Zone Designation 17S

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with version 0.5.10
of the USGS US Topo Product Standard.
A metadata file associated with this product is draft version 0.5.16

QUADRANGLE LOCATION

Belmont	Charlotte West	Charlotte East
Lake Wylie	Fort Mill	Weddington
Rock Hill West	Rock Hill East	Catawba NE

ADJOINING 7.5' QUADRANGLES

ROAD CLASSIFICATION

Interstate Route — State Route
US Route — Local Road
Ramp — 4WD

Interstate Route · US Route · State Route

FORT MILL, SC-NC
2011

Watershed and Water Quality Information

Applicant Name:	York County Pennies For Progress	**Permit Type:**	Construction
Address:	110 FLINT HILL RD, FORT MILL, SC, 29715	**Latitude/Longitude:**	35.082277 / -80.933846
MS4 Designation:	Small MS4	**Monitoring Station:**	CW-681
Within Coastal Critical Area:	No	**Water Classification (Provisional):**	FW
Waterbody Name:	Unnamed Trib	**Entered Waterbody Name:**	

NH3N	Ammonia	CD	Cadmium	CR	Chromium
CU	Copper	HG	Mercury	NI	Nickel
PB	Lead	ZN	Zinc	DO	Dissolved Oxygen
PH	pH	TURBIDITY	Turbidity	ECOLI	Escherichia coli (Freshwaters)
FC	Fecal Coliform (Shellfish)	BIO	Macroinvertebrates (Bio)	TP	(Lakes) Phosphorus
TN	(Lakes) Nitrogen	CHLA	(Lakes) Chlorophyll a	ENTERO	Enterococcus (Coastal Waters)
HGF	Mercury (Fish Tissue)	PCB	PCB (Fish)		

Station	NH3N	CD	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FC	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
CW-681	X	X	X	X	X	X	X	X	X	N	X	X	X	X	X	X	X	X	X	X

F = Standards full supported
N = Standards not supported
A = Assessed at upstream station
X = Parameter not assessed at station
WnTN = Within TMDL, parameter not supported
InTN = In TMDL, parameter not supported
WnTF = Within TMDL, parameter full supported
InTF = In TMDL, parameter full supported

PH - pH

In TMDL Watershed: Yes
TMDL Site: CW-203
TMDL Report No: 010-07
TMDL Parameter: Fecal
TMDL Document Link: https://www.scdhec.gov/sites/default/files/docs/HomeAndEnvironment/Docs/tmdl_steeleck_fc.pdf

Report Date: February 15, 2023

Appendix D

Erosion Control Standard Drawings

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER

SIGNATURE

MARCH 2, 2009

DATE

#	DATE	CHK	DESCRIPTION
6			
5			
4			
3			
2			
1	3/2009	JBH	GENERAL REVISIONS
0	3/2008	DSO	GENERAL REVISIONS

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

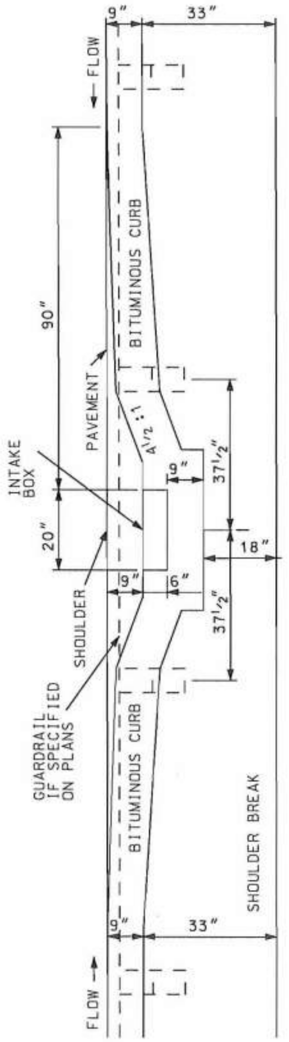
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

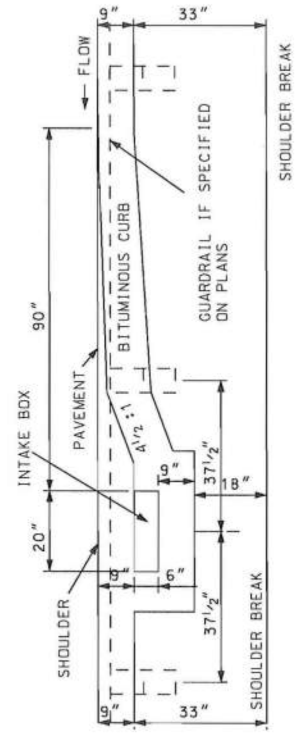
12" SLOPE DRAIN (METAL INTAKE SPILLWAY ASSEMBLY & BITUMINOUS CURB)

803-105-00

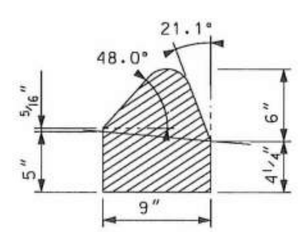
EFFECTIVE LETTING DATE MAY, 2009



DETAIL 3
SCALE 1/4":1'
BITUMINOUS CURB CONSTRUCTION AT LOW POINT OF GRADE



DETAIL 4
SCALE 1/4":1'
BITUMINOUS CURB CONSTRUCTION ON GRADE



DETAIL 5
SCALE 3/4":1'
BITUMINOUS CURB

NOTES:

1. 16 GAUGE ALUMINUM ALCLAD 3004 TO BE USED THROUGHOUT INTAKE SPILLWAY ASSEMBLY. FABRICATED FROM FLAT SMOOTH METAL. USE ALUMINUM OR GALVANIZED STEEL FASTENERS.

2. TELESCOPED SECTION OF BOX TO BE FABRICATED TO OBTAIN A SNUG FIT SECURED WITH SCREWS AS INDICATED.

3. CONCRETE CURB ADJACENT TO BRIDGES SHALL BE CONSTRUCTED AT A LOCATION THAT WILL NOT INTERFERE WITH FUTURE PLACEMENT OF GUARDRAIL.

4. PIPE SLOPE DRAIN TO BE EXTENDED TO BERM DITCH WHERE THEY OCCUR, OTHERWISE, EXTEND TO GRADE POINT OF OUTLET DRAIN WITHIN RIGHT-OF-WAY.

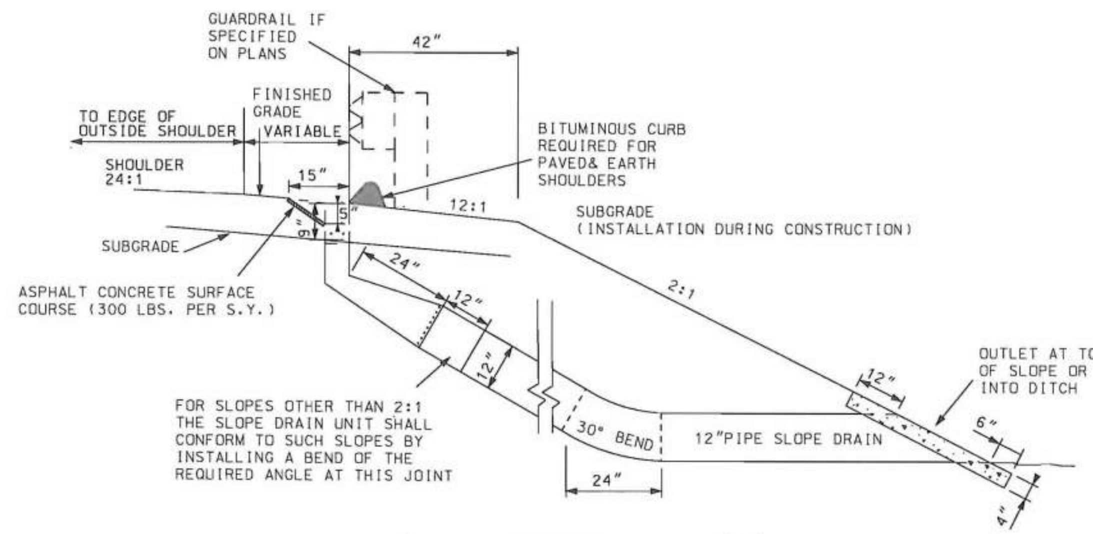
5. END PROTECTORS SHALL BE CAST IN PLACE WITH CLASS 3000 OR BETTER CONCRETE.

6. SURFACE COURSE TO BE PAID FOR IN THE UNIT CONTRACT PRICE BID FOR HOT MIX ASPHALT CONCRETE SURFACE COURSE. USE PAVEMENT MATERIAL TO MATCH ROADWAY PAVEMENT.

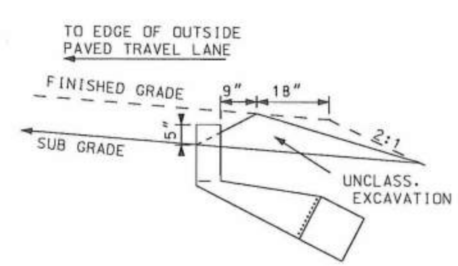
7. THE PAY ITEMS SHALL BE:

8035000 METAL INTAKE SPILLWAY ASSEMBLY_______EACH
8034120 12" PIPE SLOPE DRAIN_______________L.F.
8036120 12" SLOPE DRAIN END PROTECTOR_________EACH
7211000 BITUMINOUS CURB_______________L.F.
40303XX H/M ASPH.SURF.CR.(TYPE__)________TON

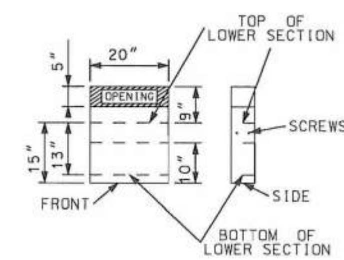
DETAIL 1
SCALE 1/4":1'
PLAN



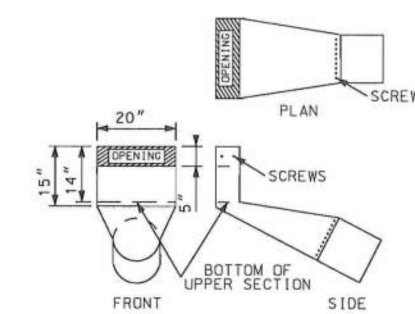
DETAIL 2
SCALE 1/4":1'
SIDE ELEVATION (POSITION OF EXTENSION ASSEMBLY FOR FINISHED GRADE)



DETAIL 6
SCALE 1/4":1'
POSITION OF EXTENSION ASSEMBLY FOR SUBGRADE



DETAIL 7
SCALE 1/4":1'
METAL INTAKE SPILLWAY UPPER EXTENSION ASSEMBLY FABRICATE FOR SNUG FIT OVER LOWER ASSEMBLEY



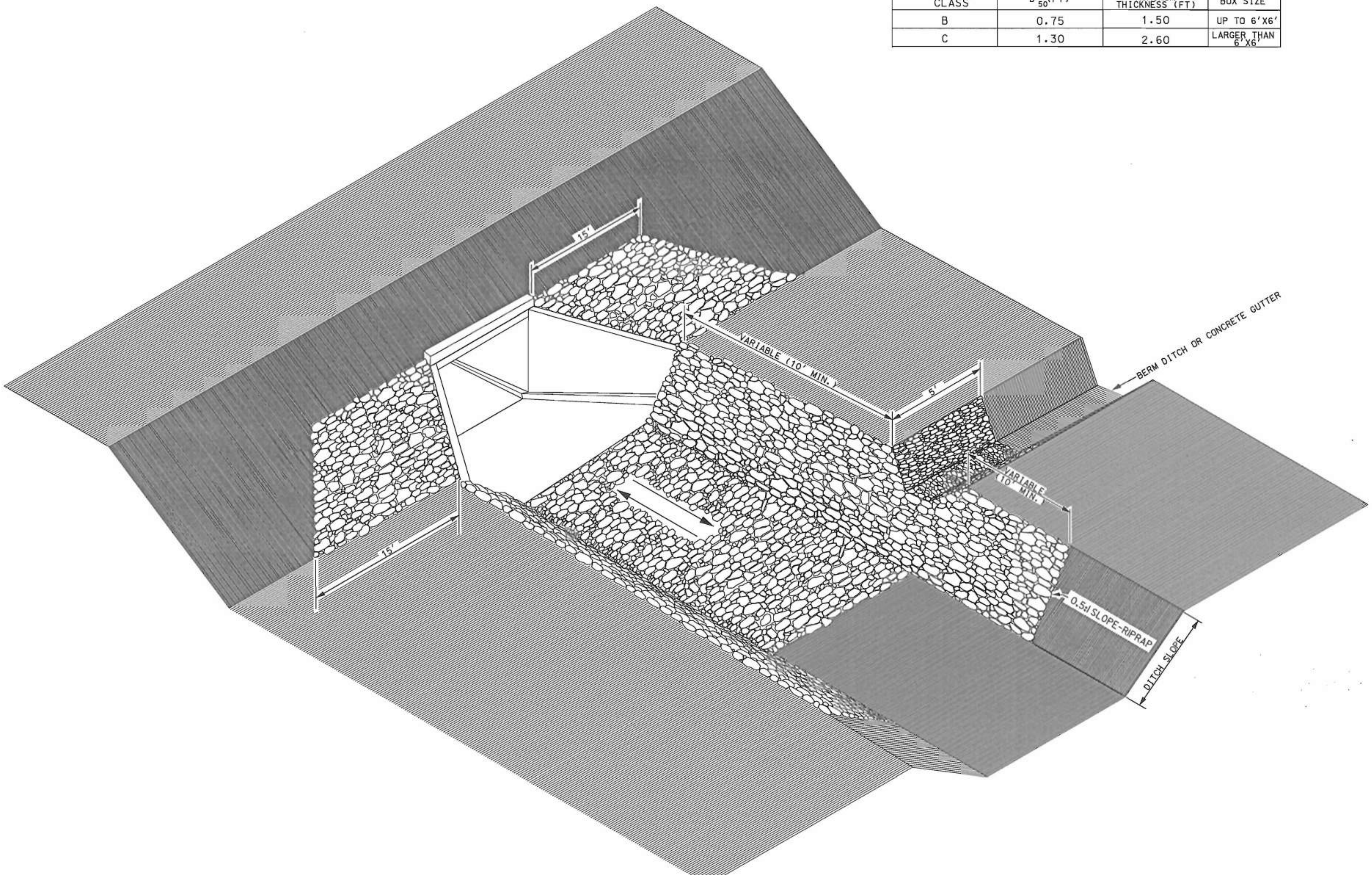
DETAIL 8
SCALE 1/4":1'
METAL INTAKE SPILLWAY LOWER EXTENSION ASSEMBLY

NOTES:

1. GEOTEXTILE FABRIC TO BE USED UNDER RIPRAP WHEN INCLUDED IN THE PLANS.
2. THE PAY ITEMS SHALL BE:
   RIPRAP - CLASS __ - ________________ TON
   GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS I) TYPE __ - __________ S.Y.

CHART 804-205A
RIPRAP PLACEMENT

MINIMUM CLASS	D_{50}(FT)	MINIMUM THICKNESS (FT)	BOX SIZE
B	0.75	1.50	UP TO 6'X6'
C	1.30	2.60	LARGER THAN 6'X6'



THIS DRAWING IS NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 8858 EDWIN SYLVESTER EARGLE, II

SIGNATURE

MARCH 3, 2009

DATE

#	DATE	CHK	DESCRIPTION
6			
5			
4			
3			
2			
1	3/2009	DSO	CHANGED CHART 804-205A
0	3/2008	DSO	GENERAL REVISIONS

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

RIPRAP
(BOX CULVERT)

804-205-00

EFFECTIVE LETTING DATE MAY 2009

REFERENCES

NATIONAL DOCUMENTS

USDA NRCS ENGINEERING FIELD MANUAL

SCDOT DOCUMENTS

WQM

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

#	DATE	CHK	DESCRIPTION
6			
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SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

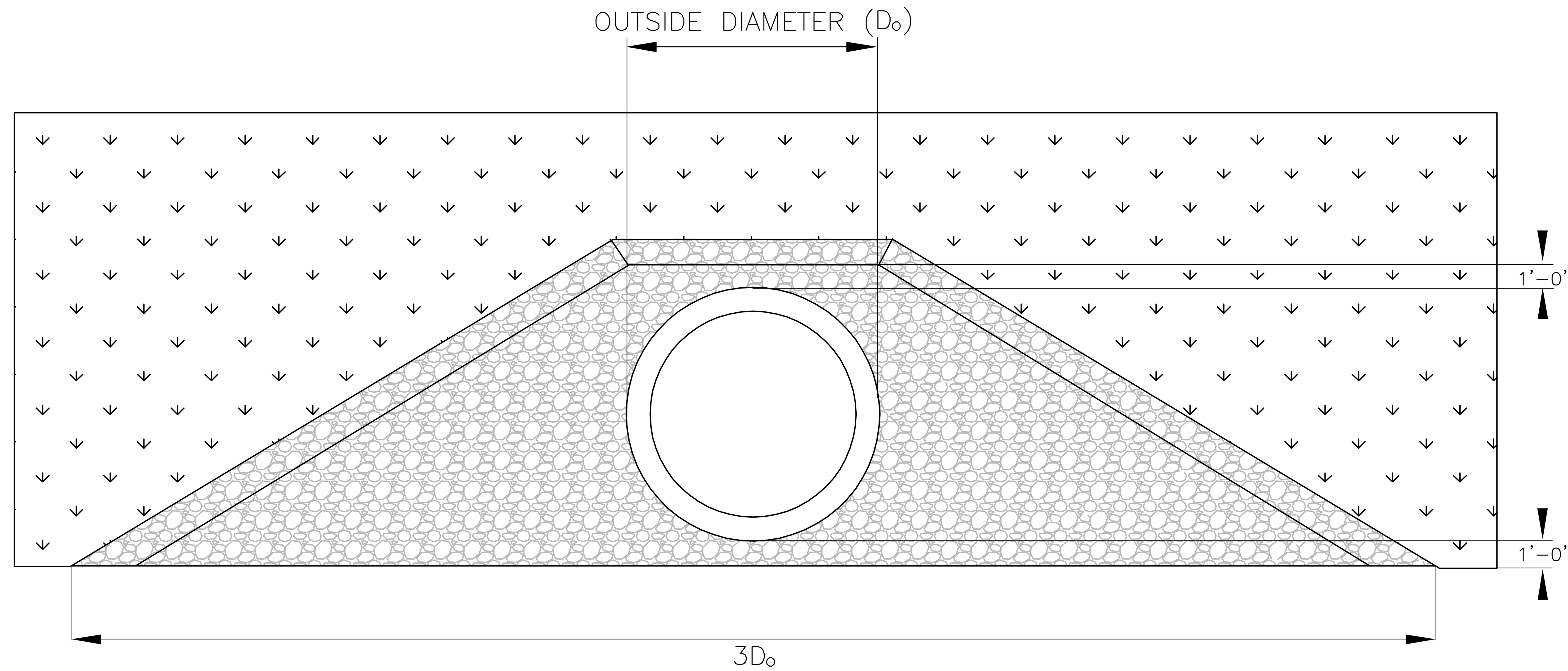
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

OUTLET PROTECTION WITH NO DEFINED CHANNEL

804–305–01

EFFECTIVE LETTING DATE JULY 2017



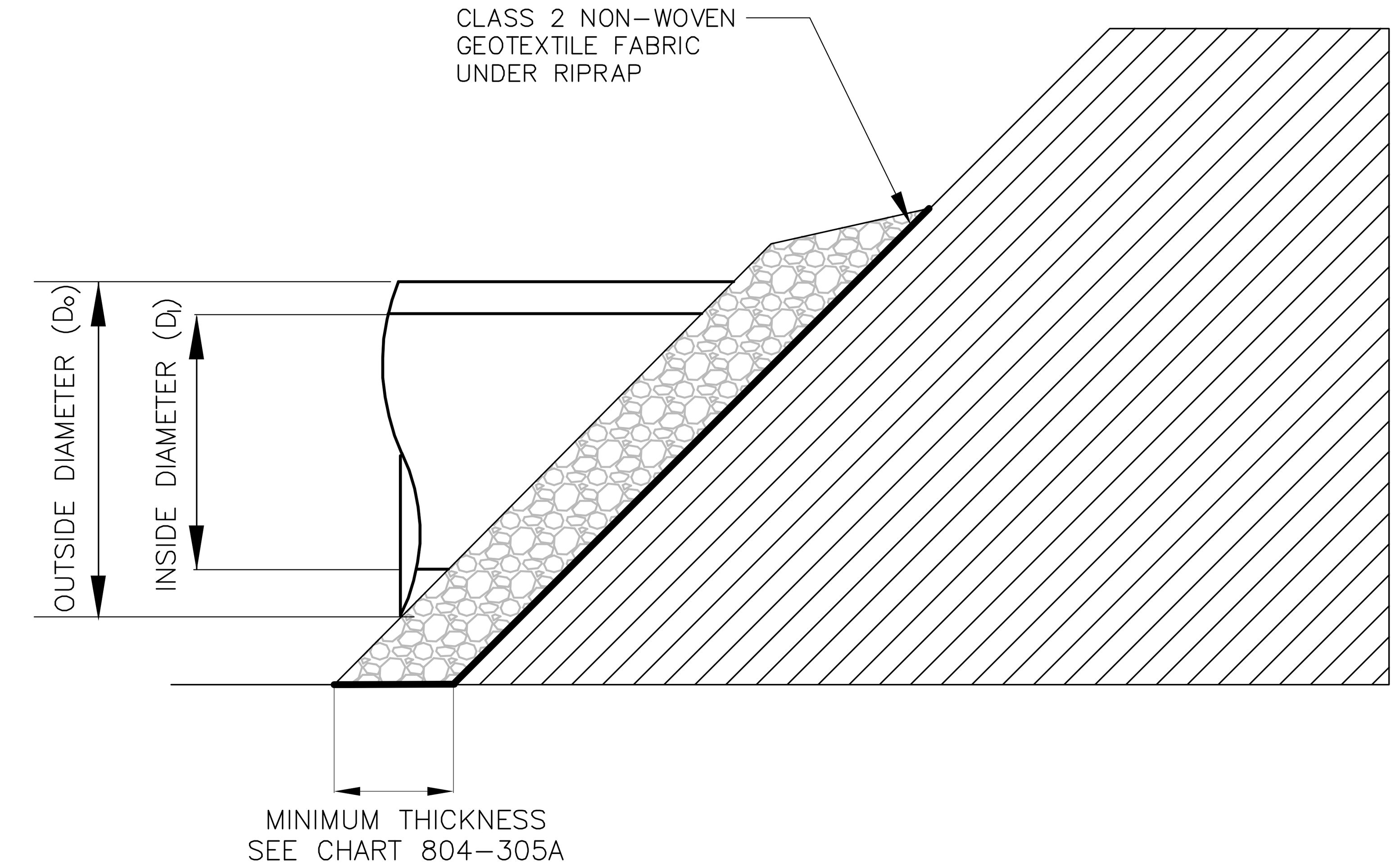
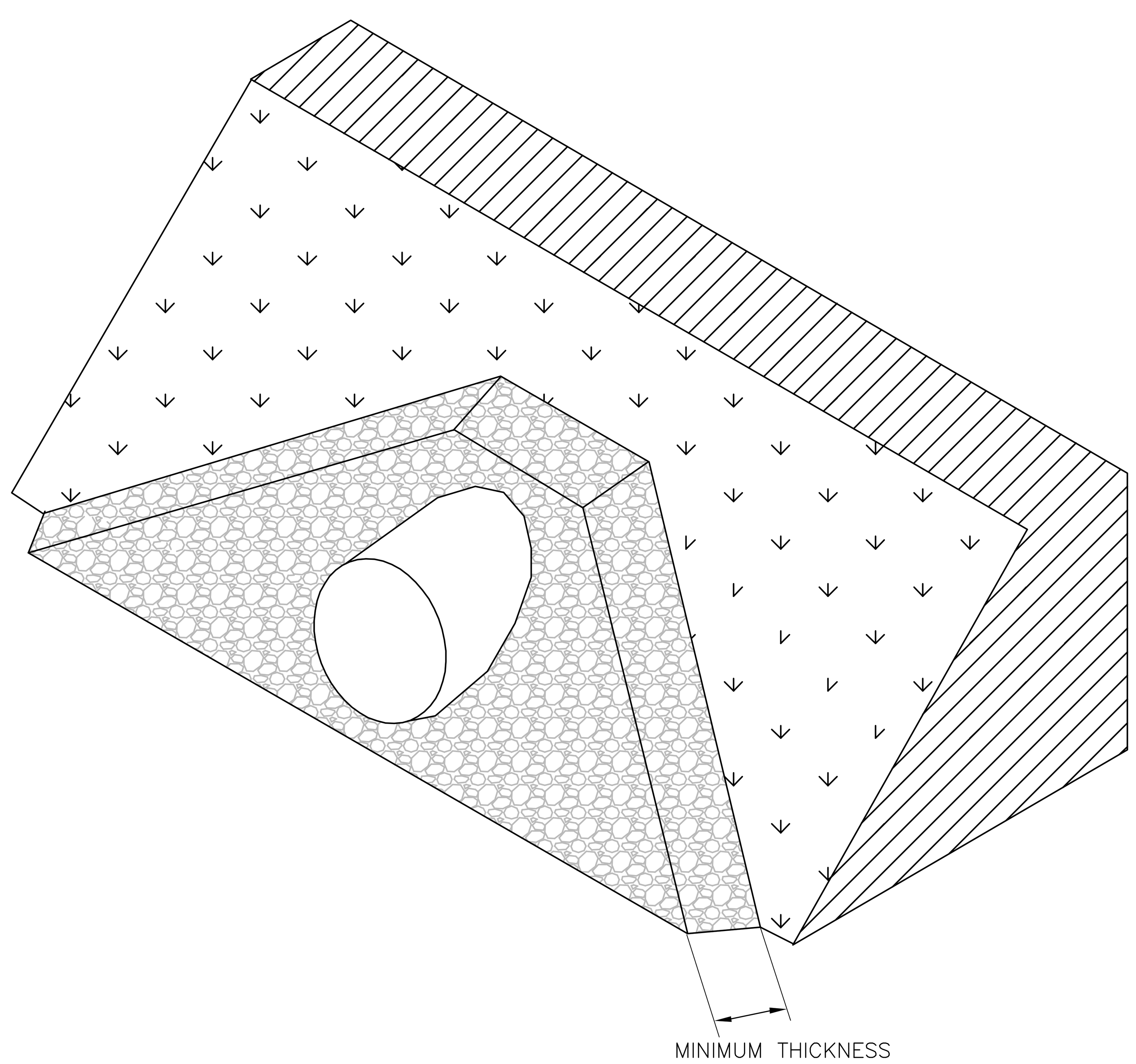


CHART 804–305A
SLOPE STABILIZATION RIPRAP PLACEMENT WITH MINIMUM TAILWATER

MINIMUM CLASS*	D_{50}(FT)	MINIMUM THICKNESS (FT)	OUTSIDE PIPE DIAMETER
A	0.50	1.00	UP TO 24"
B	0.75	1.50	UP TO 84"
C	1.30	2.60	LARGER THAN 84"

*WHEN RIPRAP APRON IS PRESENT, USE SAME CLASS OF RIPRAP ON SLOPE AS SPECIFIED FOR APRON. SEE DRAWING # 804–305–03 OR PLANS FOR APRON RIPRAP SPECIFICATIONS.



NOTES:

1) DESIGN OUTLET PROTECTION IN ACCORDANCE WITH THE SCDOT WATER QUALITY MANUAL.

2) OUTLET PROTECTION WILL HAVE A WIDTH THREE TIMES THE OUTSIDE DIAMETER OF THE OUTLET PIPE AT TOE OF SLOPE.

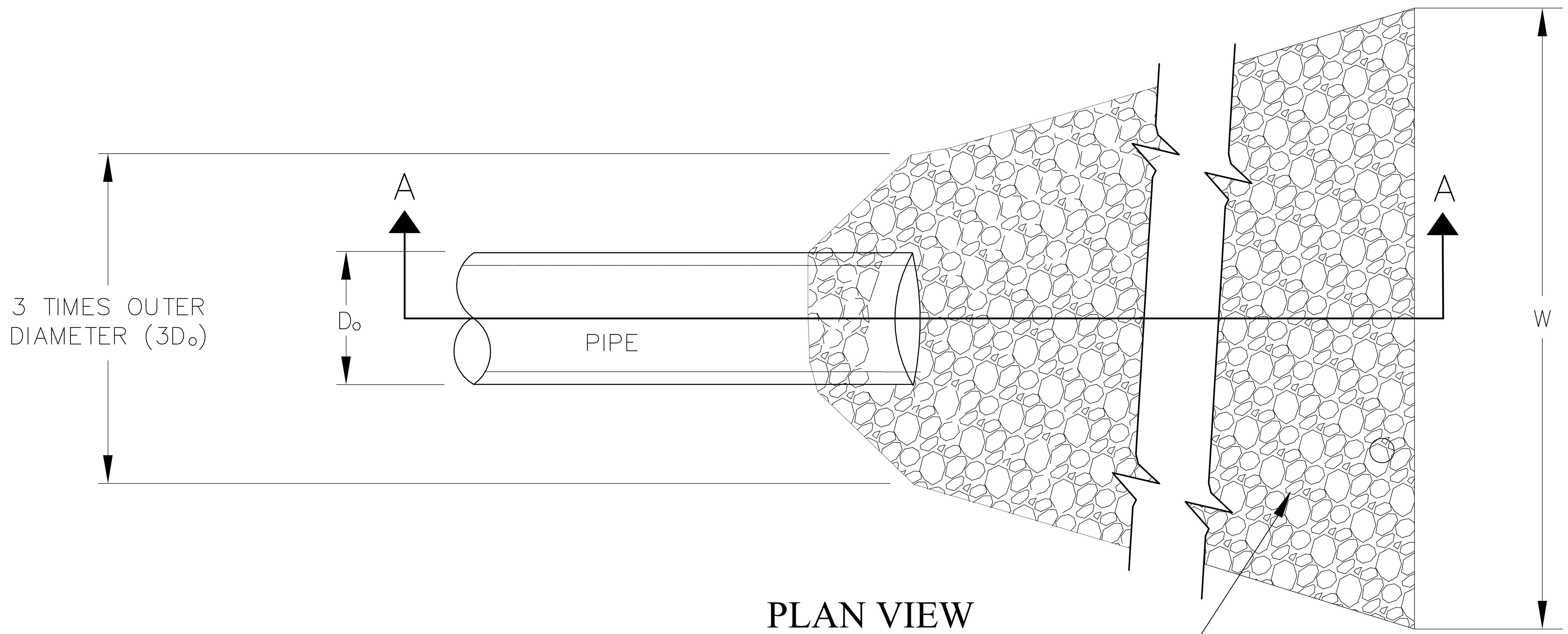
3) ADVANCE OUTLET PROTECTION UP THE SLOPE A MINIMUM OF 1 FOOT ABOVE TOP OF PIPE.

4) SEE DRAWINGS # 804–305–02 AND 804–305–03 FOR RIPRAP APRON DIMENSIONS.

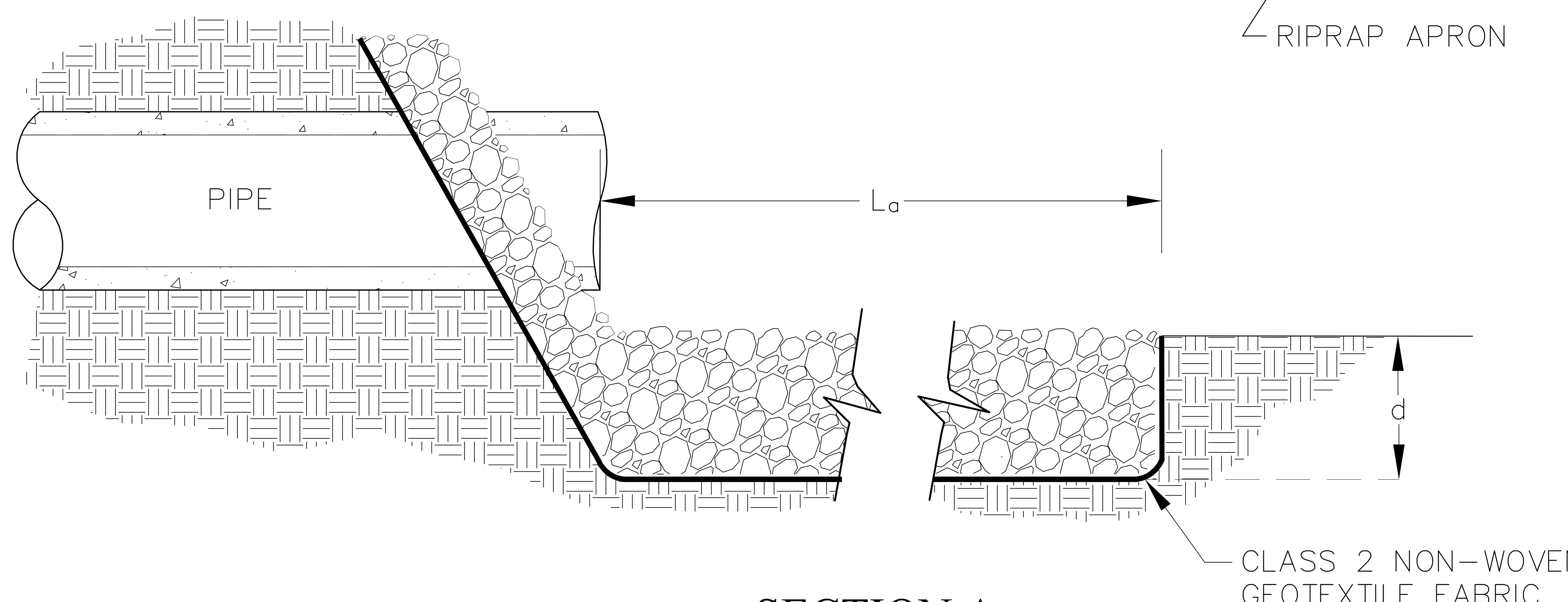
4) THE PAY ITEMS MAY INCLUDE:

2031000	UNCLASSIFIED EXCAVATION	CY
8041010	RIPRAP (CLASS A)	TON
8041020	RIPRAP (CLASS B)	TON
8041030	RIPRAP (CLASS C)	TON
8042800	GEOTEXTILE FABRIC FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)	SY
8151151	TURF REINFORCEMENT MATTING (TRM) TYPE 1	SY
8151152	TURF REINFORCEMENT MATTING (TRM) TYPE 2	SY
8151153	TURF REINFORCEMENT MATTING (TRM) TYPE 3	SY

THIS DRAWING IS NOT TO SCALE



PLAN VIEW



SECTION A

NOTES:

1) L_a = THE LENGTH OF THE RIPRAP APRON.

2) W = WIDTH OF OUTLET PROTECTION AT END OF RIPRAP APRON.

3) D_o = OUTER DIAMETER OF OUTLET PIPE.

4) $3D_o$ = WIDTH OF OUTLET PROTECTION AT TOE OF SLOPE AT PIPE OUTLET.

5) SEE DRAWING # 804-305-03 OR PLANS FOR DIMENSIONS L_a, W, AND $3D_o$.

6) d = DEPTH OF RIPRAP = 2.0 TIMES THE MAXIMUM RIPRAP DIAMETER.

7) SEE DRAWING # 804-305-01 FOR RIPRAP SLOPE STABILIZATION AROUND PIPE.

THIS DRAWING IS NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

USDA NRCS ENGINEERING FIELD MANUAL

SCDOT DOCUMENTS

WQM

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

#	DATE	CHK	DESCRIPTION
6			
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SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

OUTLET PROTECTION WITH NO DEFINED CHANNEL

804-305-02

EFFECTIVE LETTING DATE | JULY 2017

REFERENCES

NATIONAL DOCUMENTS

USDA NRCS ENGINEERING FIELD MANUAL

SCDOT DOCUMENTS

WQM

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

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SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

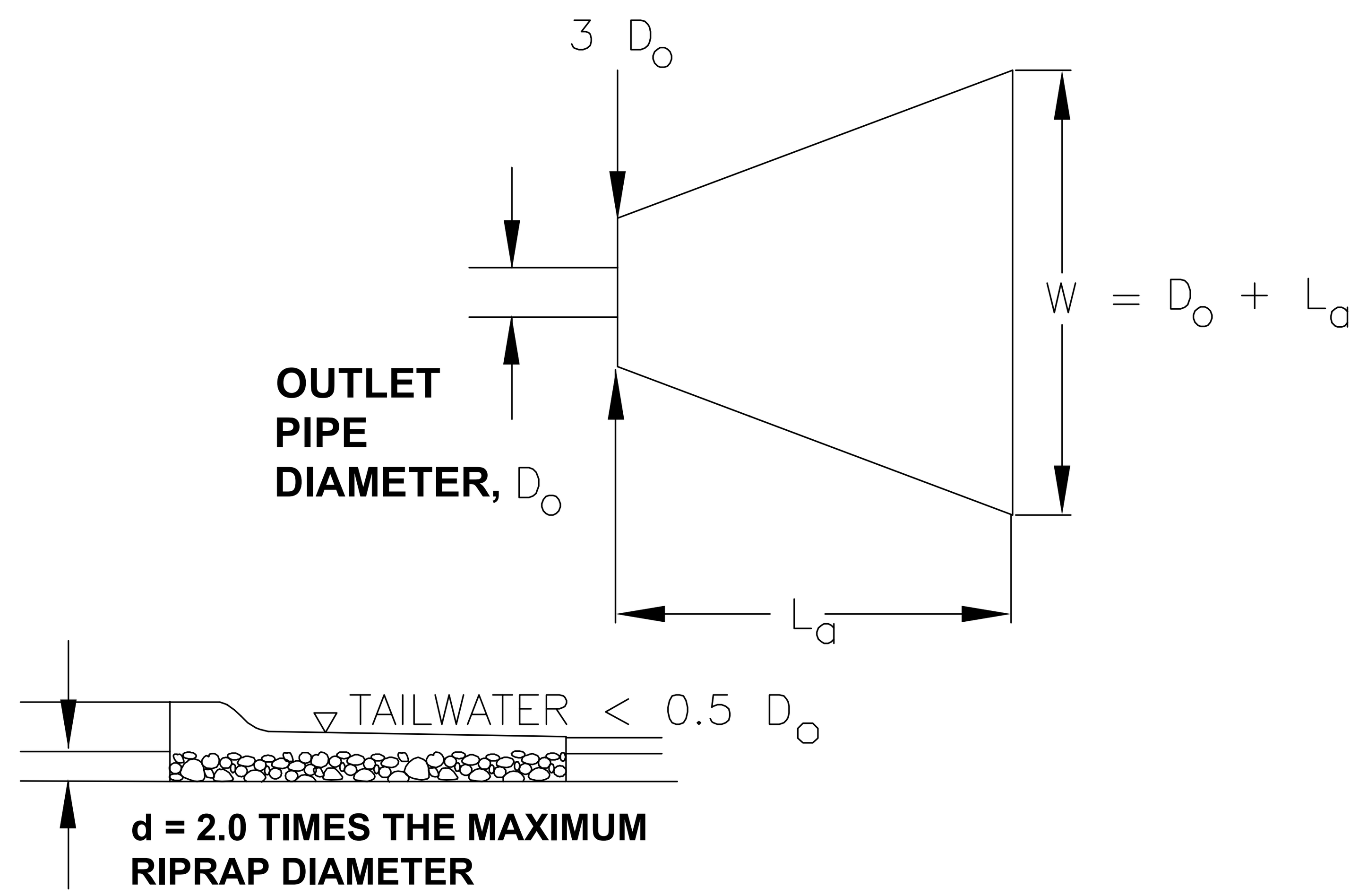
STANDARD DRAWING

OUTLET PROTECTION WITH NO DEFINED CHANNEL

804-305-03

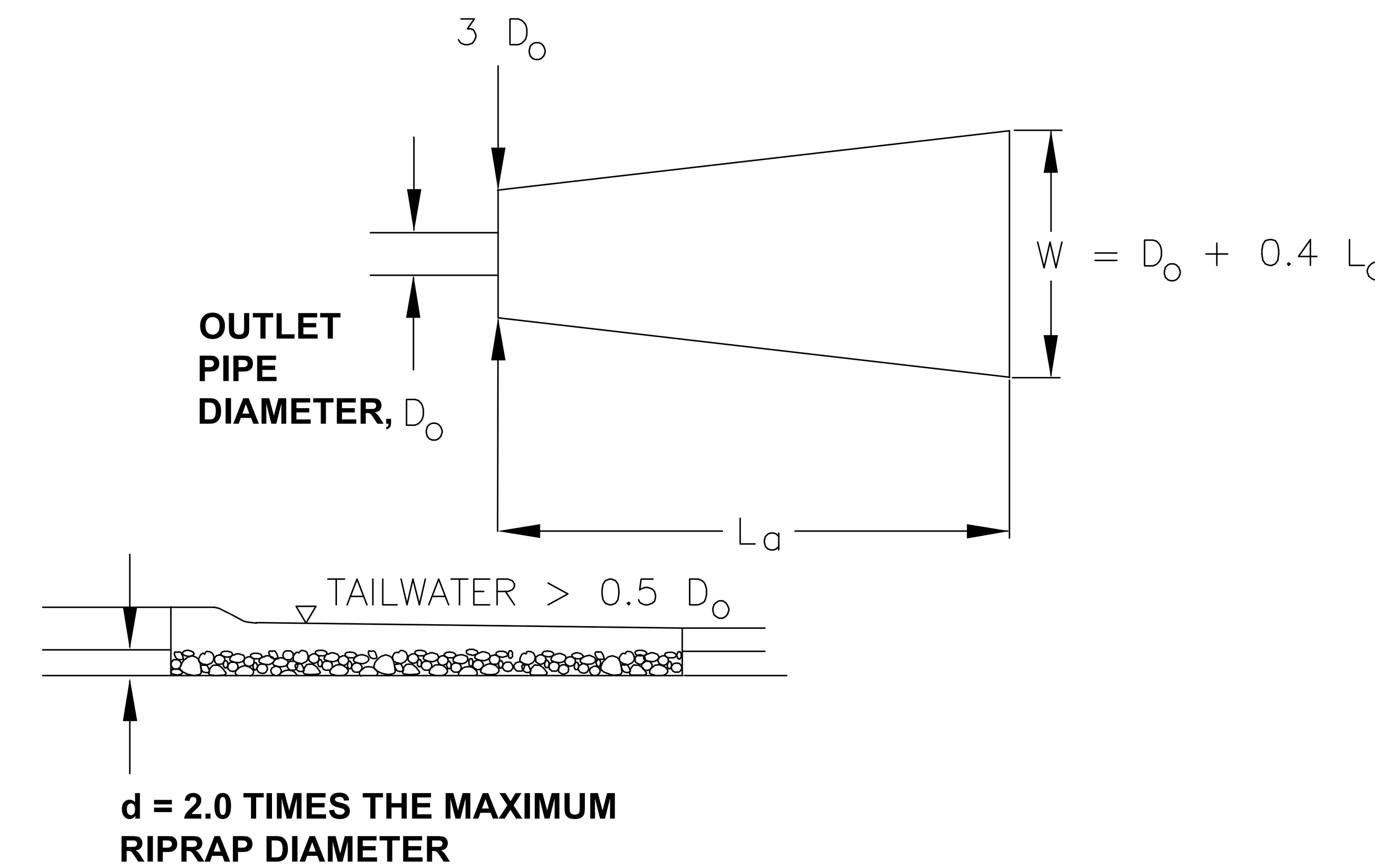
EFFECTIVE LETTING DATE JULY 2017

PIPE OUTLET TO FLAT AREA WITH NO DEFINED CHANNEL MINIMUM TAILWATER CONDITION:



PIPE INSIDE DIAMETER (D_I) (FT)	MAX PIPE SLOPE	OUTLET PROTECTION DIMENSIONS			MIN RIPRAP CLASS	RIPRAP DEPTH (d) (FT)
		$3D_O$ (FT)	L_a (FT)	W (FT)		
1.5	≤ 1%	6	10	12	A	1.5
1.5	2%	6	14	16	A	1.5
1.5	5%	6	19	21	B	2.7
2.0	≤ 1%	8	14	17	A	1.5
2.0	2%	8	19	22	B	2.7
2.0	5%	8	26	29	B	2.7
2.5	≤ 1%	10	18	21	A	1.5
2.5	2%	10	25	28	B	2.7
2.5	5%	10	34	37	C	3.6
3.0	≤ 1%	12	24	28	B	2.7
3.0	2%	12	32	36	B	2.7
3.0	5%	12	42	46	C	3.6
3.5	≤ 1%	14	28	33	B	2.7
3.5	2%	14	37	42	C	3.6
3.5	5%	14	48	53	C	3.6
4.0	≤ 1%	16	33	38	B	2.7
4.0	2%	16	43	48	C	3.6

PIPE OUTLET TO FLAT AREA WITH NO DEFINED CHANNEL MAXIMUM TAILWATER CONDITON:



PIPE INSIDE DIAMETER (D_I) (FT)	MAX PIPE SLOPE	OUTLET PROTECTION DIMENSIONS			MIN RIPRAP CLASS	RIPRAP DEPTH (d) (FT)
		$3D_O$ (FT)	L_a (FT)	W (FT)		
1.5	≤ 1%	6	8	6	A	1.5
1.5	2%	6	23	11	A	1.5
1.5	5%	6	40	18	A	1.5
2.0	≤ 1%	8	14	8	A	1.5
2.0	2%	8	30	15	A	1.5
2.0	5%	8	55	25	B	2.7
2.5	≤ 1%	10	20	11	A	1.5
2.5	2%	10	39	19	A	1.5
2.5	5%	10	66	30	B	2.7
3.0	≤ 1%	12	27	15	A	1.5
3.0	2%	12	55	26	A	1.5
3.0	5%	12	91	40	C	3.6
3.5	≤ 1%	14	33	18	A	1.5
3.5	2%	14	66	31	B	2.7
3.5	5%	14	106	47	C	3.6
4.0	≤ 1%	16	42	22	A	1.5
4.0	2%	16	78	37	B	2.7

NOTES:

1) THESE TABLES ARE ONLY APPLICABLE FOR THE PIPE SIZES AND MAXIMUM PIPE SLOPES LISTED.

2) LARGER PIPES OR GREATER SLOPES REQUIRE ALTERNATIVE OUTLET PROTECTION DESIGN.

3) WHEN PLANS SPECIFY LARGER OR DIFFERENT OUTLET PROTECTION THAN SHOWN IN TABLES, INSTALL OUTLET PROTECTION PER THE PLANS.

4) SEE DRAWING # 804-305-02 FOR MORE INFORMATION ON OUTLET PROTECTION DIMENSIONS.

THIS DRAWING IS NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

WQM

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

#	DATE	CHK	DESCRIPTION
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SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

OUTLET PROTECTION WITH DEFINED CHANNEL

804–310–00

EFFECTIVE LETTING DATE JULY 2017

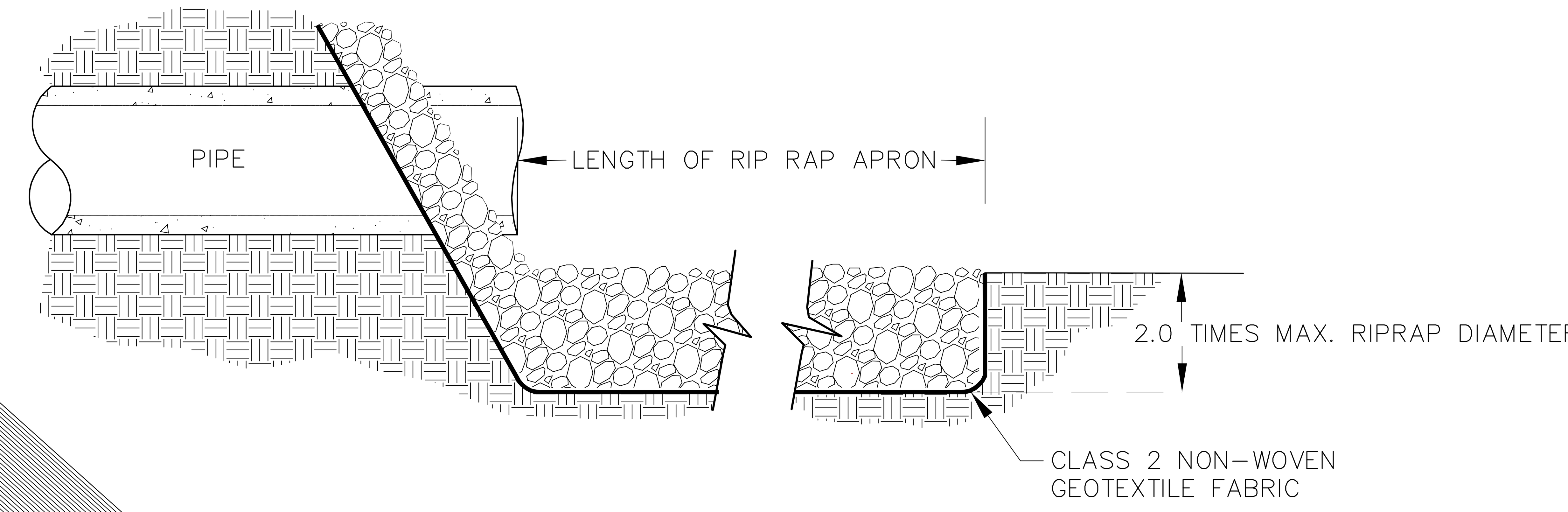
CHART 804–310A SLOPE STABILIZATION RIPRAP PLACEMENT WITH MINIMUM TAILWATER			
MINIMUM CLASS*	D_{50}(FT)	MINIMUM THICKNESS (FT)	OUTSIDE PIPE DIAMETER
A	0.50	1.00	UP TO 24"
B	0.75	1.50	UP TO 84"
C	1.30	2.60	LARGER THAN 84"

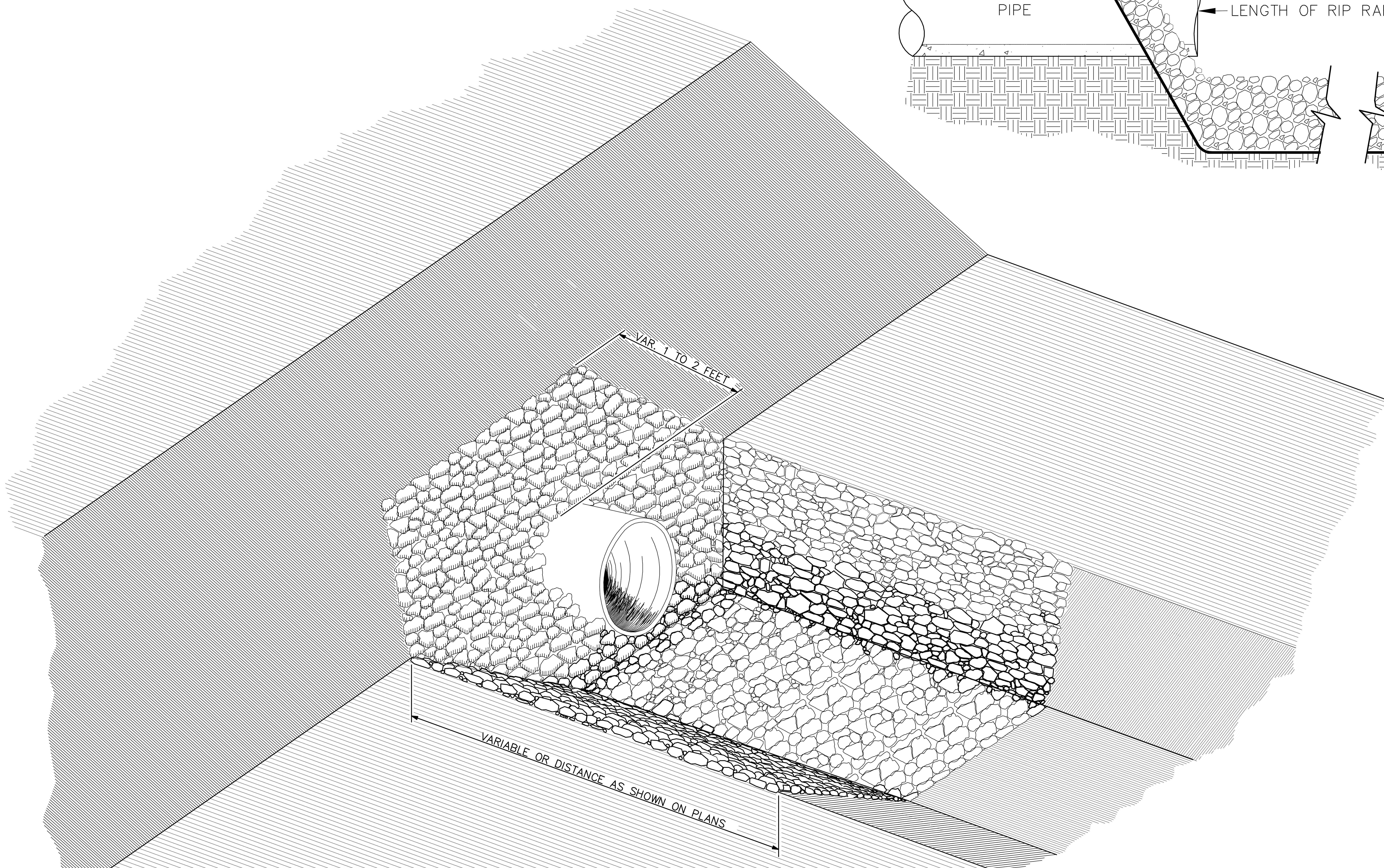
*WHEN RIPRAP CHANNEL IS PRESENT, USE SAME CLASS OF RIPRAP ON SLOPE AS SPECIFIED FOR CHANNEL ON THE PLANS.

NOTES:

1. CLASS 2 NON–WOVEN GEOTEXTILE FABRIC TO BE USED UNDER RIPRAP.
2. SEE STANDARD DRAWINGS SECTION 719–600–00 FOR ADDITIONAL PIPE END TREATMENT OPTIONS.
3. THE PAY ITEMS SHALL BE:

2031000	UNCLASSIFIED EXCAVATION	CY
8041010	RIPRAP (CLASS A)	TON
8041020	RIPRAP (CLASS B)	TON
8041030	RIPRAP (CLASS C)	TON
8042800	GEOTEXTILE FABRIC FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)	SY





THIS DRAWING IS NOT TO SCALE

REFERENCES
NATIONAL DOCUMENTS

SCDOT DOCUMENTS
SC-M-815-8 QPL 57
RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER

SIGNATURE
11/18/2016
DATE

#	DATE	CHK	DESCRIPTION
5			
4			
3			
2	8/2016	DSO	GENERAL REVISIONS
1	8/2012	DSO	UPDATED DIMENSIONS AND NOTES
0	3/2008	DSO	GENERAL REVISIONS

SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

TYPE A INLET STRUCTURE FILTERS

815-001-01

EFFECTIVE LETTING DATE JUL 2017

THIS DRAWING IS NOT TO SCALE

INSTALLATION:

1. FILTER FABRIC IS USED FOR INLET PROTECTION WHEN STORMWATER FLOWS ARE RELATIVELY SMALL (1.0 CFS OR LESS) WITH LOW VELOCITIES, WHERE THE INLET DRAINS AREA HAS GRADES NO GREATER THAN 5% AND THE IMMEDIATE DRAINAGE AREA AROUND THE INLET (5 FOOT RADIUS) HAS GRADES LESS THAN 1%. DO NOT USE IN AREAS RECEIVING CONCENTRATED FLOW OR WHERE DITCHES ARE PAVED. A TRENCH SHALL BE EXCAVATED 6 INCHES WIDE AND 6 INCHES DEEP AROUND THE OUTER PERIMETER OF THE STAKES UNLESS FABRIC IS PNEUMATICALLY INSTALLED.

2. FILTER FABRIC SHALL CONFORM TO SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (LATEST EDITION). FILTER FABRIC SHALL EXTEND A MINIMUM OF 12 INCHES INTO THE TRENCH. THE TRENCH SHALL BE BACKFILLED WITH SOIL OR CRUSHED STONE AND COMPACTED OVER THE FILTER FABRIC UNLESS FABRIC IS PNEUMATICALLY INSTALLED.

3. USE STEEL POSTS WITH A MINIMUM POST LENGTH OF 5 FEET CONSISTING OF STANDARD "T" SECTIONS WITH A WEIGHT OF 1.25 POUNDS PER FOOT (±8%). THE HEIGHT OF THE FILTER BARRIER ABOVE GROUND SHALL BE A MINIMUM OF 24 INCHES. POSTS SHALL BE SPACED AROUND THE PERIMETER OF THE INLET A MAXIMUM OF 2 FEET APART AND DRIVEN INTO THE GROUND A MINIMUM OF 24 INCHES. ATTACH FABRIC TO POSTS USING ONLY HEAVY DUTY PLASTIC TIES. ATTACH AT LEAST 4 EVENLY SPACED TIES IN A MANNER TO PREVENT SAGGING OR TEARING OF THE FABRIC.

4. FILTER FABRIC SHOULD BE IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE PROTECTED AREA TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER FABRIC SHOULD BE WRAPPED TOGETHER ONLY AT A SUPPORT POST WITH BOTH ENDS SECURELY FASTENED TO THE POST WITH A MINIMUM 6 INCH OVERLAP.

5. PROVIDE A FILTER FABRIC CAPABLE OF REDUCING EFFLUENT SEDIMENT CONCENTRATIONS BY NOT LESS THAN 80% UNDER TYPICAL SEDIMENT MIGRATION CONDITIONS.

INSPECTION AND MAINTENANCE:

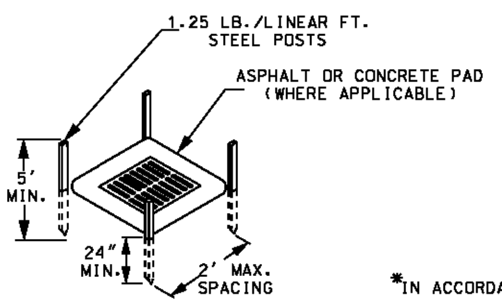
1. INSPECTIONS SHOULD BE MADE EVERY SEVEN (7) CALENDAR DAYS. ANY NEEDED REPAIRS SHOULD BE HANDLED IMMEDIATELY.

2. IF THE FABRIC BECOMES CLOGGED, IT SHOULD BE REPLACED.

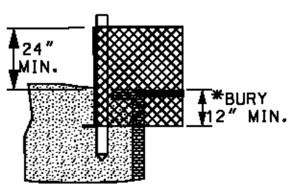
3. SEDIMENT SHOULD BE REMOVED WHEN IT REACHES APPROXIMATELY 1/3 THE HEIGHT OF THE FILTER FABRIC. IF A SUMP IS USED, SEDIMENT SHOULD BE REMOVED WHEN IT FILLS APPROXIMATELY 1/3 THE DEPTH OF THE HOLE. MAINTAIN THE POOL AREA, ALWAYS PROVIDING ADEQUATE SEDIMENT STORAGE VOLUME FOR THE NEXT STORM. TAKE CARE NOT TO DAMAGE OR UNDERCUT FABRIC WHEN REMOVING SEDIMENT. CLEANING INLET STRUCTURE FILTERS IS PAID FOR EACH (EA) FILTER CLEANED OF DEPOSITED SEDIMENT FROM THE AREA ADJACENT TO EACH INLET STRUCTURE FILTER.

4. STORM DRAIN INLET PROTECTION STRUCTURES SHOULD BE REMOVED ONLY AFTER THE DISTURBED AREAS ARE PERMANENTLY STABILIZED. REMOVE ALL CONSTRUCTION MATERIAL AND SEDIMENT, AND DISPOSE OF THEM PROPERLY. GRADE THE DISTURBED AREA TO DRAIN. USE APPROPRIATE PERMANENT STABILIZATION METHODS TO STABILIZE BARE AREAS AROUND THE INLET.

5. THE PAY ITEMS SHALL BE:
   8156219 INLET STRUCTURE FILTER TYPE A__________LF
   8154155 CLEANING INLET STRUCTURE FILTERS_______EA

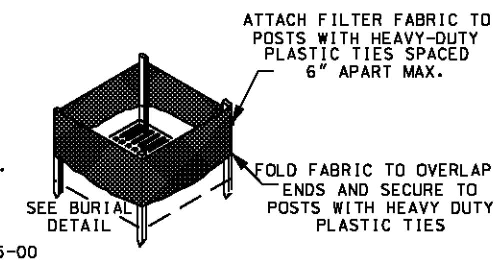


POST INSTALLATION DETAIL



*IN ACCORDANCE WITH STD. DRAWING 815-605-00

FILTER FABRIC BURIAL DETAIL



FILTER FABRIC INSTALLATION DETAIL

TYPE A LOW FLOW INLET FILTERS (FILTER FABRIC INLET PROTECTION)

INSTALLATION:

1. INSTALL SEDIMENT TUBES BY LAYING THEM FLAT ON THE GROUND. CONSTRUCT A SMALL TRENCH TO A DEPTH THAT IS 20% OF THE SEDIMENT TUBE DIAMETER. LAY THE SEDIMENT TUBE IN THE TRENCH AND COMPACT THE UPSTREAM SEDIMENT TUBE/SOIL INTERFACE. INSTALL ALL SEDIMENT TUBES SO NO GAPS EXIST BETWEEN THE SOIL AND THE BOTTOM OF THE SEDIMENT TUBE. LAP THE ENDS OF ADJACENT SEDIMENT TUBES A MINIMUM OF 6 INCHES TO PREVENT FLOW AND SEDIMENT FROM PASSING THROUGH THE FIELD JOINT. NEVER STACK SEDIMENT TUBES ON TOP OF ONE ANOTHER.

2. SHOULD SEDIMENT TUBE BECOME DAMAGED DURING INSTALLATION, PLACE A STAKE ON BOTH SIDES OF THE DAMAGED AREA TERMINATING THE TUBE SEGMENT AND INSTALL A NEW TUBE SEGMENT.

3. INSTALL SEDIMENT TUBES USING WOODEN STAKES WITH A MINIMUM POST LENGTH OF 4 FEET AND A MINIMUM MEASURED DIMENSION OF ¾" X ¾" AND A MAXIMUM MEASURED DIMENSION OF 2" X 2", OR USING STEEL POSTS (1.25lbs./linear foot). USE STEEL POSTS WITHOUT A SOIL PLATE AND PAINTING IS NOT REQUIRED. SPACE POSTS OR STAKES ON 2-FOOT CENTERS AND DRIVE THEM INTO THE GROUND TO A MINIMUM DEPTH OF 2 FEET. INSTALL THE STAKES ON THE DOWNSTREAM (1/3) OF THE SEDIMENT TUBE. ENSURE THE AREAS FOR STAKE INSTALLATION ARE COMPACTED SO THE POSTS ARE PROPERLY INSTALLED.

INSPECTION AND MAINTENANCE:

1. INSPECT SEDIMENT TUBES AFTER INSTALLATION FOR GAPS UNDER THE SEDIMENT TUBES AND FOR GAPS BETWEEN THE JOINTS OF ADJACENT ENDS OF SEDIMENT TUBES. REPAIR RILLS, GULLIES, AND ALL UNDERCUTTING NEAR SEDIMENT TUBES. INSPECT SEDIMENT TUBES EVERY 7 DAYS.

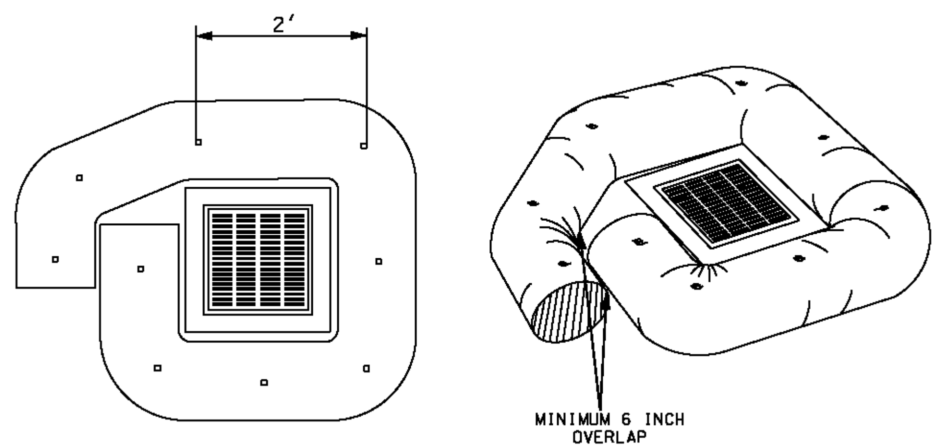
2. REMOVE SEDIMENT WHEN IT REACHES APPROXIMATELY ⅓ HEIGHT OF THE INLET STRUCTURE FILTER. IF A SUMP IS USED, REMOVE SEDIMENT WHEN IT FILLS APPROXIMATELY ⅓ THE DEPTH OF THE HOLE. MAINTAIN THE POOL AREA, ALWAYS PROVIDING ADEQUATE SEDIMENT STORAGE VOLUME FOR THE NEXT STORM EVENT. CLEANING INLET STRUCTURE FILTER IS PAID FOR EACH (EA) FILER CLEANED OF DEPOSITED SEDIMENT FROM THE AREA ADJACENT TO EACH INLET STRUCTURE FILTER.

3. REMOVE AND/OR REPLACE INSTALLED SEDIMENT TUBES AS REQUIRED TO ADAPT TO CHANGING CONSTRUCTION SITE CONDITIONS.

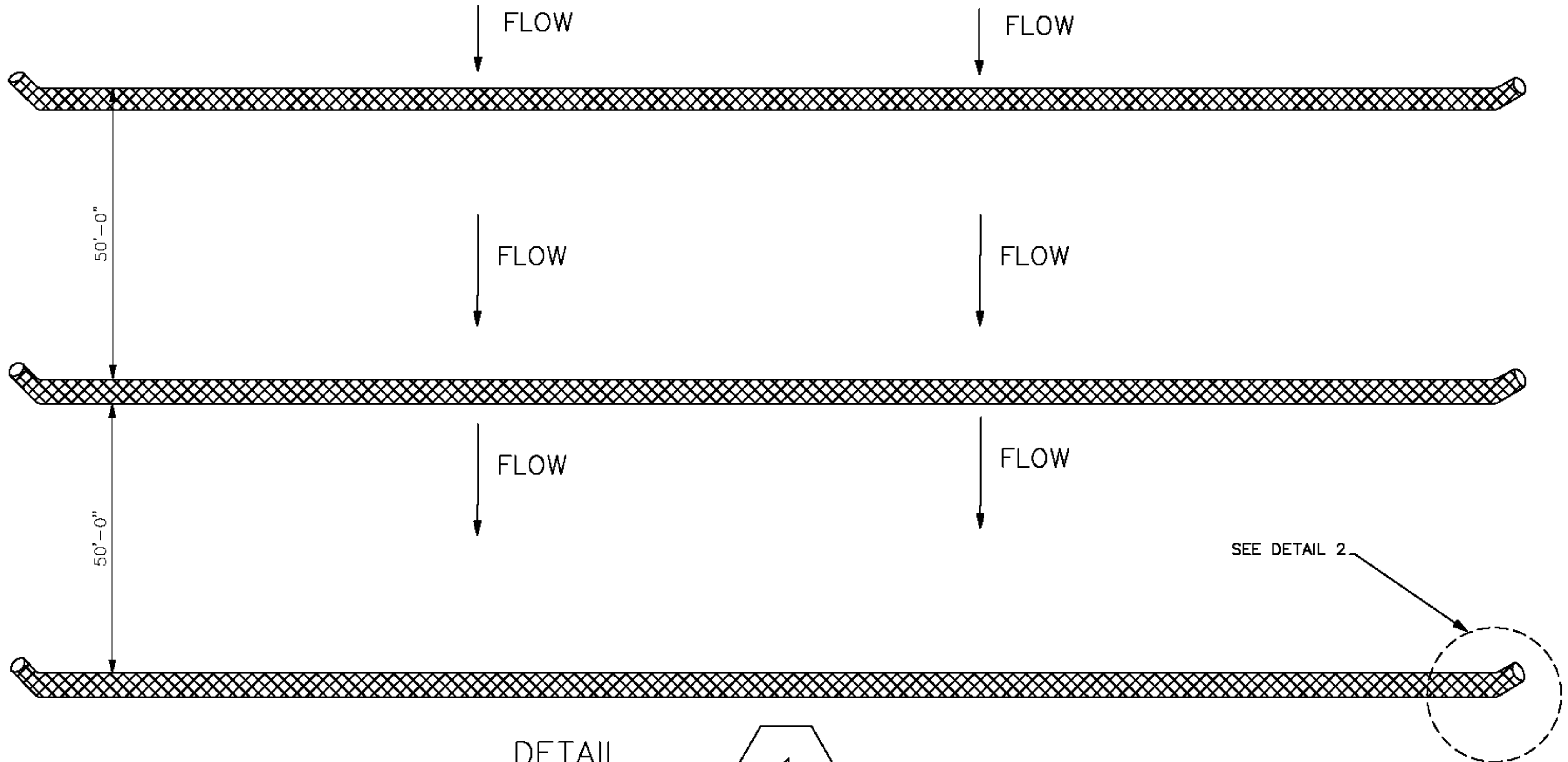
4. REMOVE ALL SEDIMENT TUBES FROM THE SITE WHEN THE FUNCTIONAL LONGEVITY IS EXCEEDED AS DETERMINED BY THE ENGINEER, INSPECTOR, OR MANUFACTURER'S REPRESENTATIVE.

5. DISPOSE OF SEDIMENT TUBES BY REGULAR MEANS AS NON-HAZARDOUS, INERT MATERIAL.

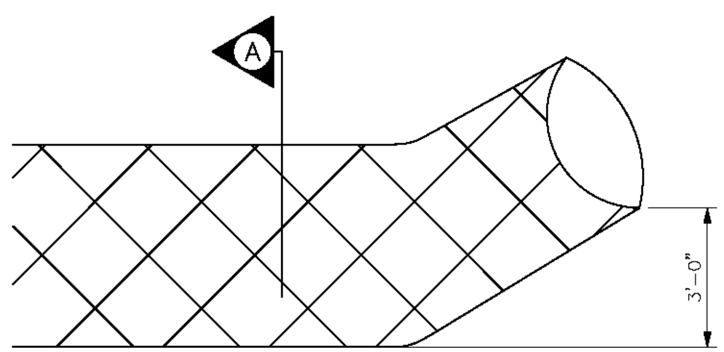
6. THE PAY ITEMS SHALL BE:
   8156219 INLET STRUCTURE FILTER TYPE A__________LF
   8154155 CLEANING INLET STRUCTURE FILTERS_______EA



TYPE A LOW FLOW INLET FILTERS (SEDIMENT TUBE INLET PROTECTION)



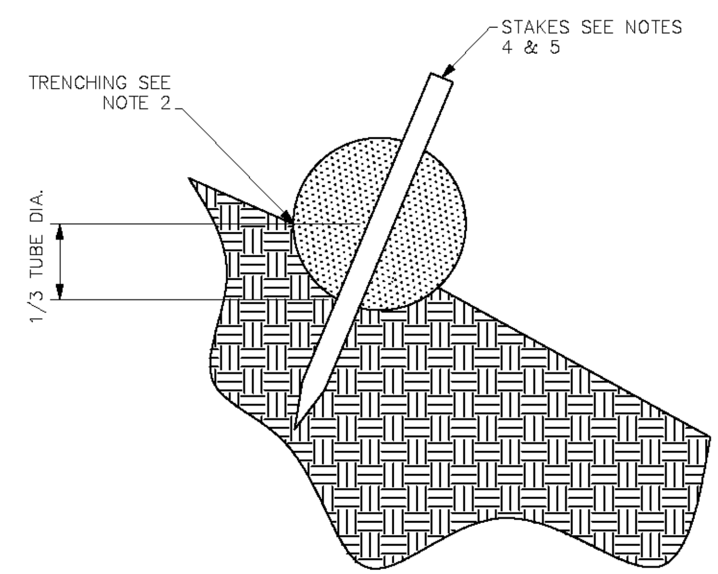
DETAIL 1
SCALE: 1" = 30'-0"
PLAN VIEW



DETAIL 2

END VIEW OF TYPE F SLOPE INTERRUPTION DEVICE

THIS DRAWING IS NOT TO SCALE



SECTION A
TYPE F SLOPE INTERRUPTION DEVICE CROSS SECTION

NOTES:

1. INSTALL ALL NON-WEIGHTED INLET TUBES FOR SLOPE INTERRUPTION DEVICES FOR HECP APPLICATION PRIOR TO THE HECP INSTALLATION.

2. EXCAVATE A TRENCH ALONG (PARALLEL) THE CONTOUR OF THE SLOPE TO A DEPTH THAT IS ⅓ THE TUBE DIAMETER. PLACE THE EXCAVATED SOIL ON THE UP-SLOPE SIDE OF THE TRENCH. PLACE THE SLOPE INTERRUPTION DEVICE INTO THE TRENCH SO IT CONTOURS TO THE SOIL SURFACE, ENSURING NO GAPS EXISTS UNDERNEATH THE TUBE. COMPACT THE EXCAVATED SOIL AGAINST THE TUBE ON THE UP-SLOPE SIDE. ENSURE THE INSTALLATION OF THE SLOPE INTERRUPTION DEVICE DOES NOT DAMAGE THE PREPARED SEEDBED.

3. INSTALL NON-WEIGHTED INLET TUBES SLOPE INTERRUPTION DEVICES FOR ECB APPLICATION AFTER THE ECB INSTALLATION ON TOP OF THE ECB. TUBE TRENCHING IS NOT REQUIRED FOR ECB APPLICATIONS. ENSURE THE INSTALLATION OF THE SLOPE INTERRUPTION DEVICE DOES NOT DAMAGE THE INSTALLED ECB.

4. INSTALL NON-WEIGHTED INLET TUBE FOR SLOPE INTERRUPTION DEVICES USING WOODEN STAKES WITH A MINIMUM LENGTH OF 3' WITH A MINIMUM MEASURED DIMENSION OF ¾" X ¾" AND A MAXIMUM MEASURED DIMENSION OF 1" X 1". DO NOT USE STEEL POSTS FOR THIS APPLICATION . INSTALL A STAKE AT EACH END OF EACH TUBE AND SPACE STAKES ON MAXIMUM 4' CENTERS. DRIVE STAKES INTO THE GROUND PERPENDICULAR TO THE SLOPE TO A DEPTH OF 2' OR TO THE MAXIMUM EXTENT PRACTICABLE.

5. INSTALL THE STAKES THROUGH THE CENTER OF THE NON-WEIGHTED TUBE.

6. ABUT ADJACENT TUBES TIGHTLY, END TO END, WITHOUT OVERLAPPING THE ENDS. TIE THE TUBE ENDS TOGETHER USING HEAVY TWINE OR PLASTIC LOCKING TIES. TURN ENDS UP OF INTERRUPTION DEVICES UP SLOPE TO ENSURE CONTAINMENT AND THE PREVENTION OF CHANNELING OF RUNOFF.

7. ENSURE THE AREAS FOR POST INSTALLATION ARE COMPACTED SO THE POSTS ARE PROPERLY INSTALLED.

8. PAY SHALL BE:
   8152006 INLET STRUCTURE FILTER TYPE F (nonweighted)__________________________ LF

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS
SC-M-815-8
QPL 58

RELATED DRAWINGS & KEYWORDS

THIS DRAWING IS ONLY VALID FOR CONSTRUCTION WHEN SEALED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF SOUTH CAROLINA. CHECK WWW.SCDOT.ORG FOR LATEST UPDATE.

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016
DATE

#	DATE	CHK	DESCRIPTION
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1	8/2016	DSO	3 TYPOS; 1 PAY #
0	8/2012	DSO	NEW DRAWING

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING
TYPE F SLOPE INTERRUPTION DEVICE

815-001-02

EFFECTIVE LETTING DATE JUL 2017

GENERAL NOTES:

1. THESE ARE APPLICABLE FOR INLETS WITH PEAK FLOW RATES LESS THAN 3 CFS WHERE THE INLET DRAIN AREA HAS GRADES LESS THAN 5% . FLOW VELOCITIES TO THE INLET MAY NOT EXCEED 3 FEET PER SECOND. USE THESE WHERE OVERFLOW CAPACITY IS NOT REQUIRED TO PREVENT EXCESSIVE PONDING AROUND THE STRUCTURE.

INSTALLATION:

1. HARDWARE FABRIC, OR COMPARABLE WIRE MESH, WITH A MAXIMUM OF 0.5 INCH X 0.5 INCH OPENINGS SHALL BE USED AS THE SUPPORTING MATERIAL AND SHALL BE EXTENDED A MINIMUM 6 INCHES INTO THE GROUND.

2. POSTS SHALL BE 1.25 LB./LINEAR FOOT STEEL POSTS WITH A MINIMUM POST LENGTH OF 48 INCHES. THE HEIGHT OF THE HARDWARE FABRIC ABOVE GRADE SHALL BE A MINIMUM OF 18 INCHES.

3. THE STEEL POSTS SHALL BE SPACED A MAXIMUM OF 2 FEET APART AROUND THE PERIMETER OF THE INLET AND DRIVEN INTO THE GROUND A MINIMUM OF 18 INCHES.

4. HEAVY DUTY WIRE TIES SPACED A MAXIMUM OF 6 INCHES APART SHALL BE USED TO ATTACH THE HARDWARE FABRIC MATERIAL TO THE STEEL POSTS.

5. THE STONE SHALL CONSIST OF AGGREGATE NO. 5 OR NO. 57 WASHED STONE AND SHALL EXTEND TO A MINIMUM HEIGHT OF 12 INCHES AND SHALL NOT EXCEED 24 INCHES AGAINST ALL 4 SIDES OF THE HARDWARE FABRIC.

INSPECTION AND MAINTENANCE:

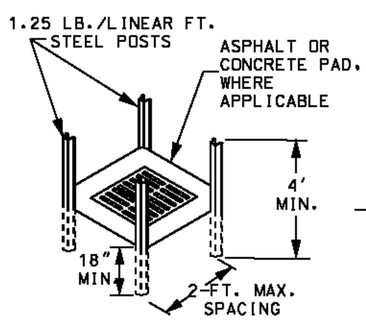
1. INSPECTIONS SHOULD BE MADE EVERY SEVEN (7) CALENDAR DAYS. ANY NEEDED REPAIRS SHOULD BE HANDLED IMMEDIATELY.

2. SEDIMENT SHOULD BE REMOVED WHEN IT REACHES APPROXIMATELY 1/3 THE HEIGHT OF THE STRUCTURE. IF A SUMP IS USED, SEDIMENT SHOULD BE REMOVED WHEN IT FILLS APPROXIMATELY 1/3 THE DEPTH OF THE HOLE. MAINTAIN THE POOL AREA, ALWAYS PROVIDING ADEQUATE SEDIMENT STORAGE VOLUME FOR THE NEXT STORM. CLEANING INLET STRUCTURE FILTERS IS PAID FOR EACH (EA) FILTER CLEANED OF DEPOSITED SEDIMENT FROM THE AREA ADJACENT TO EACH INLET STRUCTURE FILTER.

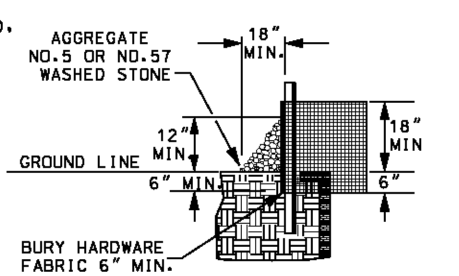
3. IF THE STONE BECOMES CLOGGED WITH SEDIMENT, THE STONES MUST BE PULLED AWAY FROM THE INLET AND CLEANED OR REPLACED. SINCE CLEANING OF GRAVEL AT A CONSTRUCTION SITE MAY BE DIFFICULT, AN ALTERNATIVE APPROACH WOULD BE TO REMOVE THE CLOGGED STONE AS FILL AND PUT FRESH STONE AROUND THE INLET. NO SEPARATE MEASUREMENT OR PAYMENT WILL BE MADE FOR THIS WORK.

4. STORM DRAIN INLET PROTECTION STRUCTURES SHOULD BE REMOVED ONLY AFTER THE DISTURBED AREAS ARE PERMANENTLY STABILIZED. REMOVE ALL CONSTRUCTION MATERIAL AND SEDIMENT, AND DISPOSE OF THEM PROPERLY. GRADE THE DISTURBED AREA TO DRAIN. STABILIZE ALL BARE AREAS IMMEDIATELY.

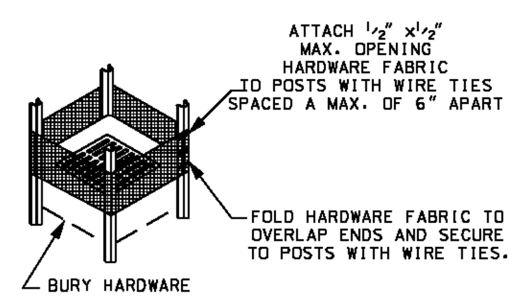
5. THE PAY ITEMS SHALL BE:
8156210 INLET STRUCTURE FILTER TYPE B____________________________EA
8154155 CLEANING INLET STRUCTURE FILTERS_________________________EA



POST INSTALLATION DETAIL



STONE AND HARDWARE FABRIC INSTALLATION DETAIL



HARDWARE FABRIC AND STONE INLET PROTECTION

TYPE B
MEDIUM FLOW, LOW VELOCITY INLET FILTERS

THIS DRAWING IS NOT TO SCALE

GENERAL NOTES:

TYPE D INLET FILTERS ARE APPLICABLE FOR DRAINAGE AREAS UP TO 2 ACRES WITH PEAK FLOW RATES GREATER THAN 3 CFS AND DRAINAGE AREAS WITH GRADES GREATER THAN 5%. FLOW VELOCITIES MAY EXCEED 3 FEET PER SECOND. HIGH FLOW, HIGH VELOCITY INLET FILTERS ARE PREFABRICATED AND WILL DIFFER ACCORDING TO THE TYPE OF DRAIN BEING PROTECTED.

THEY EXHIBIT THE FOLLOWING PROPERTIES:

1) COMPOSED OF A GEOTEXTILE FABRIC CONNECTED TO A RIGID STRUCTURE. THE GEOTEXTILE FABRIC IS NON-BIODEGRADABLE, RESISTANT TO DEGRADATION BY ULTRAVIOLET EXPOSURE, AND RESISTANT TO CONTAMINANTS COMMONLY ENCOUNTERED IN STORMWATER.

2) PROVIDE A RIGID STRUCTURE RESISTANT TO DEGRADATION BY ULTRAVIOLET EXPOSURE AND RESISTANT TO CONTAMINANTS COMMONLY ENCOUNTERED IN STORMWATER. PROVIDE A RIGID STRUCTURE THAT IS REUSABLE. DO NOT USE RIGID STRUCTURES COMPOSED OF STEEL, REBAR, CONCRETE OR WOOD.

3) PROVIDE A FILTER FABRIC CONSTRUCTED TO PROVIDE A DIRECT FIT ADJACENT TO THE ASSOCIATED RIGID STRUCTURE AND IS CAPABLE OF REDUCING EFFLUENT SEDIMENT CONCENTRATIONS BY NOT LESS THAN 80% UNDER TYPICAL SEDIMENT MIGRATION CONDITIONS.

4) HIGH FLOW, HIGH VELOCITY INLET FILTERS HAVE A TWO STAGE DESIGN. THE FIRST STAGE CONVEYS NORMAL FLOWS AT A MINIMUM CLEAN WATER FLOW RATE OF 100 GALLONS PER MINUTE PER SQUARE FOOT. THE SECOND STAGE CONVEYS HIGH FLOW RATES, WITH A MINIMUM APPARENT OPENING OF 0.5 INCH PER SQUARE INCH (NUMBER 12 STANDARD SIEVE OPENING).

5) TYPE D1 INLET FILTERS HAVE A FIRST STAGE MINIMUM HEIGHT OF 9 INCHES AND A MAXIMUM HEIGHT OF 12 INCHES IN ORDER TO ALLOW GREATER OVERFLOW CAPACITY AND PREVENT PONDING IN THE MEDIAN.

6) TYPE D2 INLET STRUCTURE FILTERS USED FOR SUMP APPLICATIONS HAVE A FIRST STAGE MINIMUM HEIGHT OF 12" AND A FIRST STAGE MAXIMUM HEIGHT OF 30" IN ORDER TO ALLOW GREATER PONDING IN THE SUMP.

7) HIGH FLOW, HIGH VELOCITY INLET FILTERS COMPLETELY SURROUND THE INLET.

8) HIGH FLOW, HIGH VELOCITY INLET FILTERS HAVE LIFTING DEVICES OR STRUCTURES TO ASSIST IN THE INSTALLATION AND TO ALLOW INSPECTION OF THE STORMWATER SYSTEM.

9) INLET STRUCTURE FILTER TYPE D1 IS TO BE USED IN MEDIAN APPLICATIONS, WHILE TYPE D2 IS TO BE USED IN SUMP APPLICATIONS. TYPE D1 INLET STRUCTURE FILTERS WILL HAVE GREATER OVERFLOW CAPACITY AND LESS FILTRATION AREA THAN TYPE D2 IN ORDER TO PREVENT PONDING IN THE MEDIANS. BOTH TYPES OF THESE INLET FILTERS ARE CAPABLE OF PROTECTING INLET STRUCTURES NOT ASSOCIATED WITH CURB INLETS AND MAY INCLUDE BUT ARE NOT LIMITED TO CATCH BASIN TYPE 9, YARD INLETS, DI 24 INCHES BY 24 INCHES, DI 24 INCHES BY 36 INCHES, AND MANHOLES.

INSTALLATION:

1. INSTALL TYPE D INLET FILTERS IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS. SECURE TYPE D INLET FILTERS WITH #5 OR #57 STONE AS BALLAST IN LIEU OF SOIL WHEN SOIL IS RECOMMENDED BY THE MANUFACTURER. PROPERLY INSTALL TYPE D INLET FILTERS SO THE INLET IS COMPLETELY ENCLOSED.

INSPECTION AND MAINTENANCE:

1. INSPECT AFTER INSTALLATION TO INSURE THAT NO GAPS EXIST THAT MAY PERMIT SEDIMENT TO ENTER THE STORM DRAIN SYSTEM.

2. INSPECTIONS SHOULD BE MADE EVERY SEVEN (7) CALENDAR DAYS. ANY NEEDED REPAIRS SHOULD BE HANDLED IMMEDIATELY.

3. SEDIMENT SHOULD BE REMOVED WHEN IT REACHES APPROXIMATELY 1/3 THE HEIGHT OF THE FILTERS. CLEANING INLET STRUCTURE FILTERS IS PAID FOR EACH (EA) FILTER CLEANED OF DEPOSITED SEDIMENT FROM THE AREA ADJACENT TO EACH INLET STRUCTURE FILTER.

4. CLEAN THE RIGID INLET PROTECTION FILTER MATERIAL WHEN IT BECOMES COVERED OR CLOGGED WITH DEPOSITED SEDIMENT.

5. REPLACE THE RIGID INLET PROTECTION FILTER MATERIAL AS DIRECTED BY THE ENGINEER.

6. THE PAY ITEMS SHALL BE:
8156205 INLET STRUCTURE FILTER TYPE D1___________________________EA
8156207 FILTER MATERIAL FOR INLET STRUCTURE FILTER TYPE D1________EA
8156215 INLET STRUCTURE FILTER TYPE D2___________________________EA
8156217 FILTER MATERIAL FOR INLET STRUCTURE FILTER TYPE D2________EA
8154155 CLEANING INLET STRUCTURE FILTERS_________________________EA

REFERENCES

NATIONAL DOCUMENTS

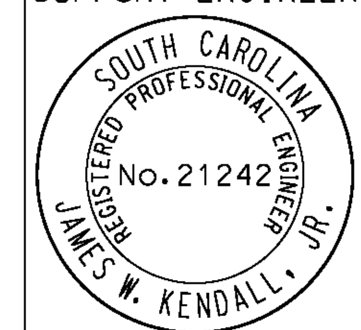
ASTM D1117-99

SCDOT DOCUMENTS

SC-M-815-8
QPL 58

RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER



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11/18/2016

DATE

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5			
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2	8/2016	DSO	GENERAL REVISIONS
1	8/2012	DSO	UPDATED NOTES AND DETAIL
0	3/2008	DSO	GENERAL REVISIONS

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

TYPE B, D1,& D2
INLET STRUCTURE
FILTERS

815-002-00

EFFECTIVE LETTING DATE | JUL 2017

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

SC-M-815-8
QPL 58

RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER

SIGNATURE

11/18/2016

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5			
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3	11/2016	DSO	GENERAL REVISIONS
2	8/2016	DSO	GENERAL REVISIONS
1	8/2012	DSO	ADDED AND UPDATED NOTES
0	3/2008	DSO	GENERAL REVISIONS

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

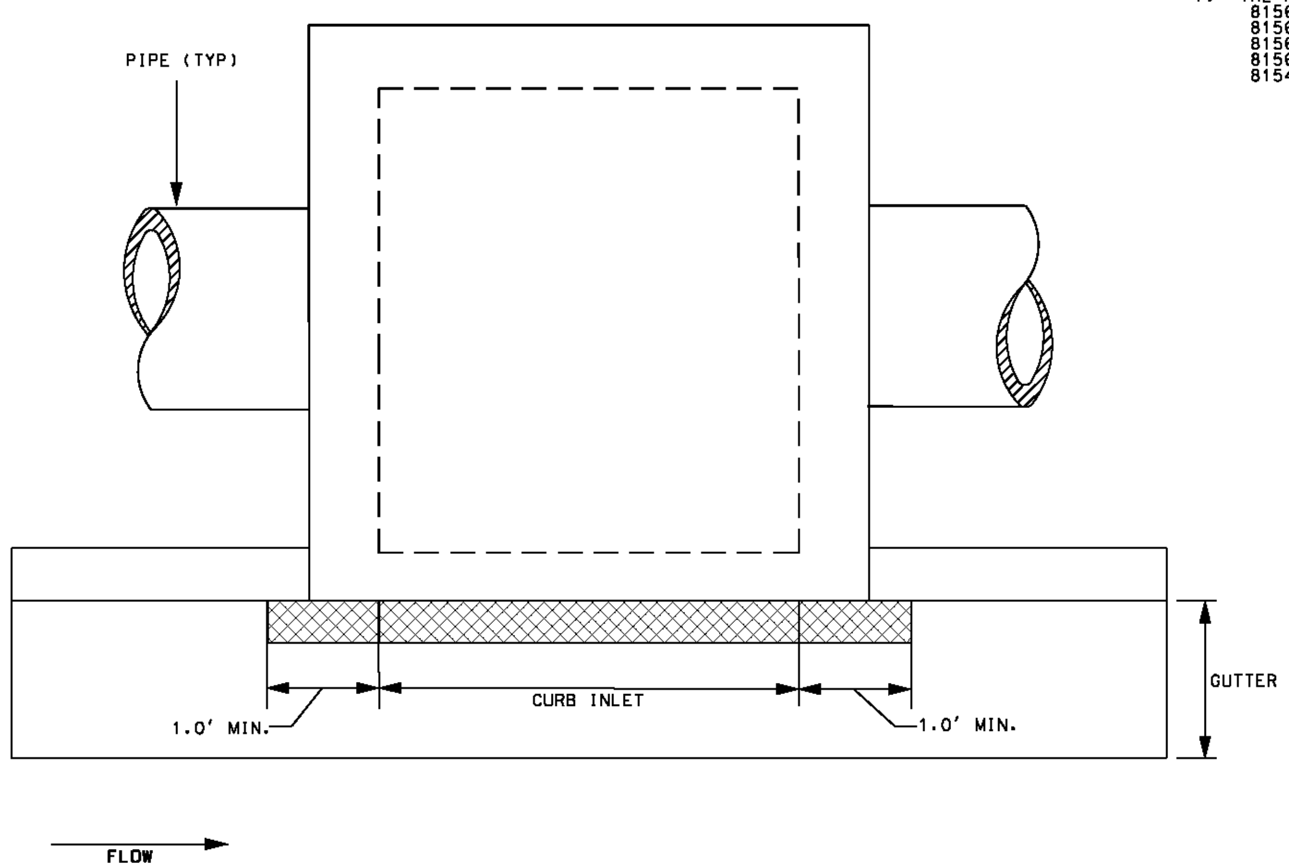
STANDARD DRAWING

TYPE E INLET STRUCTURE FILTERS

815-005-00

EFFECTIVE LETTING DATE JUL 2017

THIS DRAWING IS NOT TO SCALE



TOP VIEW

NOTES:

1. DRAWING SHOWS TYPE 16 CATCH BASIN. TYPE E INLET STRUCTURE FILTERS ARE APPLICABLE FOR CATCH BASIN TYPE 1, 16, 17, AND 18 AFTER THE ROAD SURFACE COURSE IS PLACED.

2. PLACE CURB INLET FILTER AS SHOWN IN AREA WHERE SEDIMENT MAY SPILL OVER SIDEWALK AND CURB AFTER BASE IS PLACED.

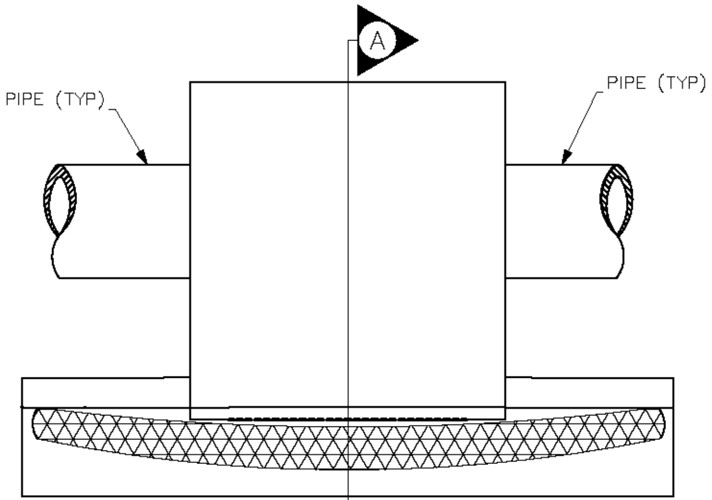
3. PROVIDE A TYPE E SURFACE COURSE INLET FILTER COMPOSED OF A UNIFORM FILTER FABRIC COVERING AN INTERNAL FILTER MATERIAL WHICH HAS AGGREGATE COMPARTMENTS FOR STONE, SAND OR OTHER WEIGHTED MATERIALS, OR PHYSICAL MECHANISMS TO HOLD THE UNIT IN PLACE. FURNISH A TYPE E SURFACE COURSE INLET FILTER THAT HAS A MAXIMUM HEIGHT THAT DOES NOT COMPLETELY BLOCK THE INLET OPENING AND A MINIMUM LENGTH THAT IS 2' LONGER THAN THE LENGTH OF THE CURB OPENING FOR FILTERS THAT DO NOT USE A PHYSICAL MECHANISM TO HOLD THE UNIT IN PLACE. DO NOT COMPLETELY BLOCK THE INLET OPENING WITH TYPE E SURFACE COURSE FILTERS TO ENSURE OVERFLOW CAN ENTER THE INLET OPENING.

4. PROVIDE A TYPE E SURFACE COURSE INLET FILTER COMPOSED OF A UNIFORM FILTER FABRIC THAT IS NON-BIODEGRADABLE AND RESISTANT TO DEGRADATION BY ULTRAVIOLET EXPOSURE AND RESISTANT TO CONTAMINANTS COMMONLY ENCOUNTERED IN STORMWATER. PROVIDE A TYPE E SURFACE COURSE INLET FILTER WITH FILTER MATERIAL THAT ALLOW STORMWATER TO FREELY FLOW WHILE TRAPPING SEDIMENT AND DEBRIS. ENSURE THAT THE FILTER MATERIAL IS RESISTANT TO CONTAMINANTS COMMONLY ENCOUNTERED IN STORMWATER. DO NOT USE STRAW BALES, PINE BALES, LEAF MULCH, OR GRASS CLIPPINGS AS FILTER MATERIALS.

5. WHEN A TYPE E SURFACE COURSE INLET FILTER UTILIZES A RIGID STRUCTURE, PROVIDE A REUSABLE RIGID STRUCTURE RESISTANT TO DEGRADATION BY ULTRAVIOLET EXPOSURE AND RESISTANT TO CONTAMINANTS COMMONLY ENCOUNTERED IN STORMWATER. DO NOT USE RIGID STRUCTURES COMPOSED OF STEEL, RE-BAR, CONCRETE OR WOOD.

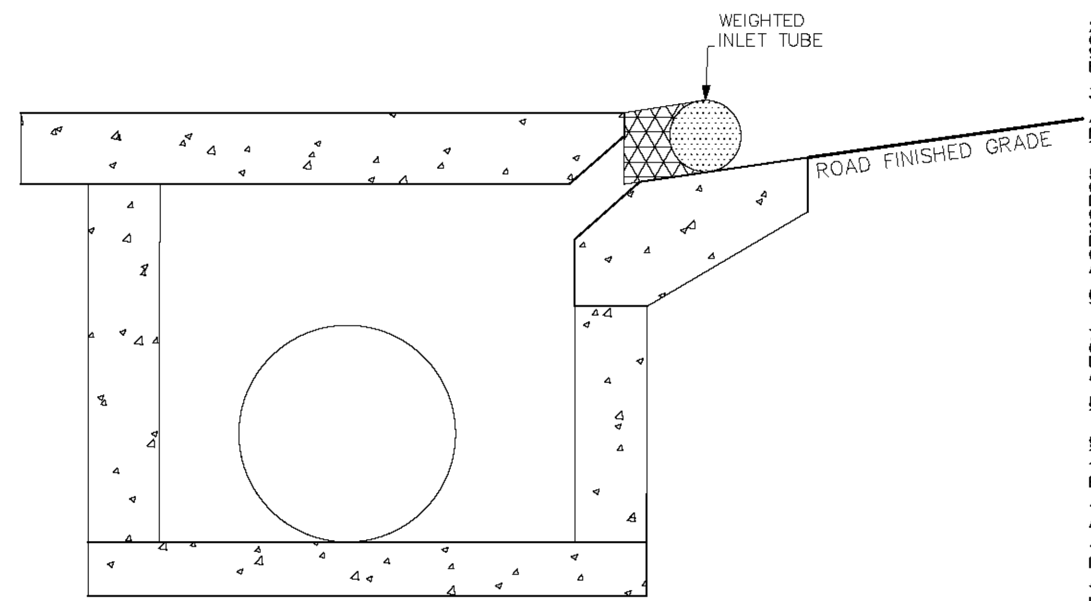
6. PONDING IS LIKELY IF SEDIMENT IS NOT REMOVED REGULARLY. INSPECTION OF CURB INLET FILTER SHOULD BE MADE EVERY SEVEN (7) CALENDAR DAYS. ANY NEEDED REPAIRS SHOULD BE HANDLED IMMEDIATELY. THE CURB INLET FILTER SHOULD BE CLEANED IF A VISUAL INSPECTION SHOWS SILT AND DEBRIS BUILT UP AROUND THE FILTER. CLEANING INLET STRUCTURE FILTERS IS PAID FOR EACH (EA) FILTER CLEANED OF DEPOSITED SEDIMENT FROM THE AREA ADJACENT TO EACH INLET STRUCTURE FILTER.

7. THE PAY ITEMS SHALL BE:
    8156211 INLET STRUCTURE FILTER - TYPE E (CATCH BASIN TYPE 1)_______EA
    8156212 INLET STRUCTURE FILTER - TYPE E (CATCH BASIN TYPE 16)_______EA
    8156213 INLET STRUCTURE FILTER - TYPE E (CATCH BASIN TYPE 17)_______EA
    8156214 INLET STRUCTURE FILTER - TYPE E (CATCH BASIN TYPE 18)_______EA
    8154155 CLEANING INLET STRUCTURE FILTERS___________________________EA



TOP VIEW

DETAIL 1



SECTION A

SIDE VIEW OF
CATCH BASIN &
TYPE F INLET STRUCTURE
FILTER

WEIGHTED INLET TUBE

NOTES:

1. DRAWING SHOWS TYPE 16 CATCH BASIN.

2. NON-WEIGHTED TUBES SHALL BE INSTALLED IMMEDIATELY AFTER GRADING AND CONSTRUCTION OF CATCH BASIN BOX. NON-WEIGHTED TUBES SHALL BE MAINTAINED DURING SUBGRADE AND BASE PREPARATION UNTIL BASE COURSE IS PLACED. THEY ARE APPLICABLE FOR CATCH BASIN TYPES 1, 16, 17, AND 18 WITH DRAINAGE AREAS LESS THAN 1 ACRE.

3. INLET TUBES MAY BE TEMPORARILY MOVED DURING CONSTRUCTION AS NEEDED.

4. CONSTRUCT A SMALL U-SHAPED TRENCH TO A DEPTH THAT IS 20% OF THE NON-WEIGHTED INLET TUBE DIAMETER. LAY THE INLET TUBE FLAT IN THE U-SHAPED TRENCH AND COMPACT THE UPSTREAM INLET TUBE SOIL INTERFACE.

5. INSTALL NON-WEIGHTED INLET TUBES USING WOODEN STAKES WITH A MINIMUM LENGTH OF 3 FEET AND A MINIMUM MEASURED DIMENSION OF 3/4" X 3/4" AND A MAXIMUM MEASURED DIMENSION 2" X 2", OR 1.25 POUNDS PER FOOT STEEL POSTS WITH A MINIMUM LENGTH OF 3 FEET. USE STEEL POSTS WITHOUT A SOIL PLATE AND PAINTING IS NOT REQUIRED. SPACE POSTS OR STAKES ON 2 FOOT CENTERS AND DRIVE THEM INTO THE GROUND TO A MINIMUM DEPTH OF 2 FEET. INSTALL NON-WEIGHTED INLET TUBES SO THAT THE TOP IS BELOW THE TOP OF THE INSTALLED CURB LINE TO ENSURE THAT ALL OVERFLOW OR OVERTOPPING WATER HAS THE ABILITY TO ENTER THE INLET UNOBSTRUCTED.

6. PLACE STAKES ON THE DOWNSTREAM SIDE OF THE NON-WEIGHTED INLET TUBE. REFER TO MANUFACTURER'S RECOMMENDATION FOR OTHER STAKING DETAILS.

7. AFTER ROAD BASE COURSE IS PLACED, WEIGHTED INLET TUBES SHALL BE PLACED FOR CATCH BASIN TYPES 1, 9, 12, 14, 15, 16, 17, & 18, DI 24 INCHES X 24 INCHES, DI 24 INCHES X 36 INCHES, MANHOLES, AND TRENCH DRAINS. WEIGHTED INLET TUBES ARE APPLICABLE WHERE CONSTRUCTION TRAFFIC MAY OCCUR AROUND THE INLET.

8. INSTALL WEIGHTED INLET TUBES LYING FLAT ON THE GROUND WITH NO GAPS BETWEEN THE UNDERLYING SURFACE AND THE TUBE.

9. DO NOT COMPLETELY BLOCK INLETS WITH INLET TUBES. INSTALL WEIGHTED INLET TUBES IN SUCH A MANNER THAT ALL OVERFLOW CAN ENTER THE INLET UNOBSTRUCTED. TO AVOID POSSIBLE FLOODING, 2 OR 3 CONCRETE CINDER BLOCKS MAY BE PLACED BETWEEN THE WEIGHTED INLET TUBE AND THE INLET.

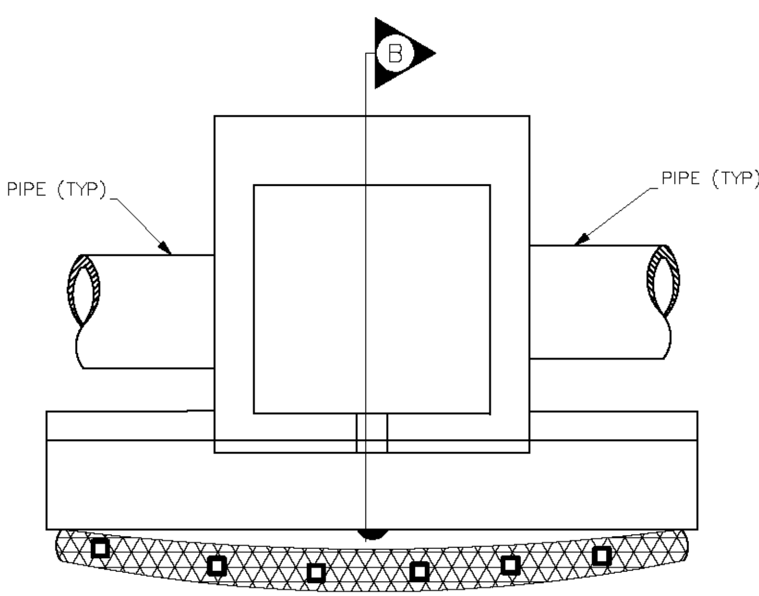
10. FOR WEEP HOLE APPLICATIONS, BOTH WEIGHTED AND NON-WEIGHTED INLET TUBES ARE APPLICABLE.

11. ALL WEIGHTED TYPE F INLET STRUCTURE FILTERS ARE APPLICABLE AS TYPE E INLET STRUCTURE FILTERS.

12. REPLACE INLET TUBES DURING INSTALLATION AS DIRECTED BY THE ENGINEER, INSPECTOR, OR MANUFACTURER'S REPRESENTATIVE AT THE CONTRACTOR'S EXPENSE.

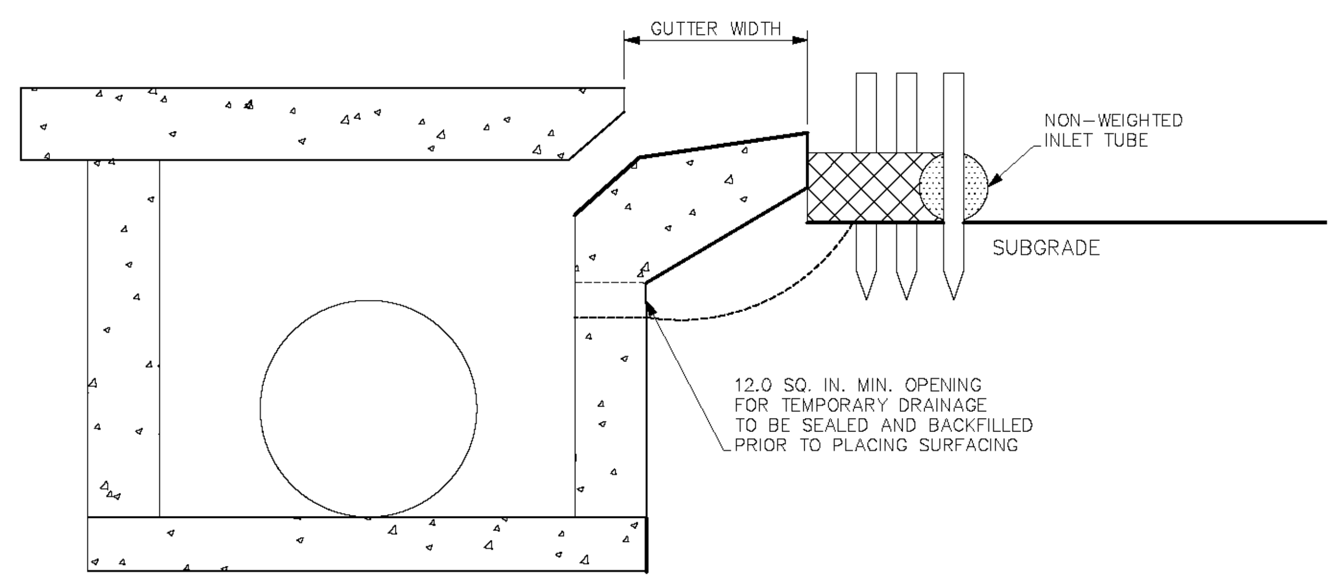
13. ALL TYPE F INLET FILTERS SHALL BE INSPECTED EVERY 7 CALENDAR DAYS.

14. THE PAY ITEMS SHALL BE:
    8152004 INLET STRUCTURE FILTER TYPE F (WEIGHTED)______________________LF
    8152006 INLET STRUCTURE FILTER TYPE F (NON-WEIGHTED)_________________LF
    8154155 CLEANING INLET STRUCTURE FILTERS_____________________________EA



TOP VIEW

DETAIL 2



SECTION B

SIDE VIEW OF
CATCH BASIN &
TYPE F INLET STRUCTURE
FILTER

NON-WEIGHTED INLET TUBE

THIS DRAWING IS NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS
SC-M-815-8
QPL 58

RELATED DRAWINGS & KEYWORDS

THIS DRAWING IS ONLY VALID FOR CONSTRUCTION WHEN SEALED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF SOUTH CAROLINA. CHECK WWW.SCDOT.ORG FOR LATEST UPDATE.

SOUTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
NO. 21242
JAMES W. KENDALL JR.

SIGNATURE

11/18/2016
DATE

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0	8/2013	DSO	UPDATED DRAWING

SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

TYPE F
INLET STRUCTURE
FILTERS

815-006-00

EFFECTIVE LETTING DATE JUL 2017

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

RELATED DRAWINGS & KEYWORDS

THIS DRAWING IS ONLY VALID FOR CONSTRUCTION WHEN SEALED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF SOUTH CAROLINA. CHECK WWW.SCDOT.ORG FOR LATEST UPDATE.

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

09/30/2016

DATE

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SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

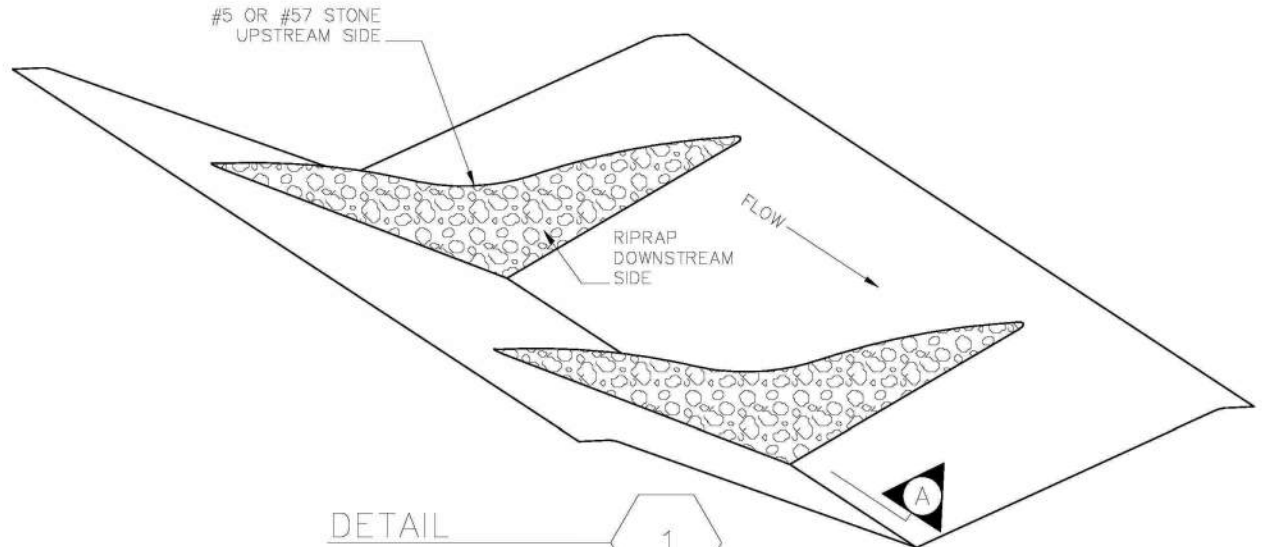
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

DITCH CHECK

815-105-00

EFFECTIVE LETTING DATE JULY, 2017



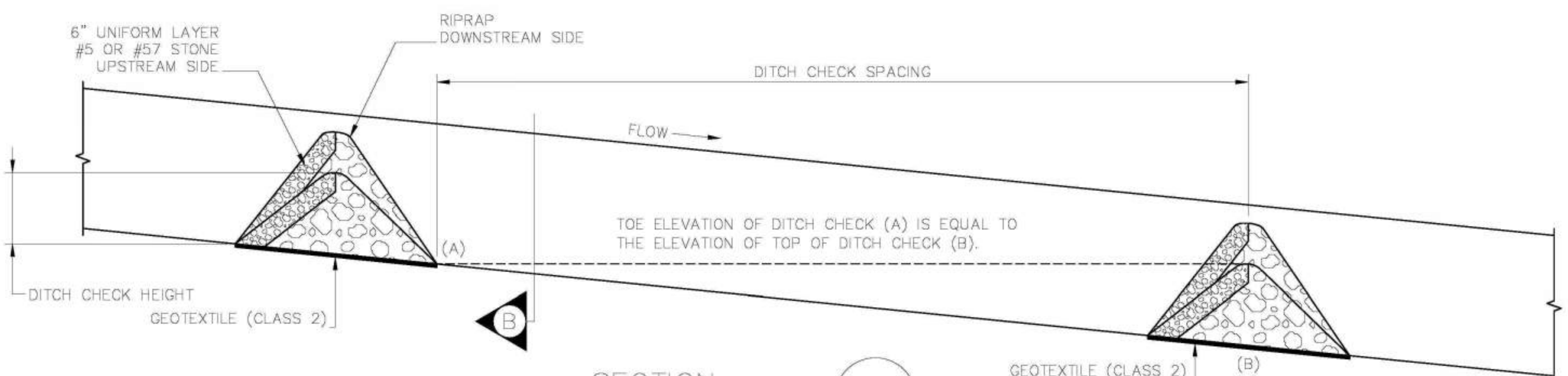
DETAIL 1

DITCH CHECK ISOMETRIC VIEW

NOTES:

1. DITCH CHECK SHOULD NEVER BE USED IN LIVE STREAM.
2. DITCH CHECK IS NOT ADEQUATE FOR MORE THAN 2 ACRES OF DRAINAGE.
3. PLACE A CLASS 2 NON-WOVEN GEOTEXTILE FABRIC THAT MEETS THE REQUIREMENTS OF SECTION 804 BENEATH THE ROCK PRIOR TO INSTALLATION OF THE ROCK.
4. RIPRAP SHALL BE CLASS A.
5. RIPRAP MAY BE HAND PLACED OR MECHANICALLY PLACED AND SHAPED.
6. PLACE 6" UNIFORM LAYER OF AGGREGATE NO. 5 OR NO. 57 STONE ON THE UPSTREAM FACE OF ROCK DITCH CHECK.
7. SLOPES OF DITCH CHECK SHALL BE NO STEEPER THAN 2:1, BUT MAY BE FLATTENED DUE TO TRAFFIC SAFETY, AS DIRECTED BY THE ENGINEER.
8. HEIGHT OF DITCH CHECK SHALL BE NO MORE THAN 2.0 FEET.
9. DITCH CHECKS SHALL BE INSPECTED EVERY 7 DAYS.
10. REMOVE COLLECTED SEDIMENT IN FRONT OF DITCH CHECK AS DETERMINED BY THE ENGINEER. PAYMENT FOR REMOVAL AND DISPOSAL OF SEDIMENT WILL BE CLEANING SILT BASIN.
11. PAY ITEM SHALL BE:

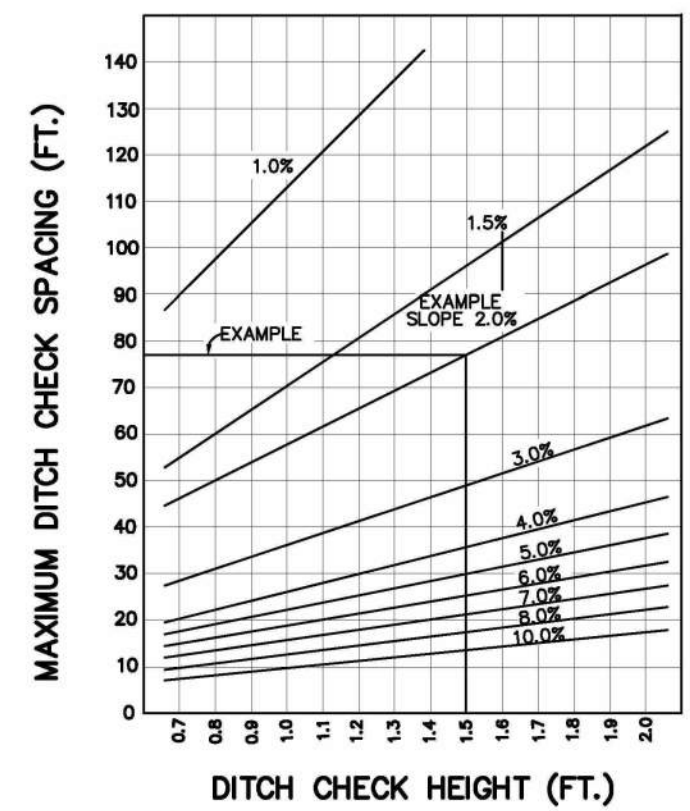
8041010 RIPRAP (CLASS A) ____ TON
8042800 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS 2) ____ SY
8154010 CLEANING SILT BASINS ____ CY
8156410 AGGREGATE NO.5 OR NO.57 FOR EROSION CONTROL ____ TON

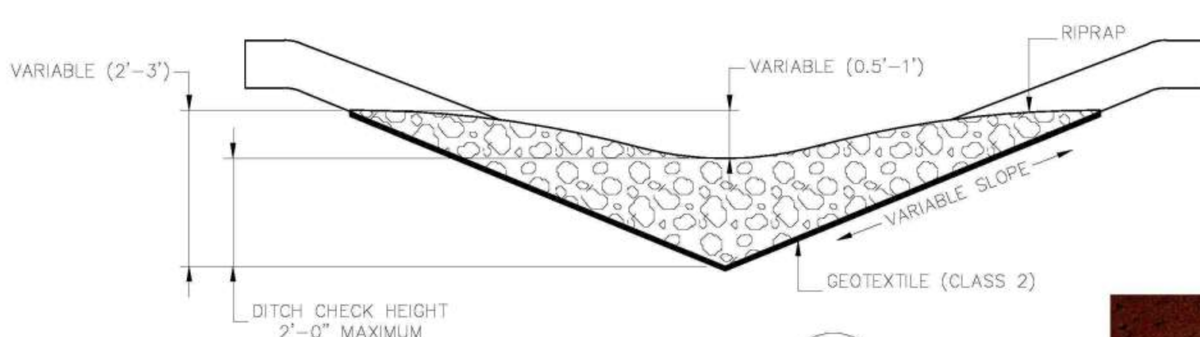


SECTION A

DITCH CHECK ELEVATION VIEW

DITCH CHECK SPACING





SECTION B

DITCH CHECK END VIEW

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

RELATED DRAWINGS & KEYWORDS

THIS DRAWING IS ONLY VALID FOR CONSTRUCTION WHEN SEALED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF SOUTH CAROLINA. CHECK WWW.SCDOT.ORG FOR LATEST UPDATE.

SOUTH CAROLINA PROFESSIONAL ENGINEER REGISTERED NO. 21242 JAMES W. KENDALL, JR.

James W. Kendall, Jr.

SIGNATURE

09/30/2016

DATE

#	DATE	CHK	DESCRIPTION
6	---	---	---
5	---	---	---
4	---	---	---
3	---	---	---
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1	---	---	---
0	8/2016	DSO	UPDATE

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

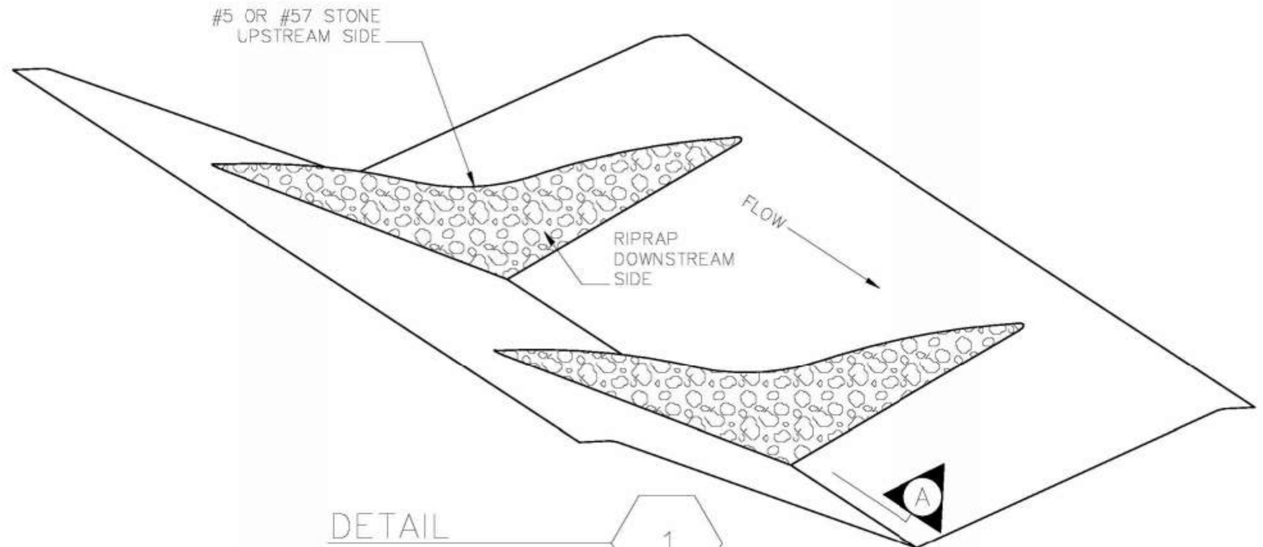
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

DITCH CHECK

815–105–00

EFFECTIVE LETTING DATE JULY, 2017



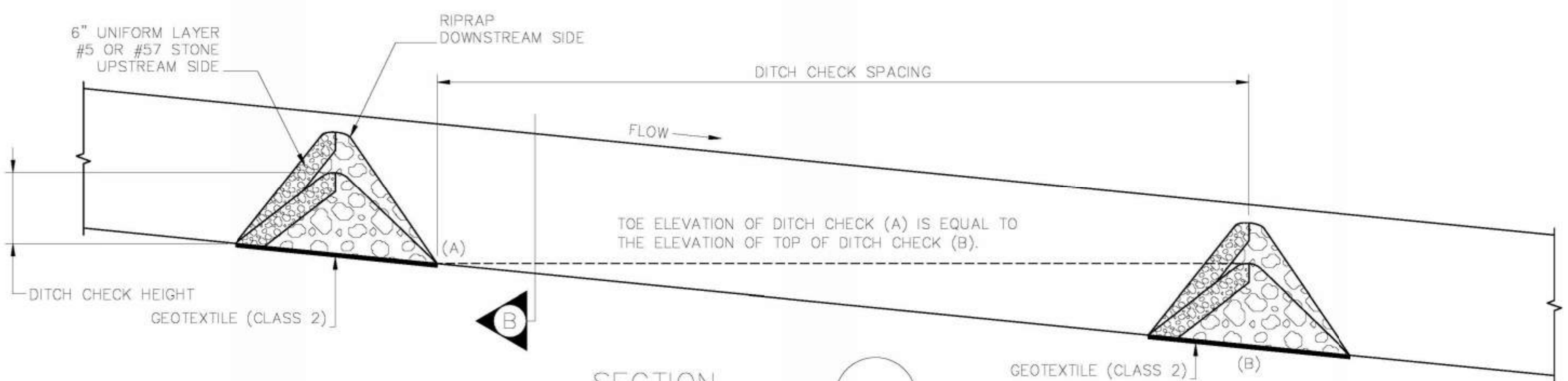
DETAIL 1

DITCH CHECK ISOMETRIC VIEW

NOTES:

1. DITCH CHECK SHOULD NEVER BE USED IN LIVE STREAM.
2. DITCH CHECK IS NOT ADEQUATE FOR MORE THAN 2 ACRES OF DRAINAGE.
3. PLACE A CLASS 2 NON–WOVEN GEOTEXTILE FABRIC THAT MEETS THE REQUIREMENTS OF SECTION 804 BENEATH THE ROCK PRIOR TO INSTALLATION OF THE ROCK.
4. RIPRAP SHALL BE CLASS A.
5. RIPRAP MAY BE HAND PLACED OR MECHANICALLY PLACED AND SHAPED.
6. PLACE 6" UNIFORM LAYER OF AGGREGATE NO. 5 OR NO. 57 STONE ON THE UPSTREAM FACE OF ROCK DITCH CHECK.
7. SLOPES OF DITCH CHECK SHALL BE NO STEEPER THAN 2:1, BUT MAY BE FLATTENED DUE TO TRAFFIC SAFETY, AS DIRECTED BY THE ENGINEER.
8. HEIGHT OF DITCH CHECK SHALL BE NO MORE THAN 2.0 FEET.
9. DITCH CHECKS SHALL BE INSPECTED EVERY 7 DAYS.
10. REMOVE COLLECTED SEDIMENT IN FRONT OF DITCH CHECK AS DETERMINED BY THE ENGINEER. PAYMENT FOR REMOVAL AND DISPOSAL OF SEDIMENT WILL BE CLEANING SILT BASIN.
11. PAY ITEM SHALL BE:

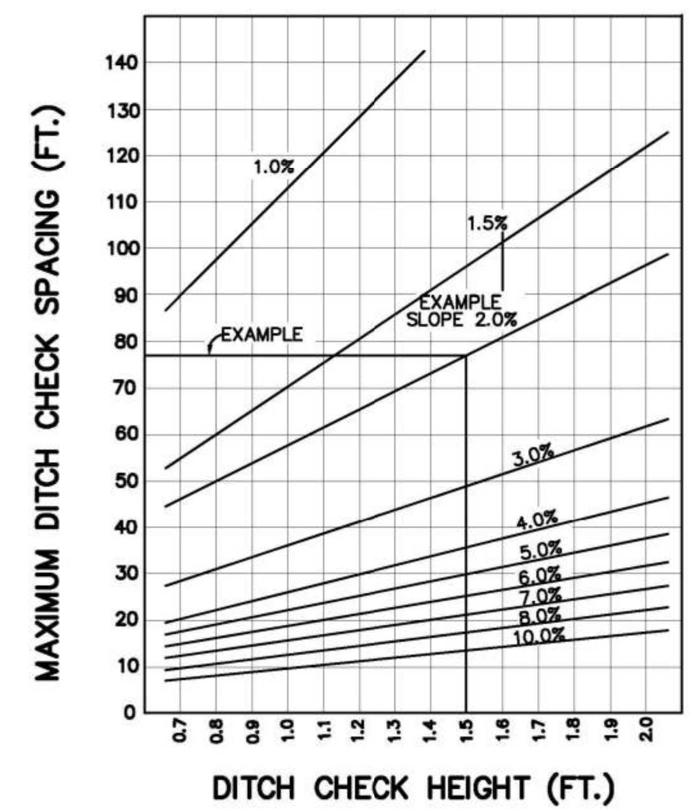
8041010 RIPRAP (CLASS A) ____ TON
8042800 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS 2) ____ SY
8154010 CLEANING SILT BASINS ____ CY
8156410 AGGREGATE NO.5 OR NO.57 FOR EROSION CONTROL ____ TON

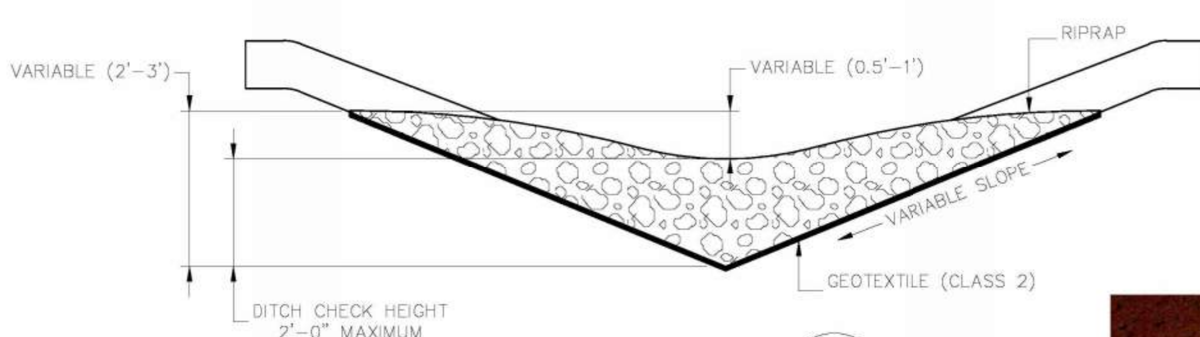


SECTION A

DITCH CHECK ELEVATION VIEW

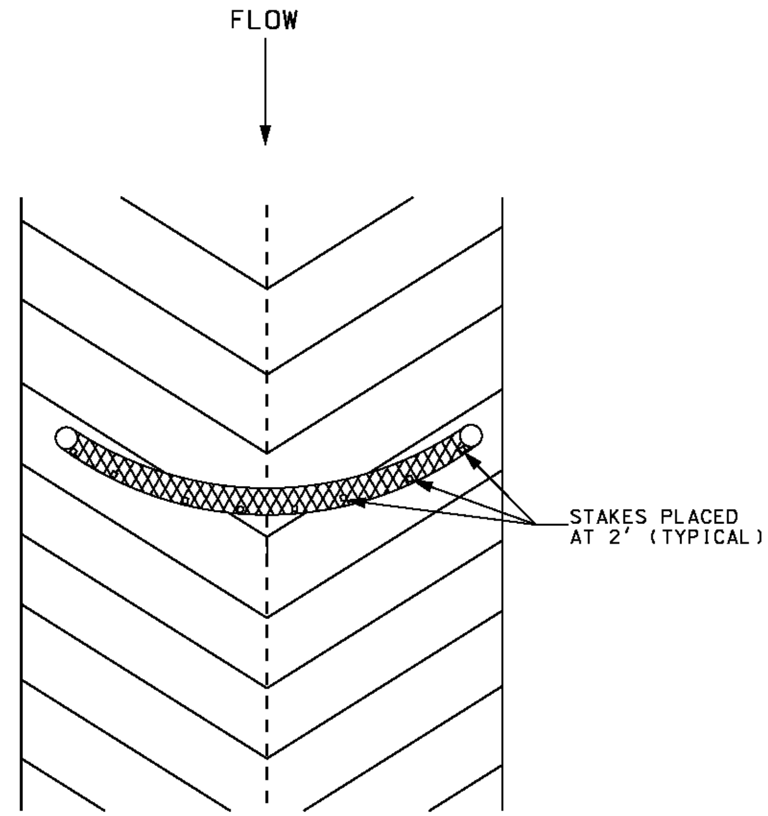
DITCH CHECK SPACING



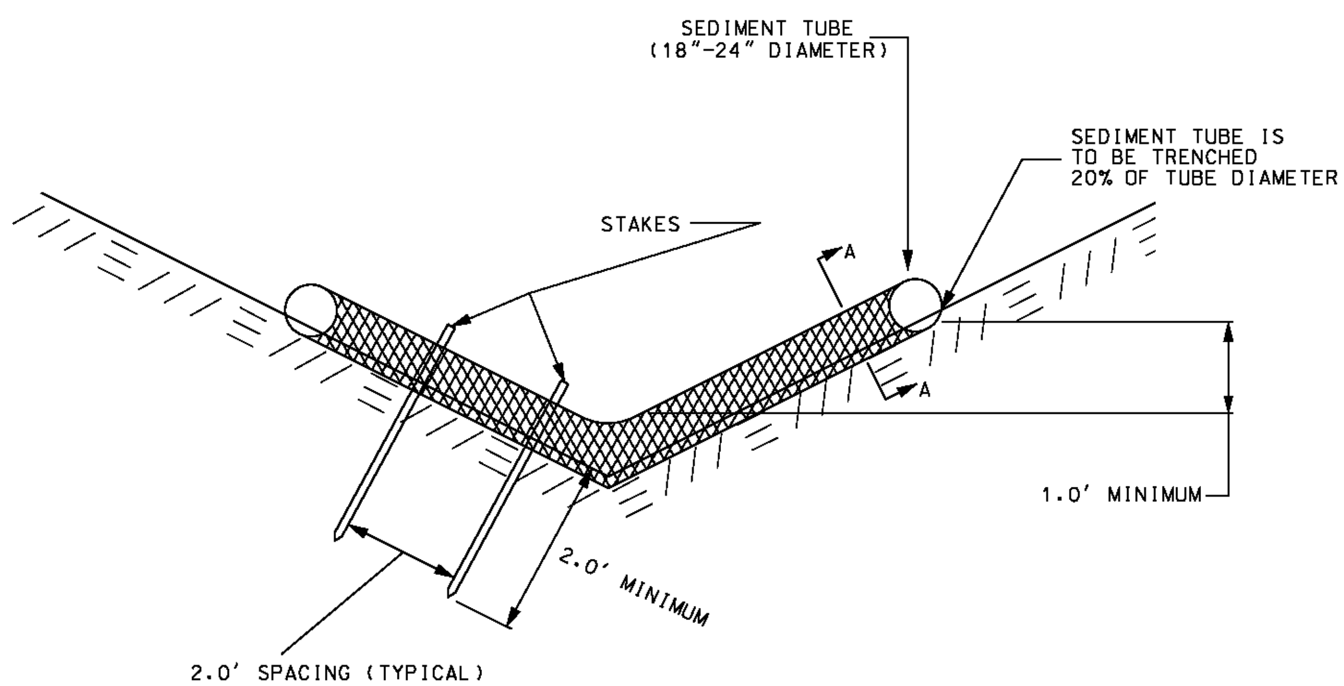


SECTION B

DITCH CHECK END VIEW



TOP VIEW
OF DITCH



END VIEW
OF DITCH

NOTES:

1. SEDIMENT TUBE SHALL COMPLY WITH THE REQUIREMENTS OF SECTION 815 OF THE SCDOT STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION (LATEST EDITION), AND MUST BE LISTED ON SCDOT QUALIFIED PRODUCT LIST NUMBER 57. SEDIMENT TUBES MUST MEET THE CRITERIA OUTLINED IN THE SUPPLEMENTAL SPECIFICATIONS BEFORE BEING LISTED ON QPL, AND BE FREE FROM DEFECTS OR TRANSPORTATION DAMAGE.

2. PROPER SITE PREPARATION IS ESSENTIAL TO ENSURE SEDIMENT TUBES ARE IN COMPLETE CONTACT WITH UNDERLYING SOIL. SEDIMENT TUBES ARE TO BE 18-24 INCHES IN DIAMETER AND ARE TO BE TRENCHED TO A DEPTH OF 20% OF TUBE DIAMETER. LAY THE SEDIMENT TUBE FLAT IN THE U-SHAPED TRENCH AND COMPACT THE UPSTREAM SEDIMENT TUBER SOIL INTERFACE. PLACE AND ANCHOR THE SEDIMENT TUBE ENDS SO THEY ARE POSITIONED UPSTREAM OF THE SEDIMENT TUBE CENTER POINT. SEDIMENT TUBES FOR DITCH CHECKS WEIGHING MORE THAN 18 POUNDS PER FOOT DO NOT REQUIRE TRENCHING.

3. SEDIMENT TUBE SHALL BE INSTALLED IMMEDIATELY AFTER GRADING AND CONSTRUCTION. SEDIMENT TUBE SHALL BE MAINTAINED DURING SUBGRADE AND BASE PREPARATION UNTIL BASE COURSE IS COMPLETE. SEDIMENT TUBES MAY BE TEMPORARILY MOVED DURING CONSTRUCTION.

4. SEDIMENT TUBES ARE TO BE INSTALLED PERPENDICULAR TO WATER FLOW AND EXTEND UP SIDE SLOPES A MINIMUM OF 1 FOOT ABOVE DESIGN FLOW DEPTH. SPACE TUBES ACCORDING TO THE FOLLOWING TABLE:

SLOPE	MAXIMUM SEDIMENT TUBE SPACING
LESS THAN 2%	150 FEET
2%	100 FEET
3%	75 FEET
4%	50 FEET
5%	40 FEET
6%	30 FEET
GREATER THAN 6%	25 FEET

5. STAKE SEDIMENT TUBES FOR DITCH CHECKS USING STAKES WITH A MINIMUM MEASURED DIMENSION OF 3/4" X 3/4" AND A MAXIMUM MEASURED DIMENSION OF 2" X 2", OR USING STEEL POSTS(1.25lbs/linear foot)A MINIMUM OF 4' IN LENGTH. USE STEEL POSTS WITHOUT A SOIL PLATE AND PAINTING IS NOT REQUIRED. SPACE POSTS OR STAKES ON 2' CENTERS AND DRIVE THEM INTO THE GROUND TO A MINIMUM DEPTH OF 2'. INSTALL THE STAKES ON THE DOWNSTREAM THIRD OF THE SEDIMENT TUBE. SEDIMENT TUBES FOR DITCH CHECKS WEIGHING MORE THAN 18 POUNDS PER FOOT DO NOT REQUIRE STAKING.

6. SELECT PROPER LENGTH OF TUBE TO MINIMIZE THE NUMBER NEEDED TO SPAN THE WIDTH OF DRAINAGE AREA. ONE CONTINUOUS LENGTH IS PREFERRED COMPARED TO TWO OVERLAPPING TUBES. IF NECESSARY, SEDIMENT TUBES CAN BE LAPPED A MINIMUM OF 6 INCHES TO PREVENT PASSAGE OF FLOW AND SEDIMENT THROUGH FIELD JOINT.

7. INSTALL SEDIMENT TUBES FOR DITCH CHECKS OVER BARE SOIL, MULCHED AREAS, OR EROSION CONTROL BLANKETS. KEEP SEDIMENT TUBES FOR DITCH CHECKS IN PLACE UNTIL FULLY ESTABLISHED VEGETATION AND ROOT SYSTEMS HAVE COMPLETELY DEVELOPED AND CAN SURVIVE ON THEIR OWN.

8. INSPECT SEDIMENT TUBES AFTER INSTALLATION FOR GAPS UNDER THE SEDIMENT TUBES AND FOR GAPS BETWEEN THE JOINTS OF ADJACENT ENDS OF SEDIMENT TUBES. INSPECT SEDIMENT TUBES EVERY 7 DAYS. REPAIR ALL RILLS, GULLIES, AND UNDERCUTTING NEAR SEDIMENT TUBES. REMOVE ALL SEDIMENT DEPOSITS THAT IMPAIR THE FILTRATION CAPABILITY OF SEDIMENT TUBES WHEN THE SEDIMENT REACHES 1/3 THE HEIGHT OF THE EXPOSED SEDIMENT TUBE.

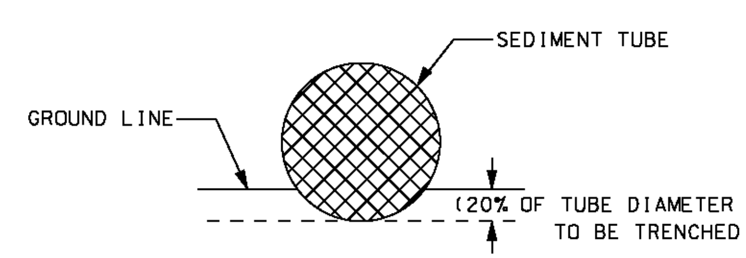
9. REMOVE AND/OR REPLACE INSTALLED SEDIMENT TUBES AS REQUIRED TO ADAPT TO CHANGING CONSTRUCTION SITE CONDITIONS. REMOVE SEDIMENT TUBES WHEN THE FUNCTIONAL LONGEVITY IS EXCEEDED AS DETERMINED BY THE ENGINEER, INSPECTOR, OR MANUFACTURER'S REPRESENTATIVE. GATHER SEDIMENT TUBES AND DISPOSE OF THEM IN REGULAR MEANS AS NON-HAZARDOUS, INERT MATERIAL.

10. PRIOR TO FINAL STABILIZATION, BACKFILL ALL TRENCHES, DEPRESSIONS, AND OTHER GROUND DISTURBANCES CAUSED BY THE REMOVAL OF SEDIMENT TUBES.

11. CLEAN OUT OF TUBES WILL BE PAID FOR AS CLEANING SILT BASINS.

12. PAYMENT SHALL INCLUDE ALL MATERIALS, LABOR, TOOLS, EQUIPMENT, MAINTENANCE, AND INCIDENTALS NECESSARY TO COMPLETE WORK.

13. THE PAY ITEMS SHALL BE:
8152007 SEDIMENT TUBE .... LF
8154010 CLEANING SILT BASINS .... CY



SECTION A-A

THIS DRAWING IS NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

SC-M-815-12
QPL 57

RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER

SOUTH CAROLINA PROFESSIONAL ENGINEER REGISTERED No. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

#	DATE	CHK	DESCRIPTION
5			
4			
3			
2	8/2016	DSO	GENERAL REVISIONS
1	8/2012	DSO	UPDATED NOTES, WOOD TEXT REMOVED
0	3/2008	DSO	GENERAL REVISIONS

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

SEDIMENT TUBE DITCH APPLICATION

815-205-00

EFFECTIVE LETTING DATE JUL 2017

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

WQM, SC-M-810

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

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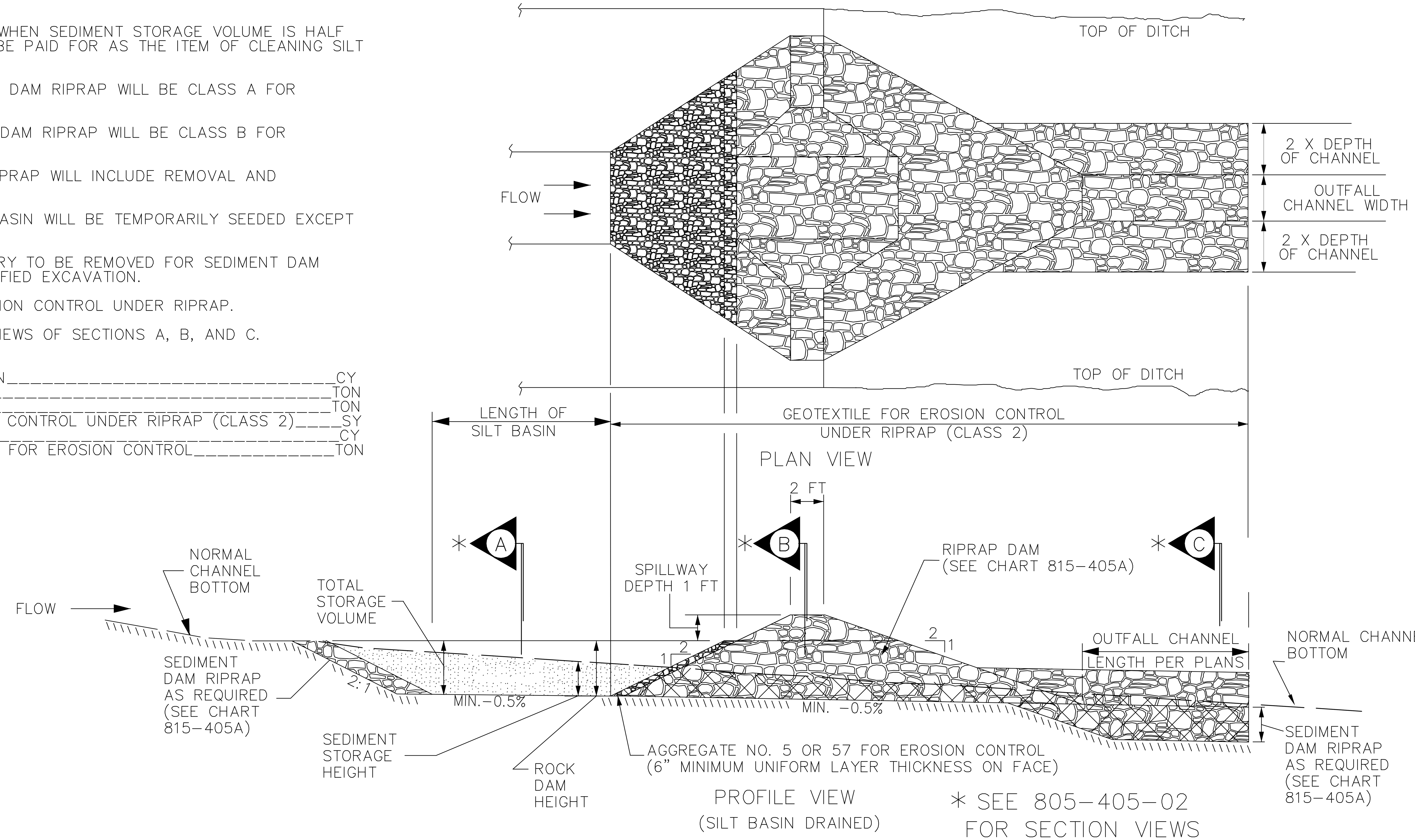
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING SEDIMENT DAM

NOTES:

1. SEDIMENT DAMS WILL BE DESIGNED IN ACCORDANCE WITH THE SCDOT WATER QUALITY MANUAL.
2. SILT BASIN MUST BE CLEANED OUT WHEN SEDIMENT STORAGE VOLUME IS HALF FULL. CLEAN OUT OF SILT BASIN WILL BE PAID FOR AS THE ITEM OF CLEANING SILT BASINS.
3. THE GRADATION CLASS OF SEDIMENT DAM RIPRAP WILL BE CLASS A FOR WATERSHEDS LESS THAN 3 ACRES.
4. THE GRADATION CLASS OF SEDIMENT DAM RIPRAP WILL BE CLASS B FOR WATERSHEDS 3 ACRES OR GREATER.
5. CONSTRUCTION OF SEDIMENT DAM RIPRAP WILL INCLUDE REMOVAL AND DISPOSAL OF RIPRAP.
6. ALL EARTHEN AREAS OF THE SILT BASIN WILL BE TEMPORARILY SEEDED EXCEPT FOR THE BOTTOM OF THE BASIN.
7. CROSS-HATCHED AREA, IF NECESSARY TO BE REMOVED FOR SEDIMENT DAM RIPRAP, WILL BE PAID FOR AS UNCLASSIFIED EXCAVATION.
8. USE CLASS 2 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP.
9. SEE DRAWING # 815-405-02 FOR VIEWS OF SECTIONS A, B, AND C.
10. THE PAY ITEMS SHALL BE:
    - 2031000 UNCLASSIFIED EXCAVATION________CY
    - 8041010 RIPRAP (CLASS A)________TON
    - 8041020 RIPRAP (CLASS B)________TON
    - 8042800 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)____SY
    - 8154010 CLEANING SILT BASINS________CY
    - 8156410 AGGREGATE NO. 5 OR 57 FOR EROSION CONTROL________TON

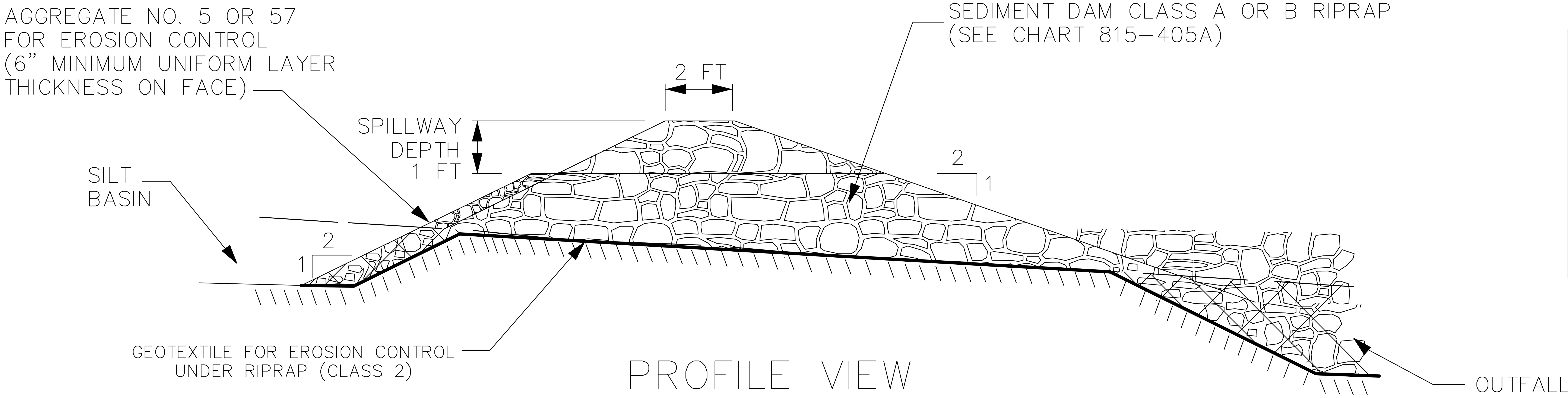
CHART 815-405A RIPRAP PLACEMENT		
CLASS	D_{50} (FT)	MINIMUM THICKNESS (FT)
A	0.50	1.00
B	0.75	1.50



South Carolina Department of Transportation
Regional Sediment Basin Specification

MAX AREA DRAINING TO DAM (ACRES)	LOWER STATE: TOTAL STORAGE VOLUME (FT^3)	UPPER STATE: TOTAL STORAGE VOLUME (FT^3)			ROCK DAM HEIGHT (TO BOTTOM OF SPILLWAY) (FT)	ROCK DAM BOTTOM WIDTH (FT)	SEDIMENT STORAGE HEIGHT (FT)	SPILLWAY BOTTOM WIDTH (FT)
		PERCENTAGE OF TOTAL DRAINAGE AREAS DISTURBED						
		75-100%	25-75%	0-25%				
1	1,450	2,815	2,115	1,505	3	3	0.50	9
2	2,900	5,630	4,225	3,010	3	3	0.50	9
3	4,350	8,445	6,335	4,510	4	3	0.75	11
4	5,800	11,260	8,445	6,015	4	4	0.75	12
5	7,250	14,075	10,560	7,520	4	4	0.75	12
6	8,700	16,890	12,670	9,025	4	4	0.75	12
7	10,150	19,705	14,780	10,530	4	6	0.75	14
8	11,600	22,520	16,890	12,030	4	6	0.75	14
9	13,050	25,335	19,000	13,535	4	6	0.75	14
10	14,500	28,150	21,115	15,040	4	6	0.75	14

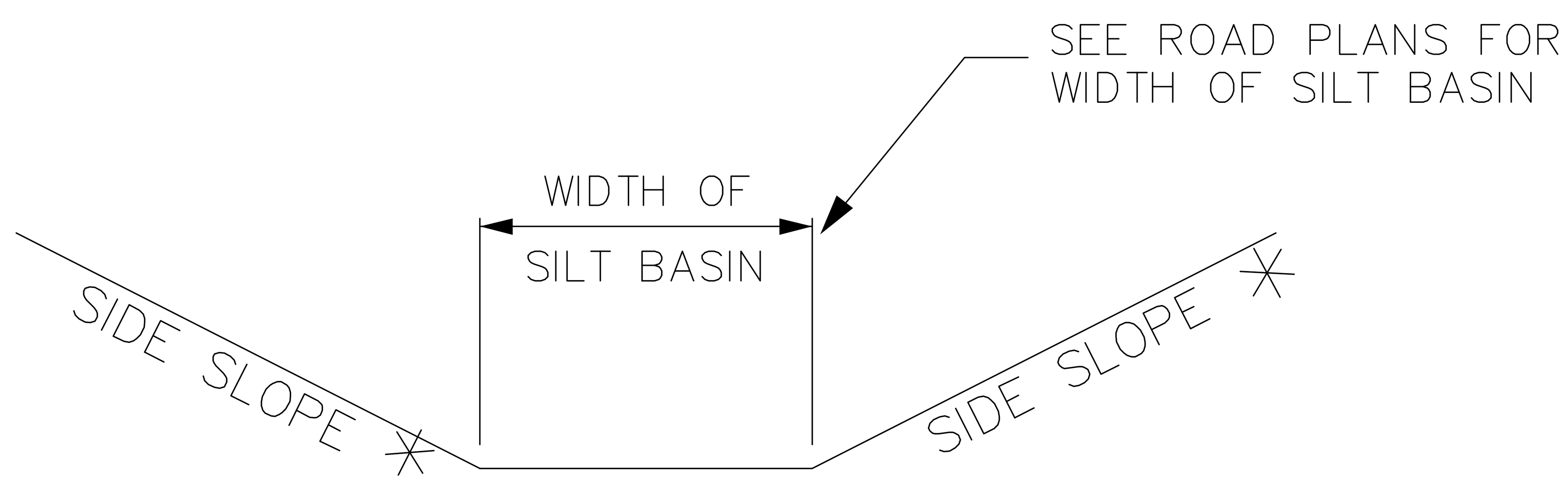
THIS DRAWING IS NOT TO SCALE



PROFILE VIEW

(SILT BASIN NOT DRAINED)

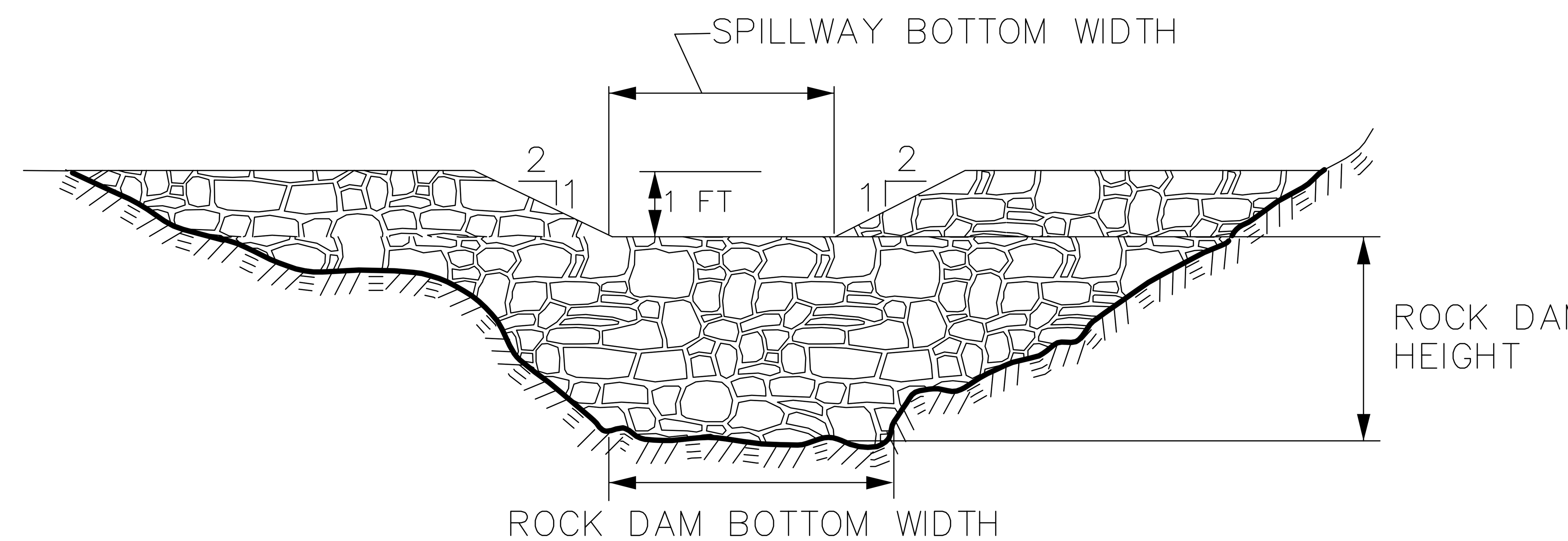
CHART 815-405A RIPRAP PLACEMENT		
CLASS	D_{50} (FT)	MINIMUM THICKNESS (FT)
A	0.50	1.00
B	0.75	1.50



* SEE EROSION CONTROL DATA SHEET

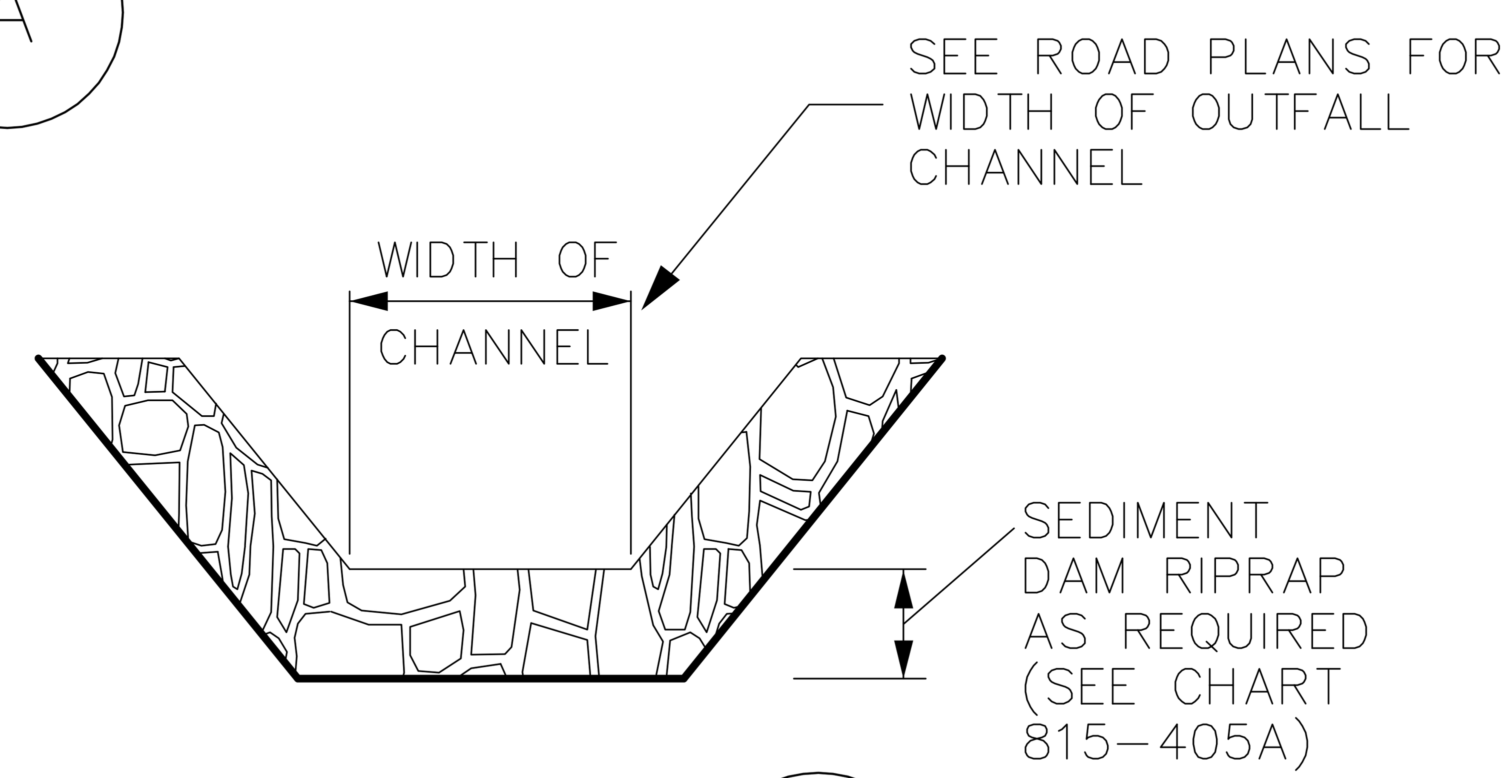
SECTION A

SILT BASIN
CROSS SECTION



SECTION B

SEDIMENT DAM
CROSS SECTION



SECTION C

OUTFALL CHANNEL
CROSS SECTION

THIS DRAWING IS NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

WQM

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

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SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING
SEDIMENT
DAM

815–405–02

EFFECTIVE LETTING DATE JULY 2017

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

SC-M-815-10

RELATED DRAWINGS & KEYWORDS

PRECONSTRUCTION SUPPORT ENGINEER

SOUTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
No. 21242
JAMES W. KENDALL, JR.

SIGNATURE

11/09/2016

DATE

#	DATE	CHK	DESCRIPTION
6			
5			
4			
3	11/2016	DSO	GENERAL REVISIONS
2	8/2016	DSO	GENERAL REVISIONS
1	8/2012	DSO	ADDED CHART 815-505
0	3/2008	DSO	GENERAL REVISIONS

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

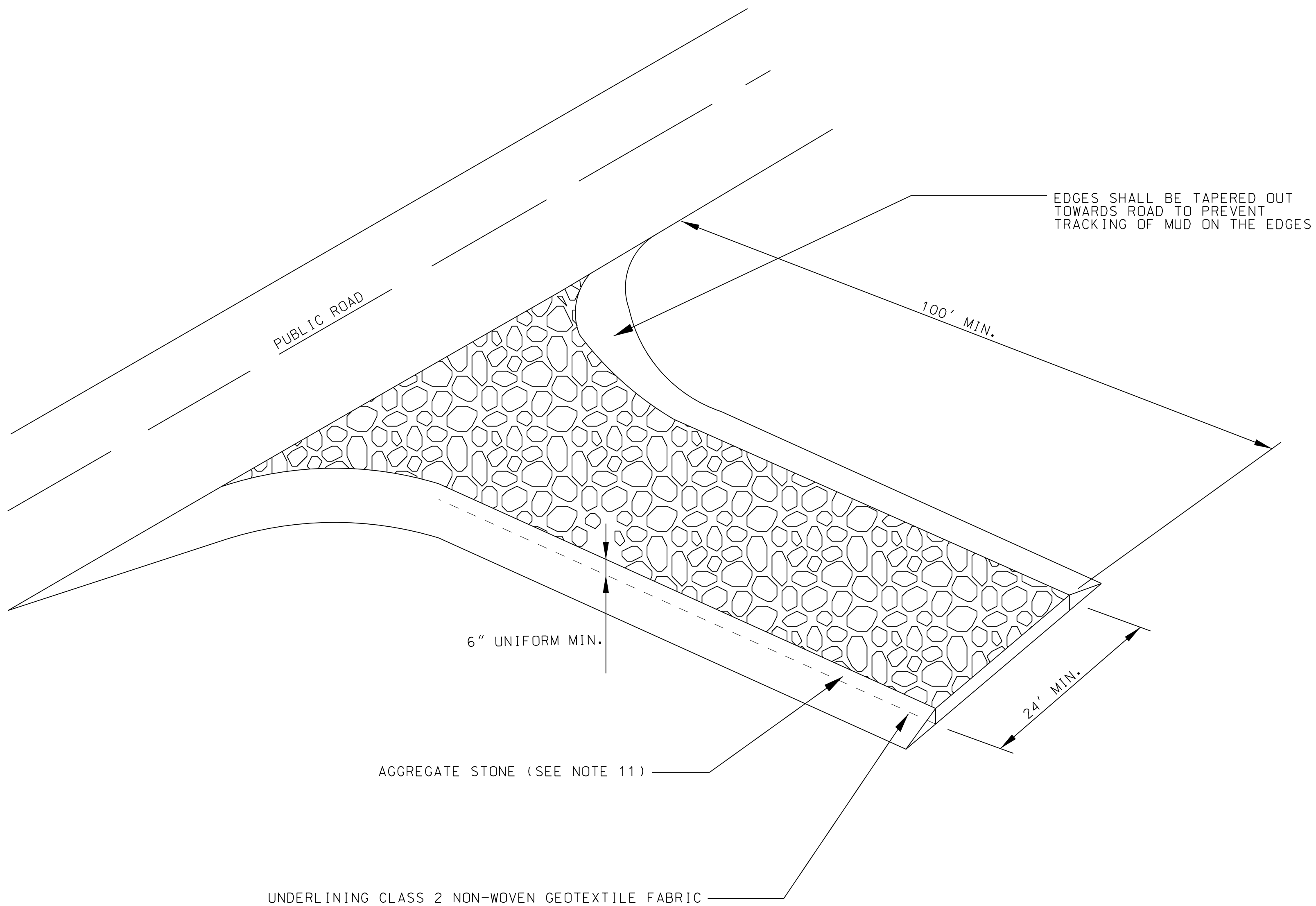
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

STABILIZED CONSTRUCTION ENTRANCE

815-505-00

EFFECTIVE LETTING DATE | JUL 2017



THIS DRAWING IS NOT TO SCALE

NOTES:

1. STABILIZED CONSTRUCTION ENTRANCES SHOULD BE USED AT ALL POINTS WHERE TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD.

2. IF WASHING IS USED, PROVISIONS MUST BE MADE TO INTERCEPT THE WASH WATER AND TRAP THE SEDIMENT BEFORE IT IS CARRIED OFF SITE. WASHDOWN FACILITIES SHALL BE REQUIRED AS DIRECTED BY SCDOT AS NEEDED. WASHDOWN AREAS IN GENERAL MUST BE ESTABLISHED WITH CRUSHED GRAVEL AND DRAIN INTO A SEDIMENT TRAP OR SEDIMENT BASIN. CONSTRUCTION ENTRANCES SHOULD BE USED IN CONJUNCTION WITH THE STABILIZATION OF CONSTRUCTION ROADS TO REDUCE THE AMOUNT OF MUD PICKED UP BY VEHICLES.

3. REMOVE ALL VEGETATION AND ANY OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA.

4. DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM STONES TO A SEDIMENT TRAP OR BASIN.

5. INSTALL A CLASS 2 NON-WOVEN GEOTEXTILE FABRIC THAT MEETS THE REQUIREMENTS OF SECTION 804 OF THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, PRIOR TO PLACING ANY STONE.

6. MINIMUM DIMENSIONS OF THE ENTRANCE SHALL BE 24-FT WIDE x 100-FT LONG, AND MAY BE MODIFIED AS NECESSARY TO ACCOMMODATE SITE CONSTRAINTS.

7. INSPECT CONSTRUCTION ENTRANCES EVERY SEVEN (7) CALENDAR DAYS. CHECK FOR MUD AND SEDIMENT BUILDUP, AS WELL AS PAD INTEGRITY. MAINTENANCE IS REQUIRED MORE FREQUENTLY IN WET WEATHER CONDITIONS. RESHAPE THE STONE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL.

8. WASH OR REPLACE STONES AS NEEDED AND AS DIRECTED BY THE ENGINEER. THE STONE IN THE ENTRANCE SHOULD BE WASHED OR REPLACED WHENEVER THE ENTRANCE FAILS TO REDUCE MUD BEING CARRIED OFF SITE BY VEHICLES. FREQUENT WASHING WILL EXTEND THE USEFUL LIFE OF STONE.

9. IMMEDIATELY REMOVE MUD AND SEDIMENT TRACKED OR WASHED ONTO PUBLIC ROADS BY BRUSHING OR SWEEPING. FLUSHING SHOULD ONLY BE USED WHEN THE WATER CAN BE DISCHARGED TO A SEDIMENT TRAP OR BASIN.

10. REPAIR ANY BROKEN PAVEMENT IMMEDIATELY.

11. USE AGGREGATE No. 1, 2, 24, OR 3 AS CONSTRUCTION ENTRANCE MATERIAL.

12. PAY ITEM:
8156490 STABILIZED CONSTRUCTION ENTRANCE_____SY

TABLE 815-605A

HEIGHT OF FILL (y) IN FEET	FILL SLOPE	MINIMUM SILT FENCE OFFSET FROM TOE OF SLOPE (x) IN FEET	MINIMUM RIGHT OF WAY OFFSET FROM TOE OF SLOPE (NPDES LINE) (z) IN FEET	CHECK LENGTH IN FEET**
<6	2:1 4:1 6:1	2	3	2
6-10	2:1	12*	13*	5
	4:1 6:1	3	4	3
>10	2:1	12*	13*	5
	4:1 6:1	4	5	4

*THESE MINIMUM OFFSETS MAY BE REDUCED WHEN CURB AND GUTTER OR SOME OTHER FEATURE REDUCES THE FLOW OF WATER DOWN THE SLOPE. THE SMALL OFFSETS OF EACH GROUP OF HEIGHT OF FILL CANNOT BE REDUCED.

**SILT FENCE CHECKS WILL HAVE A MAXIMUM LENGTH OF FIVE (5) FEET OR UNTIL THEY TIE BACK INTO THE SLOPE.

SEE 815-605-10 FOR TEMPORARY DIVERSION DIKE

SEE 815-605-20 FOR TEMPORARY SILT DITCH

SEE 815-605-30 FOR ROLLED EROSION CONTROL PRODUCT

NOTES:
1. SILT FENCE CHECKS MUST BE LOCATED EVERY 100 FEET MAXIMUM AND AT LOW POINTS. FILTER FABRICS SHALL CONFORM TO SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (LATEST EDITION).

2. USE POSTS CONFORMING TO SCDOT STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS. POSTS SHALL BE A MINIMUM OF 5 FEET LONG AND INSTALLED TO A MINIMUM DEPTH OF 24 INCHES WITH NO MORE THAN 3 FEET OF THE POST ABOVE GROUND. AT LEAST 1 TO 2 INCHES OF THE POSTS SHALL EXTEND ABOVE THE TOP OF THE FABRIC. POST SPACING WILL BE A MAXIMUM OF 6 FEET ON CENTER .

3. POSTS SHALL HAVE PROJECTIONS FOR FASTENING THE FABRIC TO THE POST. POSTS SHALL ALSO HAVE A SOIL PLATE NEAR THE BOTTOM OF THE POST, EXCEPT WHEN HEAVY CLAY SOILS ARE PRESENT ON-SITE.

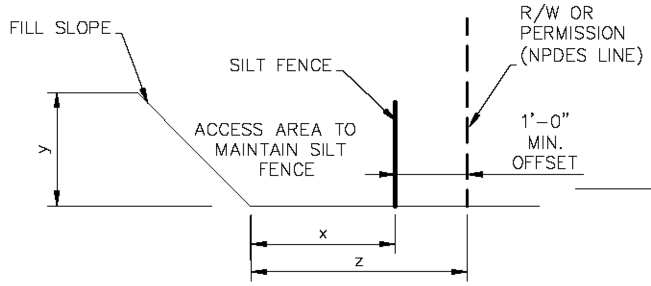
4. ATTACH FABRIC TO POSTS USING HEAVY-DUTY PLASTIC TIES THAT ARE EVENLY SPACED AND PLACED IN A MANNER TO PREVENT SAGGING OR TEARING OF THE FABRIC. IN ALL CASES TIES SHOULD BE AFFIXED IN NO LESS THAN 4 PLACES.

5. SILT SHALL BE REMOVED AND DISPOSED OF WHEN SILT ACCUMULATES TO ⅓ THE HEIGHT OF THE FENCE. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON-SITE. MAINTENANCE OF SILT FENCE WILL BE MEASURED AND PAID FOR BY THE ITEM OF REMOVAL OF SILT RETAINED BY SILT FENCE.

6. TYPICAL SILT FENCE APPLICATIONS REQUIRE 24 INCHES OF THE FABRIC TO BE ABOVE GROUND. WHEN NEEDED, THE HEIGHT OF SILT FENCE FABRIC ABOVE THE GROUND MAY BE GREATER THAN 24". SEE PLANS FOR APPLICATION OF HIGHER SILT FENCE, PAY ITEMS, AND INSTALLATION METHODS.

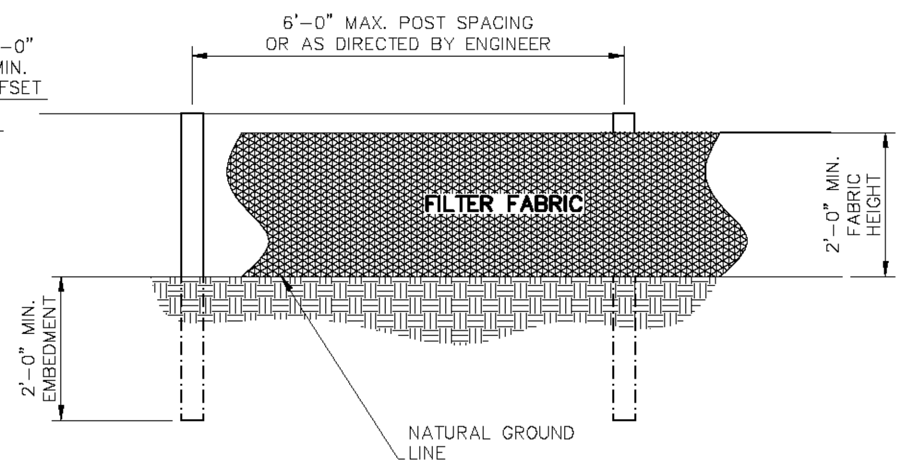
7. IN TIDAL AREAS, EXTRA SILT FENCE MAY BE REQUIRED. THE LENGTH OF POST WILL BE TWICE THE EXPOSED POST HEIGHT. POST SPACING WILL REMAIN AS SHOWN HEREON. EXTRA HEIGHT FABRIC WILL BE 4, 5, OR 6 FEET TOTAL WIDTH.

8. PAY ITEMS:
8153000 SILT FENCE ______________________________ LF
8153005 SILT FENCE EXTRA HEIGHT _________________ LF
8153090 REPLACE/REPAIR SILT FENCE _______________ LF
8154050 REMOVAL OF SILT RETAINED BY SILT FENCE ____ LF



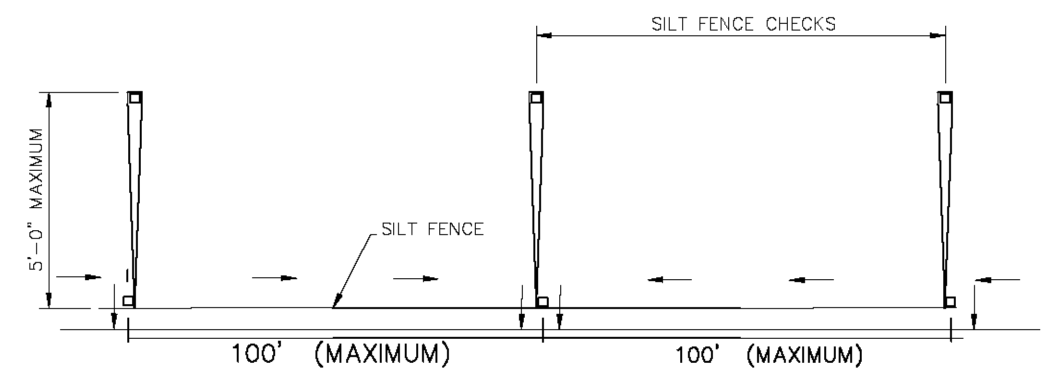
DETAIL 3

ACCESS AREA
TABLE 815-605A



DETAIL 1

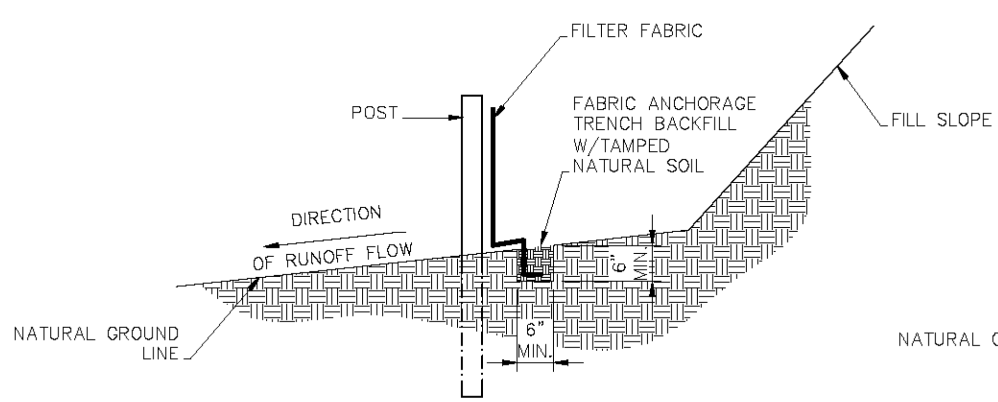
TYPICAL POST SPACING



DETAIL 2

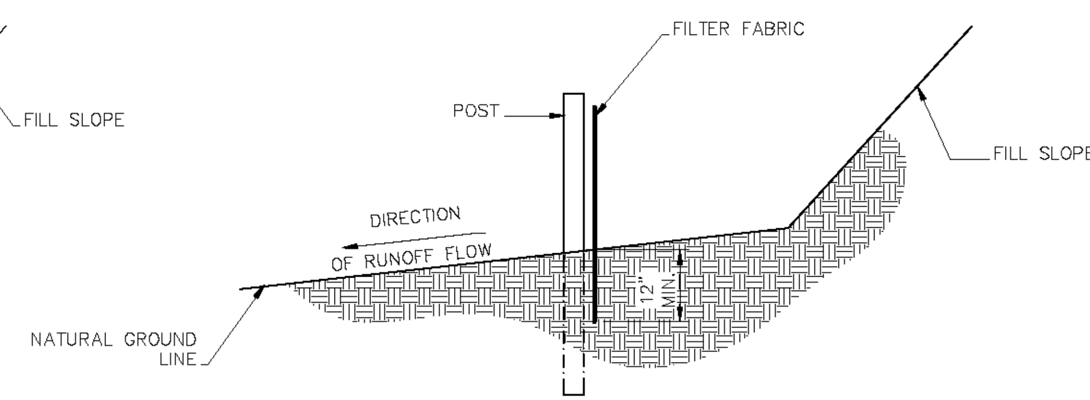
SILT FENCE CHECKS

12 INCHES OF THE FABRIC SHALL BE BURIED REGARDLESS, IF PLACED PNEUMATICALLY OR WITH A TRENCHER. BOTH METHODS SHOWN BELOW.



DETAIL 4

TRENCH METHOD



DETAIL 5

PNEUMATIC METHOD

NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS
SC-M-815-2, QPL 34

RELATED DRAWINGS & KEYWORDS

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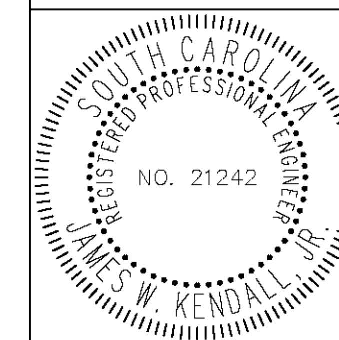

SIGNATURE

11/10/2016
DATE

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5			
4			
3	11/2016	DSO	GENERAL REVISIONS
2	8/2016	DSO	GENERAL REVISIONS
1	8/2012	KNB	ADDED SCDOT DOCUMENTS, REMOVED STEEL, CHANGED NOTES
0	3/2008	DSO	GENERAL REVISIONS

SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

TEMPORARY SILT FENCE

815-605-00

EFFECTIVE LETTING DATE JULY, 2017

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

SC-M-810
SC-M-815-9
QPL 55

RELATED DRAWINGS & KEYWORDS

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SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
NO. 21242
JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016

DATE

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4	---	---	---
3	---	---	---
2	---	---	---
1	11/2016	DSO	GENERAL REVISION
0	8/2016	DSO	NEW DRAWING

SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

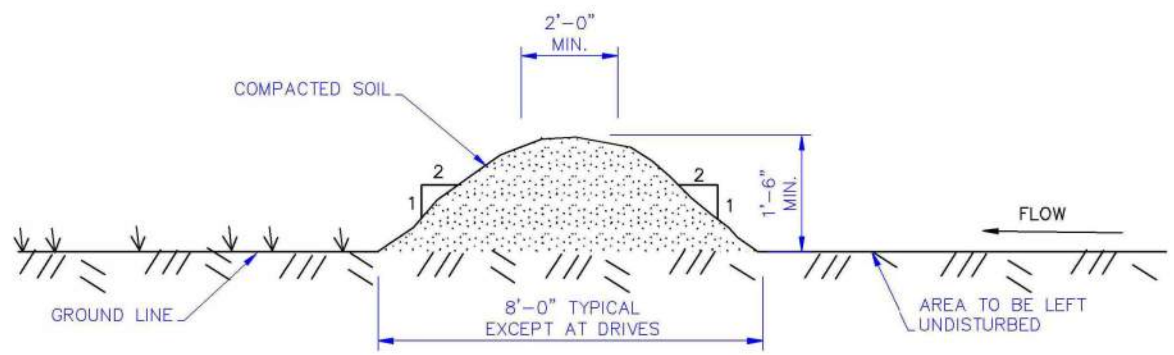
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

TEMPORARY DIVERSION DIKE

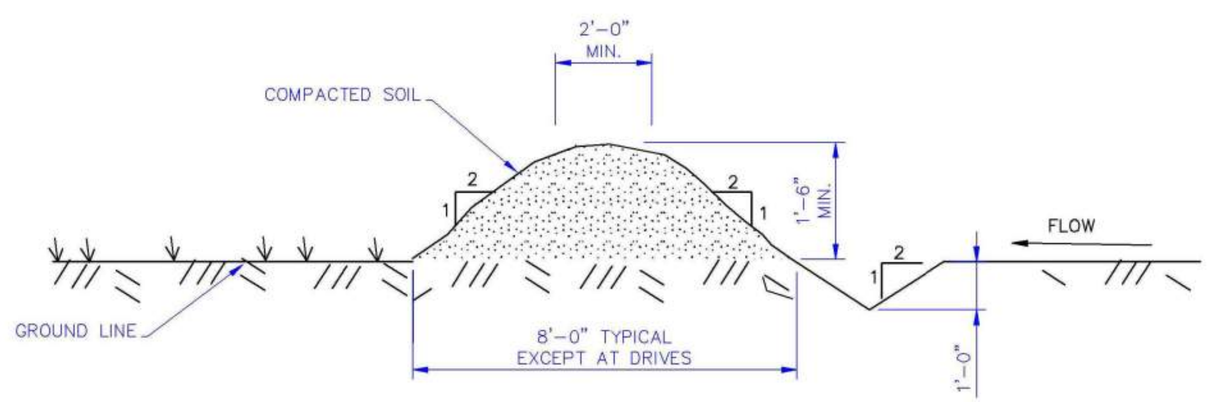
815-605-10

EFFECTIVE LETTING DATE JULY, 2017



DETAIL 6

TEMPORARY DIVERSION DIKE



DETAIL 7

TEMPORARY DIVERSION DIKE WITH DITCH

NOTES:

1. THIS ITEM IS FOR DIVERTING CLEAN WATER AROUND A CONSTRUCTION AREA.
2. CLEAR AND GRUB ALL TREES, BRUSH, STUMPS AND OTHER OBJECTIONABLE MATERIAL.
3. ENSURE THAT THE MINIMUM CONSTRUCTED CROSS SECTION MEETS ALL DIMENSIONS.
4. IMMEDIATELY AFTER CONSTRUCTION ESTABLISH VEGETATION BY SEEDING. PLACING TEMPORARY EROSION CONTROL BLANKET ON THE DIKE (AS APPLICABLE).
5. PAYMENT FOR TEMPORARY DIVERSION DIKE INCLUDES ALL MATERIALS IN PLACE, REMOVAL AND DISPOSAL OF MATERIALS, AND RESHAPING DIKE TO DRAIN. SEEDING TO BE PAID FOR SEPARATELY.
6. PAY ITEMS:
8155100 TEMPORARY DIVERSION DIKE __________ LF
8155110 TEMP DIVERSION DIKE W DITCH _________ LF
8100100 PERMANENT COVER __________________ ACRE
8100200 TEMP. COVER ______________________ ACRE

NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

SC-M-815-9
QPL 55, 56
SC-M-810

RELATED DRAWINGS & KEYWORDS

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SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
NO. 21242
JAMES W. KENDALL, JR.

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11/09/2016
DATE

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4	---	---	---
3	---	---	---
2	---	---	---
1	11/2016	DSO	GENERAL REVISION
0	8/2016	DSO	NEW DRAWING

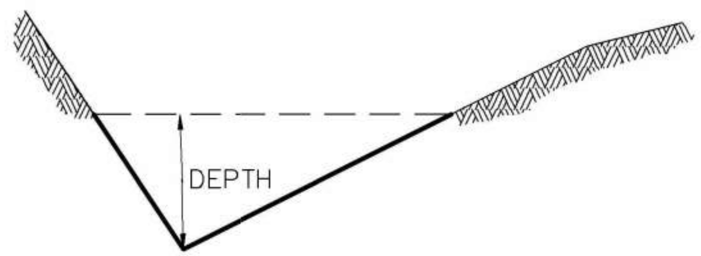
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

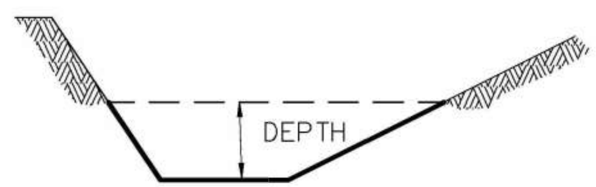
ROLLED EROSION CONTROL PRODUCT

815-605-30

EFFECTIVE LETTING DATE JULY, 2017



DETAIL 9
ROLLED EROSION CONTROL
V DITCH



DETAIL 10
ROLLED EROSION CONTROL
FLAT BOTTOM DITCH

NOTES:

1. THE DEPTH OF THE EROSION CONTROL PRODUCTS ARE TO BE DETERMINED BY DESIGN AND PLACED ON PLAN SHEETS.
2. INSTALL IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
3. COST OF INSTALLATION AND MATERIALS SHALL BE INCLUDED IN THE PAY ITEM FOR ROLLED EROSION CONTROL PRODUCT.
4. PAY ITEMS:

8151150 TEMPORARY EROSION CONTROL BLANKET (ECB) _________ SY
8151151 TURF REINFORCEMENT MATTING (TRM) TYPE 1 __________ SY
8151152 TURF REINFORCEMENT MATTING (TRM) TYPE 2 __________ SY
8151153 TURF REINFORCEMENT MATTING (TRM) TYPE 3 __________ SY

NOT TO SCALE

REFERENCES

NATIONAL DOCUMENTS

SCDOT DOCUMENTS

WQM, SC-M-810

RELATED DRAWINGS & KEYWORDS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 21242 JAMES W. KENDALL, JR.

SIGNATURE

11/18/2016
DATE

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6		
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SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING
SEDIMENT DAM FOR PIPE INLET

815-406-00

EFFECTIVE LETTING DATE JULY 2017

NOTES:

1. SEDIMENT DAM FOR PIPE INLET WILL BE DESIGNED IN ACCORDANCE WITH THE SCDOT WATER QUALITY MANUAL.

2. SILT BASIN MUST BE CLEANED OUT WHEN SEDIMENT STORAGE VOLUME IS HALF FULL. CLEAN OUT OF SILT BASIN WILL BE PAID FOR AS THE ITEM OF CLEANING SILT BASINS.

3. CONSTRUCTION OF SEDIMENT DAM RIPRAP WILL INCLUDE REMOVAL AND DISPOSAL OF RIPRAP.

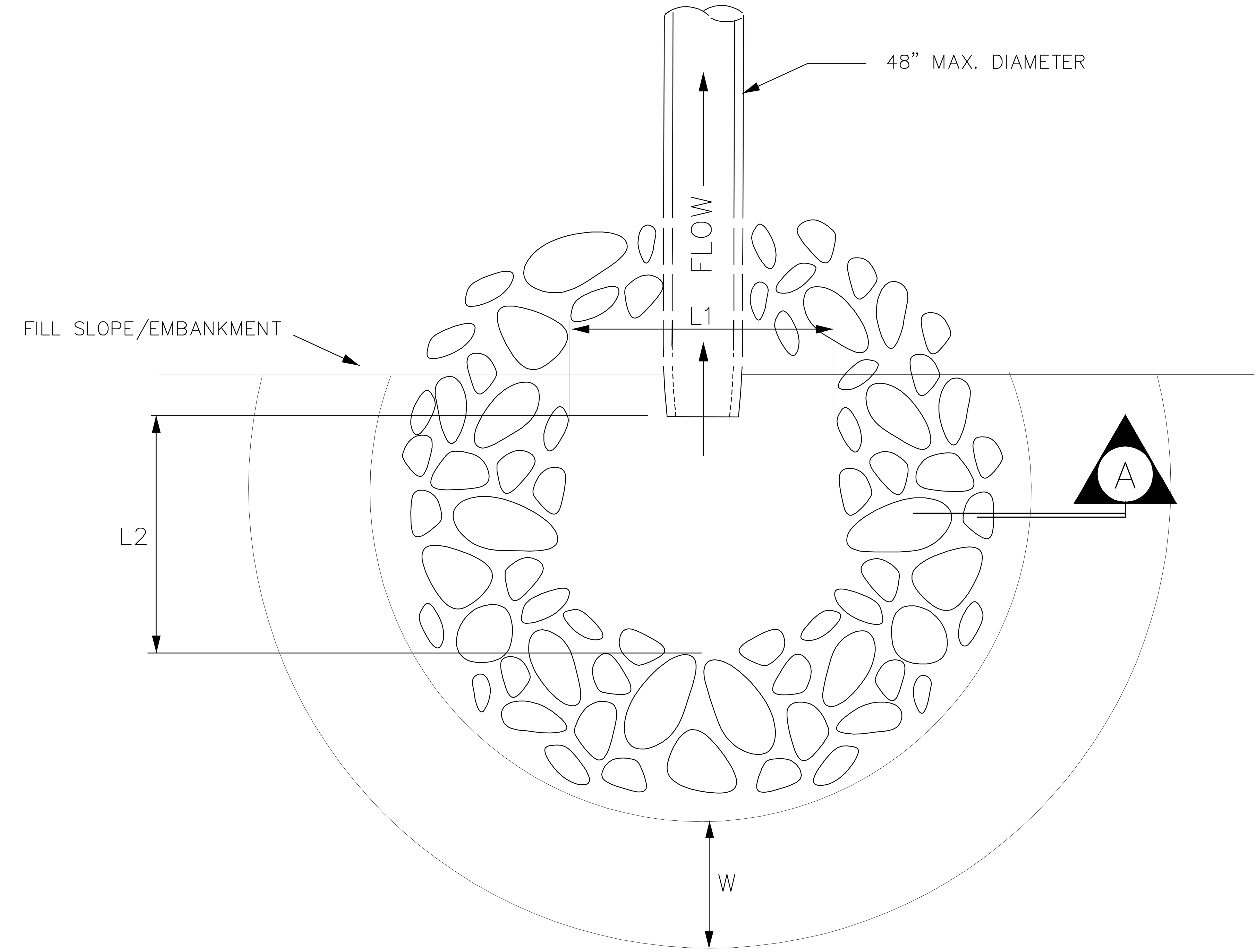
4. ALL EARTHEN AREAS OF THE SILT BASIN WILL BE TEMPORARILY SEEDED EXCEPT FOR THE BOTTOM OF THE BASIN.

5. CROSS-HATCHED AREA, IF NECESSARY TO BE REMOVED FOR SEDIMENT DAM RIPRAP, WILL BE PAID FOR AS UNCLASSIFIED EXCAVATION.

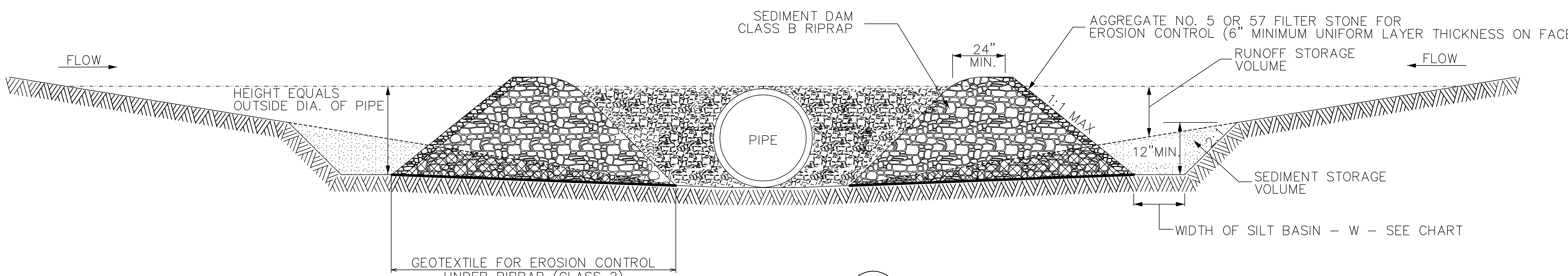
6. USE CLASS 2 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP.

7. THE PAY ITEMS SHALL BE:
   2031000 UNCLASSIFIED EXCAVATION____CY
   8041020 RIPRAP (CLASS B)____TON
   8042800 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)____SY
   8154010 CLEANING SILT BASINS____CY
   8156410 AGGREGATE NO. 5 OR 57 FOR EROSION CONTROL____TON

PIPE SIZE (IN)	ROCK DAM HEIGHT (FT)	WIDTH OF SILT BASIN - W - (FT) MAX AREA DRAINING TO PIPE				SEDIMENT DAM INSIDE L_1 (FT)	SEDIMENT DAM INSIDE L_2 (FT)
		0.5 AC	1.0 AC	1.5 AC	2.0 AC		
18	1.5	4.0	7.0	11.0	14.0	3.5	1.75
24	2.0	3.0	6.0	9.0	12.0	4.0	2.00
30	2.5	2.5	5.5	8.0	10.5	4.5	2.25
36	3.0	2.5	4.5	7.0	9.5	5.0	2.50
42	3.5	2.0	4.0	6.0	7.5	7.5	3.75
48	4.0	2.0	3.5	5.5	7.0	8.0	4.00



PLAN VIEW
SEDIMENT DAM
FOR PIPE INLET



SECTION A
ELEVATION
SEDIMENT DAM
FOR PIPE INLETS

THIS DRAWING IS NOT TO SCALE

Appendix E

Stormwater Management Design Study

STORMWATER MANAGEMENTDESIGN STUDY
FOR THE PROPOSED CONSTRUCTION
OF US 21 NORTH PHASE I & SC 51
YORK COUNTY, SOUTH CAROLINA
FINAL PLANS REPORT

ROUTE/ROAD NUMBER:	**US 21 North Phase I & SC 51**
SCDOT PROJECT NO.:	**0042332**
YORK COUNTY PROJECT NO.:	**11149-004**

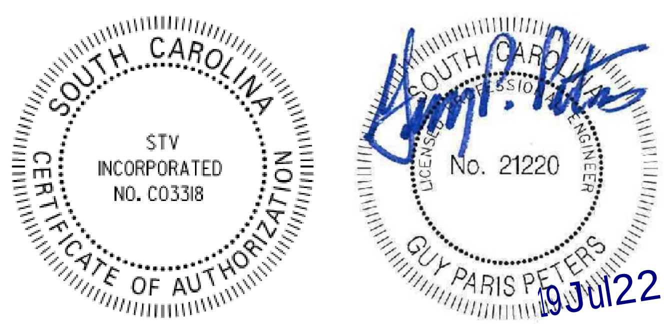
30 September 2021
13 April 2022 r1
19 July 2022 r2

PREPARED BY:	**Guy P. Peters, PE, CFM**
CHECKED BY:	**Steven C. Noriega, PE**

Hydraulic Design Reference for this study is the:

2009

Edition of SCDOT's "Requirements for Hydraulic Design Studies."



STV INCORPORATED
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, South Carolina 29730-3392
www.stvinc.com

STORMWATER MANAGEMENT DESIGN STUDY FOR THE PROPOSED CONSTRUCTION OF US 21 PHASE I AND SC 51

FINAL PLANS REPORT

TABLE OF CONTENTS

SOUTH CAROLINA PROFESSIONAL ENGINEER LICENSED No. 21220 GUY PARIS PETERS

19Jul22

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Introduction

STV Incorporated entered into an agreement with York County to provide professional engineering services for the proposed roadway widening of US 21 and SC 51 from SC 460 (Springfield Parkway) to 700 feet south of S-48 (Springhill Farm Road) (See Figure 1: Project Location Map). The project consists of widening the roadways from a 2 lane typical section to a 5 lane typical section with shoulder and ditches and a 5 lane section with curb and gutter. The studied area includes approximately 2.82 miles of US 21 and 0.84 miles of SC 51. This area also includes all applicable watershed areas that drain to the roadway. The project's total area of land disturbance is 52.6 acres. In accordance with guidance in SCDOT Water Quality Design Memorandum WQDM-02, the project area is computed as 55.6 acres.

This report contains drainage calculations and summary tables for hydrology, culvert hydraulics, open channel and closed system hydraulics, pre- versus post-construction discharge, and erosion control. The purpose of this report is to document the design procedures that were used to analyze the hydrology and hydraulics of the proposed roadway improvements.

Site Description

US 21 and SC 51 are existing roadways located in York County, South Carolina, within the town of Fort Mill (Figure 1). The project area is in rolling terrain, ranging in elevation from about 583 feet to 671 feet above sea level. The soils consist of loamy sands and clay loam. These soils vary between well drained and poorly drained; however they are mostly well drained (see Table 1 for general soils information and end of narrative section for Soils Map). These characteristics are common in this area of South Carolina.

TMDL/303d Impaired Waterbodies

The nearest Water Quality Monitoring Station, CW-203, for all project outfalls is located on Steele Creek at S-46-98 in York County. CW-203 is listed on the current SC DHEC 2017 list of approved TMDLs, for fecal coliform bacteria (FC). Site storm water runoff from the project is not anticipated to be a source for further FC impairment.

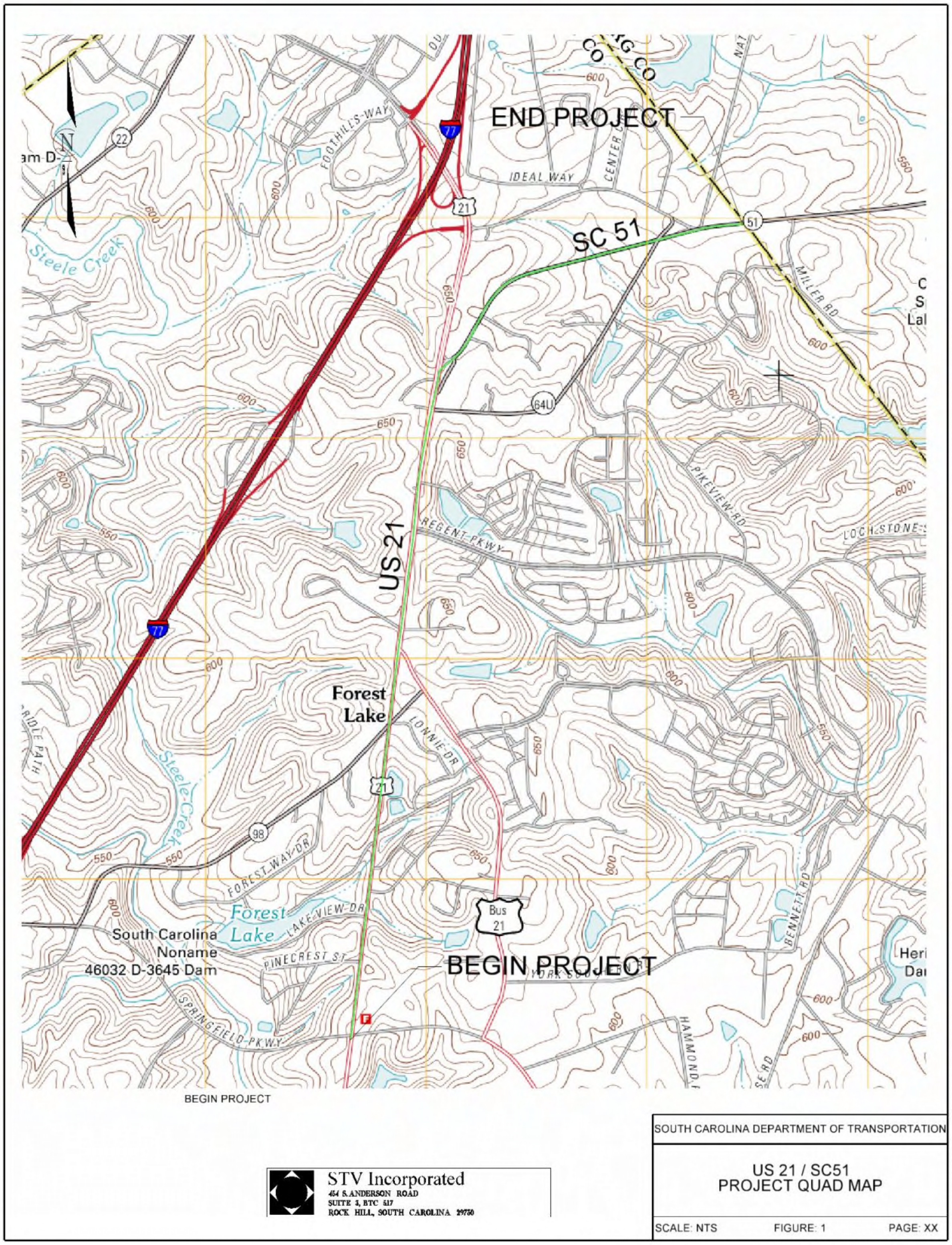


Figure 1: Project Location Map

Map Symbol	Soil Name	Description	Drainage	Hydrologic Soil Group
ArA	Armenia loam, 0 to 2 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* 6-18 inches (apparent) *Frequency of ponding:* None *Available water storage:* Moderate (~6.5 inches)	Poorly drained	D
BbA	Brewback fine sandy loam, 0 to 2 percent slopes	*Depth to restrictive feature:* 36 inches *Depth to water table:* About 6 - 40 inches (perched) *Frequency of ponding:* None *Available water storage:* Low (~4.2 inches)	Somewhat poorly drained	D
BbB	Brewback fine sandy loam, 2 to 6 percent slopes	*Depth to restrictive feature:* 36 inches *Depth to water table:* About 6 - 40 inches (perched) *Frequency of ponding:* None *Available water storage:* Low (~4.2 inches)	Somewhat poorly drained	D
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* High (~9.3 inches)	Well drained	B
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~8.4 inches)	Well drained	B
CfB3	Cecil clay loam, 2 to 6 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~8.8 inches)	Well drained	B
CfC3	Cecil clay loam, 6 to 10 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~8.8 inches)	Well drained	B
ChA	Chewacla loam. 0 to 2 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* About 6 - 72 inches *Frequency of ponding:* None *Available water storage:* High (~10.8 inches)	Somewhat poorly drained	B/D
MeB2	Mecklenburg-Wynott complex, 2 to 6 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~7.6 inches)	Well drained	C
MkB3	Mecklenburg-Wynott complex, 2 to 6 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~8.3 inches)	Well drained	C
MkC3	Mecklenburg-Wynott complex, 2 to 6 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~8.3 inches)	Well drained	C
PaD2	Pacolet sandy clay loam, 10 to 15 persent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~8.2 inches)	Well drained	B
PcE3	Pacolet clay loam, 15 to 25 percent slopes	*Depth to restrictive feature:* More than 80 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Moderate (~7.1 inches)	Well drained	B

Table 1: Soils Descriptions for US 21 and SC 51 Widening in York County, South Carolina

W	Water			
WbC2	Wynott-Brewback complex, 6 to 10 percent slopes	*Depth to restrictive feature:* 20-40 inches *Depth to water table:* N/A *Frequency of ponding:* None *Available water storage:* Low (~3.6 inches)	Well drained	D
WmD2	Wynott Mecklenburg-complex, 10 to 15 percent slopes	*Depth to restrictive feature:* 20-40 inches *Depth to water table:* >80 inches *Frequency of ponding:* None *Available water storage:* Low (~3.6 inches)	Well drained	C
WwE2	Wynott-Wilkes complex, 15 to 25 percent slopes	*Depth to restrictive feature:* 20-40 inches *Depth to water table:* >80 inches *Frequency of ponding:* None *Available water storage:* Low (~3.6 inches)	Well drained	D
WyB2	Wynott-Winnsboro complex, 6 to 10 percent slopes	*Depth to restrictive feature:* 20-40 inches *Depth to water table:* >80 inches *Frequency of ponding:* None *Available water storage:* Low (~3.6 inches)	Well drained	D
WyC2	Wynott-Winnsboro complex, 6 to 10 percent slopes	*Depth to restrictive feature:* 20-40 inches *Depth to water table:* >80 inches *Frequency of ponding:* None *Available water storage:* Low (~3.6 inches)	Well drained	D

Table 1: Soils Descriptions for US 21 and SC 51 Widening in York County, South Carolina

Calculations Methodology

Hydrology

Design Criteria

In accordance with the SCDOT's "Requirements for Hydraulic Design Studies" dated May 26, 2009, the following design criteria were used (see Appendices A, B, and C for calculations):

1) Roadside Ditches and Outfalls
   a) 10-year peak discharge for drainage areas from 0 to 40 acres.
   b) 25-year peak discharge for drainage areas from 40 to 500 acres.
   c) 50-year peak discharge for drainage areas greater than 500 acres.
2) Culverts
   a) 50-year peak discharge for primary road and interstate routes.
   b) 25-year peak discharge for secondary roads.
   c) 10-year peak discharge for driveway pipes.

Methodology

The rational method was used to calculate peak discharges for all drainage systems with drainage areas up to 100 acres. A spreadsheet is used to calculate Q. The Rational formula is as follows:

$$Q = C \cdot I \cdot DA \cdot C_f$$

Where: Q = discharge in cubic feet per second (cfs)
C = the runoff coefficient
I = the rainfall intensity in inches per hour (in/hr)
DA = Drainage Area (ac), and where
C_f, Runoff Factor, is defined by:

Recurrence Interval, Years	Return Period, % annual chance	Runoff Factor, C_f
2 – 10	50-10	1.0
25	4	1.1
50	2	1.2
100	1	1.25

Runoff Coefficient (C)

Runoff coefficients were determined from a visual inspection of the project area and the following table from SCDOT's "Requirements for Hydraulic Design Studies" dated May 26, 2009.

RUNOFF FACTORS FOR RATIONAL METHOD			
Land cover type	**Flat**	**Rolling**	**Hilly**
	0% - 2%	**2% - 10%**	**Over 10%**
Pavements & Roofs	0.90	0.90	0.90
Earth shoulders	0.50	0.50	0.50
Drives & Walks	0.75	0.80	0.85
Gravel Pavements	0.50	0.55	0.60
City Business Areas	0.80	0.85	0.85
Unpaved Road, Sandy Soils	0.34	0.45	0.59
Unpaved Road, Silty Soils	0.35	0.47	0.61
Unpaved Road, Clay Soils	0.40	0.53	0.69
Apartment Dwelling Areas	0.50	0.60	0.70
Suburban, Normal Residential	0.45	0.50	0.55
Dense Residential Sections	0.60	0.65	0.70
Lawns, Sandy Soils	0.10	0.15	0.20
Lawns, Heavy Soils	0.17	0.22	0.35
Grass Shoulders	0.25	0.25	0.25
Side Slopes, Earth	0.60	0.60	0.60
Side Slopes, Turf	0.30	0.30	0.30
Median Areas, Turf	0.25	0.30	0.30
Cultivated Land, Clay & Loam	0.50	0.55	0.60
Cultivated Land, Sand & Gravel	0.25	0.30	0.35
Industrial Areas, Light	0.50	0.70	0.80
Industrial Areas, Heavy	0.60	0.80	0.90
Parks & Cemeteries	0.10	0.15	0.25
Playgrounds	0.20	0.25	0.30
Woodland & Forest	0.10	0.15	0.20
Meadows & Pasture Land	0.25	0.30	0.35
Unimproved Areas	0.10	0.20	0.30
Rail Yards	0.25	0.30	NA
Expressways & Freeways*	0.60*	0.70*	0.75*
* The designer can also calculate weighted 'C' values for expressways and freeways using the values in the table for pavement, side slopes and planted medians. Revised 3/16/09			

Table 2: Runoff Coefficients for Rational Formula

Time of Concentration (Tc)

Time of Concentration is calculated using a spreadsheet based on the TR-55 method. All Tc values were derived from the existing conditions from digital mapping, field survey, and USGS topographic maps (see Appendices A, B, and C for calculations).

Rainfall intensity (I)

Rainfall intensities were determined using the following equation and the values indicated in the Rainfall Intensity Values charts provided by SCDOT at the time the project design phase was started.

$$i = \frac{a}{(b + t_c)^c}$$

The coefficients for Rock Hill, South Carolina for the 2-, 5-, 10-, 25-, 50-, and 100-year rainfalls are given in the table below as well as the intensity values for the 5-, 10-, and 15-minute times of concentration.

Rock Hill, South Carolina								
Frequency		a	b	c	i (t_c = 5)	i (t_c = 10)	i (t_c = 15)
% annual chance	*x*-year						
50	2	240.26568	35.61513	1.03559	5.19	4.60	4.13
20	5	254.71848	33.33552	1.02140	6.15	5.42	4.85
10	10	264.71357	31.82192	1.01175	6.89	6.06	5.40
4	25	276.98802	30.00177	1.00001	7.91	6.92	6.15
2	50	286.34575	28.61559	0.99107	8.80	7.66	6.79
1	100	294.57238	27.37215	0.98314	9.65	8.38	7.41

Table 3: Rainfall Intensities for Rock Hill, SC

Drainage Area (DA)

Drainage areas for ditches, and culverts were delineated with "Microstation V8i" utilizing field survey, USGS topographic maps, digital mapping, and field observation (see Figures 7a, 7b, 8a and 8b for Drainage Area Maps).

NRCS Win TR-55 Method

The Win TR-55 method is used to calculate peak discharges for all drainage areas from 100 acres up to 640 acres.

Open Channel Hydraulics

Design Criteria

1) Minimum Ditch Grade should be 0.30%.
2) Maximum Shear Stress allowable will be 1.00 lbs/ft^2 for Class 'C' vegetation.
3) Minimum ditch depth should be 1.0' below the sub-grade of the roadway.
4) No modifications will be made to natural channels unless to prevent scour and erosion.

Methodology

An in-house spreadsheet using the formulas and procedure from HEC-15 (FHWA-IP-87-7, April 1988), "Design of Roadside Channels with Flexible Linings", and the FHWA Hydraulic Toolbox were used to analyze proposed ditch sections and outfalls. The ditches were analyzed for shear stress and adequate ditch depth. Where ditch section analysis indicated instability due to shear stress, a permanent erosion control mat or riprap lining was proposed to stabilize the ditch (see Appendix A for ditch calculations). Shear stress is calculated using the formula:

$$\tau = \gamma dS$$

Where: τ = shear stress (lb/ft^2)
γ = unit weight of water (62.4 lb/ft^3)

D = flow depth (ft)
S = Channel gradient (ft/ft)

Storm Drain Systems Hydraulics

Design Criteria

1) Inlet Spacing (see Appendix E for inlet capacity calculations and spacing data)
   a) Design spread not to exceed or the shoulder width.
   b) Maximum spacing is 400'.
   c) Minimum spacing is typically 150'. However, due to flat longitudinal slopes and the need for yard inlets, spacing less than 150' will be required in some locations.
2) Pipes (see Appendix E for Geopak Calculations)
3) Minimum pipe slope should be 0.30%. A pipe slope of 0.10% to 0.2% was used when the minimum could not be achieved due to depth constraints.
   a) Minimum velocity for design discharge should be 3.0 fps.
   b) Minimum diameter should be 18", (15" for yard drains).
   c) Minimum cover should be 1.5', (0.5' for yard drains). Minimum cover was reduced where there was a depth constraint.
   d) Design flow depths should not exceed 0.94 times the pipe diameter. Flow depth was exceeded where there was a depth constraint.

Methodology

The SCDOT's "Inlet Spacing Charts" were used to determine the maximum allowable drainage area for each Type 16 catch basins. An inlet capacity spreadsheet was used to calculate spread for Type 1 catch basins. The median drainage was spaced for future widening using an inlet capacity spreadsheet based on HEC 12. (See Appendix E for inlet capacity calculations and spacing data).

The computer program Geopak Drainage was used to analyze and determine pipe sizes for closed systems. The SCDOT's "Specification Support Manual for Geopak Drainage", October 1, 2002, was used as a guide to set the program's internal design preferences and drainage library. (See Appendix E for storm pipe and hydraulic grade line computations).

Culvert Hydraulics

Design Criteria

1) Prevent potential damage to upstream property.
2) Headwater should be 1.0' below the subgrade of roadway.
3) Meet FEMA floodway or flood hazard requirements where applicable.
4) Design headwater should be limited to 1.2 times the height of the culvert.

Methodology

The FHWA computer program "HY-8" version 7.3 was used to perform the hydraulic analysis for the project culvert crossings. See Appendix B for culvert data summary and "HY-8" results. Outfall channels were also analyzed for the culvert design storm using the "HY8" uniform flow rating curve.

Pre vs. Post Analysis

Design Criteria

Pre and post development peak discharge rates were calculated for each outfall for the 2- and 10-year storm events. If post development discharges increased and/or if significant downstream impacts were anticipated, then the appropriate storm water management practice will be designed.

For this project, the change from a rural typical section to a curb and gutter typical section resulted in point discharges onto undeveloped property and into existing outfall ditches, where the existing discharge from the road is sheet flow. Downstream conditions were explored in the field and we do not anticipate adverse impacts from the new project outfalls. Figures 8a and 8b provide a complete depiction of pre and post development drainage areas. Discharge calculations can be found in Appendix C.

As a result of discussions with York County, roadway storm drainage was designed to reduce post development discharges below pre-development levels at receiving channels that drain to Forest Lake, the man-made pond that is a feature of the Forest Lake neighborhood. This was done in response to information contained in correspondence from SCDOT and from the Forest Lake Neighborhood Association, copies of which is provided in Appendix C

Methodology

The rational method was used to generate pre and post development peak discharges for all drainage areas less than 100 acres. The project outfalls were hydraulically analyzed to determine downstream impacts. See Appendix C for Pre versus Post construction discharge calculations. Based on these calculations, this project will not pose any adverse impacts to the downstream receiving water body and/or properties and will not require detention practices.

Sediment and Erosion Control

Design Criteria

The sediment and erosion control structures for this project consist of sediment dams, sediment dam for pipe inlet, silt fence, ditch checks/sediment tubes, erosion control blankets, permanent turf reinforcement matting and outlet protection. See Appendix D for detailed data and calculations. All projects that have one or more acres of disturbed area will be designed for sediment and erosion control in accordance with DHEC's General Permit and State Erosion Control regulations. All stormwater from the construction site should be treated before it is released.

Methodology

1) *Sediment Dams* (SCDOT Standard Drawing No. 815-405-01 and 815-405-02.) will be placed at the outfall locations as shown on the plans and are used to remove sediment from construction runoff where the total drainage area is less than 10 acres. Sediment dams will be designed in accordance with the SCDOT's "Stormwater Quality Design Manual."
2) *Sediment Dam for Pipe Inlet* (SCDOT Stand Drawing No. 815-406-00) will be placed at pipe inlet as shown on the plans and are used to remove sediment from construction runoff where the total disturbed area in less than 2 acres. Sediment dams for Pipe Inlet will be designed in accordance with the SCDOT's "Stormwater Quality Design Manual."

3) *Silt Fence* (SCDOT Standard Drawing No. 815-605-00) will be placed along the perimeter of the disturbed area where runoff is in sheet flow or concentrated flow less than 0.5 cfs. Silt Fence will act as a sediment filter by retarding flow and promoting deposition.
4) *Ditch Checks* (SCDOT Standard Drawing No. 815-105-00) or 20" Sediment Tubes (SCDOT Standard Drawing No. 815-205-00) will be placed in the roadside ditches and are intended to reduce erosion in the channel by restricting the velocity. The check dams will be placed so that the downstream toe of one check dam is level with the top of the next one downstream.
5) *Erosion Control Blankets and/or Turf Reinforcement Mats* (SCDOT Standard Drawing No. 815-6 05-00) will be placed in ditches as called out on the Erosion Control Data Sheet and on some 2:1 slopes. These rolled erosion control products will protect the exposed soil from the forces of raindrop impact and overland flow, and will promote growth of vegetation.
6) *Outlet Protection riprap aprons* will be placed at the outlet end of the cross culverts to protect the receiving channel from scour by reducing the discharge velocity and dissipating the energy.

Sediment and erosion control devices should be inspected weekly and after each storm event. Any damage to devices should be repaired immediately, and any silt accumulated should be removed. All disturbed areas should be covered with temporary or permanent vegetation as soon as practical. All devices should be properly maintained during all phases of construction and be removed once the area has been stabilized.

Appendix A

NRCS Soils Data

United States Department of Agriculture

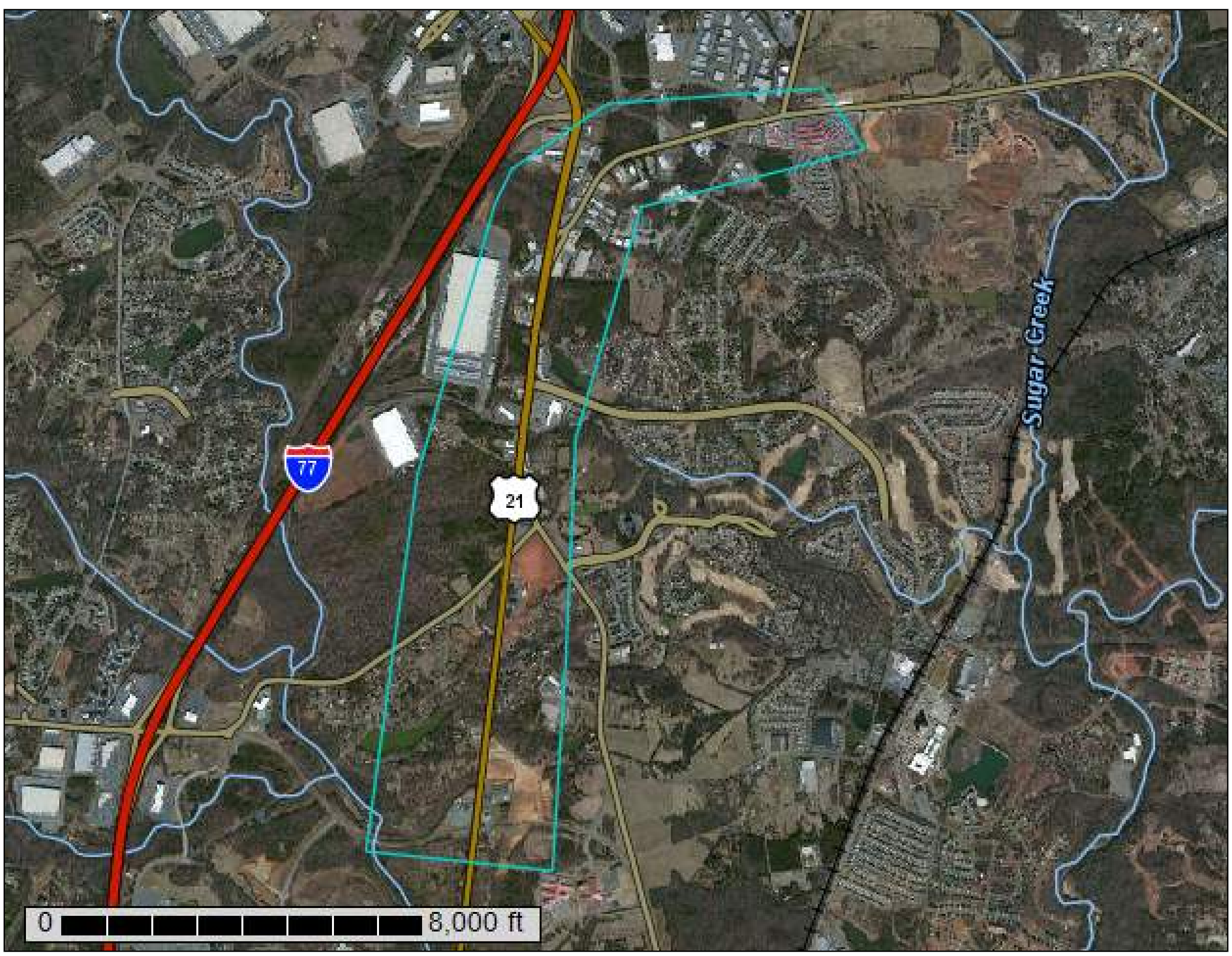
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Mecklenburg County, North Carolina, and York County, South Carolina

US 21 & SC 51



August 18, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

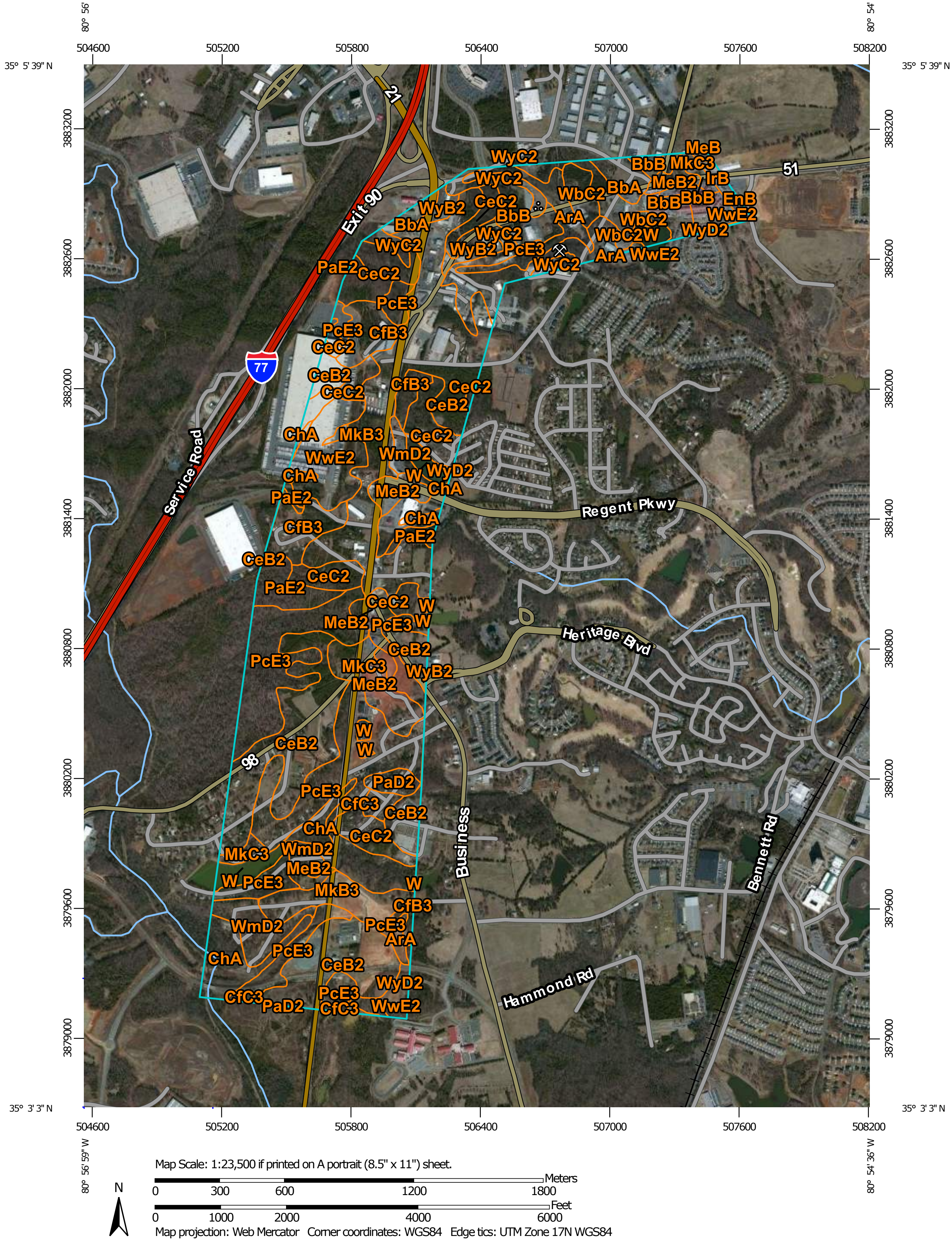
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


80° 56' 59" W
80° 54' 36" W
504600
505200
505800
506400
507000
507600
508200
35° 5' 39" N
35° 3' 3" N
3883200
3882600
3882000
3881400
3880800
3880200
3879600
3879000
WyC2
MeB
BbB
MkC3
51
WyC2
MeB2
IrB
BbA
WbC2
CeC2
BbB
EnB
WyB2
BbB
WwE2
ArA
WbC2
Exit 90
BbA
WyC2
WbC2W
WyD2
WyC2
WyB2
PcE3
ArA
WwE2
WyC2
PaE2
CeC2
WyC2
PcE3
PcE3
CfB3
CeC2
77
CeB2
CeC2
CfB3
CeC2
CeB2
ChA
MkB3
CeC2
WwE2
WmD2
Service Road
ChA
W
WyD2
PaE2
MeB2
ChA
Regent Pkwy
CfB3
ChA
PaE2
CeB2
CeC2
PaE2
CeC2
W
MeB2
PcE3
W
Heritage Blvd
CeB2
PcE3
MkC3
WyB2
MeB2
W
CeB2
W
98
PaD2
PcE3
CfC3
CeB2
ChA
CeC2
MkC3
WmD2
Business
MeB2
W
PcE3
MkB3
W
Bennett Rd
CfB3
WmD2
PcE3
ArA
ChA
PcE3
CeB2
WyD2
Hammond Rd
CfC3
PaD2
PcE3
CfC3
WwE2
Map Scale: 1:23,500 if printed on A portrait (8.5" x 11") sheet.
Meters
0
300
600
1200
1800
Feet
0
1000
2000
4000
6000
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
Area of Interest (AOI)

Soils
Soil Map Unit Polygons
Soil Map Unit Lines
Soil Map Unit Points

Special Point Features
Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other
Special Line Features

Water Features
Streams and Canals

Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background
Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,800 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mecklenburg County, North Carolina
Survey Area Data: Version 14, Sep 10, 2014

Soil Survey Area: York County, South Carolina
Survey Area Data: Version 12, Sep 29, 2015

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 11, 2011—Feb 13, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Mecklenburg County, North Carolina (NC119)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
EnB	Enon sandy loam, 2 to 8 percent slopes	1.6	0.2%
IrB	Iredell fine sandy loam, 1 to 8 percent slopes	2.6	0.3%
MeB	Mecklenburg fine sandy loam, 2 to 8 percent slopes	0.8	0.1%
Subtotals for Soil Survey Area		**5.1**	**0.6%**
Totals for Area of Interest		**880.9**	**100.0%**

York County, South Carolina (SC091)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
ArA	Armenia loam, 0 to 2 percent slopes, occasionally flooded	19.3	2.2%
BbA	Brewback fine sandy loam, 0 to 2 percent slopes	12.8	1.5%
BbB	Brewback fine sandy loam, 2 to 6 percent slopes	39.2	4.5%
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	237.2	26.9%
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	72.4	8.2%
CfB3	Cecil clay loam, 2 to 6 percent slopes, severely eroded	35.5	4.0%
CfC3	Cecil clay loam, 6 to 10 percent slopes, severely eroded	5.3	0.6%
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	30.7	3.5%
MeB2	Mecklenburg-Wynott complex, 2 to 6 percent slopes, moderately eroded	43.1	4.9%
MkB3	Mecklenburg-Wynott complex, 2 to 6 percent slopes, severely eroded	22.9	2.6%
MkC3	Mecklenburg-Wynott complex, 6 to 10 percent slopes, severely eroded	6.7	0.8%
PaD2	Pacolet sandy clay loam, 10 to 15 percent slopes, moderately eroded	5.7	0.6%
PaE2	Pacolet sandy clay loam, 15 to 25 percent slopes, moderately eroded	19.0	2.2%

York County, South Carolina (SC091)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
PcE3	Pacolet clay loam, 15 to 25 percent slopes, severely eroded	180.0	20.4%
W	Water	20.2	2.3%
WbC2	Wynott-Brewback complex, 6 to 10 percent slopes, moderately eroded	10.4	1.2%
WmD2	Wynott-Mecklenburg complex, 10 to 15 percent slopes, moderately eroded	34.9	4.0%
WwE2	Wynott-Wilkes complex, 15 to 25 percent slopes, moderately eroded	32.6	3.7%
WyB2	Wynott-Winnsboro complex, 2 to 6 percent slopes, moderately eroded	16.8	1.9%
WyC2	Wynott-Winnsboro complex, 6 to 10 percent slopes, moderately eroded	25.2	2.9%
WyD2	Wynott-Winnsboro complex, 10 to 15 percent slopes, moderately eroded	5.9	0.7%
Subtotals for Soil Survey Area		**875.8**	**99.4%**
Totals for Area of Interest		**880.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used.

Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mecklenburg County, North Carolina

EnB—Enon sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3t8m
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Enon and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enon

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Typical profile

Ap - 0 to 7 inches: fine sandy loam
BA - 7 to 10 inches: sandy clay loam
Bt - 10 to 27 inches: clay
BC - 27 to 33 inches: clay loam
C - 33 to 80 inches: loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

IrB—Iredell fine sandy loam, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3t8x
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Iredell and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Iredell

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Typical profile

A - 0 to 6 inches: fine sandy loam
Bt - 6 to 24 inches: clay
BC - 24 to 28 inches: clay loam
C - 28 to 80 inches: loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Sedgefield

Percent of map unit: 8 percent
Landform: Ridges
Landform position (two-dimensional): Summit, footslope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Wynott

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Armenia, undrained

Percent of map unit: 3 percent
Landform: Drainageways on interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

MeB—Mecklenburg fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3t92
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Mecklenburg and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mecklenburg

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bt - 7 to 34 inches: clay
C - 34 to 80 inches: loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

York County, South Carolina

ArA—Armenia loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2lpwd
Elevation: 450 to 690 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Armenia, occasionally flooded, and similar soils: 86 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Armenia, Occasionally Flooded

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Alluvium derived from diabase and/or alluvium derived from gabbro and/or alluvium derived from diorite

Typical profile

A - 0 to 4 inches: loam
BA - 4 to 8 inches: clay loam
B1 - 8 to 51 inches: clay
B2 - 51 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Worsham, occasionally flooded

Percent of map unit: 14 percent
Landform: Depressions

Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

BbA—Brewback fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2lpzd
Elevation: 200 to 1,400 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Brewback and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brewback

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gabbro and/or residuum weathered from diorite and/or residuum weathered from diabase

Typical profile

A - 0 to 4 inches: fine sandy loam
BE - 4 to 10 inches: sandy clay loam
B - 10 to 30 inches: clay
BC - 30 to 36 inches: clay
Cr - 36 to 80 inches: weathered bedrock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Iredell

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

BbB—Brewback fine sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2lpzp
Elevation: 200 to 1,400 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Brewback and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brewback

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gabbro and/or residuum weathered from diorite and/or residuum weathered from diabase

Typical profile

A - 0 to 4 inches: fine sandy loam
BE - 4 to 10 inches: sandy clay loam
B - 10 to 30 inches: clay
BC - 30 to 36 inches: clay
Cr - 36 to 80 inches: weathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Iredell

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

CeB2—Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2th00
Elevation: 450 to 1,450 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 50 to 66 degrees F
Frost-free period: 180 to 280 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Cecil, moderately eroded, and similar soils: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cecil, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from granite and/or residuum weathered from gneiss

Typical profile
A - 0 to 3 inches: sandy clay loam
Bt - 3 to 48 inches: clay
BCt - 48 to 80 inches: sandy clay loam

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cataula, moderately eroded
Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Bethlehem, moderately eroded
Percent of map unit: 3 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

CeC2—Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded

Map Unit Setting
National map unit symbol: 2tqlf

Elevation: 220 to 1,160 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 50 to 66 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cecil, moderately eroded, and similar soils: 93 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cecil, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Typical profile

A - 0 to 3 inches: sandy clay loam
Bt - 3 to 48 inches: clay
BCt - 48 to 80 inches: sandy clay loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cataula, moderately eroded

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Bethlehem, moderately eroded

Percent of map unit: 3 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

CfB3—Cecil clay loam, 2 to 6 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2lpzy
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cecil, severely eroded, and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cecil, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Typical profile

A - 0 to 1 inches: sandy loam
BA - 1 to 3 inches: sandy clay loam
B - 3 to 80 inches: clay

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cataula, moderately eroded

Percent of map unit: 3 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

CfC3—Cecil clay loam, 6 to 10 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2lq03
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Cecil, severely eroded, and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cecil, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Typical profile

A - 0 to 1 inches: sandy loam
BA - 1 to 3 inches: sandy clay loam
B - 3 to 80 inches: clay

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Helena, moderately eroded

Percent of map unit: 3 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

ChA—Chewacla loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2sclw
Elevation: 90 to 1,930 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 50 to 66 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile
A - 0 to 10 inches: loam
Bw - 10 to 80 inches: sandy clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 10.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Toccoa, frequently flooded
Percent of map unit: 15 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wehadkee, ponded
Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

MeB2—Mecklenburg-Wynott complex, 2 to 6 percent slopes, moderately eroded

Map Unit Setting
National map unit symbol: 2lq2k
Elevation: 410 to 960 feet

Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Mecklenburg, moderately eroded, and similar soils: 50 percent
Wynott, moderately eroded, and similar soils: 36 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mecklenburg, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Typical profile

A - 0 to 4 inches: sandy loam
B - 4 to 35 inches: clay
BC - 35 to 50 inches: clay loam
C - 50 to 80 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay
BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 14 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

MkB3—Mecklenburg-Wynott complex, 2 to 6 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2lq2q
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Mecklenburg, severely eroded, and similar soils: 50 percent

Wynott, severely eroded, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mecklenburg, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Typical profile

A - 0 to 2 inches: sandy loam
B - 2 to 26 inches: clay
BC - 26 to 40 inches: sandy clay loam
CB - 40 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Wynott, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 2 inches: sandy loam
B - 2 to 26 inches: clay
BC - 26 to 32 inches: sandy clay loam
Cr - 32 to 80 inches: weathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Cecil, severely eroded

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

MkC3—Mecklenburg-Wynott complex, 6 to 10 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2lq2t
Elevation: 400 to 980 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Mecklenburg, severely eroded, and similar soils: 50 percent
Wynott, severely eroded, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mecklenburg, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Typical profile

A - 0 to 2 inches: sandy loam
B - 2 to 26 inches: clay
BC - 26 to 40 inches: sandy clay loam
CB - 40 to 80 inches: sandy loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Wynott, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 2 inches: sandy loam
B - 2 to 26 inches: clay
BC - 26 to 32 inches: sandy clay loam
Cr - 32 to 80 inches: weathered bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Cecil, severely eroded

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

PaD2—Pacolet sandy clay loam, 10 to 15 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq32
Elevation: 250 to 600 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Pacolet, moderately eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pacolet, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from granite and/or residuum weathered from gneiss

Typical profile

A - 0 to 2 inches: sandy loam
B - 2 to 26 inches: clay
BC - 26 to 43 inches: clay loam

C - 43 to 80 inches: loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Hard labor

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

PaE2—Pacolet sandy clay loam, 15 to 25 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq33
Elevation: 220 to 750 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Pacolet, moderately eroded, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pacolet, Moderately Eroded

Setting

Landform: Interfluves

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Typical profile

A - 0 to 2 inches: sandy loam
B - 2 to 26 inches: clay
BC - 26 to 43 inches: clay loam
C - 43 to 80 inches: loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Hard labor

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

PcE3—Pacolet clay loam, 15 to 25 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2lq31
Elevation: 220 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Pacolet, severely eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pacolet, Severely Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gneiss and/or residuum weathered from granite

Typical profile

A - 0 to 1 inches: sandy clay loam
B - 1 to 26 inches: clay
BC - 26 to 80 inches: clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Wynott, moderately eroded

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex

Across-slope shape: Linear
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 4ts5
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

WbC2—Wynott-Brewback complex, 6 to 10 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq4p
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Wynott, moderately eroded, and similar soils: 45 percent
Brewback, moderately eroded, and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay

BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Brewback, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 2 inches: sandy loam
BE - 2 to 9 inches: sandy clay loam
B - 9 to 36 inches: clay
BC - 36 to 38 inches: sandy clay loam
Cr - 38 to 80 inches: weathered bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 20 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

WmD2—Wynott-Mecklenburg complex, 10 to 15 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq4s
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Wynott, moderately eroded, and similar soils: 45 percent
Mecklenburg, moderately eroded, and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay
BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Mecklenburg, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite

Typical profile

A - 0 to 4 inches: sandy loam
B - 4 to 35 inches: clay
BC - 35 to 50 inches: clay loam
C - 50 to 80 inches: loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 15 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex

Across-slope shape: Linear
Hydric soil rating: No

WwE2—Wynott-Wilkes complex, 15 to 25 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq4w
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Wynott, moderately eroded, and similar soils: 55 percent
Wilkes, moderately eroded, and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay
BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Wilkes, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 4 inches: sandy loam
B - 4 to 15 inches: sandy clay loam
BC - 15 to 18 inches: sandy loam
Cr - 18 to 45 inches: weathered bedrock
R - 45 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 40 to 72 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Winnsboro, moderately eroded

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

WyB2—Wynott-Winnsboro complex, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq53
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wynott, moderately eroded, and similar soils: 55 percent
Winnsboro, moderately eroded, and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay
BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Winnsboro, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 4 inches: sandy loam
B - 4 to 25 inches: clay
BC - 25 to 32 inches: sandy clay loam
C - 32 to 52 inches: sandy loam
Cr - 52 to 80 inches: weathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Mecklenburg, moderately eroded

Percent of map unit: 15 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

WyC2—Wynott-Winnsboro complex, 6 to 10 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq56
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Wynott, moderately eroded, and similar soils: 55 percent
Winnsboro, moderately eroded, and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay
BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Winnsboro, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 4 inches: sandy loam
B - 4 to 25 inches: clay
BC - 25 to 32 inches: sandy clay loam
C - 32 to 52 inches: sandy loam
Cr - 52 to 80 inches: weathered bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wilkes, moderately eroded

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

WyD2—Wynott-Winnsboro complex, 10 to 15 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2lq58
Elevation: 410 to 960 feet
Mean annual precipitation: 42 to 55 inches
Mean annual air temperature: 51 to 72 degrees F
Frost-free period: 202 to 249 days
Farmland classification: Not prime farmland

Map Unit Composition

Wynott, moderately eroded, and similar soils: 50 percent
Winnsboro, moderately eroded, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wynott, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 5 inches: sandy loam
B - 5 to 21 inches: clay
BC - 21 to 29 inches: sandy clay loam
Cr - 29 to 80 inches: weathered bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Winnsboro, Moderately Eroded

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from diorite and/or residuum weathered from gabbro

Typical profile

A - 0 to 4 inches: sandy loam
B - 4 to 25 inches: clay
BC - 25 to 32 inches: sandy clay loam
C - 32 to 52 inches: sandy loam
Cr - 52 to 80 inches: weathered bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wilkes, moderately eroded

Percent of map unit: 15 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

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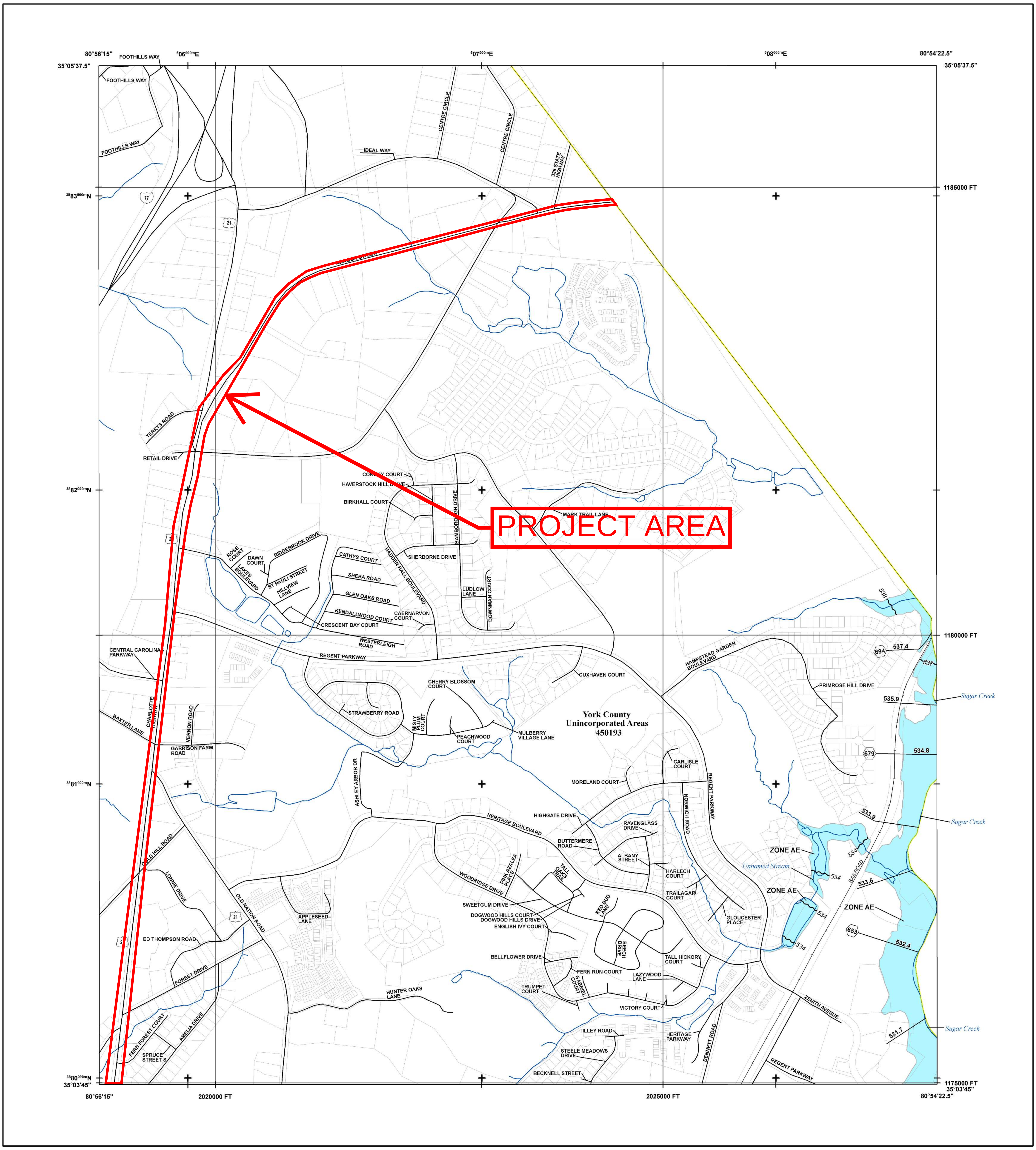
Appendix B

FEMA FIRMs



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	NO SCREEN Areas of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert or Storm Sewer
	Accredited or Provisionally Accredited Levee, Dike or Floodwall
	Non-accredited Levee, Dike or Floodwall
OTHER FEATURES	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

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For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by York County, South Carolina and Catawba Regional Council of Governments, dated 2008.

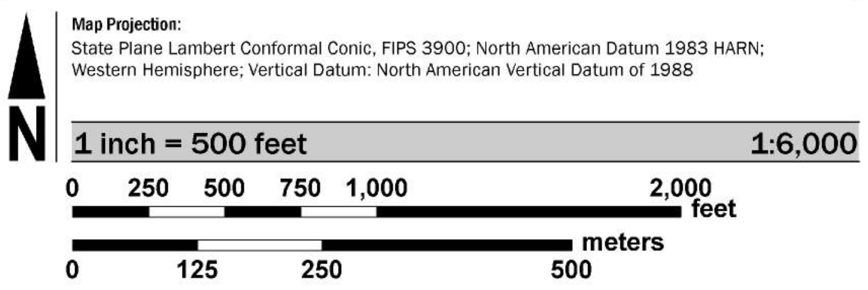
The digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of South Carolina and the Federal Emergency Management Agency (FEMA). The State of South Carolina has implemented a long term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the local level. As a part off this effort, the state of South Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM. http://dnr.state.sc.us

DNR

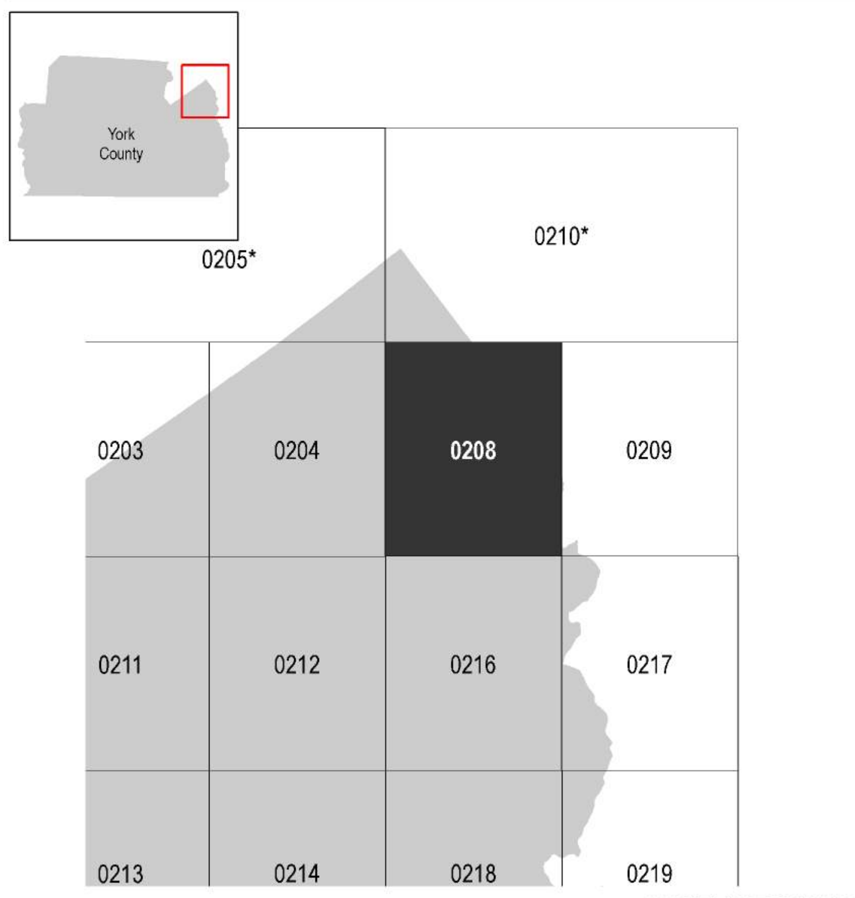
SCALE

Map Projection:
State Plane Lambert Conformal Conic, FIPS 3900; North American Datum 1983 HARN; Western Hemisphere; Vertical Datum: North American Vertical Datum of 1988

1 inch = 500 feet **1:6,000**



PANEL LOCATOR



*PANEL NOT PRINTED

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

YORK COUNTY, SOUTH CAROLINA
and Incorporated Areas

PANEL **208** OF **505**

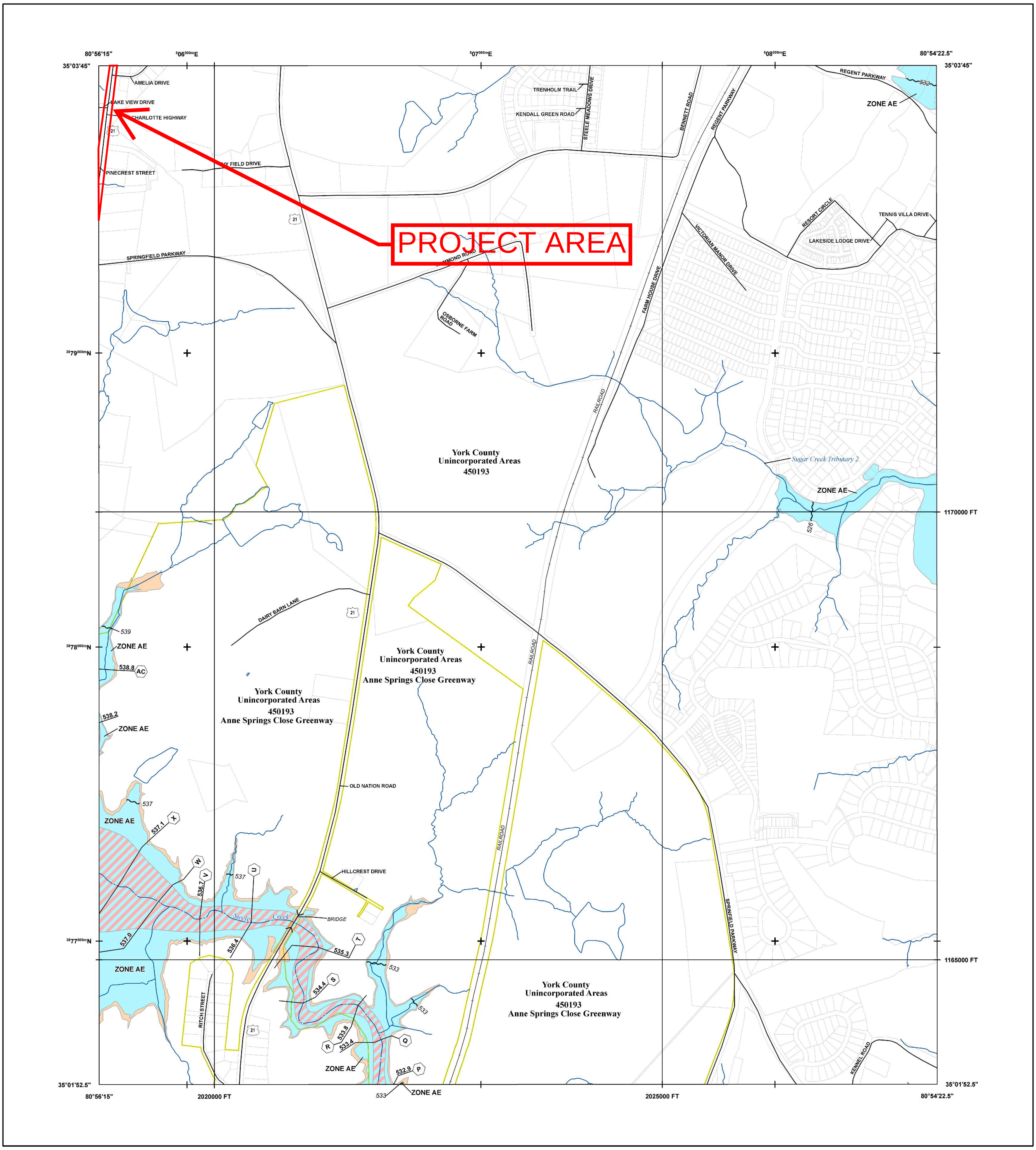
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
YORK COUNTY	450193	0208	F

VERSION NUMBER
2.3.2.1

MAP NUMBER
45091C0208F

MAP REVISED
MAY 16, 2017



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	NO SCREEN	Areas of Minimal Flood Hazard *Zone X*
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert or Storm Sewer
		Accredited or Provisionally Accredited Levee, Dike or Floodwall
		Non-accredited Levee, Dike or Floodwall
OTHER FEATURES	E 18.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8	Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

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For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

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DNR

SCALE

N

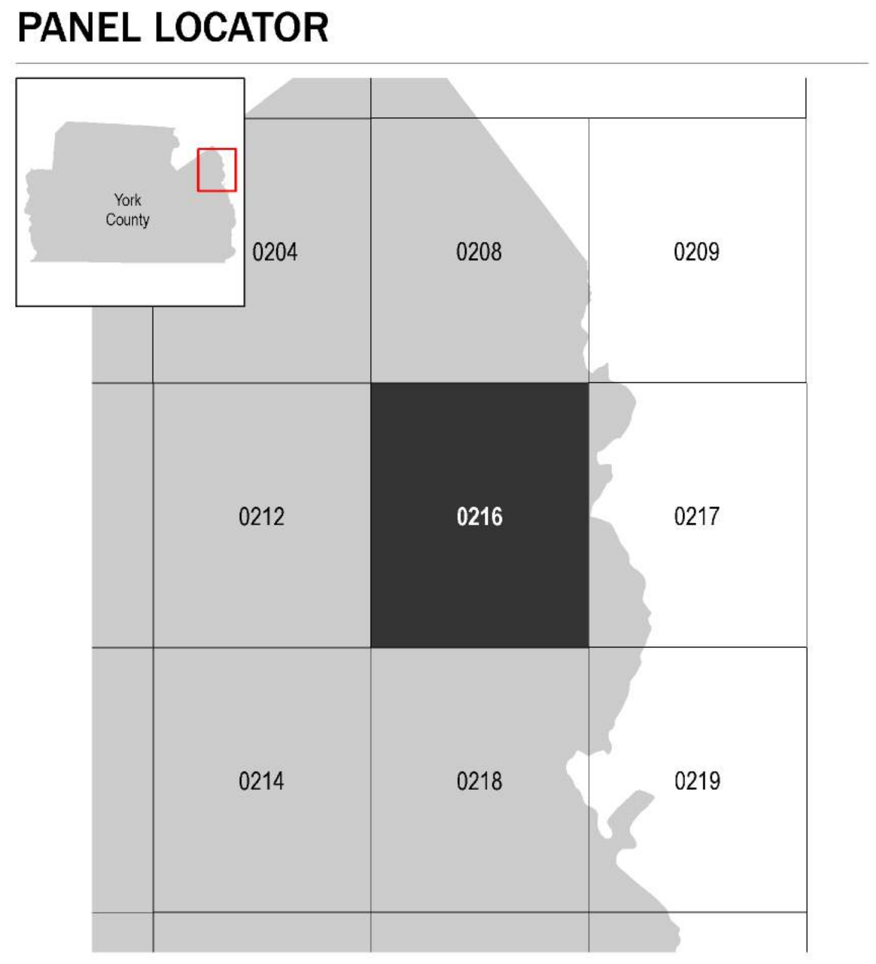
Map Projection:
State Plane Lambert Conformal Conic, FIPS 3900; North American Datum 1983 HARN; Western Hemisphere; Vertical Datum: North American Vertical Datum of 1988

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

YORK COUNTY, SOUTH CAROLINA

and Incorporated Areas

PANEL 216 OF 505

FEMA

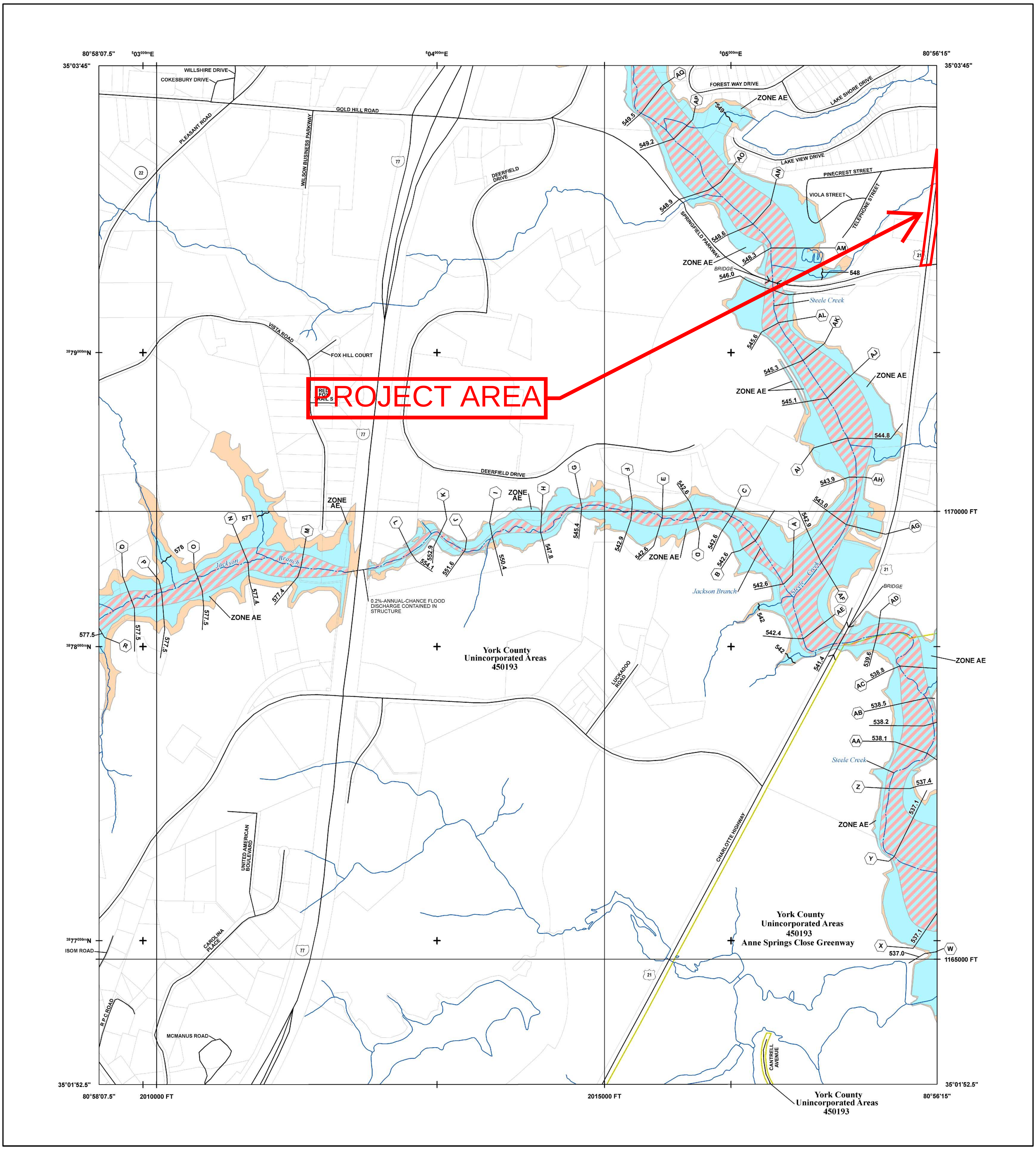
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
YORK COUNTY	450193	0216	F

VERSION NUMBER
2.3.2.1

MAP NUMBER
45091C0216F

MAP REVISED
MAY 16, 2017



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	NO SCREEN Areas of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert or Storm Sewer
	Accredited or Provisionally Accredited Levee, Dike or Floodwall
	Non-accredited Levee, Dike or Floodwall
OTHER FEATURES	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

DNR

NOTES TO USERS

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For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

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SCALE

N

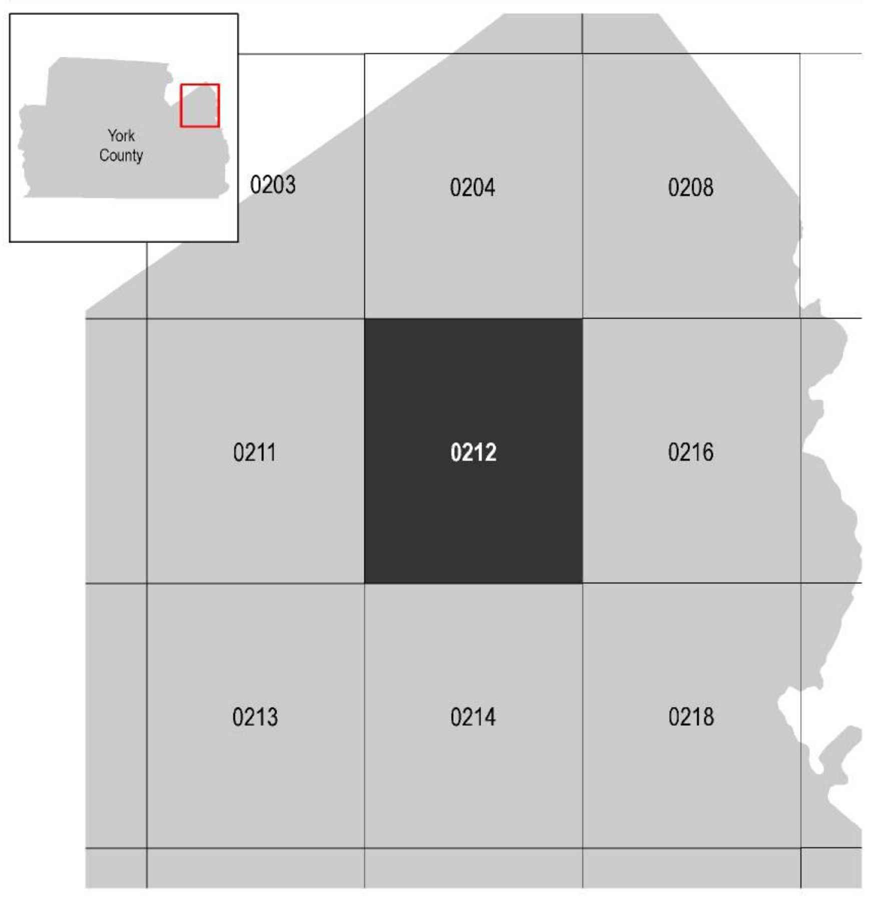
Map Projection:
State Plane Lambert Conformal Conic, FIPS 3900; North American Datum 1983 HARN; Western Hemisphere; Vertical Datum: North American Vertical Datum of 1988

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

YORK COUNTY, SOUTH CAROLINA
and Incorporated Areas

PANEL **212** OF **505**

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
YORK COUNTY	450193	0212	F

VERSION NUMBER
2.3.2.1

MAP NUMBER
45091C0212F

MAP REVISED
MAY 16, 2017

Appendix C

Ditch Calculations

STV

STV	JOB: US 21/ SC 51 Phase I Widening		1 SHEET
Consulting Engineers	SUBJECT: Ditch-5		
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Pavement	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.011	0.150	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	74	27	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0120	0.1000	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0184	0.0284	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	4.32		
13. Wetted perimeter, p_w	ft.	7.59		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.5692		
15. Channel slope, s	ft./ft.	0.0080		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.62		
17b. Input Velocity, FPS	ft./sec.	2.62		
18. Flow length, L	ft.	480		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0510	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0693	0.0284	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.07 Hour

4.2 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-6 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L ≤ 300 ft)	ft.	57		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0280		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0106	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	3.00		
13. Wetted perimeter, p_w	ft.	6.32		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4747		
15. Channel slope, s	ft./ft.	0.0120		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.84		
17b. Input Velocity, FPS	ft./sec.	2.84		
18. Flow length, L	ft.	479		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0469	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0575	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) ..... 0.06 Hour

3.5 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening	3
Consulting Engineers	SUBJECT:	Ditch-7	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	67		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0240		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0128	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	6.75		
13. Wetted perimeter, p_w	ft.	9.49		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7113		
15. Channel slope, s	ft./ft.	0.0150		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.15		
17b. Input Velocity, FPS	ft./sec.	4.15		
18. Flow length, L	ft.	629		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0421	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0549	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.05 Hour

3.3 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-8 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	63		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.0113	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	6.75		
13. Wetted perimeter, p_w	ft.	9.49		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7113		
15. Channel slope, s	ft./ft.	0.0170		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.42		
17b. Input Velocity, FPS	ft./sec.	4.42		
18. Flow length, L	ft.	574		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0361	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0474	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.05 Hour

2.8 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-9 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	81		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1545	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	217		
9. Watercourse slope, s	ft./ft.	0.0270		
10. Average velocity, V (figure 3-1)	ft./sec.	2.65		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0227	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	12.96		
13. Wetted perimeter, p_w	ft.	14.84		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.8733		
15. Channel slope, s	ft./ft.	0.0200		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.50		
17b. Input Velocity, FPS	ft./sec.	5.50		
18. Flow length, L	ft.	435		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0220	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1992	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.20 Hour

12 min

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	36		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0090		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0936	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0360		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	6.53		
17b. Input Velocity, FPS	ft./sec.	6.53		
18. Flow length, L	ft.	551		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0234	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1170	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.12 Hour
7 min

STV	JOB: US 21/ SC 51 Phase I Widening		7 SHEET
Consulting Engineers	SUBJECT: Ditch-12		
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	56		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0190		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0988	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	4.00		
13. Wetted perimeter, p_w	ft.	8.25		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4848		
15. Channel slope, s	ft./ft.	0.1540		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	10.31		
17b. Input Velocity, FPS	ft./sec.	10.31		
18. Flow length, L	ft.	127		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0034	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1022	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.10 Hour

6.1 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		8
Consulting Engineers	SUBJECT: Ditch-16		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	90		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0680		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.0867	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0038		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.12		
17b. Input Velocity, FPS	ft./sec.	2.12		
18. Flow length, L	ft.	262		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0343	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1210	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.12 Hour

7.3 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-18 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	46		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0540		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0556	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.69		
17b. Input Velocity, FPS	ft./sec.	4.69		
18. Flow length, L	ft.	77		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0046	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0602	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.06 Hour

3.6 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-19 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16	10 SHEET OF 26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0310		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1292	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	48		
9. Watercourse slope, s	ft./ft.	0.0430		
10. Average velocity, V (figure 3-1)	ft./sec.	3.35		
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0040	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	18.75		
13. Wetted perimeter, p_w	ft.	15.81		
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.	1.1860		
15. Channel slope, s	ft./ft.	0.0160		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	6.03		
17b. Input Velocity, FPS	ft./sec.	6.03		
18. Flow length, L	ft.	342		
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0157	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1489	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.15 Hour

8.9 min

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Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	42		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0320		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0079	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	ft.^{2}	18.75		
13. Wetted perimeter, p_w	ft.	15.81		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	1.1860		
15. Channel slope, s	ft./ft.	0.0120		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.23		
17b. Input Velocity, FPS	ft./sec.	5.23		
18. Flow length, L	ft.	47		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0025	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0104	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.01 Hour

0.6 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		12
Consulting Engineers	SUBJECT:	Ditch-23		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	192		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1040		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.1342	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1342	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.13 Hour

8.1 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening
Consulting Engineers	SUBJECT: Ditch-24
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	285		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0630		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2249	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	4.00		
13. Wetted perimeter, p_w	ft.	8.25		
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.	0.4848		
15. Channel slope, s	ft./ft.	0.0380		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.12		
17b. Input Velocity, FPS	ft./sec.	5.12		
18. Flow length, L	ft.	134		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0073	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2322	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.23 Hour

14 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening — 14 SHEET SUBJECT: Ditch-25 CALC'D BY: PRJ DATE: 7-Jul-16 — OF CHECK'D BY: GPP DATE: 8-Jul-16 — 26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	115		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0350		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1376	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	2.50		
13. Wetted perimeter, p_w	ft.	5.39		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4638		
15. Channel slope, s	ft./ft.	0.0315		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.53		
17b. Input Velocity, FPS	ft./sec.	4.53		
18. Flow length, L	ft.	434		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0266	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1643	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.16 Hour

9.9 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1100		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0779	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	190		
9. Watercourse slope, s	ft./ft.	0.1000		
10. Average velocity, V (figure 3-1)	ft./sec.	5.10		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0103	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	5.00		
13. Wetted perimeter, p_w	ft.	10.20		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.4902		
15. Channel slope, s	ft./ft.	0.0370		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.09		
17b. Input Velocity, FPS	ft./sec.	5.09		
18. Flow length, L	ft.	417		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0228	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1109	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour
6.7 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-27 CALC'D BY: PRJ CHECK'D BY: GPP	DATE: 7-Jul-16 DATE: 8-Jul-16	16 SHEET OF 26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	105		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0350		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1280	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	2.50		
13. Wetted perimeter, p_w	ft.	5.39		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4638		
15. Channel slope, s	ft./ft.	0.0160		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.23		
17b. Input Velocity, FPS	ft./sec.	3.23		
18. Flow length, L	ft.	129		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0111	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1391	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.14 Hour

8.3 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	17
Consulting Engineers	SUBJECT: Ditch-28	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	246		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0440		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2308	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2308	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.23 Hour
14 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	212		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0510		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1931	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	3.00		
13. Wetted perimeter, p_w	ft.	6.32		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4747		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.95		
17b. Input Velocity, FPS	ft./sec.	2.95		
18. Flow length, L	ft.	186		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0175	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2106	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.21 Hour
13 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-30 CALC'D BY: PRJ CHECK'D BY: GPP	DATE: 7-Jul-16 DATE: 8-Jul-16	19 SHEET OF 26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	90		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0280		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1237	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	32.00		
13. Wetted perimeter, p_w	ft.	17.89		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.7887		
15. Channel slope, s	ft./ft.	0.0200		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	8.87		
17b. Input Velocity, FPS	ft./sec.	8.87		
18. Flow length, L	ft.	337		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0106	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1342	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.13 Hour

8.1 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	62		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0510		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0722	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	24.50		
13. Wetted perimeter, p_w	ft.	15.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.5655		
15. Channel slope, s	ft./ft.	0.0030		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.14		
17b. Input Velocity, FPS	ft./sec.	3.14		
18. Flow length, L	ft.	412		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0364	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1086	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour
6.5 min

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JOB:	US 21/ SC 51 Phase I Widening		
SUBJECT:	Ditch-32		
CALC'D BY:	PRJ	DATE:	7-Jul-16
CHECK'D BY:	GPP	DATE:	8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	160		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0330		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1835	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0150		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.03		
17b. Input Velocity, FPS	ft./sec.	5.03		
18. Flow length, L	ft.	701		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0387	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2222	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.22 Hour

13 min

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STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-33 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	256		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2815	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	8.00		
13. Wetted perimeter, p_w	ft.	8.94		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.8949		
15. Channel slope, s	ft./ft.	0.0180		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.30		
17b. Input Velocity, FPS	ft./sec.	5.30		
18. Flow length, L	ft.	531		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0278	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3093	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.31 Hour

19 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	162		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2691	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	75		
9. Watercourse slope, s	ft./ft.	0.1400		
10. Average velocity, V (figure 3-1)	ft./sec.	6.04		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0035	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD	DE	
12. Cross sectional flow area, a	$ft.^2$	3.14	8.00	
13. Wetted perimeter, p_w	ft.	6.28	8.94	
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.5000	0.8949	
15. Channel slope, s	ft./ft.	0.0320	0.0090	
16. Manning's roughness coefficient, n		0.0120	0.0350	
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	13.99	3.75	
17b. Input Velocity, FPS	ft./sec.	13.99	3.75	
18. Flow length, L	ft.	222	289	
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0044		0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2769	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.28 Hour

17 min

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STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-35 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L ≤ 300 ft)	ft.	25		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0540		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0042	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	4.00		
13. Wetted perimeter, p_w	ft.	8.25		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4848		
15. Channel slope, s	ft./ft.	0.0110		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.76		
17b. Input Velocity, FPS	ft./sec.	2.76		
18. Flow length, L	ft.	140		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0141		0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0183	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.02 Hour

1.1 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		25
Consulting Engineers	SUBJECT:	Ditch-36		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	107		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1931	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.93		
17b. Input Velocity, FPS	ft./sec.	3.93		
18. Flow length, L	ft.	120		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0085		0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2016	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.20 Hour

12 min

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STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch-36		26 SHEET
	CALC'D BY: PRJ CHECK'D BY: GPP	DATE: 7-Jul-16 DATE: 8-Jul-16	OF 26

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	59		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1300		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.0477	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	4.00		
13. Wetted perimeter, p_w	ft.	8.25		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4848		
15. Channel slope, s	ft./ft.	0.0680		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	6.85		
17b. Input Velocity, FPS	ft./sec.	6.85		
18. Flow length, L	ft.	97		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0039		0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0517	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.05 Hour

3.1 min

STV	STV INC Consulting Engineers 454 South Anderson Road Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4099	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Hydrologic Data Summary CALC'D BY: PRJ DATE: 7-Jul-2016 CHK'D BY: GPP DATE: 8-Jul-2016	1 of 1

DITCH HYDROLOGIC DATA SUMMARY

Site Data				RUNOFF (Rational Method) Q = C*I*A*Cf - (Cf10 = 1.0)					
Drainage Area Number	Road Name	From Station (Upstream)	To Station (Downstream)	Runoff Coefficient 'C'	Time of Conc. 'Tc'	Rainfall Intensity 'I' (in./hr.)	Drainage Area 'A' (ac.)	Cf	Total Runoff 'Q' (c.f.s.)
DA-5	OLDSC51 (RT)	302+74	308+00	0.63	5	6.89	2.70	1.00	11.7
DA-6	OLDSC51 (LT)	302+75	307+32	0.35	5	6.89	0.54	1.00	1.3
DA-7	SPRINGHILL (RT)	24+00	30+00	0.30	5	6.89	1.42	1.00	2.9
DA-8	SPRINGHILL (LT)	24+00	30+00	0.45	5	6.89	2.05	1.00	6.4
DA-9	FLINT (LT)	16+70	20+77	0.45	12	5.78	2.86	1.00	7.4
DA-10	FLINT (RT)	16+70	22+50	0.63	7	6.53	1.07	1.00	4.4
DA-12	LAKESBLVD (RT)	11+00	12+31	0.45	6	6.69	0.21	1.00	0.6
DA-16	OLDNACL (LT)	13+27	13+58	0.51	7	6.62	4.66	1.00	15.7
DA-18	OLDNACL (RT)	13+66	14+40	0.45	5	6.89	0.21	1.00	0.7
DA-19	OLDNACL (RT)	10+50	13+28	0.56	9	6.22	3.38	1.00	11.8
DA-21	GARRISONFARM (RT)	11+00	11+35	0.84	5.00	6.89	0.13	1.00	0.8
DA-23	LAKESHORE (LT)	13+00	13+50	0.55	8.10	6.35	0.36	1.00	1.3
DA-24	AMELIA (LT)	11+00	11+96	0.35	14.00	5.52	0.65	1.00	1.3
DA-25	BAXTER (LT)	14+00	14+21	0.45	9.90	6.07	1.00	1.00	2.7
DA-26	FERNFOREST (RT)	10+50	11+00	0.60	6.70	6.58	3.29	1.00	13.0
DA-27	ANDREW (LT)	00+50	01+88	0.35	6.32	6.65	0.51	1.00	1.2
DA-28	ANDREW (RT)	01+00	01+88	0.32	14.00	5.52	0.89	1.00	1.6
DA-29	ANDREW (RT)	02+50	04+50	0.37	13.00	5.65	1.02	1.00	2.1
DA-30	GOLDHILL (LT)	28+50	32+00	0.32	8.10	6.35	0.82	1.00	1.7
DA-31	GOLDHILL (RT)	27+00	31+50	0.51	6.50	6.62	1.67	1.00	5.6
DA-32	GOLDHILL (LT)	14+10	22+00	0.42	13.00	5.65	1.66	1.00	3.9
DA-33	GOLDHILL (RT)	14+27	22+50	0.30	19.00	4.97	2.71	1.00	4.0
DA-34	US 21BUSINESS (RT)	22+00	25+00	0.65	17.00	5.18	4.75	1.00	16.0

STV	STV INC Consulting Engineers 454 South Anderson Road Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4099	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Hydrologic Data Summary CALC'D BY: PRJ DATE: 7-Jul-2016 CHK'D BY: GPP DATE: 8-Jul-2016	1 of 1

DITCH HYDROLOGIC DATA SUMMARY

Site Data				RUNOFF (Rational Method) Q = C*I*A*Cf - (Cf10 = 1.0)						
Drainage Area Number	Road Name	From Station (Upstream)	To Station (Downstream)	Runoff Coefficient 'C'	Time of Conc. 'Tc'	Rainfall Intensity 'I' (in./hr.)	Drainage Area 'A' (ac.)	Cf	Total Runoff 'Q' (c.f.s.)	
DA-35	ANDREW (LT)	02+60	03+50	0.45	5.00	6.89	0.14	1.00	0.4	
DA-36	EX-FLINT (LT)	10+00	11+41	0.35	12.00	5.78	0.94	1.00	1.90	
DA-37	EX-FOREST (LT)	11+69	12+32	0.30	5.00	6.89	0.24	1.00	0.50	
DA-38	US21 (LT)	0+00	17+00	D/S OF CULVERT EP5				1.00	6.22	Tail Ditch
DA-39	OLDNACL (LT)	0+00	34+00	0.35	8.60	6.27	2.75	1.00	6.03	Tail Ditch

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	1 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 302+74 To Station: 308+00 Road Name: OLDSC51 (RT)

SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
302+74	642.53	2.5	303+00	642.61	2.9	11.7	1.60	0.045	0.0031	7.68	10.18	0.76	1.52	11.7	1.60	0.31	GOOD	GOOD
303+00	642.61	2.9	303+50	642.76	2.8	11.7	1.61	0.045	0.0030	7.76	10.23	0.76	1.51	11.7	1.61	0.30	GOOD	GOOD
303+50	642.76	2.8	304+00	642.91	1.8	11.7	1.61	0.045	0.0030	7.76	10.23	0.76	1.51	11.7	1.61	0.30	GOOD	GOOD
304+00	642.91	1.8	304+50	643.91	2.2	11.7	1.13	0.045	0.0200	3.81	7.16	0.53	3.07	11.7	1.13	1.41	GOOD	FIX
304+50	643.91	2.2	305+00	644.26	2.1	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD
305+00	644.26	2.1	305+50	644.61	2.0	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD
305+50	644.61	2.0	306+00	644.96	1.9	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD
306+00	644.96	1.9	306+50	645.31	2.0	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD
306+50	645.31	2.0	307+00	645.66	2.1	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD
307+00	645.66	2.1	307+50	646.01	2.1	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD
307+50	646.01	2.1	308+00	646.36	1.9	11.7	1.37	0.045	0.0070	5.65	8.72	0.65	2.07	11.7	1.37	0.60	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730 (803) 980-4970

JOB:	US 21/ SC 51 Phase I Widening		2 SHEET
SUBJECT:	Ditch Analysis		
CALC'D BY:	PRJ	DATE: 07-Jul-16	OF
CHEK'D BY:	GPP	DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type **C** Vegetation (Enter A, B, C, D, or E)

From Station: **302+75** To Station: **307+32** Road Name: **OLDSC51 (LT)**

SL= **2.00** SR= **4.00** B= **0.00**

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
302+75	638.63	1.4	303+00	638.92	2.0	1.3	0.55	0.045	0.0116	0.90	3.48	0.26	1.45	1.3	0.55	0.40	GOOD	GOOD
303+00	638.92	2.0	303+50	639.47	1.3	1.3	0.55	0.045	0.0110	0.92	3.52	0.26	1.42	1.3	0.55	0.38	GOOD	GOOD
303+50	639.47	1.3	304+00	640.07	3.3	1.3	0.54	0.045	0.0120	0.89	3.46	0.26	1.46	1.3	0.54	0.41	GOOD	GOOD
304+00	640.07	3.3	304+50	640.67	1.6	1.3	0.54	0.045	0.0120	0.89	3.46	0.26	1.46	1.3	0.54	0.41	GOOD	GOOD
304+50	640.67	1.6	305+00	641.02	1.7	1.3	0.60	0.045	0.0070	1.09	3.83	0.28	1.20	1.3	0.60	0.26	GOOD	GOOD
305+00	641.02	1.7	305+50	641.17	2.1	1.3	0.71	0.045	0.0030	1.49	4.49	0.33	0.87	1.3	0.71	0.13	GOOD	GOOD
305+50	641.17	2.1	306+00	641.32	2.0	1.3	0.71	0.045	0.0030	1.49	4.49	0.33	0.87	1.3	0.71	0.13	GOOD	GOOD
306+00	641.32	2.0	306+50	643.82	1.3	1.3	0.42	0.045	0.0500	0.52	2.65	0.20	2.50	1.3	0.42	1.30	GOOD	FIX
306+50	643.82	1.3	307+00	644.17	1.4	1.3	0.60	0.045	0.0070	1.09	3.83	0.28	1.20	1.3	0.60	0.26	GOOD	GOOD
307+00	644.17	1.4	307+32	644.27	1.0	1.3	0.70	0.045	0.0031	1.47	4.45	0.33	0.88	1.3	0.70	0.14	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	JOB: US 21/ SC 51 Phase I Widening	3
Consulting Engineers	SUBJECT: Ditch Analysis	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 07-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHEK'D BY: GPP DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 24+00 To Station: 30+00 Road Name: SPRINGHILL (RT)

SL= 6.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
24+00	618.54	1.3	24+50	618.36	1.3	2.9	0.82	0.045	0.0036	2.71	6.85	0.40	1.07	2.9	0.82	0.18	GOOD	GOOD
24+50	618.36	1.3	25+00	617.98	1.3	2.9	0.72	0.045	0.0076	2.05	5.95	0.34	1.42	2.9	0.72	0.34	GOOD	GOOD
25+00	617.98	1.3	25+50	617.25	1.3	2.9	0.63	0.045	0.0146	1.60	5.26	0.30	1.81	2.9	0.63	0.58	GOOD	GOOD
25+50	617.25	1.3	26+00	616.37	1.3	2.9	0.61	0.045	0.0176	1.49	5.08	0.29	1.94	2.9	0.61	0.67	GOOD	GOOD
26+00	616.37	1.3	26+50	615.50	1.3	2.9	0.61	0.045	0.0174	1.50	5.09	0.29	1.93	2.9	0.61	0.66	GOOD	GOOD
26+50	615.50	1.3	27+00	614.65	1.2	2.9	0.62	0.045	0.0170	1.51	5.12	0.30	1.92	2.9	0.62	0.65	GOOD	GOOD
27+00	614.65	1.2	27+50	613.60	1.0	2.9	0.59	0.045	0.0210	1.40	4.92	0.28	2.07	2.9	0.59	0.77	GOOD	GOOD
27+50	613.60	1.0	28+00	613.25	1.3	2.9	0.73	0.045	0.0070	2.11	6.04	0.35	1.37	2.9	0.73	0.32	GOOD	GOOD
28+00	613.25	1.3	28+50	612.33	1.3	2.9	0.61	0.045	0.0184	1.47	5.04	0.29	1.97	2.9	0.61	0.70	GOOD	GOOD
28+50	612.33	1.3	29+00	611.41	1.3	2.9	0.61	0.045	0.0184	1.47	5.04	0.29	1.97	2.9	0.61	0.70	GOOD	GOOD
29+00	611.41	1.3	29+50	610.49	1.3	2.9	0.61	0.045	0.0184	1.47	5.04	0.29	1.97	2.9	0.61	0.70	GOOD	GOOD
29+50	610.49	1.3	30+00	609.57	1.3	2.9	0.61	0.045	0.0184	1.47	5.04	0.29	1.97	2.9	0.61	0.70	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	JOB: US 21/ SC 51 Phase I Widening	4
Consulting Engineers	SUBJECT: Ditch Analysis	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 07-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHEK'D BY: GPP DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 24+00 To Station: 30+00 Road Name: SPRINGHILL (LT)

SL= 2.00 SR= 6.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
24+00	618.31	1.3	24+50	617.36	1.3	6.4	0.81	0.045	0.0190	2.63	6.74	0.39	2.44	6.4	0.81	0.96	GOOD	GOOD
24+50	617.36	1.3	25+00	616.11	1.3	6.4	0.77	0.045	0.0250	2.37	6.41	0.37	2.70	6.4	0.77	1.20	GOOD	FIX
25+00	616.11	1.3	25+50	614.91	1.3	6.4	0.78	0.045	0.0240	2.41	6.45	0.37	2.66	6.4	0.78	1.16	GOOD	FIX
25+50	614.91	1.3	26+00	613.82	1.3	6.4	0.79	0.045	0.0218	2.50	6.57	0.38	2.56	6.4	0.79	1.07	GOOD	FIX
26+00	613.82	1.3	26+50	612.72	1.3	6.4	0.79	0.045	0.0220	2.49	6.56	0.38	2.57	6.4	0.79	1.08	GOOD	FIX
26+50	612.72	1.3	27+00	611.77	1.3	6.4	0.81	0.045	0.0190	2.63	6.74	0.39	2.44	6.4	0.81	0.96	GOOD	GOOD
27+00	611.77	1.3	27+50	611.02	1.3	6.4	0.85	0.045	0.0150	2.87	7.05	0.41	2.23	6.4	0.85	0.79	GOOD	GOOD
27+50	611.02	1.3	28+00	610.48	1.3	6.4	0.90	0.045	0.0108	3.25	7.50	0.43	1.97	6.4	0.90	0.61	GOOD	GOOD
28+00	610.48	1.3	28+50	610.30	1.3	6.4	1.11	0.045	0.0036	4.90	9.21	0.53	1.31	6.4	1.11	0.25	GOOD	GOOD
28+50	610.30	1.3	29+00	609.91	1.3	6.4	0.96	0.045	0.0078	3.67	7.97	0.46	1.74	6.4	0.96	0.47	GOOD	GOOD
29+00	609.91	1.3	29+50	609.36	1.3	6.4	0.90	0.045	0.0110	3.23	7.47	0.43	1.98	6.4	0.90	0.62	GOOD	GOOD
29+50	609.36	1.3	30+00	608.67	1.3	6.4	0.86	0.045	0.0138	2.96	7.16	0.41	2.16	6.4	0.86	0.74	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type **C** Vegetation (Enter A, B, C, D, or E)

From Station: **16+70** To Station: **19+50** Road Name: **FLINT (LT)**

SL= **2.00** SR= **6.00** B= **0.00**

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
16+70	608.75	1.3	17+00	608.65	1.3	7.4	1.19	0.045	0.0033	5.63	9.87	0.57	1.31	7.4	1.19	0.25	GOOD	GOOD
17+00	608.65	1.3	17+50	608.40	1.5	7.4	1.10	0.045	0.0050	4.83	9.15	0.53	1.53	7.4	1.10	0.34	GOOD	GOOD
17+50	608.40	1.5	18+00	608.15	1.7	7.4	1.10	0.045	0.0050	4.83	9.15	0.53	1.53	7.4	1.10	0.34	GOOD	GOOD
18+00	608.15	1.7	18+50	607.90	1.9	7.4	1.10	0.045	0.0050	4.83	9.15	0.53	1.53	7.4	1.10	0.34	GOOD	GOOD
18+50	607.90	1.9	19+00	607.65	1.6	7.4	1.10	0.045	0.0050	4.83	9.15	0.53	1.53	7.4	1.10	0.34	GOOD	GOOD
19+00	607.65	1.6	19+50	605.00	2.3	7.4	0.70	0.045	0.0530	1.99	5.86	0.34	3.72	7.4	0.70	2.33	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

	STV	JOB:	US 21/ SC 51 Phase I Widening	6
	Consulting Engineers	SUBJECT:	Ditch Analysis	SHEET
	454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ DATE: 07-Jul-16	OF
	Rock Hill, SC, 29730 (803) 980-4970	CHEK'D BY:	GPP DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 19+50 To Station: 20+77 Road Name: FLINT (LT)

SL= 2.00 SR= 4.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
19+50	605.00	2.3	20+00	603.00	2.1	7.4	0.83	0.045	0.0400	2.08	5.30	0.39	3.55	7.4	0.83	2.08	GOOD	FIX
20+00	603.00	2.1	20+50	601.30	2.7	7.4	0.86	0.045	0.0340	2.21	5.46	0.41	3.34	7.4	0.86	1.82	GOOD	FIX
20+50	601.30	2.7	20+77	600.10	2.9	7.4	0.82	0.045	0.0444	2.00	5.19	0.39	3.70	7.4	0.82	2.27	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	7 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 16+70 To Station: 22+00 Road Name: FLINT (RT)

SL= 6.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
16+70	606.45	1.6	17+00	606.14	1.1	4.4	0.79	0.045	0.0103	2.49	6.57	0.38	1.76	4.4	0.79	0.51	GOOD	GOOD
17+00	606.14	1.1	17+50	605.90	1.4	4.4	0.91	0.045	0.0048	3.32	7.58	0.44	1.32	4.4	0.91	0.27	GOOD	GOOD
17+50	605.90	1.4	18+00	605.50	2.6	4.4	0.83	0.045	0.0080	2.74	6.89	0.40	1.60	4.4	0.83	0.41	GOOD	GOOD
18+00	605.50	2.6	18+50	605.10	2.1	4.4	0.83	0.045	0.0080	2.74	6.89	0.40	1.60	4.4	0.83	0.41	GOOD	GOOD
18+50	605.10	2.1	19+00	604.70	2.0	4.4	0.83	0.045	0.0080	2.74	6.89	0.40	1.60	4.4	0.83	0.41	GOOD	GOOD
19+00	604.70	2.0	19+50	604.30	1.3	4.4	0.83	0.045	0.0080	2.74	6.89	0.40	1.60	4.4	0.83	0.41	GOOD	GOOD
19+50	604.30	1.3	20+00	602.05	1.1	4.4	0.60	0.045	0.0450	1.44	4.98	0.29	3.06	4.4	0.60	1.68	GOOD	FIX
20+00	602.05	1.1	20+50	600.05	2.2	4.4	0.61	0.045	0.0400	1.50	5.10	0.29	2.93	4.4	0.61	1.53	GOOD	FIX
20+50	600.05	2.2	21+00	598.05	1.9	4.4	0.61	0.045	0.0400	1.50	5.10	0.29	2.93	4.4	0.61	1.53	GOOD	FIX
21+00	598.05	1.9	21+50	595.55	1.7	4.4	0.59	0.045	0.0500	1.38	4.89	0.28	3.19	4.4	0.59	1.83	GOOD	FIX
21+50	595.55	1.7	22+00	591.05	1.3	4.4	0.51	0.041	0.0900	1.04	4.24	0.24	4.24	4.4	0.51	2.86	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	8 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 22+00 To Station: 22+50 Road Name: FLINT (RT)

SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
22+00	591.05	1.3	22+50	586.55	2.1	4.4	0.56	0.040	0.0900	0.95	3.58	0.27	4.63	4.4	0.56	3.16	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	9 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 11+00 To Station: 12+31 Road Name: LAKESBLVD (RT)

SL= 6.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
11+00	656.57	1.0	11+50	649.85	1.0	0.6	0.23	0.045	0.1344	0.21	1.92	0.11	2.81	0.6	0.23	1.94	GOOD	FIX
11+50	649.85	1.0	12+00	642.50	2.1	0.6	0.23	0.045	0.1470	0.21	1.89	0.11	2.90	0.6	0.23	2.09	GOOD	FIX
12+00	642.50	2.1	12+31	637.00	1.0	0.6	0.22	0.044	0.1774	0.19	1.81	0.10	3.16	0.6	0.22	2.41	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	JOB: US 21/ SC 51 Phase I Widening	10
Consulting Engineers	SUBJECT: Ditch Analysis	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ/SCN DATE: 07-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHEK'D BY: GPP DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 13+27 To Station: 13+58 Road Name: OLDNACL(LT)

SL= 4.00 SR= 4.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
13+27	628.01	3.1	13+50	627.61	2.8	15.7	1.15	0.045	0.0174	5.30	9.49	0.56	2.96	15.7	1.15	1.25	GOOD	FIX
13+50	627.61	2.8	13+58	627.78	2.4	15.7	1.11	0.045	0.0212	4.92	9.14	0.54	3.19	15.7	1.11	1.47	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	11 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 13+66 To Station: 14+40 Road Name: OLDNACL (RT)

SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
13+66	630.04	3.3	14+00	630.48	2.1	0.7	0.43	0.045	0.0129	0.54	2.70	0.20	1.29	0.7	0.43	0.34	GOOD	GOOD
14+00	630.48	2.1	14+40	631.00	1.0	0.7	0.42	0.045	0.0130	0.54	2.70	0.20	1.29	0.7	0.42	0.34	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	JOB: US 21/ SC 51 Phase I Widening	12
Consulting Engineers	SUBJECT: Ditch Analysis	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 07-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHEK'D BY: GPP DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 10+50 To Station: 13+28 Road Name: OLDNACL (RT)

SL= 6.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
10+50	629.03	2.0	11+00	628.86	2.0	11.8	1.41	0.045	0.0034	7.93	11.71	0.68	1.49	11.8	1.41	0.30	GOOD	GOOD
11+00	628.86	2.0	11+50	628.63	2.0	11.8	1.33	0.045	0.0046	7.08	11.07	0.64	1.67	11.8	1.33	0.38	GOOD	GOOD
11+50	628.63	2.0	12+00	628.38	2.0	11.8	1.31	0.045	0.0050	6.86	10.89	0.63	1.72	11.8	1.31	0.41	GOOD	GOOD
12+00	628.38	2.0	12+50	628.20	2.0	11.8	1.39	0.045	0.0036	7.76	11.59	0.67	1.52	11.8	1.39	0.31	GOOD	GOOD
12+50	628.20	2.0	13+00	628.01	2.0	11.8	1.38	0.045	0.0038	7.60	11.47	0.66	1.55	11.8	1.38	0.33	GOOD	GOOD
13+00	628.01	2.0	13+28	627.92	2.0	11.8	1.42	0.045	0.0032	8.10	11.84	0.68	1.46	11.8	1.42	0.29	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730 (803) 980-4970

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 11+00 To Station: 11+35 Road Name: GARRISONFARM (RT)
SL= 6.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
11+00	643.38	1.0	11+35	643.79	1.0	0.8	0.41	0.045	0.0117	0.66	3.39	0.20	1.21	0.8	0.41	0.30	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	JOB: US 21/ SC 51 Phase I Widening	14
Consulting Engineers	SUBJECT: Ditch Analysis	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 07-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHEK'D BY: GPP DATE: 08-Jul-16	28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 13+00 To Station: 13+50 Road Name: LAKESHORE (LT)

SL= 2.00 SR= 4.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
13+00	583.83	3.0	13+50	587.16	1.0	1.3	0.39	0.045	0.0666	0.47	2.51	0.19	2.79	1.3	0.39	1.64	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	15 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 11+00 To Station: 11+96 Road Name: AMELIA (LT)

SL= 2.00 SR= 6.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
11+00	587.63	1.0	11+50	586.38	1.0	1.3	0.42	0.045	0.0250	0.72	3.52	0.20	1.81	1.3	0.42	0.66	GOOD	GOOD
11+50	586.38	1.0	11+96	585.19	2.1	1.3	0.42	0.045	0.0259	0.71	3.50	0.20	1.84	1.3	0.42	0.68	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	16 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 14+00 To Station: 14+21 Road Name: BAXTER LN (LT)

SL= 2.00 SR= 4.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
14+00	642.50	3.8	14+21	640.86	3.1	2.7	0.50	0.044	0.0781	0.75	3.18	0.24	3.59	2.7	0.50	2.44	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT² THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV

STV
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730   (803) 980-4970

JOB: US 21/ SC 51 Phase I Widening
SUBJECT: Ditch Analysis
CALC'D BY: PRJ   DATE: 07-Jul-16
CHEK'D BY: GPP   DATE: 08-Jul-16

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 10+50   To Station: 11+00   Road Name: FERNFOREST (RT)
SL= 4.00   SR= 2.00   B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
10+50	583.20	1.5	11+00	585.20	1.0	13.0	1.02	0.044	0.0400	3.10	6.47	0.48	4.19	13.0	1.02	2.54	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730 (803) 980-4970

JOB: US 21/ SC 51 Phase I Widening
SUBJECT: Ditch Analysis
CALC'D BY: PRJ DATE: 07-Jul-16
CHEK'D BY: GPP DATE: 08-Jul-16

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 00+50 To Station: 01+88 Road Name: ANDREW (LT)
SL= 2.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
00+50	613.56	1.4	01+00	612.76	1.3	1.2	0.59	0.045	0.0160	0.70	2.64	0.26	1.72	1.2	0.59	0.59	GOOD	GOOD
01+00	612.76	1.3	01+50	611.96	1.1	1.2	0.59	0.045	0.0160	0.70	2.64	0.26	1.72	1.2	0.59	0.59	GOOD	GOOD
01+50	611.96	1.1	01+88	611.35	1.7	1.2	0.59	0.045	0.0161	0.70	2.64	0.26	1.73	1.2	0.59	0.59	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730 (803) 980-4970

JOB: US 21/ SC 51 Phase I Widening
SUBJECT: Ditch Analysis
CALC'D BY: PRJ DATE: 07-Jul-16
CHEK'D BY: GPP DATE: 08-Jul-16

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 01+00 To Station: 01+88 Road Name: ANDREW (RT)
SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
01+00	615.03	1.3	01+50	614.38	1.6	1.6	0.58	0.045	0.0130	1.01	3.68	0.27	1.59	1.6	0.58	0.47	GOOD	GOOD
01+50	614.38	1.6	01+88	613.89	1.4	1.6	0.58	0.045	0.0129	1.01	3.69	0.27	1.58	1.6	0.58	0.47	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730 (803) 980-4970

JOB: US 21/ SC 51 Phase I Widening
SUBJECT: Ditch Analysis
CALC'D BY: PRJ DATE: 07-Jul-16
CHEK'D BY: GPP DATE: 08-Jul-16

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 02+50 To Station: 04+50 Road Name: ANDREW (RT)
SL= 6.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
02+50	615.67	1.5	03+00	615.07	1.0	2.1	0.58	0.045	0.0120	1.35	4.84	0.28	1.55	2.1	0.58	0.44	GOOD	GOOD
03+00	615.07	1.0	03+50	613.95	1.0	2.1	0.52	0.045	0.0224	1.07	4.30	0.25	1.96	2.1	0.52	0.72	GOOD	GOOD
03+50	613.95	1.0	04+00	613.35	1.0	2.1	0.58	0.045	0.0120	1.35	4.84	0.28	1.55	2.1	0.58	0.44	GOOD	GOOD
04+00	613.35	1.0	04+50	612.77	1.2	2.1	0.59	0.045	0.0116	1.37	4.87	0.28	1.53	2.1	0.59	0.42	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	21 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 28+50 To Station: 31+50 Road Name: GOLDHILL (LT)

SL= 2.00 SR= 4.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
28+50	639.72	1.1	29+00	639.57	2.4	1.7	0.78	0.045	0.0030	1.83	4.96	0.37	0.93	1.7	0.78	0.15	GOOD	GOOD
29+00	639.57	2.4	29+50	639.42	2.7	1.7	0.78	0.045	0.0030	1.83	4.96	0.37	0.93	1.7	0.78	0.15	GOOD	GOOD
29+50	639.42	2.7	30+00	639.27	3.0	1.7	0.78	0.045	0.0030	1.83	4.96	0.37	0.93	1.7	0.78	0.15	GOOD	GOOD
30+00	639.27	3.0	30+50	639.12	3.3	1.7	0.78	0.045	0.0030	1.83	4.96	0.37	0.93	1.7	0.78	0.15	GOOD	GOOD
30+50	639.12	3.3	31+00	638.97	3.2	1.7	0.78	0.045	0.0030	1.83	4.96	0.37	0.93	1.7	0.78	0.15	GOOD	GOOD
31+00	638.97	3.2	31+50	637.22	4.7	1.7	0.49	0.045	0.0350	0.73	3.13	0.23	2.34	1.7	0.49	1.07	GOOD	FIX

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT² THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	22 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 27+00 To Station: 31+50 Road Name: GOLDHILL (RT)
SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
27+00	636.53	1.0	27+50	636.38	1.0	3.0	0.97	0.045	0.0030	2.80	6.14	0.46	1.07	3.0	0.97	0.18	GOOD	GOOD
27+50	636.38	1.0	28+00	636.23	1.3	3.0	0.97	0.045	0.0030	2.80	6.14	0.46	1.07	3.0	0.97	0.18	GOOD	GOOD
28+00	636.23	1.3	28+50	636.08	1.6	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD
28+50	636.08	1.6	29+00	635.93	1.8	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD
29+00	635.93	1.8	29+50	635.78	2.1	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD
29+50	635.78	2.1	30+00	635.63	2.4	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD
30+00	635.63	2.4	30+50	635.48	2.8	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD
30+50	635.48	2.8	31+00	635.33	3.5	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD
31+00	635.33	3.5	31+50	635.18	4.1	5.6	1.22	0.045	0.0030	4.46	7.76	0.58	1.25	5.6	1.22	0.23	GOOD	GOOD

Discharge has been discretized

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT² THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	23 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 14+10 To Station: 22+00 Road Name: GOLDHILL (LT)

SL= 2.00 SR= 4.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
14+10	620.00	1.2	14+50	622.58	1.4	3.9	0.60	0.045	0.0646	1.07	3.80	0.28	3.65	3.90	0.60	2.41	GOOD	FIX
14+50	622.58	1.4	15+00	624.15	1.5	3.9	0.69	0.045	0.0314	1.41	4.36	0.32	2.76	3.9	0.69	1.34	GOOD	FIX
15+00	624.15	1.5	15+50	625.50	1.2	3.9	0.71	0.045	0.0270	1.49	4.49	0.33	2.61	3.9	0.71	1.19	GOOD	FIX
15+50	625.50	1.2	16+00	626.73	1.2	3.9	0.72	0.045	0.0246	1.55	4.57	0.34	2.52	3.9	0.72	1.10	GOOD	FIX
16+00	626.73	1.2	16+50	628.06	1.4	3.9	0.71	0.045	0.0266	1.50	4.50	0.33	2.60	3.9	0.71	1.17	GOOD	FIX
16+50	628.06	1.4	17+00	629.18	1.3	3.9	0.73	0.045	0.0224	1.60	4.65	0.34	2.44	3.9	0.73	1.02	GOOD	FIX
17+00	629.18	1.3	17+50	630.11	1.2	3.9	0.76	0.045	0.0186	1.72	4.81	0.36	2.27	3.9	0.76	0.88	GOOD	GOOD
17+50	630.11	1.2	18+00	630.83	1.4	3.9	0.79	0.045	0.0144	1.89	5.05	0.37	2.06	3.9	0.79	0.71	GOOD	GOOD
18+00	630.83	1.4	18+50	631.41	1.5	3.9	0.83	0.045	0.0116	2.05	5.26	0.39	1.90	3.9	0.83	0.60	GOOD	GOOD
18+50	631.41	1.5	19+00	631.98	2.3	3.9	0.83	0.045	0.0114	2.06	5.27	0.39	1.89	3.9	0.83	0.59	GOOD	GOOD
19+00	631.98	2.3	19+50	632.63	2.6	3.9	0.81	0.045	0.0130	1.96	5.14	0.38	1.99	3.9	0.81	0.66	GOOD	GOOD
19+50	632.63	2.6	20+00	633.33	2.6	3.9	0.80	0.045	0.0140	1.91	5.07	0.38	2.04	3.9	0.80	0.70	GOOD	GOOD
20+00	633.33	2.6	20+50	633.59	2.6	3.9	0.96	0.045	0.0052	2.77	6.11	0.45	1.41	3.9	0.96	0.31	GOOD	GOOD
20+50	633.59	2.6	21+00	633.75	2.6	3.9	1.05	0.045	0.0032	3.32	6.69	0.50	1.17	3.9	1.05	0.21	GOOD	GOOD
21+00	633.75	2.6	21+50	633.96	2.7	3.9	1.00	0.045	0.0042	3.00	6.36	0.47	1.30	3.9	1.00	0.26	GOOD	GOOD
21+50	633.96	2.7	22+00	634.19	1.8	3.9	0.98	0.045	0.0046	2.90	6.25	0.46	1.35	3.9	0.98	0.28	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT² THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	24 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 14+27 To Station: 22+50 Road Name: GOLDHILL (RT)

SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
14+27	620.26	1.8	14+50	622.40	2.0	4.0	0.54	0.040	0.0913	0.89	3.46	0.26	4.51	4.0	0.54	3.10	GOOD	FIX
14+50	622.40	2.0	15+00	624.70	1.8	4.0	0.64	0.045	0.0460	1.25	4.10	0.30	3.21	4.0	0.64	1.85	GOOD	FIX
15+00	624.70	1.8	15+50	626.05	2.0	4.0	0.71	0.045	0.0270	1.52	4.53	0.34	2.63	4.0	0.71	1.20	GOOD	FIX
15+50	626.05	2.0	16+00	626.55	3.1	4.0	0.86	0.045	0.0100	2.21	5.46	0.40	1.81	4.0	0.86	0.54	GOOD	GOOD
16+00	626.55	3.1	16+50	628.75	1.2	4.0	0.65	0.045	0.0440	1.27	4.13	0.31	3.16	4.0	0.65	1.78	GOOD	FIX
16+50	628.75	1.2	17+00	630.40	1.7	4.0	0.69	0.045	0.0330	1.41	4.36	0.32	2.83	4.0	0.69	1.41	GOOD	FIX
17+00	630.40	1.7	17+50	632.05	2.9	4.0	0.69	0.045	0.0330	1.41	4.36	0.32	2.83	4.0	0.69	1.41	GOOD	FIX
17+50	632.05	2.9	18+00	632.55	2.6	4.0	0.86	0.045	0.0100	2.21	5.46	0.40	1.81	4.0	0.86	0.54	GOOD	GOOD
18+00	632.55	2.6	18+50	633.05	3.2	4.0	0.86	0.045	0.0100	2.21	5.46	0.40	1.81	4.0	0.86	0.54	GOOD	GOOD
18+50	633.05	3.2	19+00	633.55	3.5	4.0	0.86	0.045	0.0100	2.21	5.46	0.40	1.81	4.0	0.86	0.54	GOOD	GOOD
19+00	633.55	3.5	19+50	634.05	3.4	4.0	0.86	0.045	0.0100	2.21	5.46	0.40	1.81	4.0	0.86	0.54	GOOD	GOOD
19+50	634.05	3.4	20+00	634.30	3.0	4.0	0.98	0.045	0.0050	2.86	6.21	0.46	1.40	4.0	0.98	0.30	GOOD	GOOD
20+00	634.30	3.0	20+50	634.55	2.4	4.0	0.98	0.045	0.0050	2.86	6.21	0.46	1.40	4.0	0.98	0.30	GOOD	GOOD
20+50	634.55	2.4	21+00	634.80	2.0	4.0	0.98	0.045	0.0050	2.86	6.21	0.46	1.40	4.0	0.98	0.30	GOOD	GOOD
21+00	634.80	2.0	21+50	635.05	1.7	3.0	0.88	0.045	0.0050	2.31	5.58	0.41	1.30	3.0	0.88	0.27	GOOD	GOOD
21+50	635.05	1.7	22+00	635.30	1.4	2.0	0.75	0.045	0.0050	1.70	4.79	0.36	1.17	2.0	0.75	0.24	GOOD	GOOD
22+00	635.30	1.4	22+50	635.45	1.1	1.0	0.63	0.045	0.0030	1.21	4.03	0.30	0.81	1.0	0.63	0.12	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	25 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type **C** Vegetation (Enter A, B, C, D, or E)

From Station: **22+00** To Station: **25+00** Road Name: **US 21 BUSINESS (RT)**

SL= **4.00** SR= **2.00** B= **0.00**

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
22+00	622.40	2.0	25+00	620.43	2.0	16.0	1.56	0.045	0.0066	7.31	9.93	0.74	2.19	16.0	1.56	0.64	GOOD	GOOD

*** Ditch extends beyond the end of the GEOPAK chain. Stations beyond STA 23+65.54 are theoretical stations if the chain was extended

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	26 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 02+60 To Station: 03+50 Road Name: ANDREW (LT)

SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
02+60	611.60	0.9	03+00	610.84	0.9	0.4	0.32	0.045	0.0190	0.31	2.04	0.15	1.30	0.4	0.32	0.38	GOOD	GOOD
03+00	610.84	0.9	03+50	613.63	0.8	0.4	0.26	0.045	0.0558	0.21	1.67	0.12	1.94	0.4	0.26	0.91	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT² THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	27 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 10+00 To Station: 11+41 Road Name: EXISTING FLINT (LT)
SL= 4.00 SR= 2.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
11+41	618.27	1.0	11+00	617.31	1.0	1.9	0.55	0.045	0.0234	0.92	3.52	0.26	2.07	1.9	0.55	0.81	GOOD	GOOD
11+00	617.31	1.0	10+50	616.14	1.0	1.9	0.55	0.045	0.0234	0.92	3.52	0.26	2.07	1.9	0.55	0.81	GOOD	GOOD
10+50	616.14	1.0	10+00	614.95	1.0	1.9	0.55	0.045	0.0238	0.91	3.51	0.26	2.08	1.9	0.55	0.82	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT^2 THEN LINING WILL BE TURF REINFORCEMENT MATTING

STV	STV Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Ditch Analysis CALC'D BY: PRJ DATE: 07-Jul-16 CHEK'D BY: GPP DATE: 08-Jul-16	28 SHEET OF 28

DITCH ANALYSIS USING MANNINGS OPEN CHANNEL FOR VEGETATIVE LININGS

For Type C Vegetation (Enter A, B, C, D, or E)

From Station: 11+69 To Station: 12+32 Road Name: EXISTING FOREST (LT)

SL= 2.00 SR= 6.00 B= 0.00

From Sta.	Ditch Elev.	Ditch Depth	To Sta.	Ditch Elev.	Ditch Depth	Q(Actual) c.f.s.	Depth ft.	Manning's n	Slope ft./ft.	Area sq. ft.	Wetted Perim.	Hyd. Rad. ft.	Velocity f.p.s.	Q(Cal.) c.f.s.	Depth ft.	Shear p.s.f.	Depth Comment	Shear Comment
11+69	587.94	0.7	12+00	586.12	0.5	0.5	0.25	0.045	0.0587	0.25	2.10	0.12	1.97	0.5	0.25	0.92	GOOD	GOOD
12+00	586.12	0.5	12+32	586.00	0.6	0.5	0.42	0.045	0.0038	0.71	3.51	0.20	0.70	0.5	0.42	0.10	GOOD	GOOD

REMARK: ALL DITCHES LINED WITH TEMPORARY EROSION CONTROL BLANKET. IF SHEAR > 1.75 LB/FT² THEN LINING WILL BE TURF REINFORCEMENT MATTING

Appendix D

Culvert and Driveway Pipe Calculations

STV 100 Years	STV Incorporated 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392 803.980.4970 www.stvinc.com	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Culvert Summary CALC'D BY: PRJ/SCN DATE: 4-Aug-21 CHEK'D BY: GPP DATE: 5-Aug-21	1 SHEET OF 2	

CULVERT SUMMARY SHEET

SITE DATA					RUNOFF (Rational Method) $Q = C*I*A*C_f$ - ($C_{f25} = 1.1$, $C_{f50} = 1.2$, $C_{f100} = 1.25$) $Q_{500} = Q_{100} * 1.7$												PIPE DATA								RESULTS				
I.D.	Location	Upstream Building Elevation (ft)	Roadway Elevation (ft)	1' Freeboard Below Roadway Subgrade Elevation (ft)	Runoff Coefficient 'C'	Drainage Area 'A' (ac)	Time of Conc. 'T_c' (min)	Rainfall Intensity 2 Year (in/hr)	Rainfall Intensity 25 Year (in/hr)	Rainfall Intensity 50 Year (in/hr)	Rainfall Intensity 100 Year (in/hr)	Total Runoff 2 Year (cfs)	Total Runoff 25 Year (cfs)	Total Runoff 50 Year (cfs)	Total Runoff 100 Year (cfs)	Total Runoff 500 Year (cfs)	Material	Number of Barrel	Pipe Dia. / Box Height (in)	Pipe Length (ft)	Invert Up	Invert Down	Pipe Slope (ft/ft)	2 Year HW Elev (ft)	50 Year HW Elev (ft)	50 Year HW/D	100 Year Outlet Velocity (fps)	100 Year HW Elev (ft)	Flood / Overtop Probability (Year)
EP-2	US21 Sta 33+79 - 5'x5' RCBC	N/A	595.4	591.9	0.47	58.1	24	3.48	5.13	5.64	6.13	105	154	185	209	356	RCBC	1	60	229	565.47	561.95	0.015		575.01	1.91	8.36	576.24	< 0.2
XEP-2[1]	Existing EP-2 w/o extensions	N/A	595.4	591.9	0.47	58.1	24		5.13	5.64	6.13	0	154	185	209	356	RCBC	1	60	135	564.80	562.74	0.015		580.22	3.08	20.90	583.38	< 0.2
EP-3	US21 Sta 41+06 - 5'x5' RCBC	N/A	588.9	585.4	0.53	125.4	45	2.10	3.32	3.65	3.97	139	221	242	264	448	RCBC	1	60	312	568.40	565.41	0.010		574.29	1.18	14.60	574.95	< 0.2
XEP-3	Existing EP-3 w/o extensions	N/A	588.9	585.4	0.53	128.6	45		3.32	3.65	3.97	0	221	242	264	448	RCBC	1	60	125	567.32	566.12	0.010		574.29	1.39	14.60	574.95	< 0.2
CLP-4	US21 Sta 66+74 - 36" RCP	N/A	638.2	634.7	0.55	8.2	10		6.92	7.66	8.38	0	42	51	58	99	RCP	1	36	178	621.83	617.43	0.025		625.87	1.35	14.83	626.46	< 0.2
EP-5	US21 Sta 116+89 - 18" RCP	N/A	664.0	660.5	0.42	2.9	18		5.81	6.40	6.97	0	8	9	11	18	RCP	1	18	161	653.77	637.79	0.099		655.54	1.18	16.45	655.89	< 0.2
EP-6	SC51 Sta 316+23 - 6'x6' RCBC	N/A	600.7	597.3	0.32	38.5	55		3.26	3.56	3.85	0	44	53	59	101	RCBC	1	72	132	591.22	589.10	0.016		593.35	0.35	2.46	593.45	< 0.2
XEP-6[2]	Existing EP-6 w/o extensions	N/A	599.3	595.9	0.32	38.5	55		3.26	3.56	3.85	0	44	53	59	101	RCBC	1	72	30	589.35	589.26	0.003		593.64	0.71	4.68	593.78	< 0.2

1. EP-2 is approximately 3/5 filled with sediment in existing conditions and has been modeled accordingly.
2. EP-6 is approximately 1/3 filled with sediment in existing conditions, so culvert was analyzed in HY-8 as a 6' span x 4' height RCBC.

STV	STV INC Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29732 (803) 980-4970	JOB:	US 21/ SC 51 Phase I Widening			1
		SUBJECT:	Culvert Summary			SHEET
		CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
		CHEK'D BY:	GPP	DATE:	8-Jul-16	1

CULVERT SUMMARY SHEET

	SITE DATA				RUNOFF $Q = C*I*A*C_f$ - (C_{f10} = 1.0, C_{f25} = 1.1, C_{f50} = 1.2, C_{f100} = 1.25) $Q_{500} = Q_{100}$ * 1.7											Rational Method	PIPE DATA									RESULTS					
I.D.	Location	Upstream Building Elevation (ft.)	Roadway Elevation (ft.)	1' Freeboard Below Roadway Subgrade Elevation (ft.)	Runoff Coefficient 'C'	Drainage Area 'A' (ac.)	Time of Conc. 'T_c' (min.)	Rainfall Intensity 10 Year (in./hr.)	Rainfall Intensity 25 Year (in./hr.)	Rainfall Intensity 50 Year (in./hr.)	Rainfall Intensity 100 Year (in./hr.)	Total Runoff 10 Year (c.f.s.)	Total Runoff 25 Year (c.f.s.)	Total Runoff 50 Year (c.f.s.)	Total Runoff 100 Year (c.f.s.)	Total Runoff 500 Year (c.f.s.)	Material	Number of Barrel	Pipe Diameter (in)	Pipe Length (ft.)	Invert Up	Invert Down	Pipe Slope (ft./ft.)	10 Yr. H.W. Elev. (ft.)	10 Yr. HW / D	25 Yr. H.W. Elev. (ft.)	25 Yr. HW / D	25 Yr. Outlet Vel. (f.p.s.)	100 Yr. H.W. Elev. (ft.)	Flood / Overtop Frequency (Yr.)
CLP-8	LAKESHORE - Sta. 12+86	N/A	587.42	585.36	0.55	0.36	8	6.35	7.27	8.05	8.82	1.3	1.6	1.9	2.2	3.7	RCP	1	18	65	583.83	582.00	0.028	584.39	0.37	584.46	0.42	6.23	584.57	>500
EP-9	TERRYS - Sta. 11+88 (Existing)	N/A	667.46	664.19	0.55	1.46	9	6.19	7.08	7.84	8.58	5.0	6.3	7.6	8.6	14.6	RCP	1	18	83	660.58	657.08	0.042	661.79	0.81	661.98	0.93	10.16	662.34	>500
CLP-11	GOLDHILL- Sta. 24+20	N/A	636.68	635.61	0.35	5.28	20	4.88	5.54	6.10	6.64	9.0	11.3	13.5	15.3	26.1	RCP	1	24	155	618.70	606.64	0.078	620.16	0.73	620.38	0.84	16.16	620.75	>500
CLP-12	BAXTER- Sta. 14+21	N/A	645.01	643.32	0.45	1.04	10	6.07	6.94	7.68	8.40	2.8	3.6	4.3	4.9	8.4	RCP	1	18	65	640.86	639.60	0.019	641.73	0.58	641.88	0.68	6.89	642.08	>500
CLP-13	ANDREW- Sta. 1+88	N/A	618.64	616.95	0.32	0.89	12	5.78	6.59	7.29	7.96	1.6	2.1	2.5	2.8	4.8	RCP	1	18	102	613.89	611.35	0.025	614.52	0.42	614.62	0.49	6.49	614.76	>500
CLP-14	OLD NATION RD -Sta. 17+23 (EP-531)	N/A	633.17	631.48	0.80	1.09	5	6.89	7.91	8.80	9.65	6.0	7.6	9.2	10.5	17.9	RCP	1	18	55	628.53	627.59	0.017	629.91	0.92	630.13	1.07	7.84	630.38	>500
CLP-15	GOLDHILL- Sta. 14+18	N/A	624.27	622.43	0.30	2.7	19	4.97	5.65	6.22	6.78	4	5	6	7	12	RCP	1	18	72	620.26	620.00	0.004	621.38	0.75	621.54	0.85	4.80	621.86	>500
CLP-16	OLD NATION RD -Sta. 13+28	N/A	634.09	632.30	0.62	3.7	8	6.37	7.29	8.08	8.84	15	18	22	25	43	RCP	1	24	62	627.92	627.55	0.006	630.01	1.05	630.35	1.22	6.99	631.25	>500
CLP-17	EXISTING SPRINGHILL -Sta. 23+36	N/A	619.00	617.31	0.35	1.2	15	5.40	6.15	6.79	7.41	2	3	3	4	6	RCP	1	18	109	615.60	614.95	0.006	616.32	0.48	616.52	0.61	4.52	616.69	>500

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening		1
Consulting Engineers	SUBJECT: Sideline Pipe Summary		SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ/SCN	DATE: 19-Apr-2021	OF
Rock Hill, SC, 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 19-Apr-2021	1

OPEN SYSTEM SIDELINE PIPE SUMMARY

Site Data			Runoff (Rational Method) $Q_{(10)} = C * I * A$					Pipe Data			
ID	Road Name	Station	Runoff Coefficient (C)	Drainage Area (A) (acre)	Time of Conc. (min.)	Intensity (I) (in./hr.)	Runoff (Q) (c.f.s.)	Material	Pipe Length (ft.)	Pipe Diameter (in.)	Pipe Slope (ft./ft/)
DRWY PIPE -11	FERNFOREST (RT)	10+85	0.60	2.94	7	6.62	11.68	RCP	22	24	0.005
DRWY PIPE -14	US 21 (RT)	113+67	0.50	0.20	5	6.89	0.69	RCP	45	18	0.039
DRWY PIPE -18	GOLDHILL (LT)	16+11	0.42	1.38	13	5.65	3.27	RCP	32	18	0.027
DRWY PIPE -20	GOLDHILL (RT)	19+68	0.30	1.48	16	5.29	2.35	RCP	36	18	0.009
DRWY PIPE -21	GOLDHILL (RT)	14+84	0.30	2.64	18	5.07	4.02	RCP	62	18	0.004
DRWY PIPE -25	OLDNACL(RT)	13+51	0.45	0.21	5	6.89	0.65	RCP	33	18	0.012
DRWY PIPE -26	OLDNACL(RT)	13+50	0.51	4.66	7	6.62	15.73	RCP	53	24	0.006
DRWY PIPE -27	OLDNACL(RT)	17+54	0.68	1.88	9	6.22	7.95	RCP	41	18	0.025
DRWY PIPE -28	OLDSC51(RT)	305+80	0.63	1.05	5	6.89	4.56	RCP	53	18	0.007
DRWY PIPE -32	OLDSC51(LT)	305+90	0.35	0.22	5	6.89	0.53	RCP	49	18	0.014
DRWY PIPE -36	US 21 (RT)	78+75	0.40	0.16	5	6.89	0.43	RCP	63	18	0.008
DRWY PIPE - 34	GOLDHILL (LT)	20+41	0.40	0.34	5	6.89	0.94	RCP	93	18	0.004
DRWY PIPE - 35	GOLDHILL (RT)	20+44	0.50	0.15	5	6.89	0.52	RCP	90	18	0.005

STV

STV / RWA
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

JOB:	US 21/ SC 51 Phase I Widening			SHEET 1
SUBJECT:	Culvert - EP-2			
CALC'D BY:	SKH	DATE:	7-Jul-16	OF 14
CHECK'D BY:	GPP	DATE:	8-Jul-16	

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0360		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2931	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	533		
9. Watercourse slope, s	ft./ft.	0.0660		
10. Average velocity, V (figure 3-1)	ft./sec.	4.15		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0357	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	24.00		
13. Wetted perimeter, p_w	ft.	16.94		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.4168		
15. Channel slope, s	ft./ft.	0.0200		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	7.59		
17b. Input Velocity, FPS	ft./sec.	7.59		
18. Flow length, L	ft.	1876		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0686	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3974	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.40 Hour

24 min

STV	JOB: US 21 / SC 51 Phase I Widening		2
Consulting Engineers	SUBJECT: Culvert - EP-3		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH/SCN	DATE: 17-Jun-21	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 17-Jun-21	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.800		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0400		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4452	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	313		
9. Watercourse slope, s	ft./ft.	0.0895		
10. Average velocity, V (figure 3-1)	ft./sec.	4.83		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0180	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	11.71		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	1.0248		
15. Channel slope, s	ft./ft.	0.0175		
16. Manning's roughness coefficient, n		0.0450		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.45		
17b. Input Velocity, FPS	ft./sec.	4.45		
18. Flow length, L	ft.	2575		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.1607	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.6239	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.62 Hour

37 min

STV

STV / RWA	JOB: US 21/ SC 51 Phase I Widening		3
Consulting Engineers	SUBJECT: Culvert - CLP-4		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.200		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0700		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1174	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.69		
17b. Input Velocity, FPS	ft./sec.	4.69		
18. Flow length, L	ft.	838		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0497	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1671	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.17 Hour

10 min

STV / RWA
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	196		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0210		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2587	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC	CD	
12. Cross sectional flow area, a	$ft.^2$	1.77	6.00	
13. Wetted perimeter, p_w	ft.	4.71	12.17	
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.3758	0.4930	
15. Channel slope, s	ft./ft.	0.0120	0.0180	
16. Manning's roughness coefficient, n		0.0120	0.0350	
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	7.08	3.56	
17b. Input Velocity, FPS	ft./sec.	7.08	3.56	
18. Flow length, L	ft.	124	396	
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0049	0.0309	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2635	0.0309	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.29 Hour

17.7 min

STV

STV / RWA	JOB: US 21/ SC 51 Phase I Widening		5
Consulting Engineers	SUBJECT: Culvert - EP-6		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0200		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.8126	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	176		
9. Watercourse slope, s	ft./ft.	0.0630		
10. Average velocity, V (figure 3-1)	ft./sec.	4.05		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0121	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0240		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.34		
17b. Input Velocity, FPS	ft./sec.	5.34		
18. Flow length, L	ft.	1660		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0864	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.9111	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.91 Hour

55 min

STV

STV / RWA	JOB: US 21/ SC 51 Phase I Widening		6 SHEET
Consulting Engineers	SUBJECT: Culvert - CLP-8		
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	192		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1040		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1342	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1342	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.13 Hour

8 min

STV / RWA
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	96		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0240		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1385	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	16.00		
13. Wetted perimeter, p_w	ft.	16.49		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9703		
15. Channel slope, s	ft./ft.	0.0150		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.11		
17b. Input Velocity, FPS	ft./sec.	5.11		
18. Flow length, L	ft.	249		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0135	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1521	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.15 Hour

9 min

STV / RWA	JOB: US 21/ SC 51 Phase I Widening	8
Consulting Engineers	SUBJECT: Culvert - CLP-11	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Path #1	Path #2	Path #3
Segment ID	AB		
1. Surface Description (table 3-1)	Grass		
2. Manning's roughness coefficient, n (table 3-1)	0.150		
3. Flow length, L (total L $\leq$ 300 ft) ... ft.	300		
4. Two-year 24-hour rainfall, P_2 ... in.	3.60		
5. Land slope, s ... ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t ... hr.	0.3196	0.0000	0.0000

Shallow concentrated flow

	Path #1	Path #2	Path #3
Segment ID			
7. Surface description (Paved or Unpaved)			
8. Flow length, L ... ft.			
9. Watercourse slope, s ... ft./ft.			
10. Average velocity, V (figure 3-1) ... ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr.	0.0000	0.0000	0.0000

Channel flow

	Path #1	Path #2	Path #3
Segment ID	BC		
12. Cross sectional flow area, a ... ft.^{2}	48.00		
13. Wetted perimeter, p_w ... ft.	48.17		
14. Hydraulic Radius, r = a / p_w Compute r ... ft.	0.9965		
15. Channel slope, s ... ft./ft.	0.0600		
16. Manning's roughness coefficient, n ...	0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ... ft./sec.	10.40		
17b. Input Velocity, FPS ... ft./sec.	10.40		
18. Flow length, L ... ft.	320		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr.	0.0085	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19) ... hr.	0.3281	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) ... 0.33 Hour

20 min

STV

STV / RWA	JOB: US 21/ SC 51 Phase I Widening		9
Consulting Engineers	SUBJECT: Culvert - CLP-12		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	115		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0350		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1376	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	2.50		
13. Wetted perimeter, p_w	ft.	5.39		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4638		
15. Channel slope, s	ft./ft.	0.0315		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.53		
17b. Input Velocity, FPS	ft./sec.	4.53		
18. Flow length, L	ft.	434		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0266	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1643	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.16 Hour

9.9 min

STV

STV / RWA	JOB: US 21/ SC 51 Phase I Widening		10
Consulting Engineers	SUBJECT: Culvert - CLP-13		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SKH	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	216		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0440		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2080	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2080	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.21 Hour

12 min

STV / RWA	JOB: US 21/ SC 51 Phase I Widening		11
Consulting Engineers	SUBJECT: Culvert - CLP-14 (EP531)		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SCN	DATE: 7-Apr-21	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 7-Apr-21	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID				
1. Surface Description (table 3-1)				
2. Manning's roughness coefficient, n (table 3-1)				
3. Flow length, L (total L $\leq$ 300 ft)	ft.			
4. Two-year 24-hour rainfall, P_2	in.			
5. Land slope, s	ft./ft.			
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0000	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.00 Hour

5 min

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	256		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2815	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	8.00		
13. Wetted perimeter, p_w	ft.	8.94		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.8949		
15. Channel slope, s	ft./ft.	0.0180		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.30		
17b. Input Velocity, FPS	ft./sec.	5.30		
18. Flow length, L	ft.	531		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0278	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3093	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.31 Hour

19 min

STV / RWA
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.200		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0700		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1174	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.69		
17b. Input Velocity, FPS	ft./sec.	4.69		
18. Flow length, L	ft.	339		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0201	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1375	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.14 Hour
8 min

STV / RWA
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

JOB:	US 21/ SC 51 Phase I Widening			14
SUBJECT:	Culvert - CLP-17			SHEET
CALC'D BY:	SKH	DATE:	7-Jul-16	OF
CHECK'D BY:	GPP	DATE:	8-Jul-16	14

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	184		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0190		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2560	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2560	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.26 Hour

15 min

STV

STV Consulting Engineers			
454 South Anderson Road, Suite 3, BTC 517	JOB: US 21 NORTH PHASE AND SC 51		SHEET 1
Rock Hill, SC 29730 (803) 980-4970	SUBJECT: Drivewaypipe-11		OF 10
	CALC'D BY: PRJ/SCN	DATE: 19-Apr-21	
	CHECK'D BY: GPP	DATE: 19-Apr-21	

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1100		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0779	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	190		
9. Watercourse slope, s	ft./ft.	0.1000		
10. Average velocity, V (figure 3-1)	ft./sec.	5.10		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0103	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	5.00		
13. Wetted perimeter, p_w	ft.	10.20		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4902		
15. Channel slope, s	ft./ft.	0.0370		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.09		
17b. Input Velocity, FPS	ft./sec.	5.09		
18. Flow length, L	ft.	379		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0207	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1089	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.11 Hour

6.5 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21 NORTH PHASE AND SC 51		2 SHEET
	SUBJECT: Drivewaypipe-14		
	CALC'D BY: PRJ/SCN	DATE: 19-Apr-21	OF
	CHECK'D BY: GPP	DATE: 19-Apr-21	10

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	72		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0540		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.0796	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	46		
9. Watercourse slope, s	ft./ft.	0.0740		
10. Average velocity, V (figure 3-1)	ft./sec.	4.39		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0029	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0825	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.08 Hour

4.9 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21 NORTH PHASE AND SC 51 SUBJECT: Drivewaypipe-18 CALC'D BY: PRJ/SCN DATE: 19-Apr-21 CHECK'D BY: GPP DATE: 19-Apr-21	3 SHEET OF 10

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	160		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0330		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1835	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0150		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.03		
17b. Input Velocity, FPS	ft./sec.	5.03		
18. Flow length, L	ft.	544		
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0300	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2136	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.21 Hour

13 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21 NORTH PHASE AND SC 51 SUBJECT: Drivewaypipe-20 CALC'D BY: PRJ/SCN DATE: 19-Apr-21 CHECK'D BY: GPP DATE: 19-Apr-21

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	217		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2466	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	8.00		
13. Wetted perimeter, p_w	ft.	8.94		
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.	0.8949		
15. Channel slope, s	ft./ft.	0.0180		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.30		
17b. Input Velocity, FPS	ft./sec.	5.30		
18. Flow length, L	ft.	314		
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0164	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2631	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.26 Hour

16 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21 NORTH PHASE AND SC 51 SUBJECT: Drivewaypipe-21 CALC'D BY: PRJ/SCN DATE: 19-Apr-21 CHECK'D BY: GPP DATE: 19-Apr-21

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Path #1	Path #2	Path #3
Segment ID	AB		
1. Surface Description (table 3-1)	Grass		
2. Manning's roughness coefficient, n (table 3-1)	0.150		
3. Flow length, L (total L $\leq$ 300 ft) ft.	256		
4. Two-year 24-hour rainfall, P_2 in.	3.60		
5. Land slope, s ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr.	0.2815	0.0000	0.0000

Shallow concentrated flow

	Path #1	Path #2	Path #3
Segment ID			
7. Surface description (Paved or Unpaved)			
8. Flow length, L ft.			
9. Watercourse slope, s ft./ft.			
10. Average velocity, V (figure 3-1) ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t hr.	0.0000	0.0000	0.0000

Channel flow

	Path #1	Path #2	Path #3
Segment ID	BC		
12. Cross sectional flow area, a ft.^{2}	8.00		
13. Wetted perimeter, p_w ft.	8.94		
14. Hydraulic Radius, r = a / p_w Compute r ft.	0.8949		
15. Channel slope, s ft./ft.	0.0180		
16. Manning's roughness coefficient, n	0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft./sec.	5.30		
17b. Input Velocity, FPS ft./sec.	5.30		
18. Flow length, L ft.	473		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t hr.	0.0248	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19) hr.	0.3063	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.31 Hour

18 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21 NORTH PHASE AND SC 51 SUBJECT: Drivewaypipe-25		6 SHEET
	CALC'D BY: PRJ/SCN CHECK'D BY: GPP	DATE: 19-Apr-21 DATE: 19-Apr-21	OF 10

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	46		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0540		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0556	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.69		
17b. Input Velocity, FPS	ft./sec.	4.69		
18. Flow length, L	ft.	77		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0046	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0602	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.06 Hour

3.6 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21 NORTH PHASE AND SC 51 SUBJECT: Drivewaypipe-26 CALC'D BY: PRJ/SCN DATE: 19-Apr-21 CHECK'D BY: GPP DATE: 19-Apr-21

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.200		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0700		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1174	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	12.65		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9486		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.69		
17b. Input Velocity, FPS	ft./sec.	4.69		
18. Flow length, L	ft.	339		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0201	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1375	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.14 Hour

8 min

STV
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0310		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1292	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	48		
9. Watercourse slope, s	ft./ft.	0.0430		
10. Average velocity, V (figure 3-1)	ft./sec.	3.35		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0040	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	18.75		
13. Wetted perimeter, p_w	ft.	15.81		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.1860		
15. Channel slope, s	ft./ft.	0.0160		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	6.03		
17b. Input Velocity, FPS	ft./sec.	6.03		
18. Flow length, L	ft.	342		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0157	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1489	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.15 Hour
8.9 min

STV	JOB: US 21 NORTH PHASE AND SC 51	SHEET 9
Consulting Engineers	SUBJECT: Drivewaypipe-28	
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ/SCN DATE: 19-Apr-21	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 19-Apr-21	10

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Pavement	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.011	0.150	
3. Flow length, L (total L $\le$ 300 ft)	ft.	74	27	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0120	0.1000	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0184	0.0284	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	4.32		
13. Wetted perimeter, p_w	ft.	7.59		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.5692		
15. Channel slope, s	ft./ft.	0.0080		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.62		
17b. Input Velocity, FPS	ft./sec.	2.62		
18. Flow length, L	ft.	186		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0198	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0381	0.0284	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.04 Hour

2.3 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970					
	JOB:	US 21 NORTH PHASE AND SC 51			10 SHEET
	SUBJECT:	Drivewaypipe-32			
	CALC'D BY:	PRJ/SCN	DATE:	19-Apr-21	OF
	CHECK'D BY:	GPP	DATE:	19-Apr-21	10

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\le$ 300 ft)	ft.	57		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0280		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0106	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	3.00		
13. Wetted perimeter, p_w	ft.	6.32		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4747		
15. Channel slope, s	ft./ft.	0.0120		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.84		
17b. Input Velocity, FPS	ft./sec.	2.84		
18. Flow length, L	ft.	155		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0152	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0258	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.03 Hour

1.5 min

HY-8 Culvert Analysis Report
Existing Conditions

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 154 cfs

Design Flow: 185 cfs

Maximum Flow: 209 cfs

Table 1 - Summary of Culvert Flows at Crossing: EP-2

Headwater Elevation (ft)	Total Discharge (cfs)	XEP-2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
579.75	154.00	154.00	0.00	1
580.62	159.50	159.50	0.00	1
581.51	165.00	165.00	0.00	1
582.43	170.50	170.50	0.00	1
583.38	176.00	176.00	0.00	1
584.36	181.50	181.50	0.00	1
585.00	185.00	185.00	0.00	1
586.41	192.50	192.50	0.00	1
587.47	198.00	198.00	0.00	1
588.57	203.50	203.50	0.00	1
589.69	209.00	209.00	0.00	1
595.40	235.08	235.08	0.00	Overtopping

Rating Curve Plot for Crossing: EP-2

Table 2 - Culvert Summary Table: XEP-2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
154.00	154.00	579.75	8.914	11.953	4-FFf	2.000	2.000	2.000	2.584	15.400	7.688
159.50	159.50	580.62	9.490	12.818	4-FFf	2.000	2.000	2.000	2.618	15.950	7.756
165.00	165.00	581.51	10.085	13.711	4-FFf	2.000	2.000	2.000	2.652	16.500	7.822
170.50	170.50	582.43	10.701	14.633	4-FFf	2.000	2.000	2.000	2.684	17.050	7.887
176.00	176.00	583.38	11.337	15.584	4-FFf	2.000	2.000	2.000	2.717	17.600	7.949
181.50	181.50	584.36	11.993	16.563	4-FFf	2.000	2.000	2.000	2.748	18.150	8.011
185.00	185.00	585.00	12.422	17.201	4-FFf	2.000	2.000	2.000	2.768	18.500	8.049
192.50	192.50	586.41	13.366	18.607	4-FFf	2.000	2.000	2.000	2.809	19.250	8.129
198.00	198.00	587.47	14.083	19.672	4-FFf	2.000	2.000	2.000	2.839	19.800	8.187
203.50	203.50	588.57	14.820	20.765	4-FFf	2.000	2.000	2.000	2.869	20.350	8.243
209.00	209.00	589.69	15.577	21.887	4-FFf	2.000	2.000	2.000	2.897	20.900	8.298

****

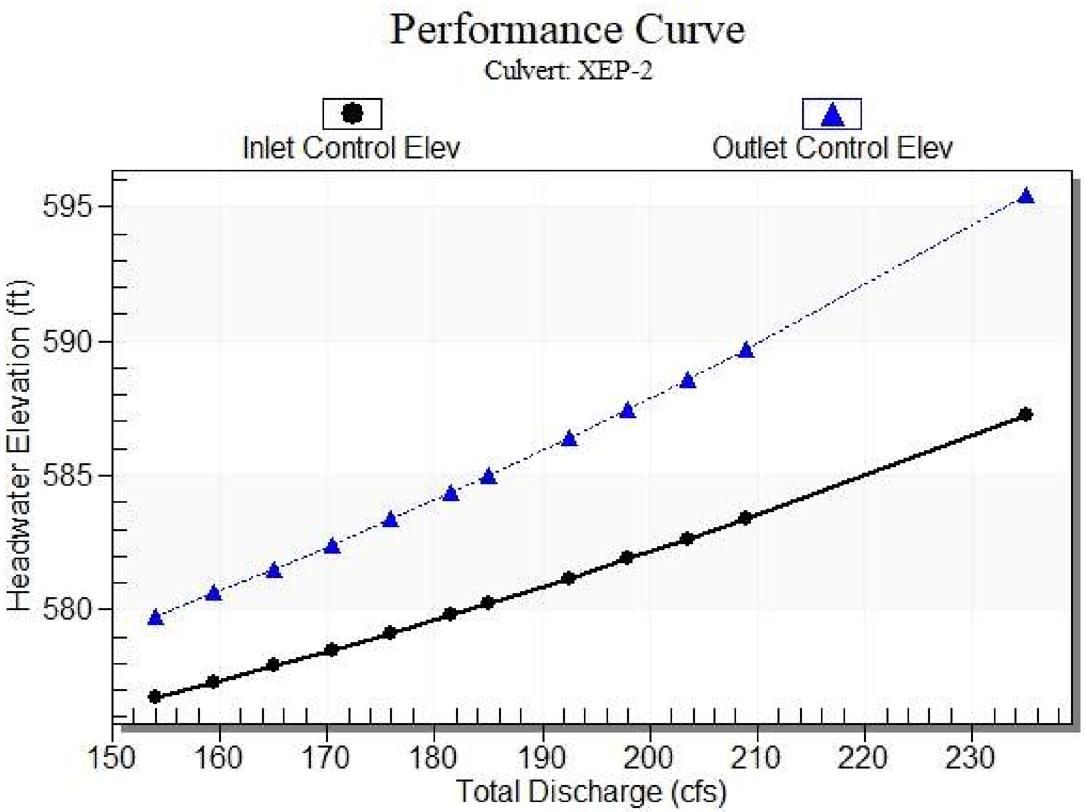
Straight Culvert

Inlet Elevation (invert): 567.80 ft, Outlet Elevation (invert): 565.74 ft

Culvert Length: 135.02 ft, Culvert Slope: 0.0153

****

Culvert Performance Curve Plot: XEP-2



Water Surface Profile Plot for Culvert: XEP-2

Site Data - XEP-2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 564.80 ft

Outlet Station: 135.00 ft

Outlet Elevation: 562.74 ft

Number of Barrels: 1

Culvert Data Summary - XEP-2

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 36.00 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: EP-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
154.00	568.32	2.58	7.69	4.03	1.19
159.50	568.36	2.62	7.76	4.08	1.19
165.00	568.39	2.65	7.82	4.14	1.20
170.50	568.42	2.68	7.89	4.19	1.20
176.00	568.46	2.72	7.95	4.24	1.20
181.50	568.49	2.75	8.01	4.29	1.20
185.00	568.51	2.77	8.05	4.32	1.21
192.50	568.55	2.81	8.13	4.38	1.21
198.00	568.58	2.84	8.19	4.43	1.21
203.50	568.61	2.87	8.24	4.48	1.21
209.00	568.64	2.90	8.30	4.52	1.21

Tailwater Channel Data - EP-2

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0250

Channel Manning's n: 0.0350

Channel Invert Elevation: 565.74 ft

Roadway Data for Crossing: EP-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 595.40 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 221 cfs

Design Flow: 242 cfs

Maximum Flow: 264 cfs

Table 4 - Summary of Culvert Flows at Crossing: EP-3

Headwater Elevation (ft)	Total Discharge (cfs)	EP-3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
573.72	221.00	221.00	0.00	1
573.83	225.30	225.30	0.00	1
573.95	229.60	229.60	0.00	1
574.06	233.90	233.90	0.00	1
574.19	238.20	238.20	0.00	1
574.29	242.00	242.00	0.00	1
574.43	246.80	246.80	0.00	1
574.56	251.10	251.10	0.00	1
574.69	255.40	255.40	0.00	1
574.82	259.70	259.70	0.00	1
574.95	264.00	264.00	0.00	1
588.90	540.90	540.90	0.00	Overtopping

Rating Curve Plot for Crossing: EP-3

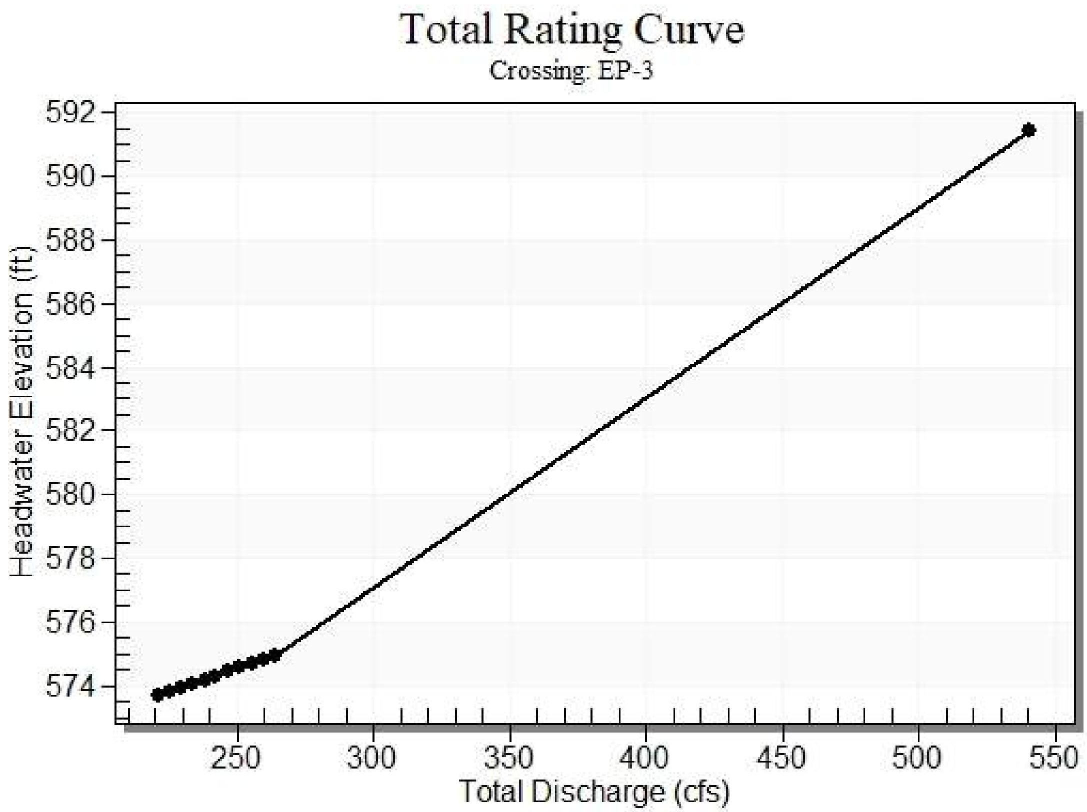


Table 5 - Culvert Summary Table: EP-3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
221.00	221.00	573.72	6.395	5.432	5-S2n	2.887	3.929	3.157	2.326	13.999	11.194
225.30	225.30	573.83	6.510	5.543	5-S2n	2.930	3.980	3.204	2.349	14.063	11.252
229.60	229.60	573.95	6.626	5.655	5-S2n	2.973	4.031	3.251	2.372	14.127	11.310
233.90	233.90	574.06	6.745	5.769	5-S2n	3.015	4.081	3.297	2.395	14.190	11.366
238.20	238.20	574.19	6.865	5.884	5-S2n	3.058	4.131	3.343	2.417	14.252	11.422
242.00	242.00	574.29	6.973	5.987	5-S2n	3.096	4.175	3.383	2.437	14.307	11.471
246.80	246.80	574.43	7.112	6.118	5-S2n	3.143	4.230	3.434	2.462	14.375	11.532
251.10	251.10	574.56	7.238	6.238	5-S2n	3.186	4.279	3.479	2.484	14.436	11.585
255.40	255.40	574.69	7.366	6.359	5-S2n	3.228	4.327	3.525	2.506	14.492	11.638
259.70	259.70	574.82	7.497	6.481	5-S2n	3.270	4.376	3.571	2.527	14.547	11.691
264.00	264.00	574.95	7.629	6.605	5-S2n	3.312	4.424	3.616	2.548	14.601	11.742

****

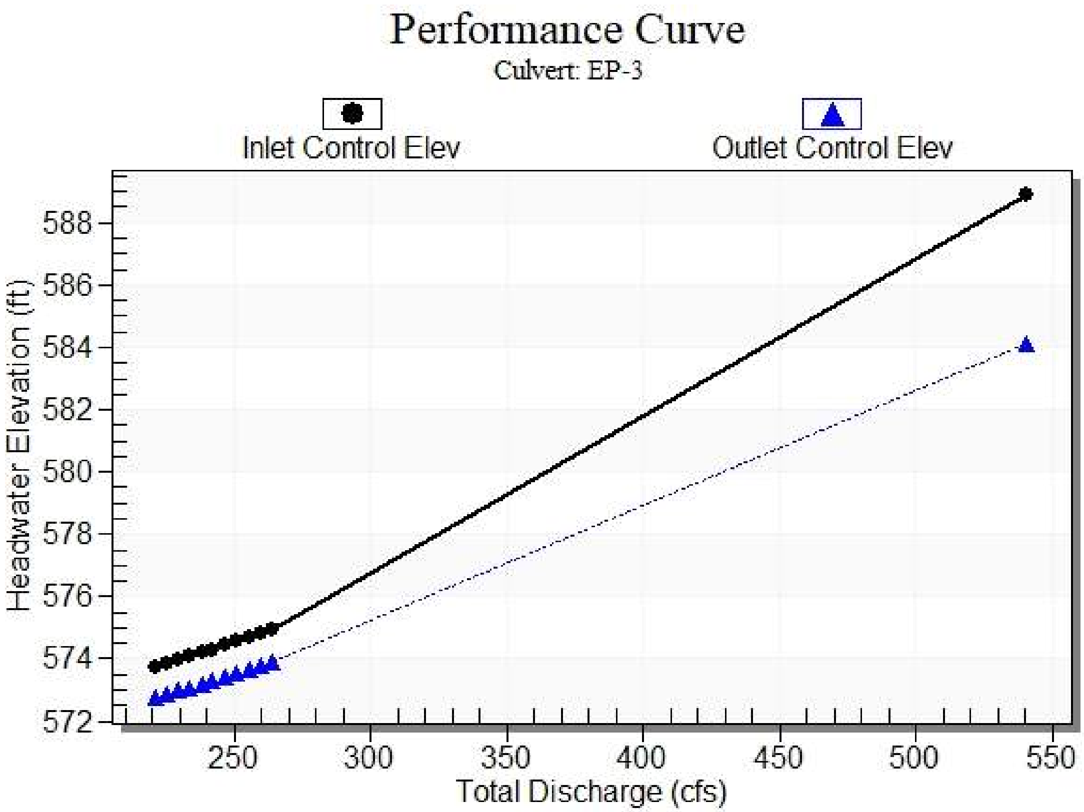
Straight Culvert

Inlet Elevation (invert): 567.32 ft, Outlet Elevation (invert): 566.12 ft

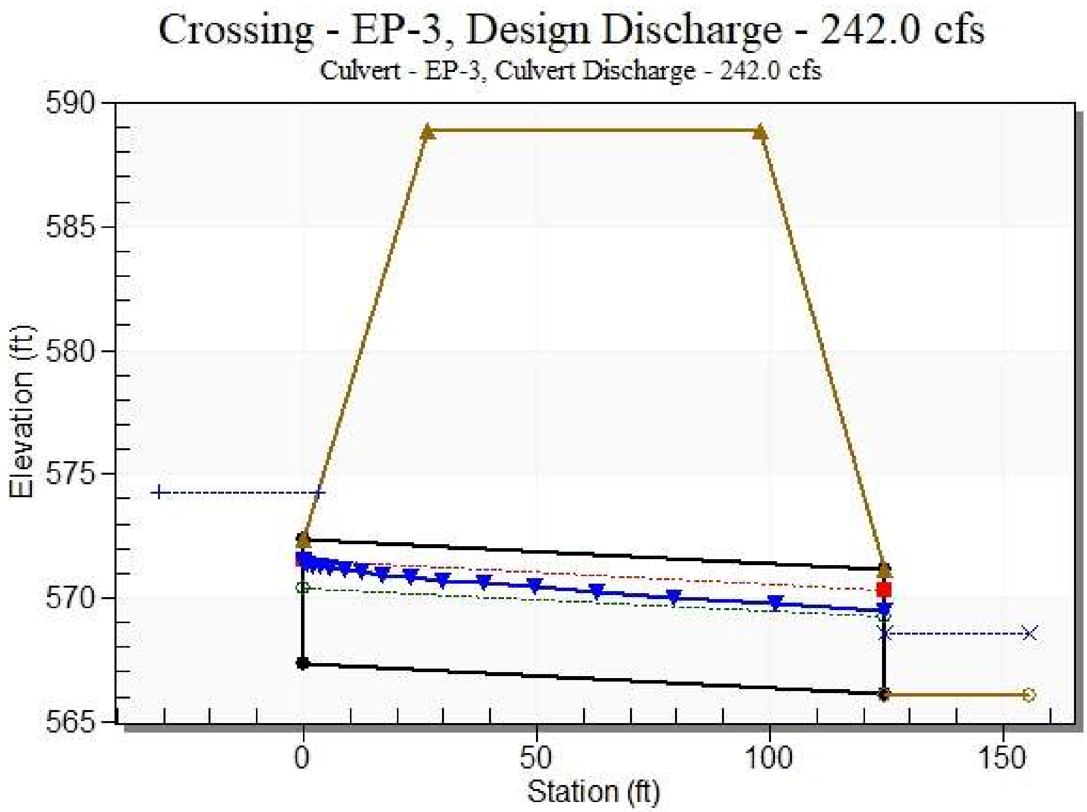
Culvert Length: 124.61 ft, Culvert Slope: 0.0096

****

Culvert Performance Curve Plot: EP-3



Water Surface Profile Plot for Culvert: EP-3



Site Data - EP-3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 567.32 ft

Outlet Station: 124.60 ft

Outlet Elevation: 566.12 ft

Number of Barrels: 1

Culvert Data Summary - EP-3

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: EP-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
221.00	568.41	2.33	11.19	6.01	1.54
225.30	568.43	2.35	11.25	6.07	1.54
229.60	568.45	2.37	11.31	6.13	1.54
233.90	568.47	2.39	11.37	6.19	1.54
238.20	568.50	2.42	11.42	6.25	1.54
242.00	568.52	2.44	11.47	6.30	1.54
246.80	568.54	2.46	11.53	6.36	1.55
251.10	568.56	2.48	11.58	6.42	1.55
255.40	568.59	2.51	11.64	6.47	1.55
259.70	568.61	2.53	11.69	6.53	1.55
264.00	568.63	2.55	11.74	6.58	1.55

Tailwater Channel Data - EP-3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0414

Channel Manning's n: 0.0350

Channel Invert Elevation: 566.08 ft

Roadway Data for Crossing: EP-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 588.90 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 42 cfs

Design Flow: 51 cfs

Maximum Flow: 58 cfs

Table 7 - Summary of Culvert Flows at Crossing: CLP-4-1

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
629.52	42.00	42.00	0.00	1
630.11	43.60	43.60	0.00	1
630.72	45.20	45.20	0.00	1
631.35	46.80	46.80	0.00	1
632.01	48.40	48.40	0.00	1
632.69	50.00	50.00	0.00	1
633.12	51.00	51.00	0.00	1
634.10	53.20	53.20	0.00	1
634.85	54.80	54.80	0.00	1
635.61	56.40	56.40	0.00	1
636.40	58.00	58.00	0.00	1
638.20	61.51	61.51	0.00	Overtopping

Rating Curve Plot for Crossing: CLP-4-1

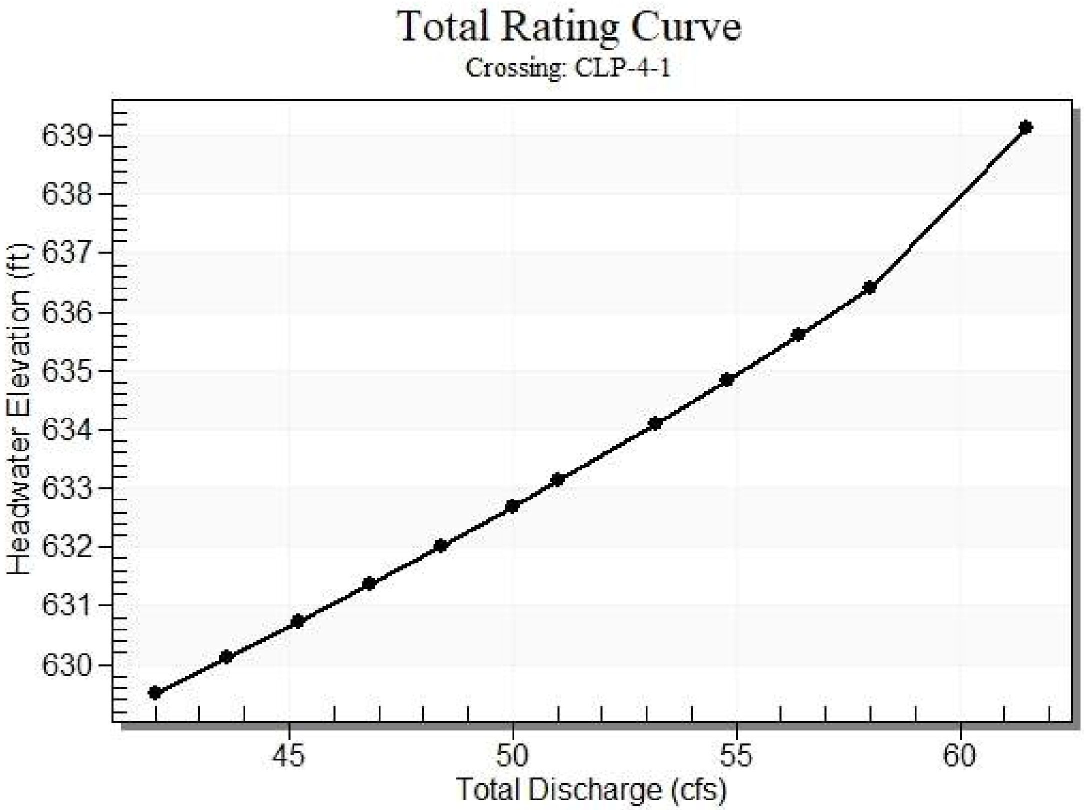


Table 8 - Culvert Summary Table: CLP-4

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
42.00	42.00	629.52	8.582	7.022	6-FFc	2.000	2.000	622.940	1.309	13.369	8.174
43.60	43.60	630.11	9.170	7.619	6-FFc	2.000	2.000	622.940	1.327	13.878	8.251
45.20	45.20	630.72	9.781	8.238	6-FFc	2.000	2.000	622.940	1.345	14.388	8.326
46.80	46.80	631.35	10.414	8.880	6-FFc	2.000	2.000	622.940	1.363	14.897	8.398
48.40	48.40	632.01	11.069	9.544	6-FFc	2.000	2.000	622.940	1.380	15.406	8.469
50.00	50.00	632.69	11.745	10.231	6-FFc	2.000	2.000	622.940	1.397	15.915	8.539
51.00	51.00	633.12	12.179	10.671	6-FFc	2.000	2.000	622.940	1.408	16.234	8.581
53.20	53.20	634.10	13.165	11.671	6-FFc	2.000	2.000	622.940	1.430	16.934	8.672
54.80	54.80	634.85	13.907	12.424	6-FFc	2.000	2.000	622.940	1.446	17.443	8.736
56.40	56.40	635.61	14.672	13.200	6-FFc	2.000	2.000	622.940	1.462	17.953	8.800
58.00	58.00	636.40	15.459	13.998	6-FFc	2.000	2.000	622.940	1.477	18.462	8.861

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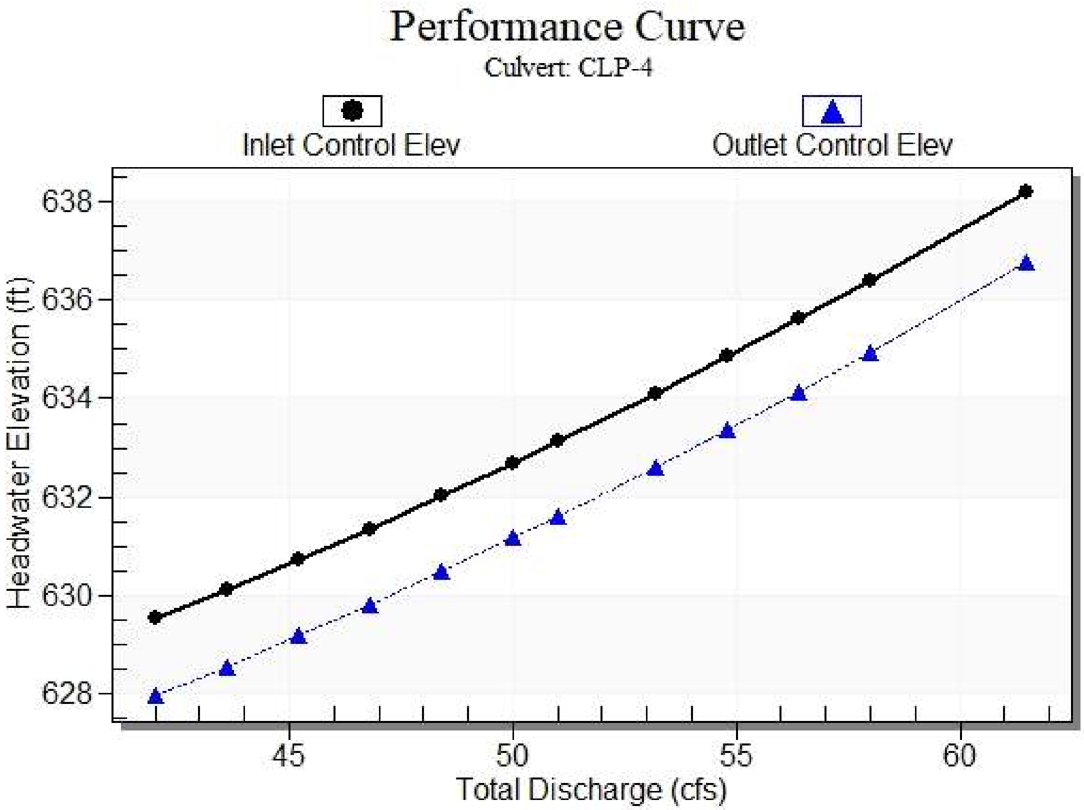
Straight Culvert

Inlet Elevation (invert): 620.94 ft,   Outlet Elevation (invert): 618.27 ft

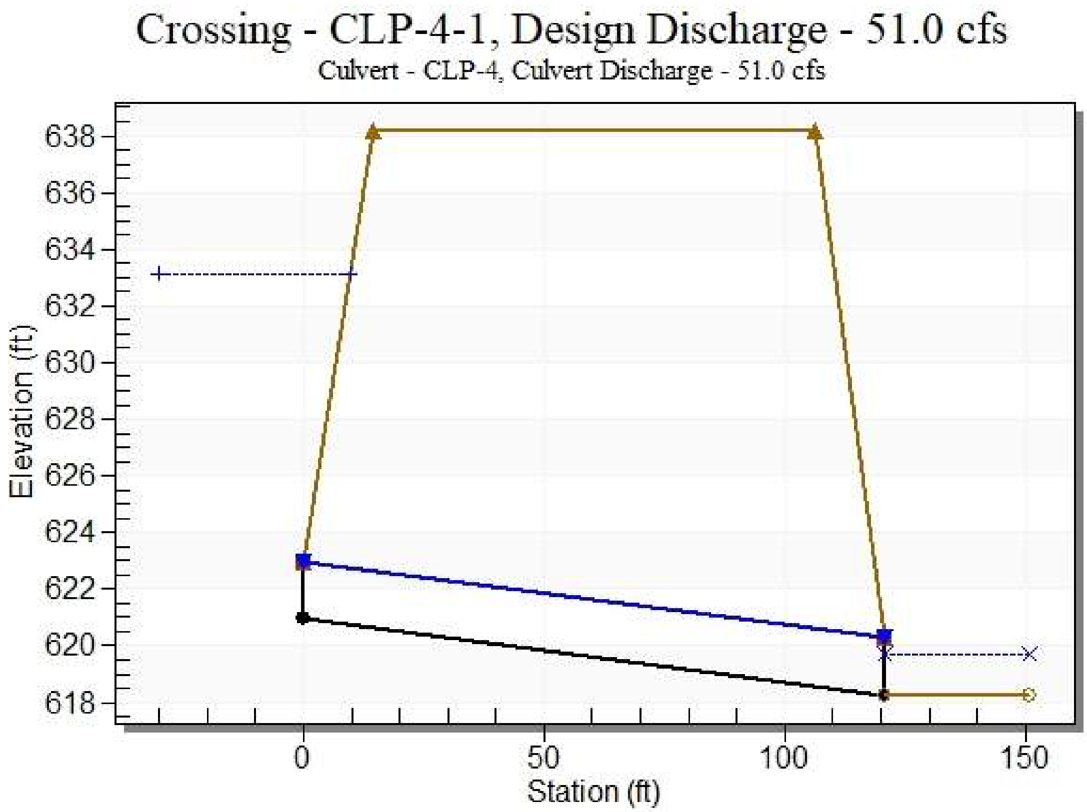
Culvert Length: 120.83 ft,   Culvert Slope: 0.0221

****

Culvert Performance Curve Plot: CLP-4



Water Surface Profile Plot for Culvert: CLP-4



Site Data - CLP-4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 620.94 ft

Outlet Station: 120.80 ft

Outlet Elevation: 618.27 ft

Number of Barrels: 1

Culvert Data Summary - CLP-4

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 9 - Downstream Channel Rating Curve (Crossing: CLP-4-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
42.00	619.58	1.31	8.17	5.72	1.78
43.60	619.60	1.33	8.25	5.80	1.78
45.20	619.62	1.35	8.33	5.88	1.79
46.80	619.63	1.36	8.40	5.95	1.79
48.40	619.65	1.38	8.47	6.03	1.80
50.00	619.67	1.40	8.54	6.10	1.80
51.00	619.68	1.41	8.58	6.15	1.80
53.20	619.70	1.43	8.67	6.25	1.81
54.80	619.72	1.45	8.74	6.32	1.81
56.40	619.73	1.46	8.80	6.38	1.81
58.00	619.75	1.48	8.86	6.45	1.82

Tailwater Channel Data - CLP-4-1

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0700

Channel Manning's n: 0.0350

Channel Invert Elevation: 618.27 ft

Roadway Data for Crossing: CLP-4-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 638.20 ft

Roadway Surface: Paved

Roadway Top Width: 92.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 44 cfs

Design Flow: 53 cfs

Maximum Flow: 59 cfs

Table 10 - Summary of Culvert Flows at Crossing: EP-6

Headwater Elevation (ft)	Total Discharge (cfs)	XEP-6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
593.43	44.00	44.00	0.00	1
593.46	45.50	45.50	0.00	1
593.50	47.00	47.00	0.00	1
593.54	48.50	48.50	0.00	1
593.57	50.00	50.00	0.00	1
593.61	51.50	51.50	0.00	1
593.64	53.00	53.00	0.00	1
593.67	54.50	54.50	0.00	1
593.71	56.00	56.00	0.00	1
593.74	57.50	57.50	0.00	1
593.78	59.00	59.00	0.00	1
599.27	307.57	307.57	0.00	Overtopping

Rating Curve Plot for Crossing: EP-6

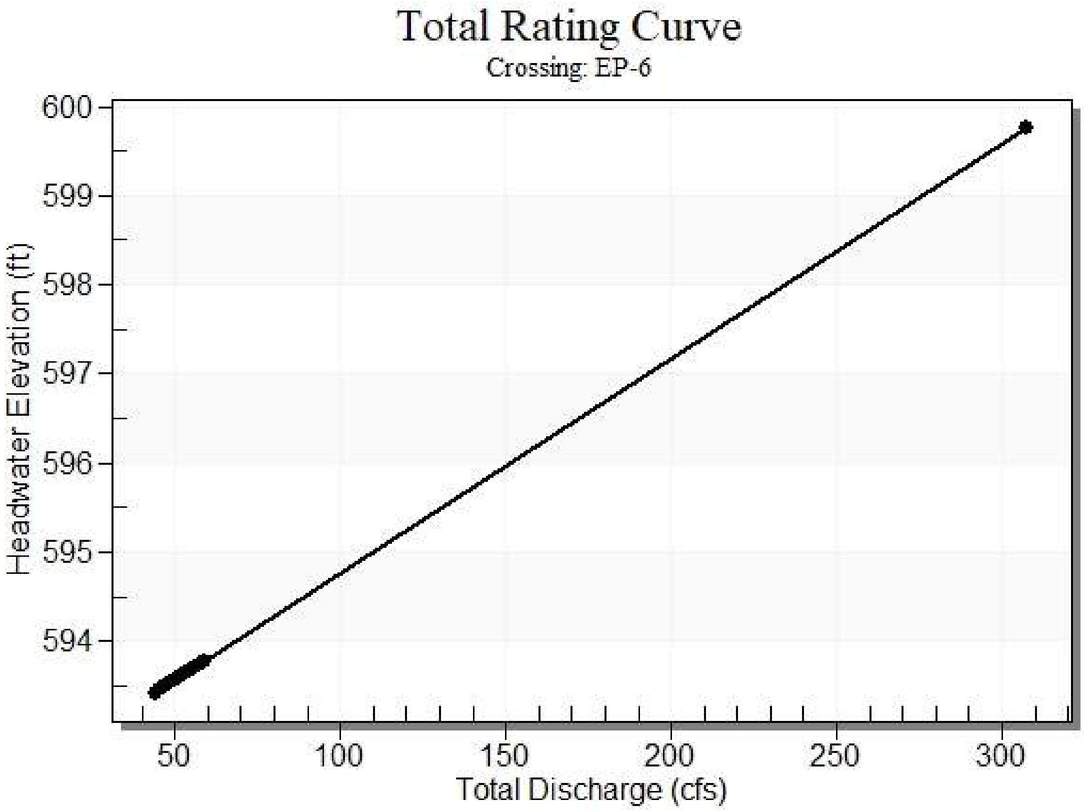


Table 11 - Culvert Summary Table: XEP-6

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
44.00	44.00	593.43	1.630	2.078	3-M1t	1.200	1.194	1.842	1.202	3.981	6.309
45.50	45.50	593.46	1.667	2.114	3-M1t	1.225	1.221	1.864	1.224	4.068	6.370
47.00	47.00	593.50	1.704	2.150	3-M1t	1.249	1.248	1.886	1.246	4.154	6.429
48.50	48.50	593.54	1.740	2.186	1-S1t	1.272	1.275	1.907	1.267	4.130	6.487
50.00	50.00	593.57	1.776	2.221	1-S1t	1.296	1.301	1.928	1.288	4.211	6.543
51.50	51.50	593.61	1.811	2.256	1-S1t	1.319	1.327	1.949	1.309	4.291	6.599
53.00	53.00	593.64	1.846	2.290	1-S1t	1.342	1.352	1.969	1.329	4.371	6.652
54.50	54.50	593.67	1.880	2.325	1-S1t	1.364	1.377	1.989	1.349	4.449	6.705
56.00	56.00	593.71	1.915	2.359	1-S1t	1.387	1.402	2.009	1.369	4.526	6.757
57.50	57.50	593.74	1.949	2.393	1-S1t	1.409	1.427	2.029	1.389	4.603	6.807
59.00	59.00	593.78	1.982	2.427	1-S1t	1.431	1.452	2.048	1.408	4.679	6.857

****

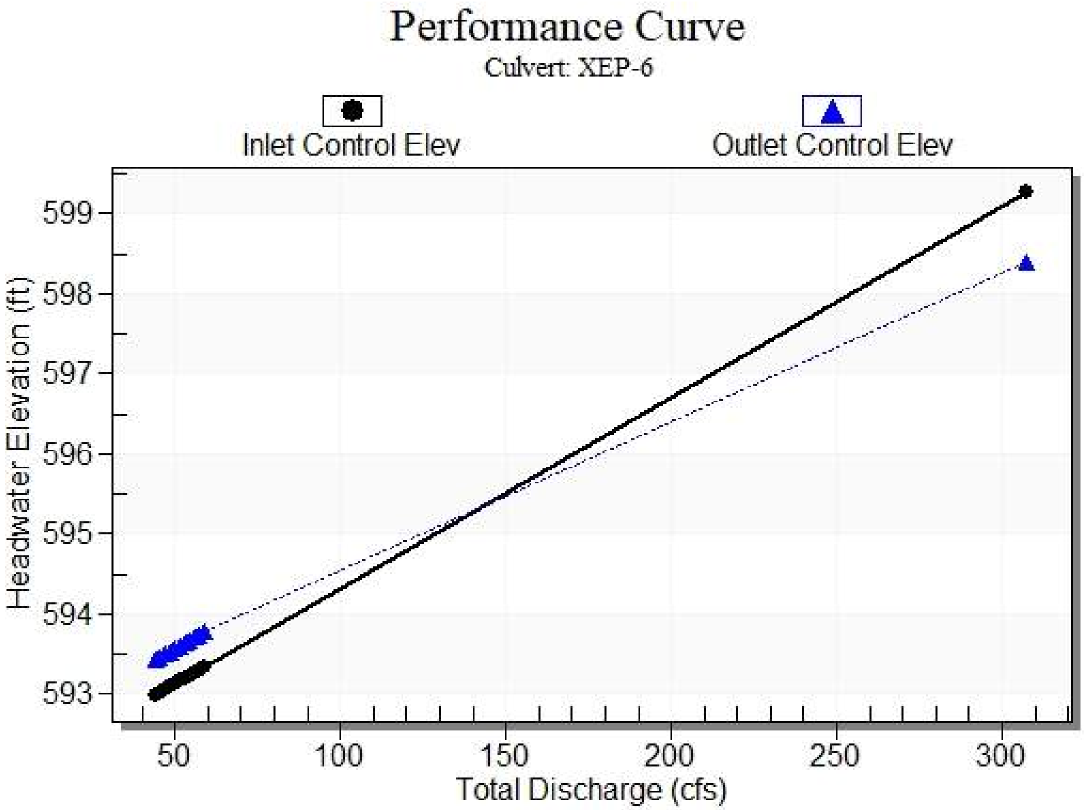
Straight Culvert

Inlet Elevation (invert): 591.35 ft, Outlet Elevation (invert): 591.26 ft

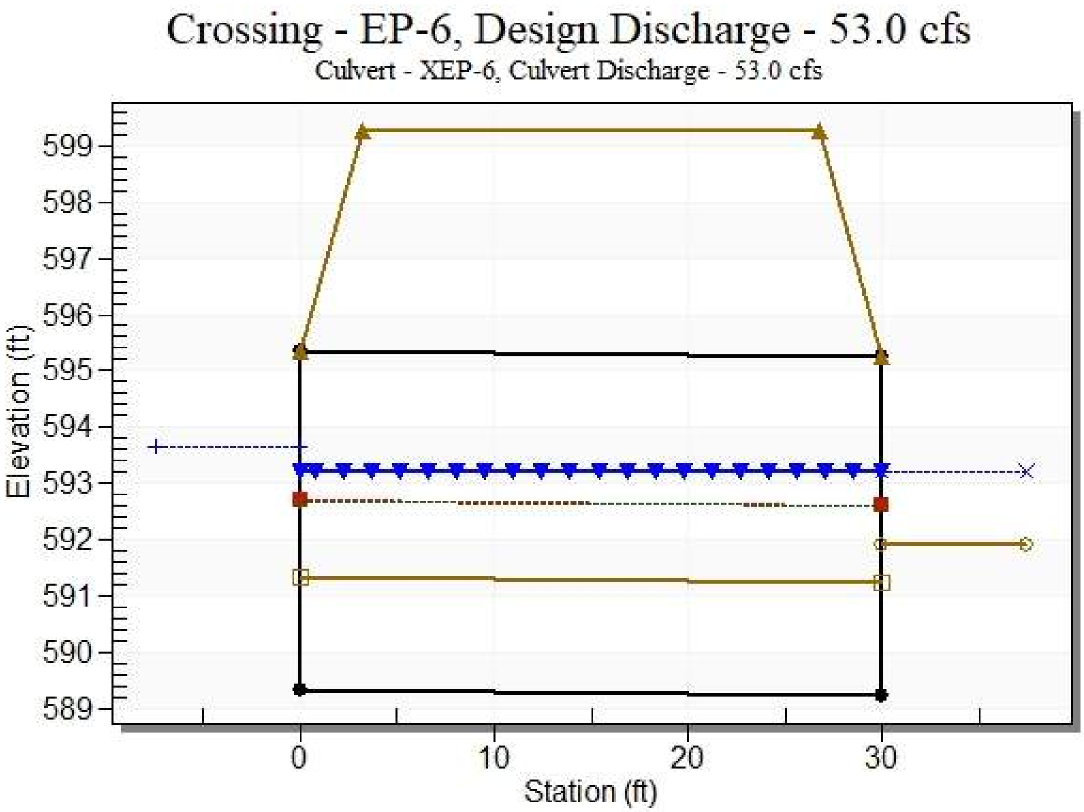
Culvert Length: 30.00 ft, Culvert Slope: 0.0030

****

Culvert Performance Curve Plot: XEP-6



Water Surface Profile Plot for Culvert: XEP-6



Site Data - XEP-6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 589.35 ft

Outlet Station: 30.00 ft

Outlet Elevation: 589.26 ft

Number of Barrels: 1

Culvert Data Summary - XEP-6

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 24.00 in

Barrel Manning's n: 0.0130 (top and sides)

Manning's n: 0.0130 (bottom)

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 12 - Downstream Channel Rating Curve (Crossing: EP-6)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
44.00	593.10	1.20	6.31	2.10	1.16
45.50	593.12	1.22	6.37	2.14	1.16
47.00	593.15	1.25	6.43	2.18	1.17
48.50	593.17	1.27	6.49	2.21	1.17
50.00	593.19	1.29	6.54	2.25	1.17
51.50	593.21	1.31	6.60	2.29	1.17
53.00	593.23	1.33	6.65	2.32	1.17
54.50	593.25	1.35	6.71	2.36	1.18
56.00	593.27	1.37	6.76	2.39	1.18
57.50	593.29	1.39	6.81	2.43	1.18
59.00	593.31	1.41	6.86	2.46	1.18

Tailwater Channel Data - EP-6

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0280

Channel Manning's n: 0.0350

Channel Invert Elevation: 591.90 ft

Roadway Data for Crossing: EP-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 599.27 ft

Roadway Surface: Paved

Roadway Top Width: 23.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 8 cfs

Design Flow: 9 cfs

Maximum Flow: 11 cfs

Table 13 - Summary of Culvert Flows at Crossing: EP-5

Headwater Elevation (ft)	Total Discharge (cfs)	EP-5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
655.38	8.00	8.00	0.00	1
655.42	8.30	8.30	0.00	1
655.47	8.60	8.60	0.00	1
655.52	8.90	8.90	0.00	1
655.53	9.00	9.00	0.00	1
655.62	9.50	9.50	0.00	1
655.67	9.80	9.80	0.00	1
655.72	10.10	10.10	0.00	1
655.78	10.40	10.40	0.00	1
655.83	10.70	10.70	0.00	1
655.89	11.00	11.00	0.00	1
664.00	32.07	32.07	0.00	Overtopping

Rating Curve Plot for Crossing: EP-5

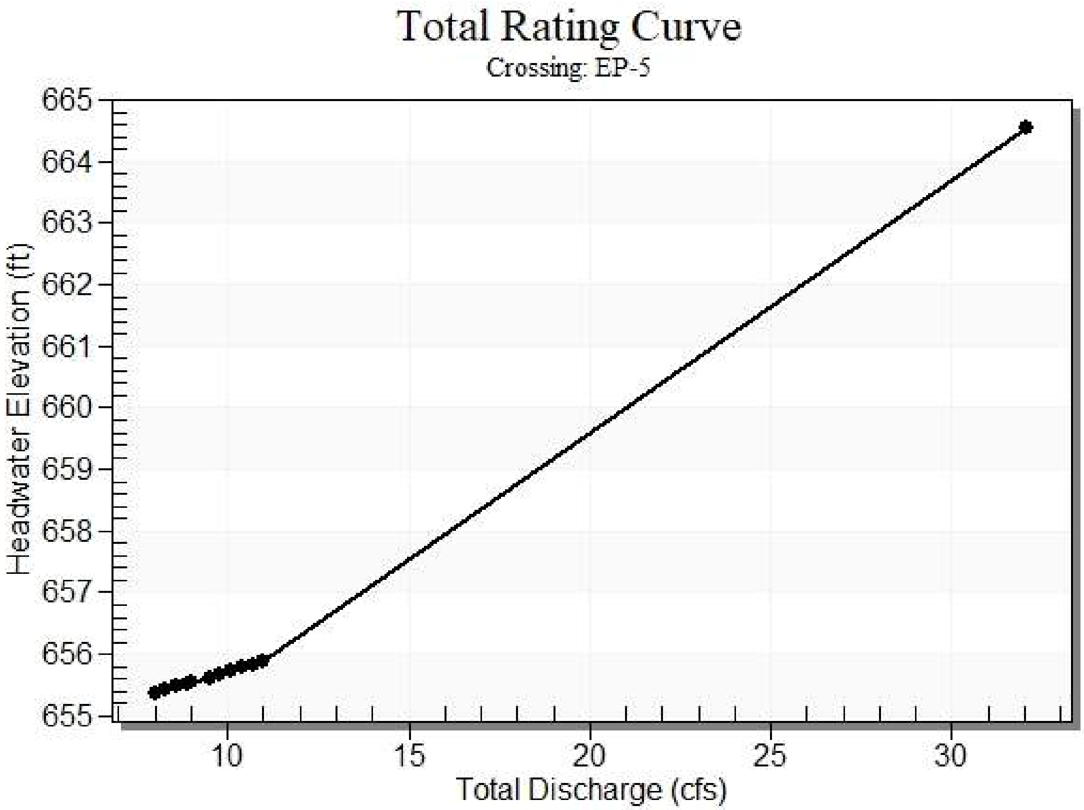


Table 14 - Culvert Summary Table: EP-5

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
8.00	8.00	655.38	1.607	0.0*	5-S2n	0.478	1.092	0.478	0.739	15.956	7.319
8.30	8.30	655.42	1.653	0.0*	5-S2n	0.487	1.112	0.487	0.750	16.129	7.387
8.60	8.60	655.47	1.700	0.0*	5-S2n	0.496	1.131	0.496	0.760	16.294	7.453
8.90	8.90	655.52	1.748	0.0*	5-S2n	0.505	1.150	0.540	0.769	15.021	7.517
9.00	9.00	655.53	1.765	0.0*	5-S2n	0.508	1.156	0.535	0.773	15.388	7.538
9.50	9.50	655.62	1.848	0.0*	5-S2n	0.523	1.189	0.523	0.788	16.736	7.641
9.80	9.80	655.67	1.900	0.0*	5-S2n	0.532	1.206	0.532	0.798	16.884	7.700
10.10	10.10	655.72	1.953	0.0*	5-S2n	0.541	1.223	0.541	0.807	17.029	7.758
10.40	10.40	655.78	2.007	0.0*	5-S2n	0.549	1.239	0.549	0.816	17.181	7.815
10.70	10.70	655.83	2.062	0.0*	5-S2n	0.558	1.255	0.593	0.824	15.901	7.871
11.00	11.00	655.89	2.119	0.0*	5-S2n	0.566	1.269	0.589	0.833	16.513	7.926

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 653.77 ft, Outlet Elevation (invert): 638.90 ft

Culvert Length: 161.98 ft, Culvert Slope: 0.0922

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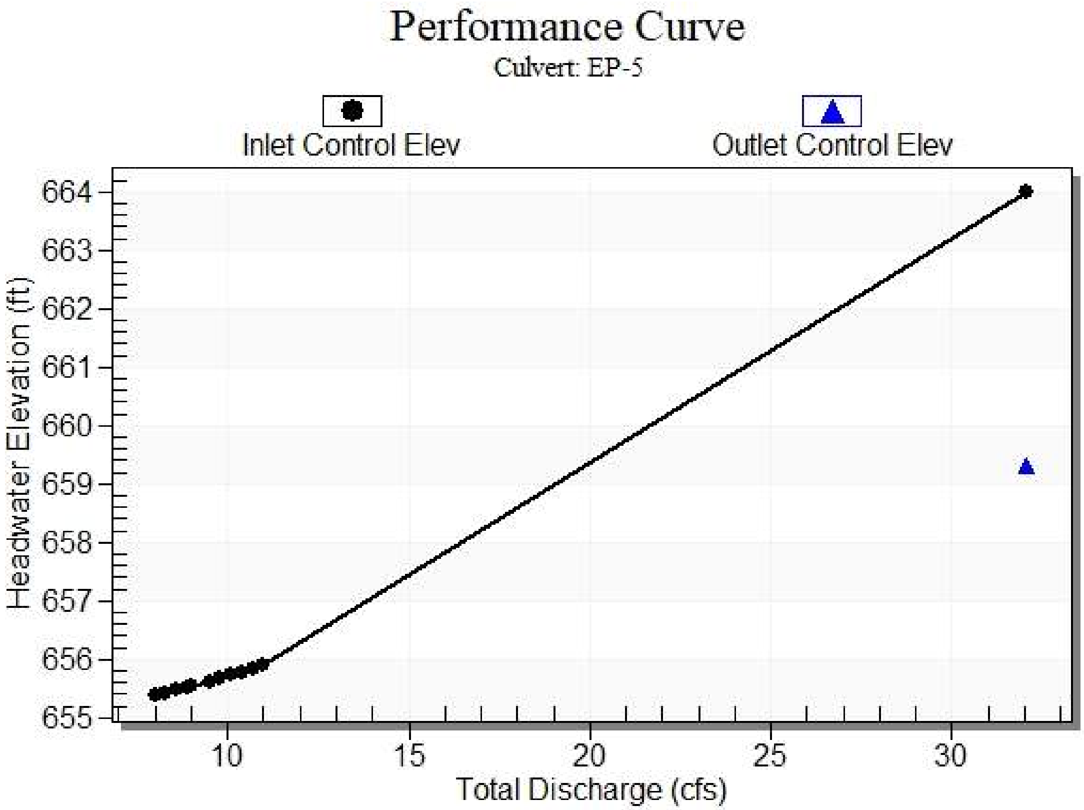
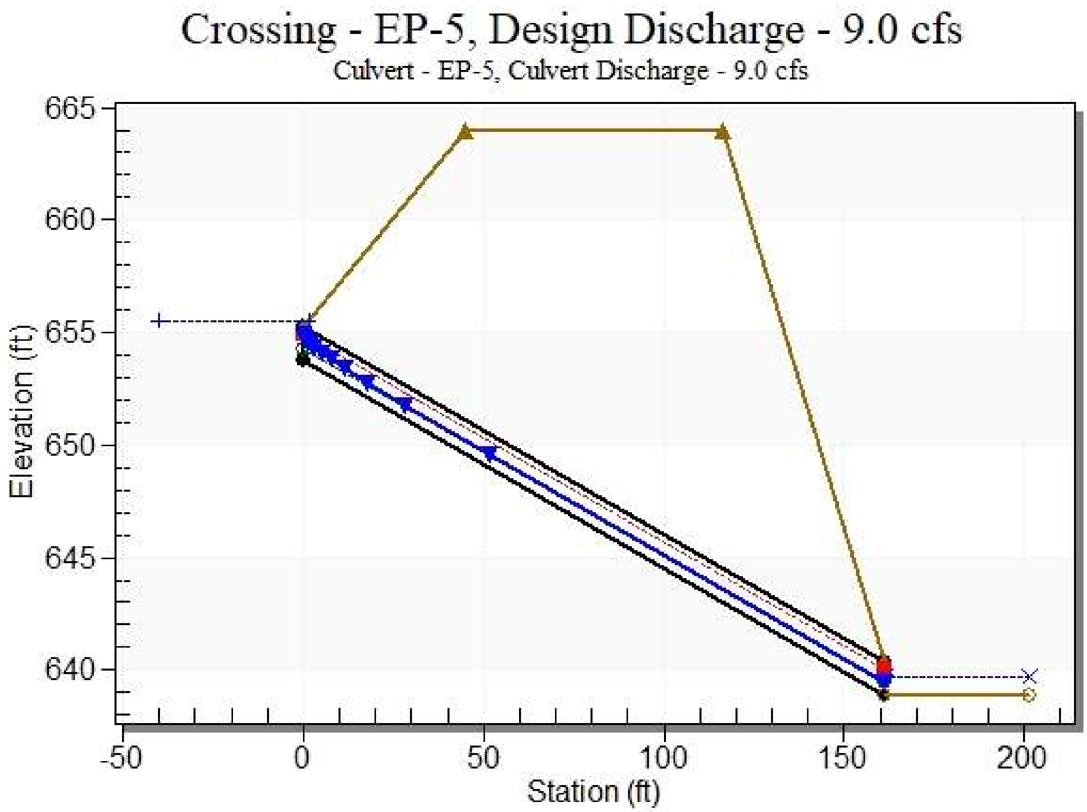
Culvert Performance Curve Plot: EP-5



Water Surface Profile Plot for Culvert: EP-5



Site Data - EP-5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 653.77 ft

Outlet Station: 161.30 ft

Outlet Elevation: 638.90 ft

Number of Barrels: 1

Culvert Data Summary - EP-5

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 15 - Downstream Channel Rating Curve (Crossing: EP-5)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
8.00	639.64	0.74	7.32	6.00	2.12
8.30	639.65	0.75	7.39	6.08	2.13
8.60	639.66	0.76	7.45	6.16	2.13
8.90	639.67	0.77	7.52	6.24	2.14
9.00	639.67	0.77	7.54	6.27	2.14
9.50	639.69	0.79	7.64	6.40	2.14
9.80	639.70	0.80	7.70	6.47	2.15
10.10	639.71	0.81	7.76	6.54	2.15
10.40	639.72	0.82	7.82	6.62	2.16
10.70	639.72	0.82	7.87	6.69	2.16
11.00	639.73	0.83	7.93	6.76	2.16

Tailwater Channel Data - EP-5

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.1300

Channel Manning's n: 0.0350

Channel Invert Elevation: 638.90 ft

Roadway Data for Crossing: EP-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 664.00 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5 cfs

Design Flow: 6.3 cfs

Maximum Flow: 8.6 cfs

Table 16 - Summary of Culvert Flows at Crossing: EP9

Headwater Elevation (ft)	Total Discharge (cfs)	EP-9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
661.34	5.00	5.00	0.00	1
661.40	5.36	5.36	0.00	1
661.45	5.72	5.72	0.00	1
661.50	6.08	6.08	0.00	1
661.53	6.30	6.30	0.00	1
661.60	6.80	6.80	0.00	1
661.66	7.16	7.16	0.00	1
661.71	7.52	7.52	0.00	1
661.77	7.88	7.88	0.00	1
661.83	8.24	8.24	0.00	1
661.89	8.60	8.60	0.00	1
667.46	24.51	24.51	0.00	Overtopping

Rating Curve Plot for Crossing: EP9

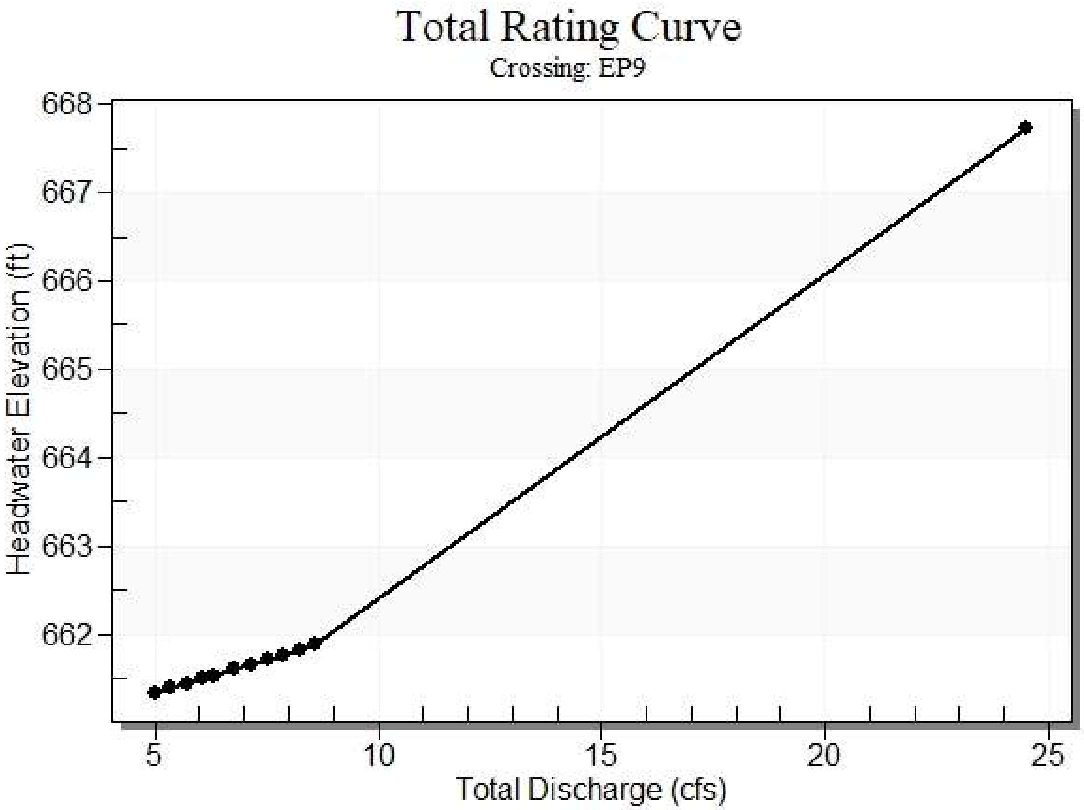


Table 17 - Culvert Summary Table: EP-9

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00	5.00	661.34	1.214	0.0*	1-S2n	0.459	0.856	0.482	0.489	9.849	3.488
5.36	5.36	661.40	1.266	0.0*	1-S2n	0.475	0.889	0.500	0.502	10.042	3.550
5.72	5.72	661.45	1.317	0.0*	1-S2n	0.492	0.919	0.492	0.514	10.964	3.608
6.08	6.08	661.50	1.368	0.0*	1-S2n	0.508	0.948	0.508	0.526	11.165	3.663
6.30	6.30	661.53	1.400	0.0*	1-S2n	0.518	0.965	0.560	0.533	10.112	3.696
6.80	6.80	661.60	1.472	0.0*	1-S2n	0.539	1.007	0.575	0.548	10.556	3.767
7.16	7.16	661.66	1.526	0.0*	5-S2n	0.555	1.033	0.555	0.559	11.650	3.816
7.52	7.52	661.71	1.581	0.0*	5-S2n	0.570	1.059	0.570	0.570	11.810	3.863
7.88	7.88	661.77	1.637	0.0*	5-S2n	0.584	1.084	0.630	0.580	10.804	3.909
8.24	8.24	661.83	1.696	0.0*	5-S2n	0.599	1.108	0.647	0.589	10.926	3.953
8.60	8.60	661.89	1.756	0.0*	5-S2n	0.613	1.131	0.661	0.599	11.085	3.995

* Full Flow Headwater elevation is below inlet invert.

****

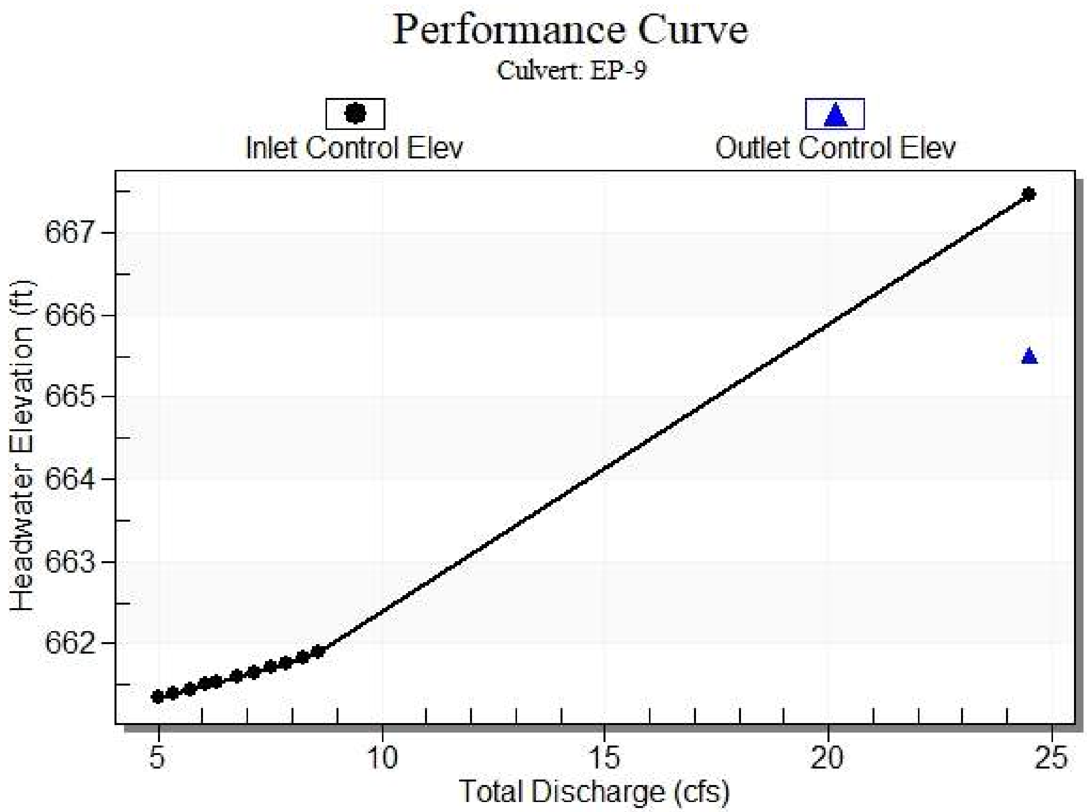
Straight Culvert

Inlet Elevation (invert): 660.13 ft,   Outlet Elevation (invert): 657.08 ft

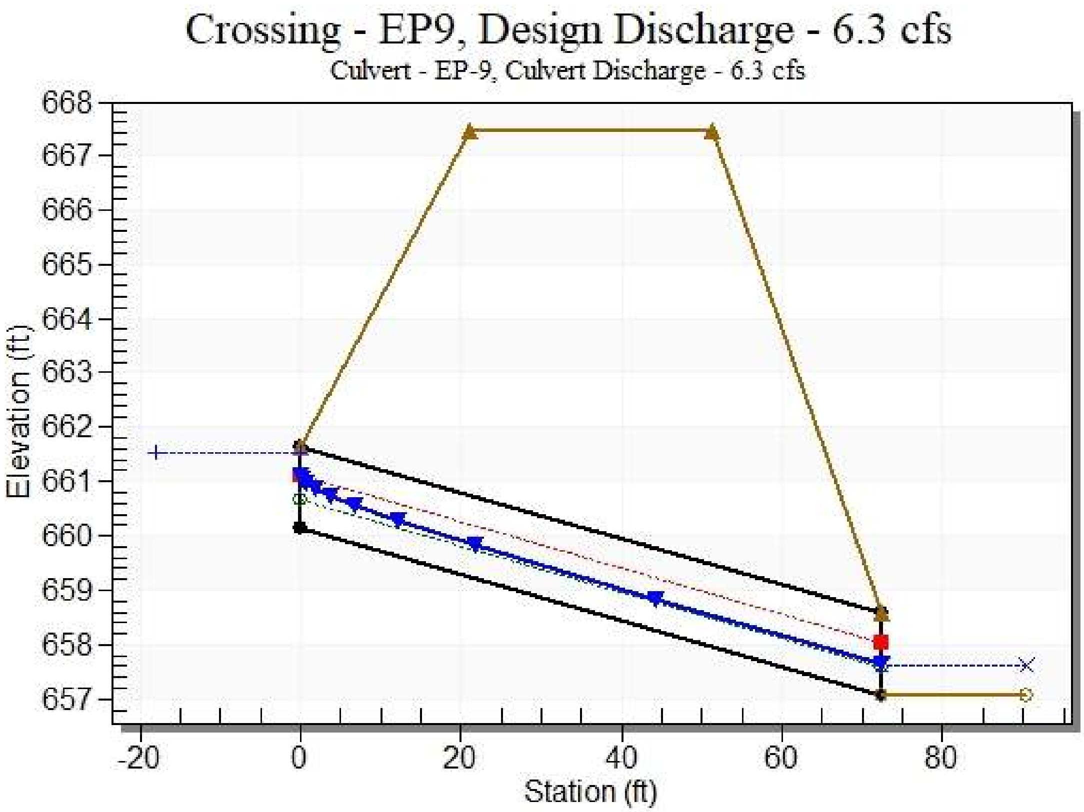
Culvert Length: 72.46 ft,   Culvert Slope: 0.0421

****

Culvert Performance Curve Plot: EP-9



Water Surface Profile Plot for Culvert: EP-9



Site Data - EP-9

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 660.13 ft

Outlet Station: 72.40 ft

Outlet Elevation: 657.08 ft

Number of Barrels: 1

Culvert Data Summary - EP-9

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 18 - Downstream Channel Rating Curve (Crossing: EP9)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
5.00	657.57	0.49	3.49	1.37	1.24
5.36	657.58	0.50	3.55	1.41	1.25
5.72	657.59	0.51	3.61	1.44	1.25
6.08	657.61	0.53	3.66	1.48	1.26
6.30	657.61	0.53	3.70	1.50	1.26
6.80	657.63	0.55	3.77	1.54	1.27
7.16	657.64	0.56	3.82	1.57	1.27
7.52	657.65	0.57	3.86	1.60	1.28
7.88	657.66	0.58	3.91	1.63	1.28
8.24	657.67	0.59	3.95	1.66	1.28
8.60	657.68	0.60	3.99	1.68	1.29

Tailwater Channel Data - EP9

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0450

Channel Manning's n: 0.0350

Channel Invert Elevation: 657.08 ft

Roadway Data for Crossing: EP9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 667.46 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2.8 cfs

Design Flow: 3.6 cfs

Maximum Flow: 4.9 cfs

Table 19 - Summary of Culvert Flows at Crossing: CLP12

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
642.68	2.80	2.80	0.00	1
642.73	3.01	3.01	0.00	1
642.77	3.22	3.22	0.00	1
642.81	3.43	3.43	0.00	1
642.84	3.60	3.60	0.00	1
642.88	3.85	3.85	0.00	1
642.92	4.06	4.06	0.00	1
642.96	4.27	4.27	0.00	1
643.00	4.48	4.48	0.00	1
643.04	4.69	4.69	0.00	1
643.08	4.90	4.90	0.00	1
645.01	11.58	11.58	0.00	Overtopping

Rating Curve Plot for Crossing: CLP12

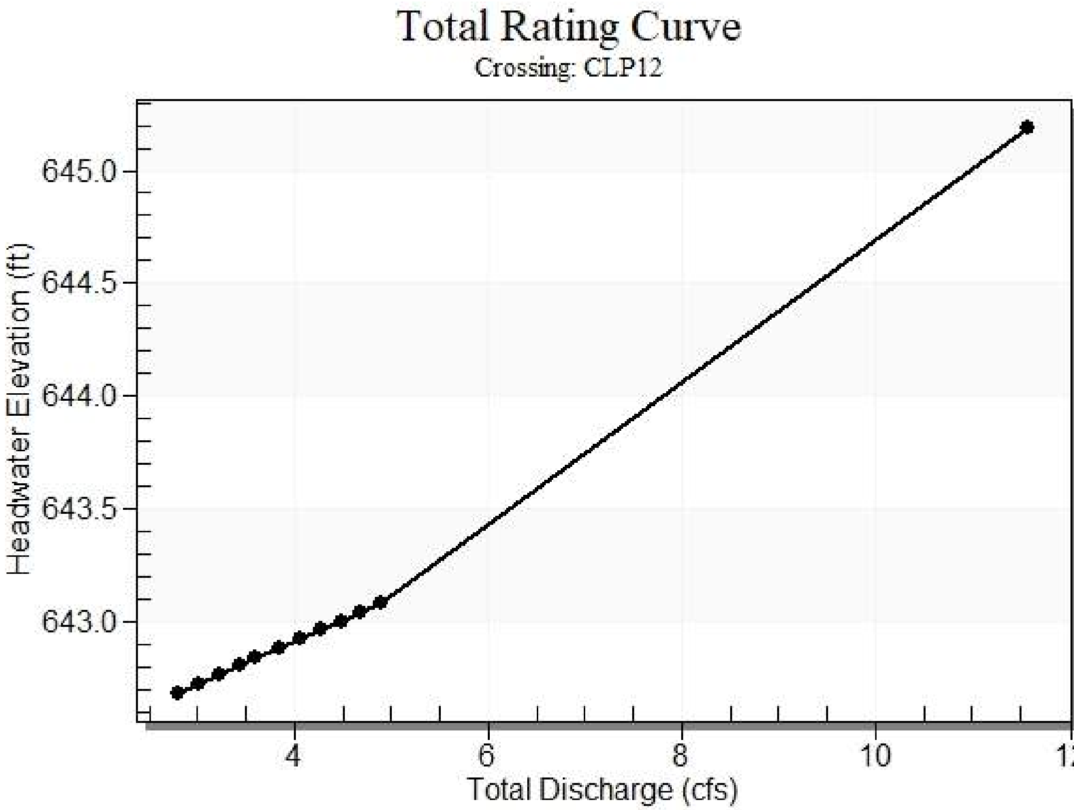


Table 20 - Culvert Summary Table: CLP-12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.80	2.80	642.68	0.954	0.0*	1-S2n	0.443	0.670	0.482	0.436	6.204	4.921
3.01	3.01	642.73	0.995	0.371	1-S2n	0.460	0.695	0.503	0.447	6.302	5.011
3.22	3.22	642.77	1.036	0.417	1-S2n	0.477	0.718	0.523	0.459	6.403	5.096
3.43	3.43	642.81	1.075	0.468	1-S2n	0.494	0.745	0.543	0.470	6.493	5.177
3.60	3.60	642.84	1.107	0.507	1-S2n	0.507	0.763	0.558	0.479	6.571	5.240
3.85	3.85	642.88	1.153	0.565	1-S2n	0.527	0.789	0.581	0.491	6.674	5.329
4.06	4.06	642.92	1.192	0.615	1-S2n	0.543	0.811	0.599	0.501	6.754	5.400
4.27	4.27	642.96	1.231	0.669	1-S2n	0.558	0.835	0.618	0.510	6.834	5.468
4.48	4.48	643.00	1.270	0.721	5-S2n	0.574	0.855	0.636	0.519	6.911	5.534
4.69	4.69	643.04	1.310	0.775	5-S2n	0.589	0.875	0.654	0.528	6.988	5.598
4.90	4.90	643.08	1.351	0.829	5-S2n	0.605	0.895	0.672	0.537	7.062	5.660

* Full Flow Headwater elevation is below inlet invert.

****

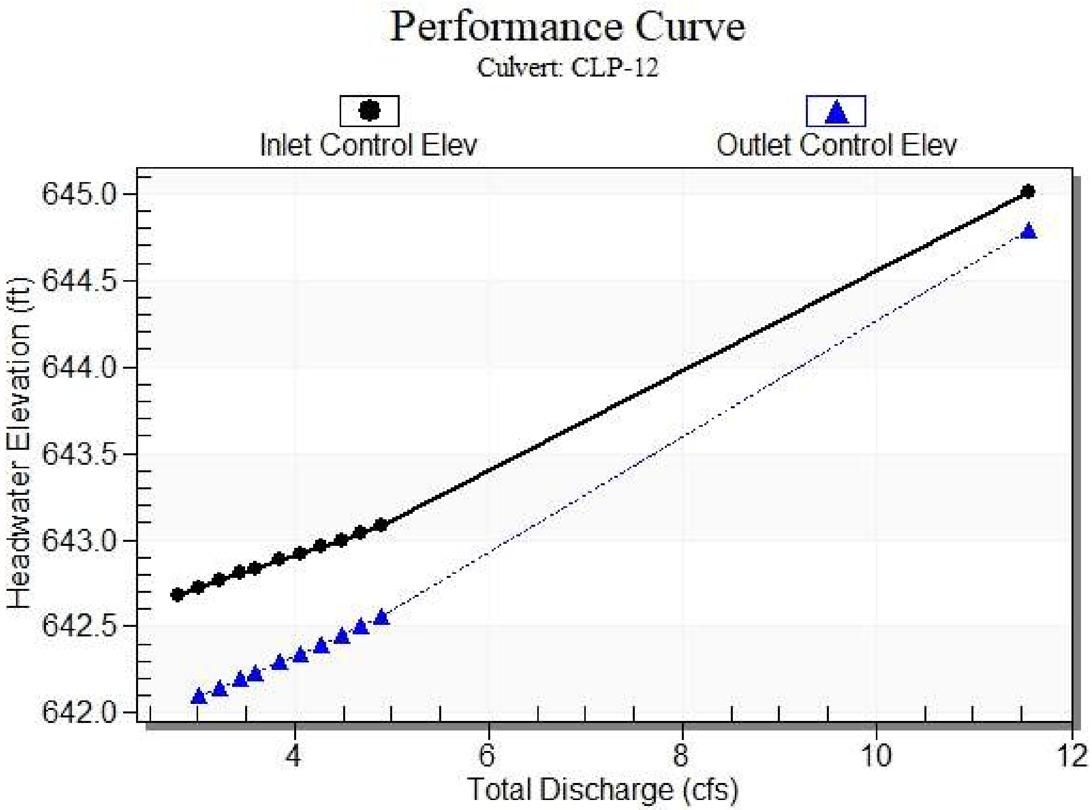
Straight Culvert

Inlet Elevation (invert): 641.73 ft,   Outlet Elevation (invert): 641.25 ft

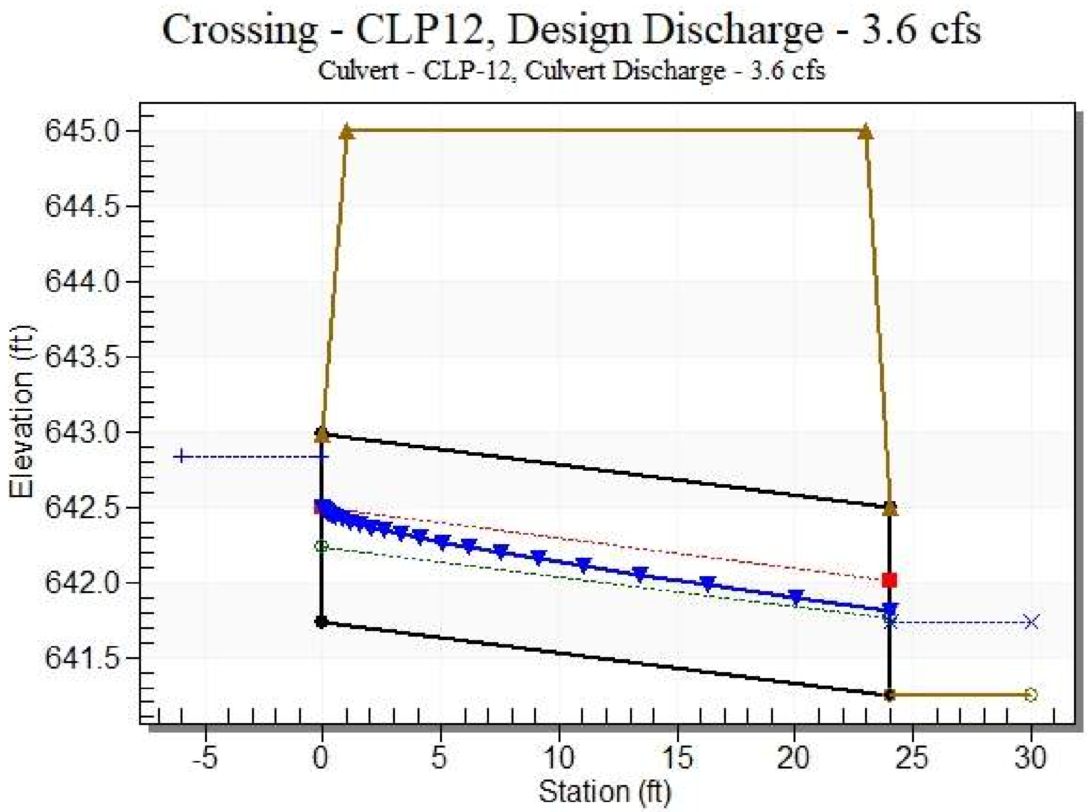
Culvert Length: 24.00 ft,   Culvert Slope: 0.0200

****

Culvert Performance Curve Plot: CLP-12



Water Surface Profile Plot for Culvert: CLP-12



Site Data - CLP-12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 641.73 ft

Outlet Station: 24.00 ft

Outlet Elevation: 641.25 ft

Number of Barrels: 1

Culvert Data Summary - CLP-12

Barrel Shape: Circular

Barrel Diameter: 1.25 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 21 - Downstream Channel Rating Curve (Crossing: CLP12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.80	641.69	0.44	4.92	2.99	1.86
3.01	641.70	0.45	5.01	3.07	1.87
3.22	641.71	0.46	5.10	3.15	1.87
3.43	641.72	0.47	5.18	3.23	1.88
3.60	641.73	0.48	5.24	3.28	1.89
3.85	641.74	0.49	5.33	3.37	1.90
4.06	641.75	0.50	5.40	3.44	1.90
4.27	641.76	0.51	5.47	3.50	1.91
4.48	641.77	0.52	5.53	3.57	1.91
4.69	641.78	0.53	5.60	3.63	1.92
4.90	641.79	0.54	5.66	3.69	1.92

Tailwater Channel Data - CLP12

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.1100

Channel Manning's n: 0.0350

Channel Invert Elevation: 641.25 ft

Roadway Data for Crossing: CLP12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 645.01 ft

Roadway Surface: Paved

Roadway Top Width: 22.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 1.6 cfs

Design Flow: 2.1 cfs

Maximum Flow: 2.8 cfs

Table 22 - Summary of Culvert Flows at Crossing: CLP13

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-13 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
614.54	1.60	1.60	0.00	1
614.58	1.72	1.72	0.00	1
614.61	1.84	1.84	0.00	1
614.64	1.96	1.96	0.00	1
614.66	2.08	2.08	0.00	1
614.67	2.10	2.10	0.00	1
614.72	2.32	2.32	0.00	1
614.74	2.44	2.44	0.00	1
614.77	2.56	2.56	0.00	1
614.79	2.68	2.68	0.00	1
614.82	2.80	2.80	0.00	1
618.64	14.63	14.63	0.00	Overtopping

Rating Curve Plot for Crossing: CLP13

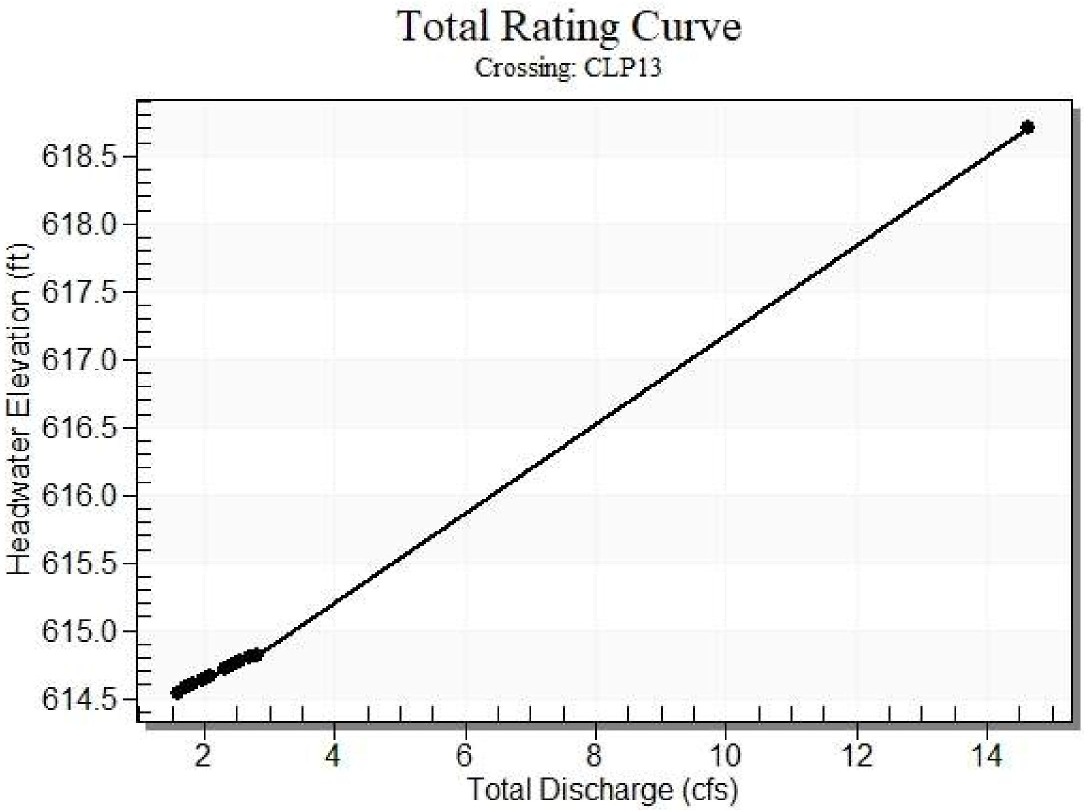


Table 23 - Culvert Summary Table: CLP-13

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.60	1.60	614.54	0.664	0.0*	1-S2n	0.270	0.499	0.285	0.426	7.369	2.202
1.72	1.72	614.58	0.696	0.0*	1-S2n	0.280	0.519	0.295	0.438	7.571	2.242
1.84	1.84	614.61	0.726	0.0*	1-S2n	0.289	0.539	0.305	0.449	7.732	2.280
1.96	1.96	614.64	0.756	0.0*	1-S2n	0.298	0.557	0.316	0.460	7.793	2.316
2.08	2.08	614.66	0.784	0.0*	1-S2n	0.308	0.575	0.327	0.470	7.906	2.351
2.10	2.10	614.67	0.789	0.0*	1-S2n	0.309	0.578	0.328	0.472	7.929	2.357
2.32	2.32	614.72	0.838	0.0*	1-S2n	0.325	0.609	0.346	0.490	8.106	2.416
2.44	2.44	614.74	0.864	0.0*	1-S2n	0.334	0.625	0.357	0.499	8.191	2.447
2.56	2.56	614.77	0.890	0.0*	1-S2n	0.342	0.641	0.367	0.508	8.279	2.476
2.68	2.68	614.79	0.914	0.0*	1-S2n	0.350	0.656	0.377	0.517	8.319	2.505
2.80	2.80	614.82	0.939	0.0*	1-S2n	0.358	0.670	0.385	0.526	8.425	2.532

* Full Flow Headwater elevation is below inlet invert.

****

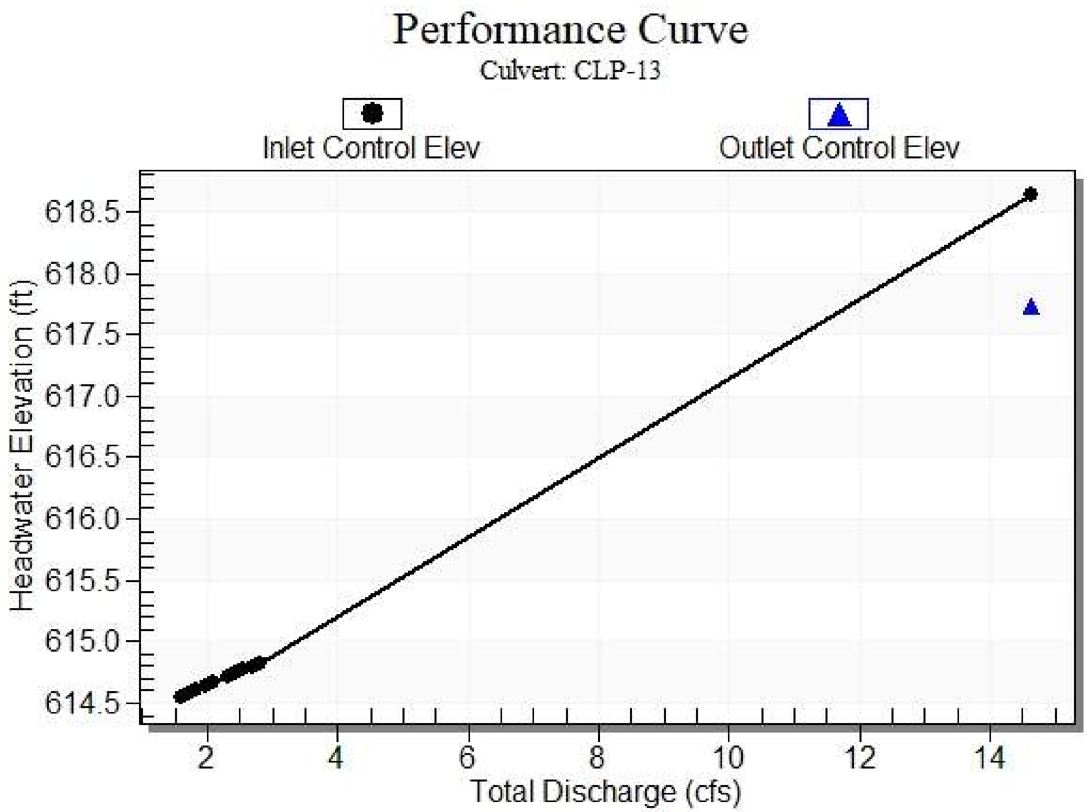
Straight Culvert

Inlet Elevation (invert): 613.88 ft, Outlet Elevation (invert): 612.35 ft

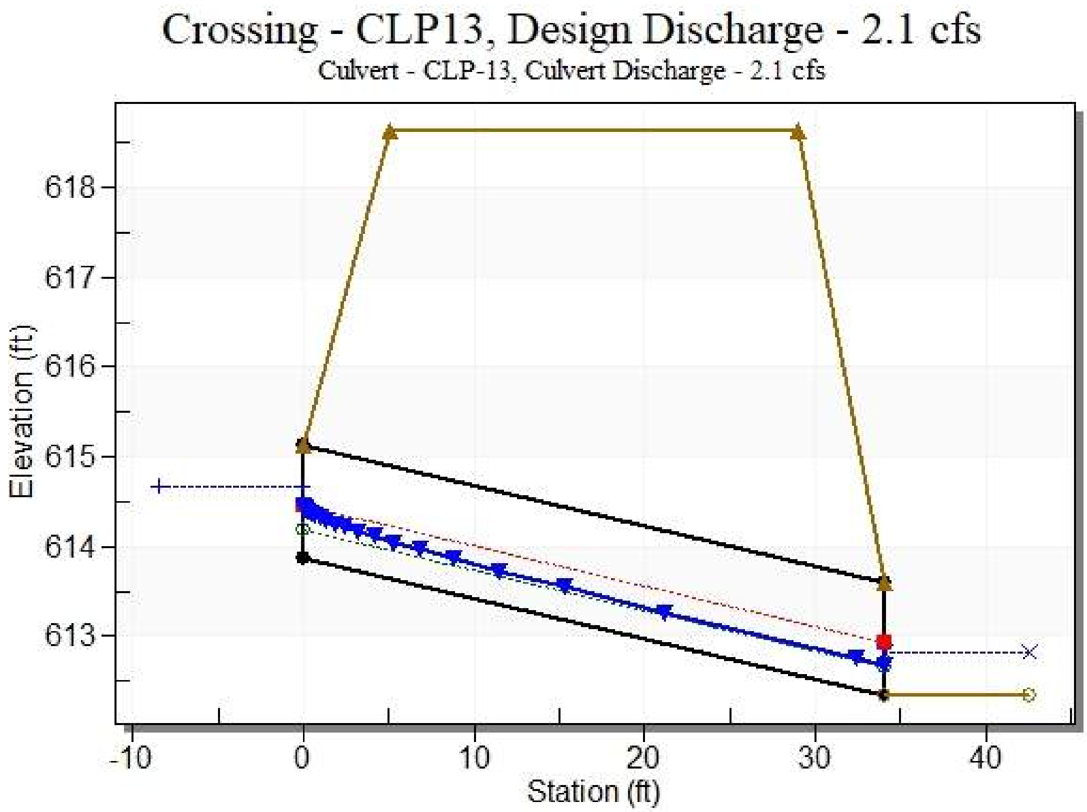
Culvert Length: 34.13 ft, Culvert Slope: 0.0449

****

Culvert Performance Curve Plot: CLP-13



Water Surface Profile Plot for Culvert: CLP-13



Site Data - CLP-13

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 613.88 ft

Outlet Station: 34.10 ft

Outlet Elevation: 612.35 ft

Number of Barrels: 1

Culvert Data Summary - CLP-13

Barrel Shape: Circular

Barrel Diameter: 1.25 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 24 - Downstream Channel Rating Curve (Crossing: CLP13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
1.60	612.78	0.43	2.20	0.59	0.84
1.72	612.79	0.44	2.24	0.60	0.84
1.84	612.80	0.45	2.28	0.62	0.85
1.96	612.81	0.46	2.32	0.63	0.85
2.08	612.82	0.47	2.35	0.65	0.85
2.10	612.82	0.47	2.36	0.65	0.85
2.32	612.84	0.49	2.42	0.67	0.86
2.44	612.85	0.50	2.45	0.69	0.86
2.56	612.86	0.51	2.48	0.70	0.87
2.68	612.87	0.52	2.50	0.71	0.87
2.80	612.88	0.53	2.53	0.72	0.87

Tailwater Channel Data - CLP13

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0220

Channel Manning's n: 0.0350

Channel Invert Elevation: 612.35 ft

Roadway Data for Crossing: CLP13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 618.64 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Table 1 - Summary of Culvert Flows at Crossing: CLP16

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CLP-16 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
630.01	10-Year	15.00	15.00	0.00	1
630.35	25-Year	18.00	18.00	0.00	1
630.77	50-Year	22.00	22.00	0.00	1
631.25	100-Year	25.00	25.00	0.00	1
634.09	Overtopping	39.47	39.47	0.00	Overtopping

Rating Curve Plot for Crossing: CLP16

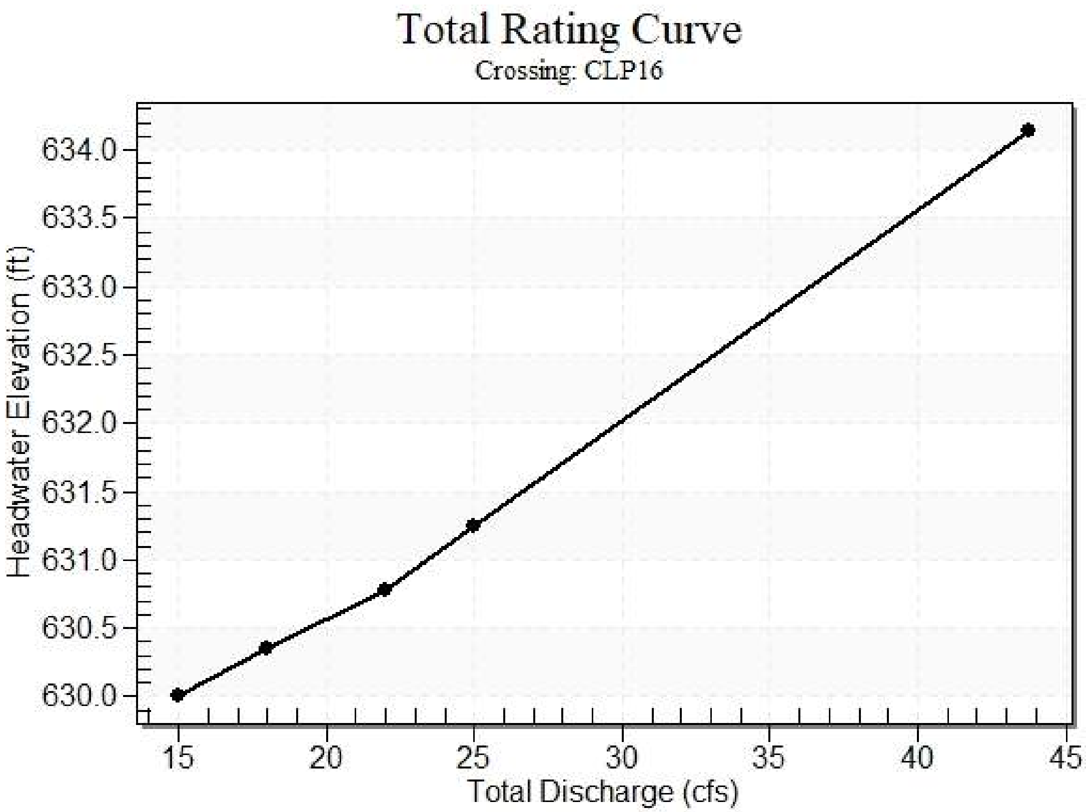


Table 2 - Culvert Summary Table: CLP-16

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10-Year	15.00	15.00	630.01	2.092	1.682	5-S2n	1.342	1.396	1.344	0.919	6.683	2.963
25-Year	18.00	18.00	630.35	2.389	2.435	7-M2c	1.555	1.528	1.528	0.984	6.988	3.101
50-Year	22.00	22.00	630.77	2.840	2.853	7-M2c	2.000	1.675	1.675	1.060	7.830	3.261
100-Year	25.00	25.00	631.25	3.226	3.330	7-M2c	2.000	1.762	1.762	1.112	8.532	3.367

****

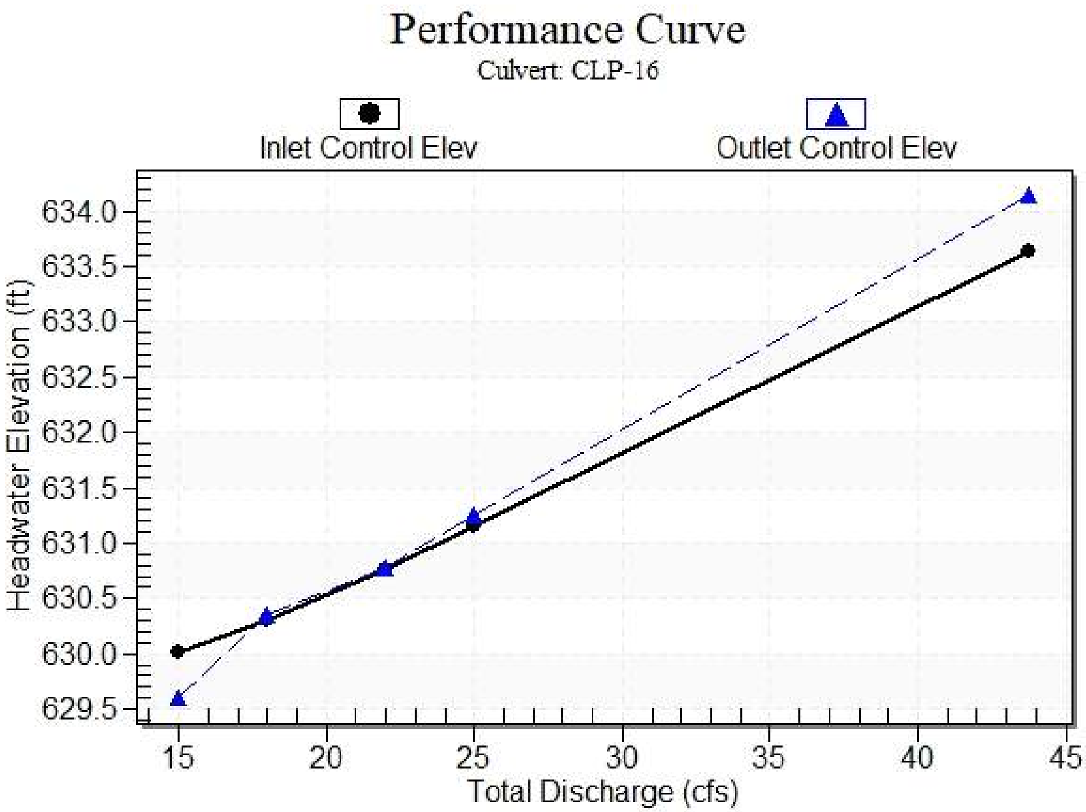
Straight Culvert

Inlet Elevation (invert): 627.92 ft, Outlet Elevation (invert): 627.55 ft

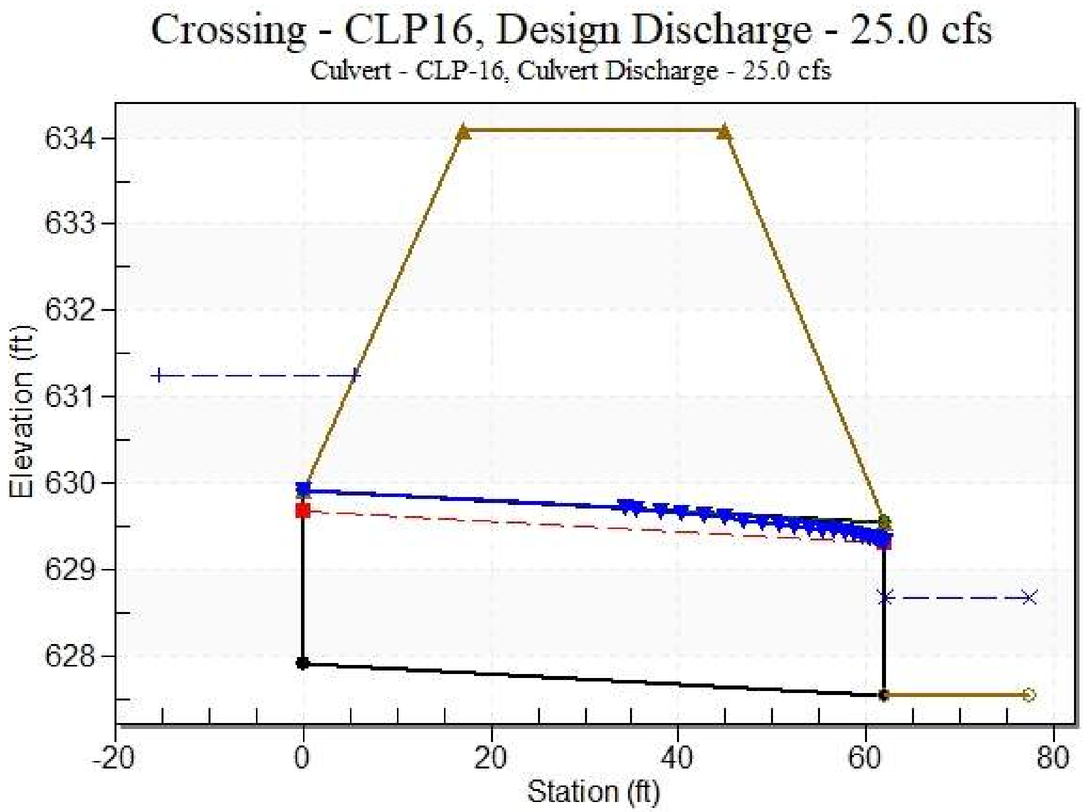
Culvert Length: 62.00 ft, Culvert Slope: 0.0060

****

Culvert Performance Curve Plot: CLP-16



Water Surface Profile Plot for Culvert: CLP-16



Site Data - CLP-16

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 627.92 ft

Outlet Station: 62.00 ft

Outlet Elevation: 627.55 ft

Number of Barrels: 1

Culvert Data Summary - CLP-16

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CLP16)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.00	628.47	0.92	2.96	0.80	0.77
18.00	628.53	0.98	3.10	0.86	0.78
22.00	628.61	1.06	3.26	0.93	0.79
25.00	628.66	1.11	3.37	0.97	0.80

Tailwater Channel Data - CLP16

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0140

Channel Manning's n: 0.0350

Channel Invert Elevation: 627.55 ft

Roadway Data for Crossing: CLP16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 634.09 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 221 cfs

Design Flow: 242 cfs

Maximum Flow: 264 cfs

Table 28 - Summary of Culvert Flows at Crossing: XEP-3

Headwater Elevation (ft)	Total Discharge (cfs)	XEP-3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
573.72	221.00	221.00	0.00	1
573.83	225.30	225.30	0.00	1
573.95	229.60	229.60	0.00	1
574.06	233.90	233.90	0.00	1
574.19	238.20	238.20	0.00	1
574.29	242.00	242.00	0.00	1
574.43	246.80	246.80	0.00	1
574.56	251.10	251.10	0.00	1
574.69	255.40	255.40	0.00	1
574.82	259.70	259.70	0.00	1
574.95	264.00	264.00	0.00	1
588.90	540.90	540.90	0.00	Overtopping

Rating Curve Plot for Crossing: XEP-3

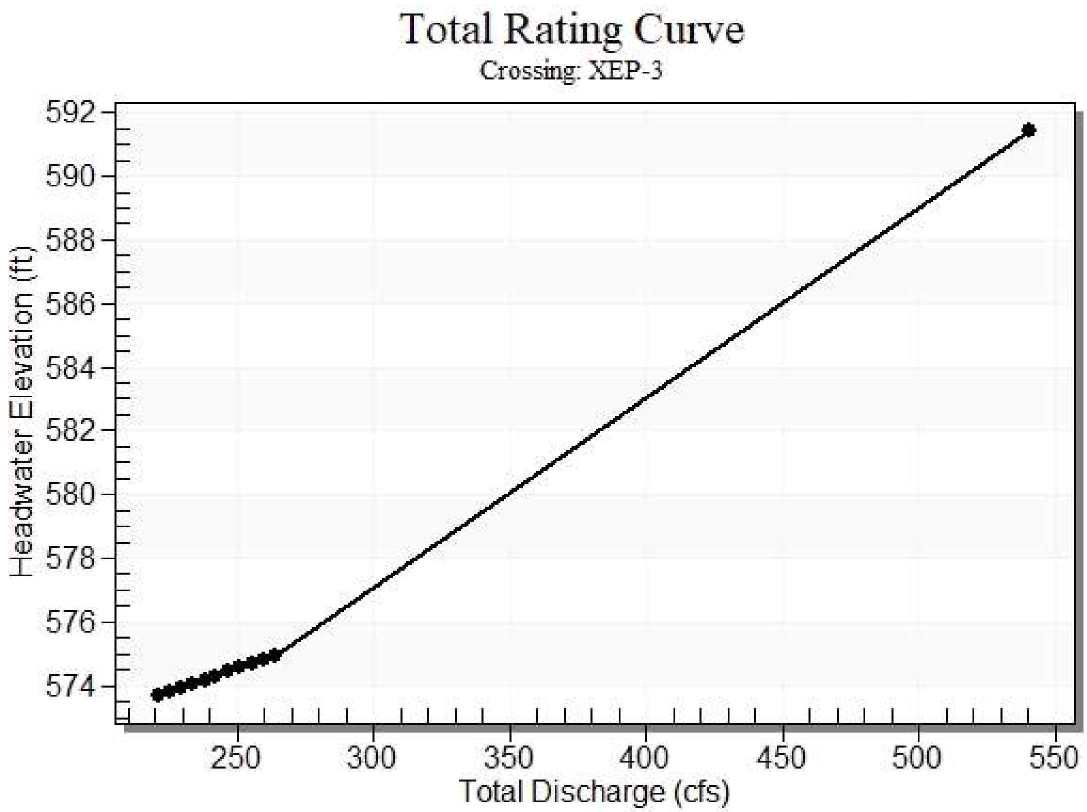


Table 29 - Culvert Summary Table: XEP-3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
221.00	221.00	573.72	6.395	5.432	5-S2n	2.887	3.929	3.157	2.326	13.999	11.194
225.30	225.30	573.83	6.510	5.543	5-S2n	2.930	3.980	3.204	2.349	14.063	11.252
229.60	229.60	573.95	6.626	5.655	5-S2n	2.973	4.031	3.251	2.372	14.127	11.310
233.90	233.90	574.06	6.745	5.769	5-S2n	3.015	4.081	3.297	2.395	14.190	11.366
238.20	238.20	574.19	6.865	5.884	5-S2n	3.058	4.131	3.343	2.417	14.252	11.422
242.00	242.00	574.29	6.973	5.987	5-S2n	3.096	4.175	3.383	2.437	14.307	11.471
246.80	246.80	574.43	7.112	6.118	5-S2n	3.143	4.230	3.434	2.462	14.375	11.532
251.10	251.10	574.56	7.238	6.238	5-S2n	3.186	4.279	3.479	2.484	14.436	11.585
255.40	255.40	574.69	7.366	6.359	5-S2n	3.228	4.327	3.525	2.506	14.492	11.638
259.70	259.70	574.82	7.497	6.481	5-S2n	3.270	4.376	3.571	2.527	14.547	11.691
264.00	264.00	574.95	7.629	6.605	5-S2n	3.312	4.424	3.616	2.548	14.601	11.742

****

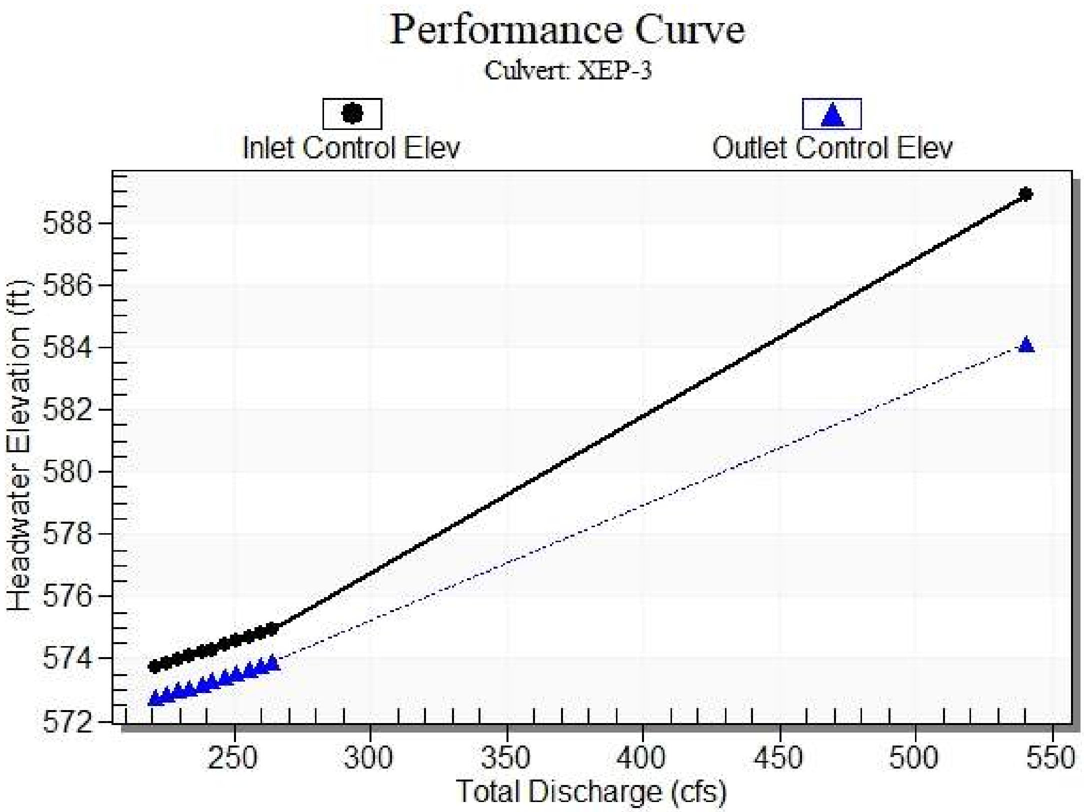
Straight Culvert

Inlet Elevation (invert): 567.32 ft, Outlet Elevation (invert): 566.12 ft

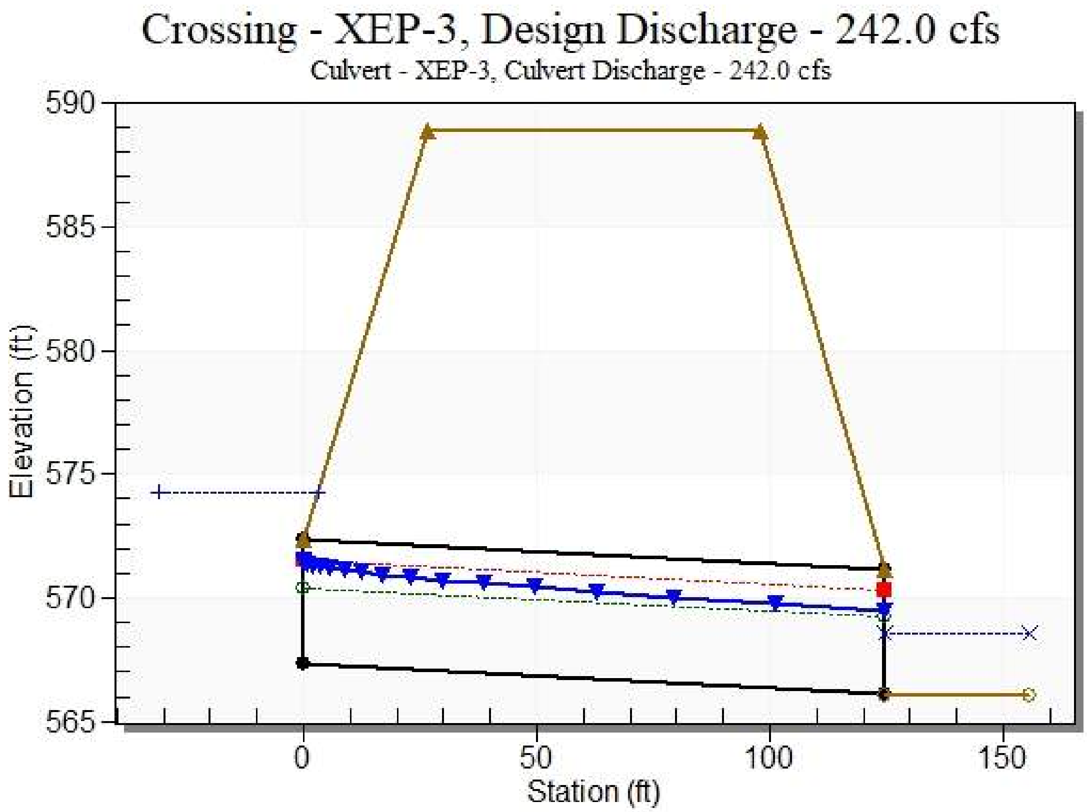
Culvert Length: 124.61 ft, Culvert Slope: 0.0096

****

Culvert Performance Curve Plot: XEP-3



Water Surface Profile Plot for Culvert: XEP-3



Site Data - XEP-3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 567.32 ft

Outlet Station: 124.60 ft

Outlet Elevation: 566.12 ft

Number of Barrels: 1

Culvert Data Summary - XEP-3

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 30 - Downstream Channel Rating Curve (Crossing: XEP-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
221.00	568.41	2.33	11.19	6.01	1.54
225.30	568.43	2.35	11.25	6.07	1.54
229.60	568.45	2.37	11.31	6.13	1.54
233.90	568.47	2.39	11.37	6.19	1.54
238.20	568.50	2.42	11.42	6.25	1.54
242.00	568.52	2.44	11.47	6.30	1.54
246.80	568.54	2.46	11.53	6.36	1.55
251.10	568.56	2.48	11.58	6.42	1.55
255.40	568.59	2.51	11.64	6.47	1.55
259.70	568.61	2.53	11.69	6.53	1.55
264.00	568.63	2.55	11.74	6.58	1.55

Tailwater Channel Data - XEP-3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0414

Channel Manning's n: 0.0350

Channel Invert Elevation: 566.08 ft

Roadway Data for Crossing: XEP-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 588.90 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

HY-8 Culvert Analysis Report
Proposed Conditions

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 154 cfs

Design Flow: 185 cfs

Maximum Flow: 209 cfs

Table 1 - Summary of Culvert Flows at Crossing: EP-2

Headwater Elevation (ft)	Total Discharge (cfs)	EP-2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
573.47	154.00	154.00	0.00	1
573.73	159.50	159.50	0.00	1
574.01	165.00	165.00	0.00	1
574.28	170.50	170.50	0.00	1
574.55	176.00	176.00	0.00	1
574.83	181.50	181.50	0.00	1
575.01	185.00	185.00	0.00	1
575.39	192.50	192.50	0.00	1
575.67	198.00	198.00	0.00	1
575.96	203.50	203.50	0.00	1
576.24	209.00	209.00	0.00	1
595.40	517.14	517.14	0.00	Overtopping

Rating Curve Plot for Crossing: EP-2

Table 2 - Culvert Summary Table: EP-2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
154.00	154.00	573.47	4.842	7.995	5-FFf	0.000	0.000	5.000	6.679	6.160	7.685
159.50	159.50	573.73	4.972	8.265	5-FFf	0.000	0.000	5.000	6.892	6.380	7.714
165.00	165.00	574.01	5.102	8.536	5-FFf	0.000	0.000	5.000	7.104	6.600	7.742
170.50	170.50	574.28	5.231	8.809	5-FFf	0.000	0.000	5.000	7.316	6.820	7.768
176.00	176.00	574.55	5.362	9.084	5-FFf	0.000	0.000	5.000	7.528	7.040	7.793
181.50	181.50	574.83	5.493	9.361	5-FFf	0.000	0.000	5.000	7.740	7.260	7.817
185.00	185.00	575.01	5.577	9.538	5-FFf	0.000	0.000	5.000	7.874	7.400	7.831
192.50	192.50	575.39	5.757	9.920	5-FFf	0.000	0.000	5.000	8.163	7.700	7.861
198.00	198.00	575.67	5.891	10.203	5-FFf	0.000	0.000	5.000	8.374	7.920	7.882
203.50	203.50	575.96	6.026	10.487	5-FFf	0.000	0.000	5.000	8.585	8.140	7.901
209.00	209.00	576.24	6.162	10.774	5-FFf	0.000	0.000	5.000	8.796	8.360	7.920

****

Double Broken-back Culvert

Inlet Elevation (invert): 565.47 ft,

Upper Break Elevation (invert): 564.80 ft,

Lower Break Elevation (invert): 562.74 ft,

Culvert Length: 228.96 ft,

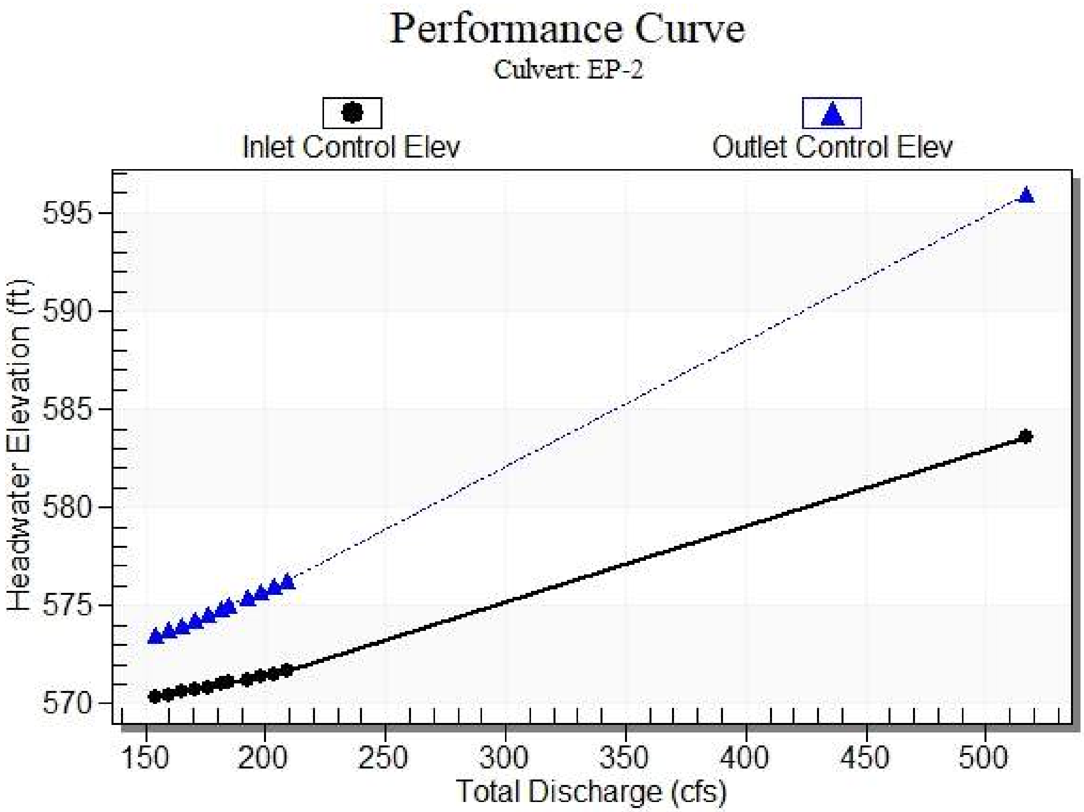
Upper Culvert Section Slope: 0.0155

Steep Culvert Section Slope: 0.0153

Runout Culvert Section Slope: 0.0154

****

Culvert Performance Curve Plot: EP-2



Water Surface Profile Plot for Culvert: EP-2

Site Data - EP-2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 565.47 ft

Upper Break Station: 43.09 ft

Upper Break Elevation: 564.80 ft

Lower Break Station: 177.65 ft

Lower Break Elevation: 562.74 ft

Outlet Station: 228.93 ft

Outlet Elevation: 561.95 ft

Number of Barrels: 1

Culvert Data Summary - EP-2

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 5.00 ft

Upper & Middle Section Material: Concrete

Lower Section Material:

Embedment: 0.00 in

Upper & Middle Section Manning's n: 0.0120

Lower Section Manning's n: 0.0120

Culvert Type: Double Broken-back

Inlet Configuration: 1:1 Bevel (45º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: EP-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
154.00	572.68	6.68	7.69	10.42	0.52
159.50	572.89	6.89	7.71	10.75	0.52
165.00	573.10	7.10	7.74	11.08	0.51
170.50	573.32	7.32	7.77	11.41	0.51
176.00	573.53	7.53	7.79	11.74	0.50
181.50	573.74	7.74	7.82	12.07	0.50
185.00	573.87	7.87	7.83	12.28	0.49
192.50	574.16	8.16	7.86	12.73	0.48
198.00	574.37	8.37	7.88	13.06	0.48
203.50	574.59	8.59	7.90	13.39	0.48
209.00	574.80	8.80	7.92	13.72	0.47

Tailwater Channel Data - EP-2

Tailwater Channel Option: Rectangular Channel

Bottom Width: 3.00 ft

Channel Slope: 0.0250

Channel Manning's n: 0.0350

Channel Invert Elevation: 566.00 ft

Roadway Data for Crossing: EP-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 595.40 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 204 cfs

Design Flow: 244 cfs

Maximum Flow: 276 cfs

Table 4 - Summary of Culvert Flows at Crossing: EP-3

Headwater Elevation (ft)	Total Discharge (cfs)	EP-3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
574.36	204.00	204.00	0.00	1
574.54	211.20	211.20	0.00	1
574.73	218.40	218.40	0.00	1
574.92	225.60	225.60	0.00	1
575.11	232.80	232.80	0.00	1
575.32	240.00	240.00	0.00	1
575.43	244.00	244.00	0.00	1
575.74	254.40	254.40	0.00	1
575.96	261.60	261.60	0.00	1
576.18	268.80	268.80	0.00	1
576.41	276.00	276.00	0.00	1
588.90	525.38	525.38	0.00	Overtopping

Rating Curve Plot for Crossing: EP-3

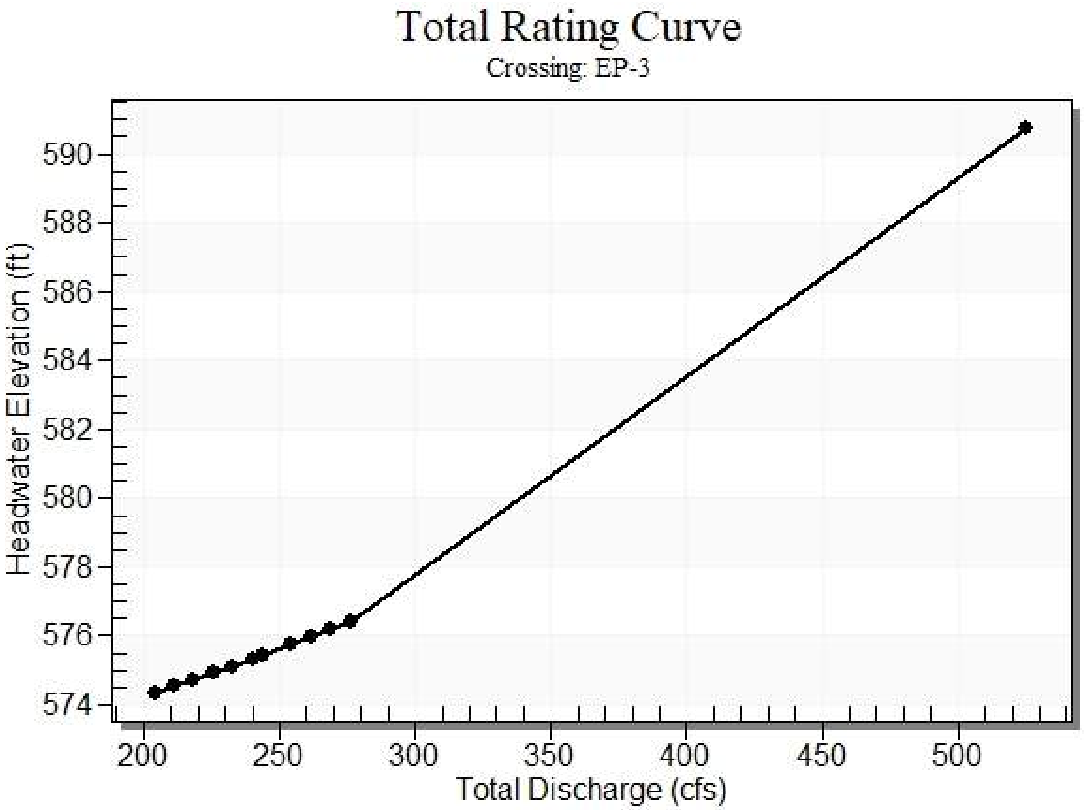


Table 5 - Culvert Summary Table: EP-3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
204.00	204.00	574.36	5.958	2.369	5-S2n	0.000	0.000	2.901	2.231	14.332	10.954
211.20	211.20	574.54	6.140	2.499	5-S2n	0.000	0.000	2.942	2.272	14.448	11.057
218.40	218.40	574.73	6.327	2.634	5-S2n	0.000	0.000	2.982	2.312	14.561	11.158
225.60	225.60	574.92	6.518	2.772	5-S2n	0.000	0.000	3.021	2.351	14.669	11.256
232.80	232.80	575.11	6.715	2.916	5-S2n	0.000	0.000	3.059	2.389	14.774	11.352
240.00	240.00	575.32	6.916	3.064	5-S2n	0.000	0.000	3.108	2.427	14.875	11.446
244.00	244.00	575.43	7.031	3.148	5-S2n	0.000	0.000	3.148	2.448	14.930	11.496
254.40	254.40	575.74	7.336	3.373	5-S2n	0.000	0.000	3.251	2.501	15.070	11.626
261.60	261.60	575.96	7.555	3.534	5-S2n	0.000	0.000	3.323	2.537	15.163	11.713
268.80	268.80	576.18	7.780	3.700	5-S2n	0.000	0.000	3.394	2.572	15.254	11.798
276.00	276.00	576.41	8.012	3.871	5-S2n	0.000	0.000	3.465	2.607	15.343	11.882

****

Double Broken-back Culvert

Inlet Elevation (invert): 568.40 ft,

Upper Break Elevation (invert): 567.32 ft,

Lower Break Elevation (invert): 566.12 ft,

Culvert Length: 312.22 ft,

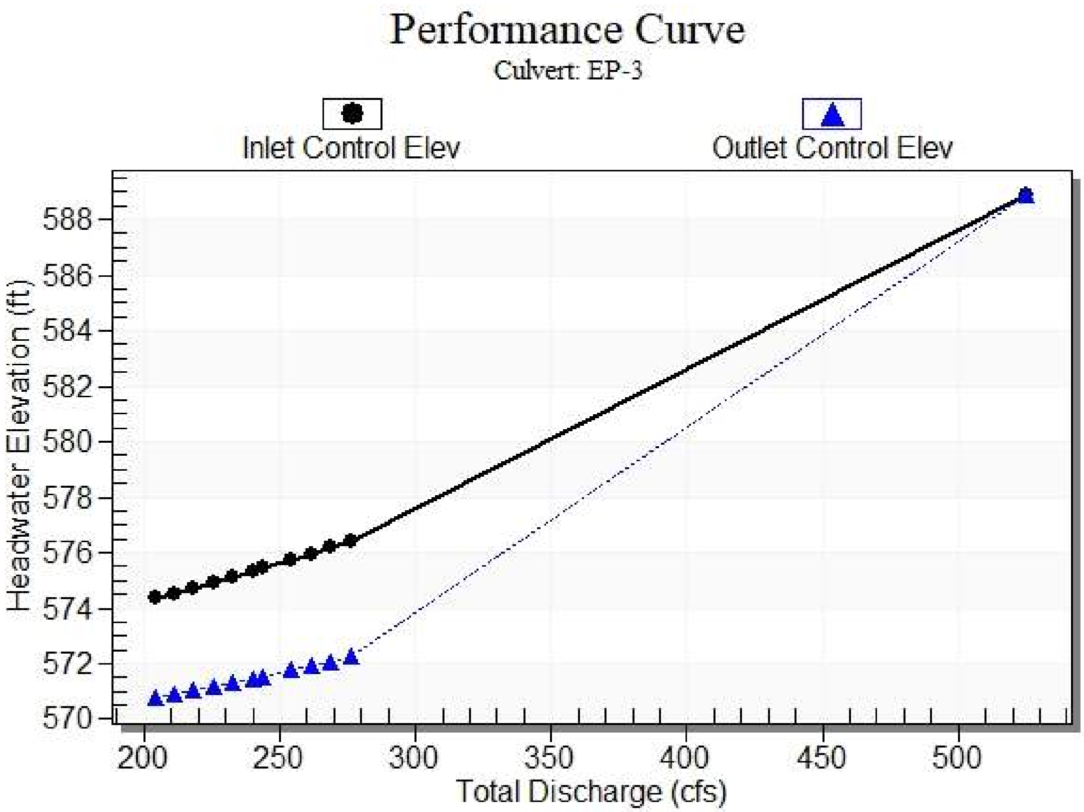
Upper Culvert Section Slope: 0.0096

Steep Culvert Section Slope: 0.0097

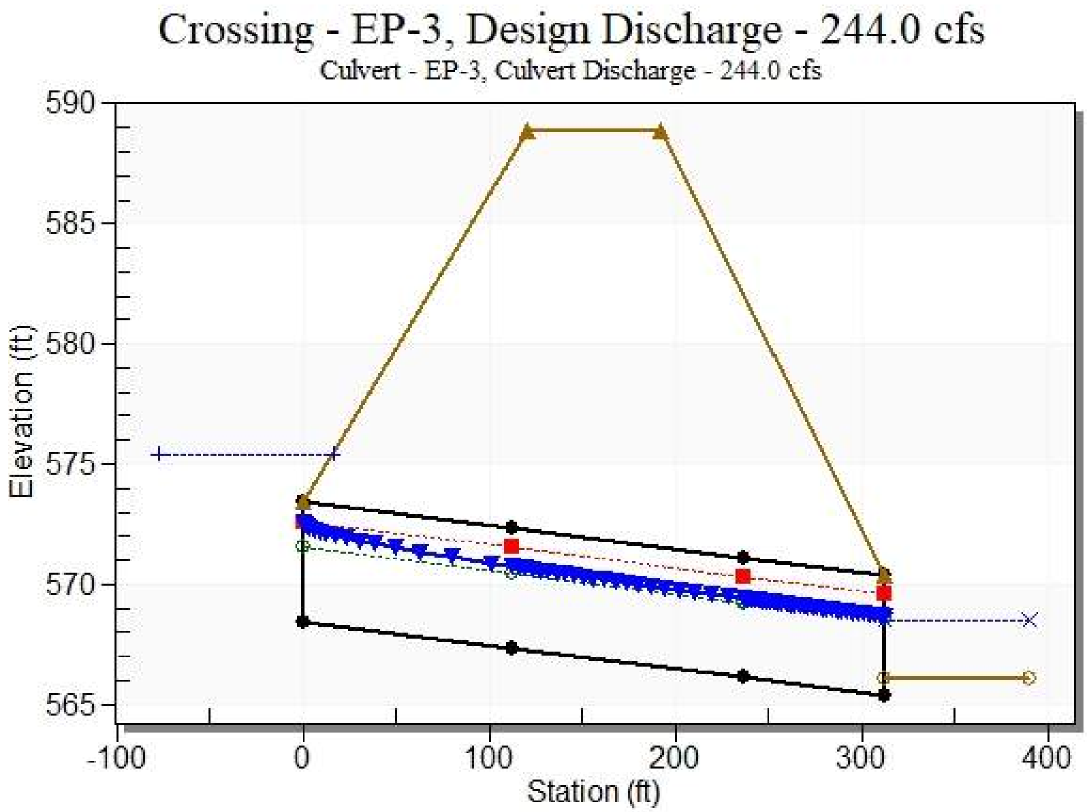
Runout Culvert Section Slope: 0.0094

****

Culvert Performance Curve Plot: EP-3



Water Surface Profile Plot for Culvert: EP-3



Site Data - EP-3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 568.40 ft

Upper Break Station: 112.33 ft

Upper Break Elevation: 567.32 ft

Lower Break Station: 236.51 ft

Lower Break Elevation: 566.12 ft

Outlet Station: 312.21 ft

Outlet Elevation: 565.41 ft

Number of Barrels: 1

Culvert Data Summary - EP-3

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 5.00 ft

Upper & Middle Section Material: Concrete

Lower Section Material:

Embedment: 0.00 in

Upper & Middle Section Manning's n: 0.0120

Lower Section Manning's n: 0.0120

Culvert Type: Double Broken-back

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: EP-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
204.00	568.31	2.23	10.95	5.76	1.53
211.20	568.35	2.27	11.06	5.87	1.53
218.40	568.39	2.31	11.16	5.97	1.54
225.60	568.43	2.35	11.26	6.07	1.54
232.80	568.47	2.39	11.35	6.17	1.54
240.00	568.51	2.43	11.45	6.27	1.54
244.00	568.53	2.45	11.50	6.32	1.54
254.40	568.58	2.50	11.63	6.46	1.55
261.60	568.62	2.54	11.71	6.55	1.55
268.80	568.65	2.57	11.80	6.64	1.55
276.00	568.69	2.61	11.88	6.73	1.56

Tailwater Channel Data - EP-3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0414

Channel Manning's n: 0.0350

Channel Invert Elevation: 566.08 ft

Roadway Data for Crossing: EP-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 588.90 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 42 cfs

Design Flow: 51 cfs

Maximum Flow: 58 cfs

Table 7 - Summary of Culvert Flows at Crossing: CLP-4-1

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
625.22	42.00	42.00	0.00	1
625.33	43.60	43.60	0.00	1
625.44	45.20	45.20	0.00	1
625.56	46.80	46.80	0.00	1
625.67	48.40	48.40	0.00	1
625.79	50.00	50.00	0.00	1
625.87	51.00	51.00	0.00	1
626.05	53.20	53.20	0.00	1
626.18	54.80	54.80	0.00	1
626.32	56.40	56.40	0.00	1
626.46	58.00	58.00	0.00	1
638.20	132.38	132.38	0.00	Overtopping

Rating Curve Plot for Crossing: CLP-4-1

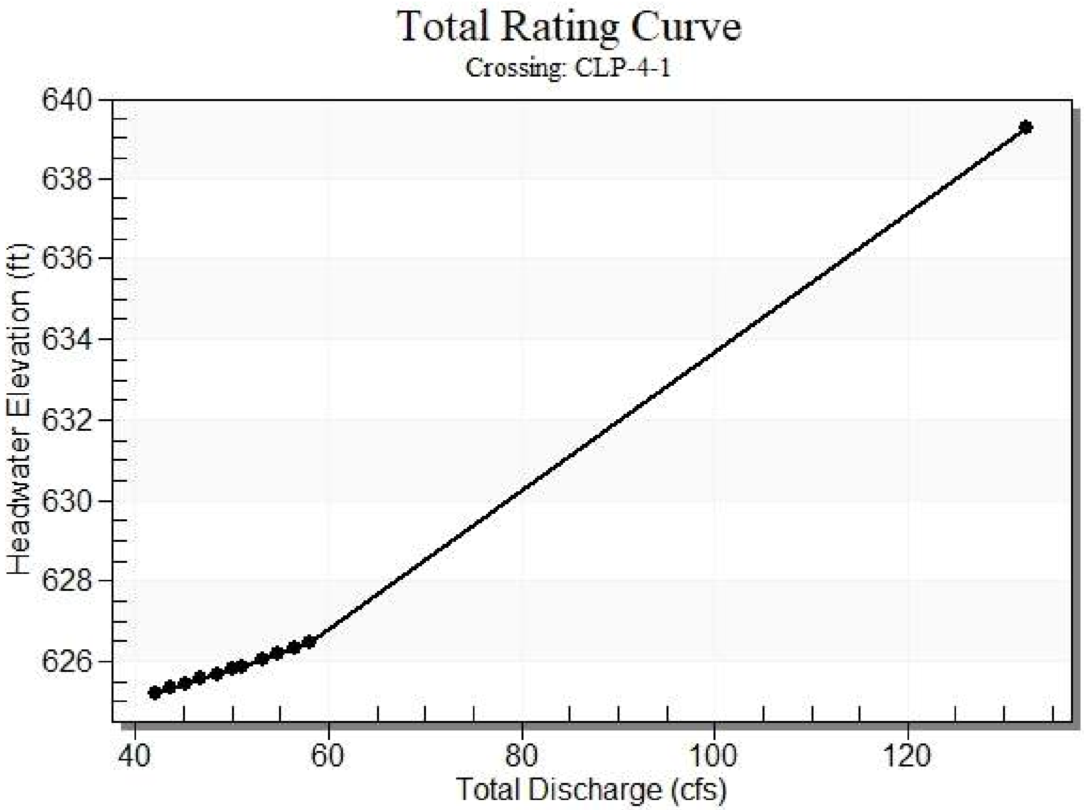


Table 8 - Culvert Summary Table: CLP-4

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
42.00	42.00	625.22	3.395	0.0*	5-S2n	1.229	2.109	1.304	1.309	13.767	8.174
43.60	43.60	625.33	3.502	0.0*	5-S2n	1.255	2.149	1.335	1.327	13.862	8.251
45.20	45.20	625.44	3.612	0.0*	5-S2n	1.280	2.188	1.363	1.345	13.989	8.326
46.80	46.80	625.56	3.726	0.0*	5-S2n	1.306	2.225	1.389	1.363	14.137	8.398
48.40	48.40	625.67	3.843	0.118	5-S2n	1.331	2.262	1.413	1.380	14.294	8.469
50.00	50.00	625.79	3.964	0.262	5-S2n	1.356	2.298	1.445	1.397	14.358	8.539
51.00	51.00	625.87	4.042	0.355	5-S2n	1.371	2.320	1.463	1.408	14.406	8.581
53.20	53.20	626.05	4.218	0.563	5-S2n	1.405	2.367	1.503	1.430	14.532	8.672
54.80	54.80	626.18	4.352	0.718	5-S2n	1.429	2.400	1.530	1.446	14.631	8.736
56.40	56.40	626.32	4.489	0.878	5-S2n	1.454	2.432	1.557	1.462	14.732	8.800
58.00	58.00	626.46	4.632	1.040	5-S2n	1.478	2.463	1.584	1.477	14.833	8.861

* Full Flow Headwater elevation is below inlet invert.

****

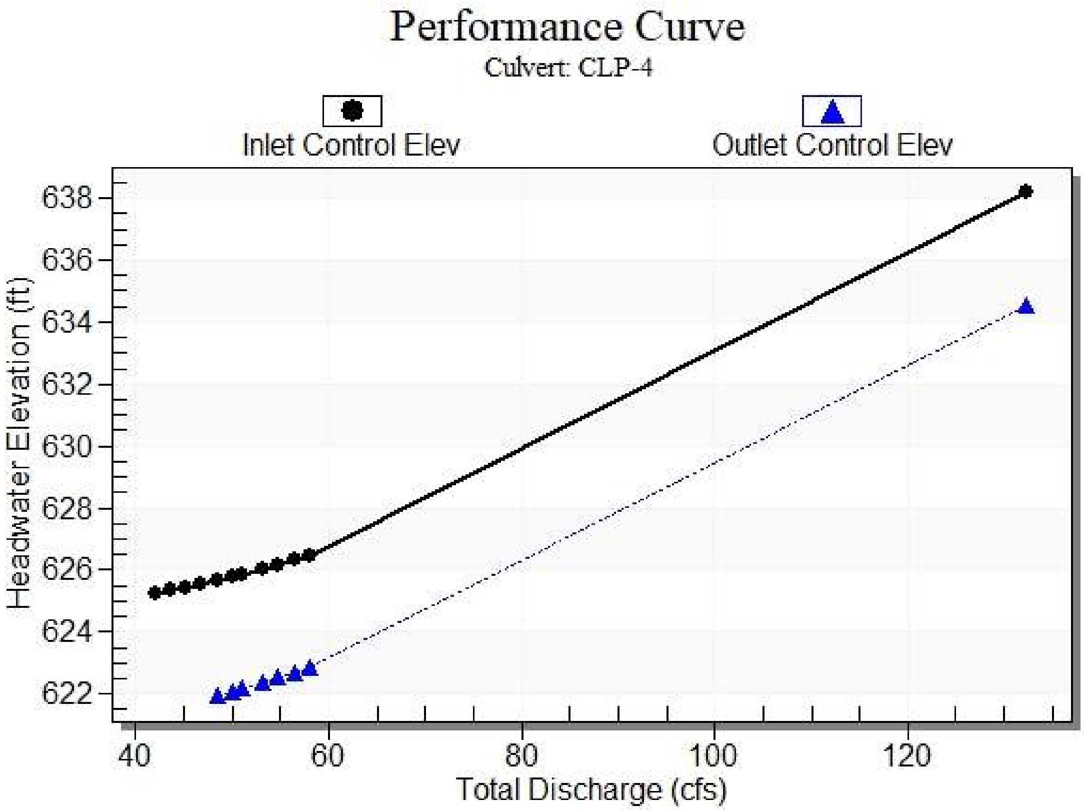
Straight Culvert

Inlet Elevation (invert): 621.83 ft, Outlet Elevation (invert): 617.43 ft

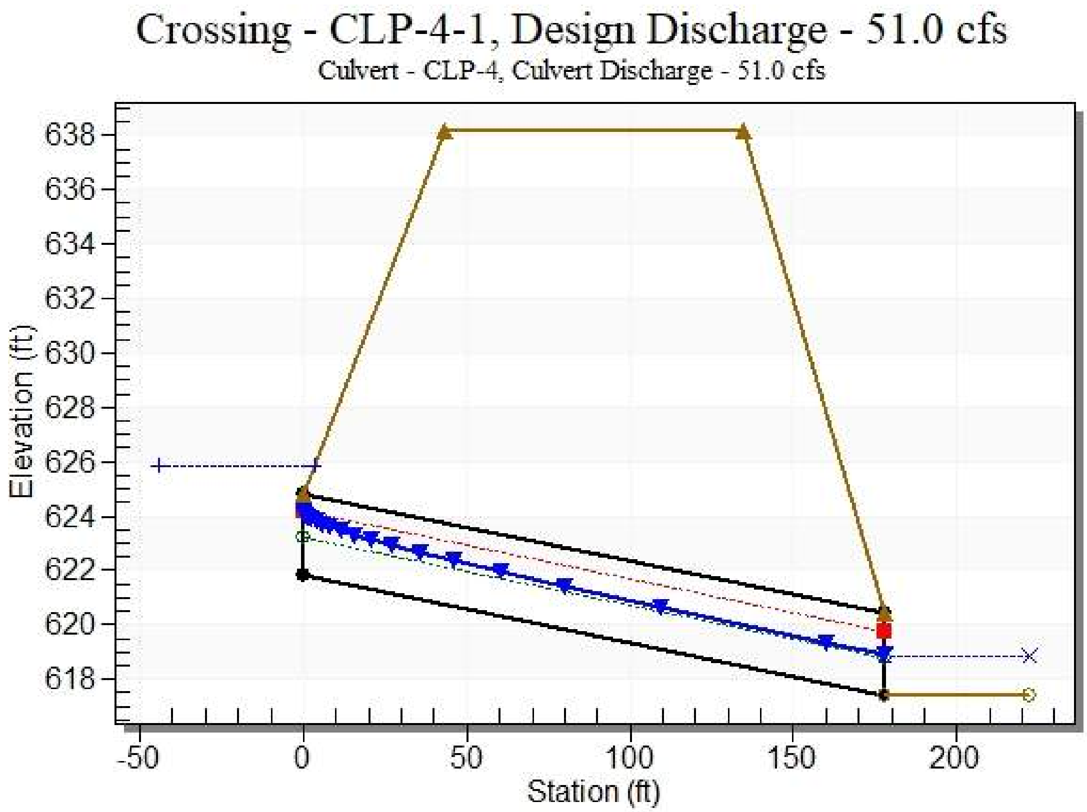
Culvert Length: 178.05 ft, Culvert Slope: 0.0247

****

Culvert Performance Curve Plot: CLP-4



Water Surface Profile Plot for Culvert: CLP-4



Site Data - CLP-4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 621.83 ft

Outlet Station: 178.00 ft

Outlet Elevation: 617.43 ft

Number of Barrels: 1

Culvert Data Summary - CLP-4

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 9 - Downstream Channel Rating Curve (Crossing: CLP-4-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
42.00	618.74	1.31	8.17	5.72	1.78
43.60	618.76	1.33	8.25	5.80	1.78
45.20	618.78	1.35	8.33	5.88	1.79
46.80	618.79	1.36	8.40	5.95	1.79
48.40	618.81	1.38	8.47	6.03	1.80
50.00	618.83	1.40	8.54	6.10	1.80
51.00	618.84	1.41	8.58	6.15	1.80
53.20	618.86	1.43	8.67	6.25	1.81
54.80	618.88	1.45	8.74	6.32	1.81
56.40	618.89	1.46	8.80	6.38	1.81
58.00	618.91	1.48	8.86	6.45	1.82

Tailwater Channel Data - CLP-4-1

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0700

Channel Manning's n: 0.0350

Channel Invert Elevation: 617.43 ft

Roadway Data for Crossing: CLP-4-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 638.20 ft

Roadway Surface: Paved

Roadway Top Width: 92.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 44 cfs

Design Flow: 53 cfs

Maximum Flow: 59 cfs

Table 10 - Summary of Culvert Flows at Crossing: EP-6

Headwater Elevation (ft)	Total Discharge (cfs)	EP-6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
593.18	44.00	44.00	0.00	1
593.21	45.50	45.50	0.00	1
593.24	47.00	47.00	0.00	1
593.26	48.50	48.50	0.00	1
593.29	50.00	50.00	0.00	1
593.32	51.50	51.50	0.00	1
593.35	53.00	53.00	0.00	1
593.37	54.50	54.50	0.00	1
593.40	56.00	56.00	0.00	1
593.43	57.50	57.50	0.00	1
593.45	59.00	59.00	0.00	1
600.70	321.80	321.80	0.00	Overtopping

Rating Curve Plot for Crossing: EP-6

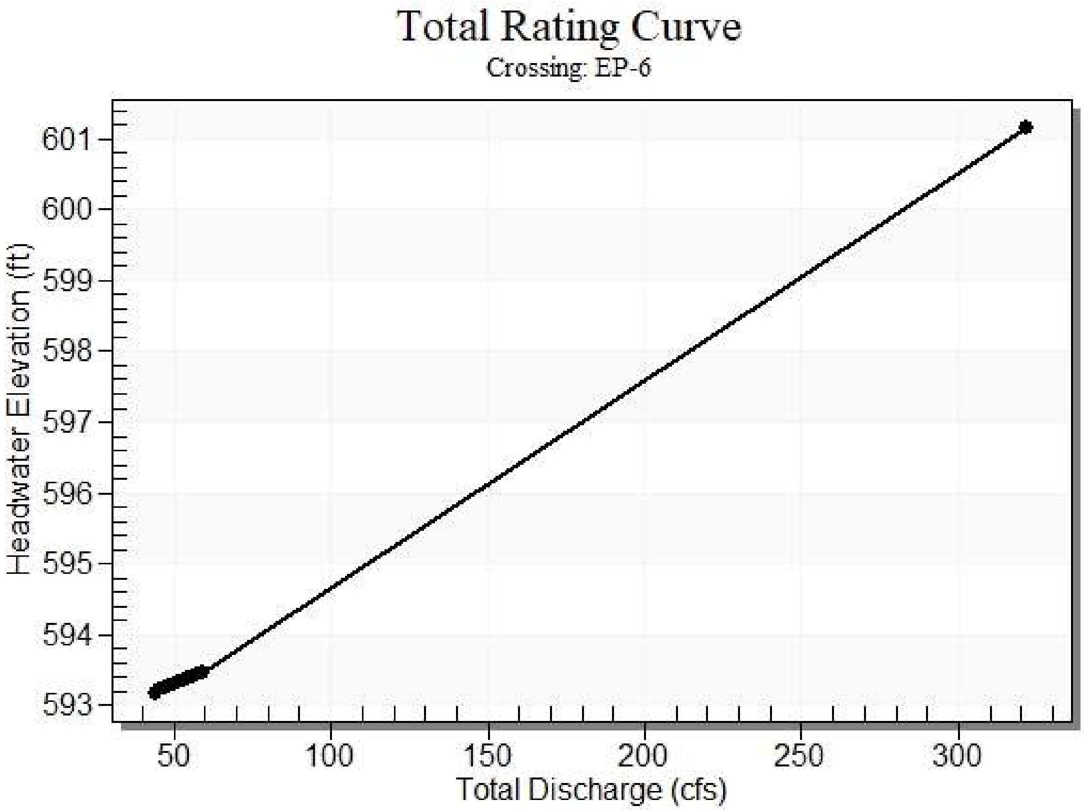


Table 11 - Culvert Summary Table: EP-6

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
44.00	44.00	593.18	1.796	1.962	5-FFf	0.000	1.186	4.000	1.202	1.833	6.309
45.50	45.50	593.21	1.836	1.990	5-FFf	0.000	1.213	4.000	1.224	1.896	6.370
47.00	47.00	593.24	1.876	2.017	5-FFf	0.000	1.240	4.000	1.246	1.958	6.429
48.50	48.50	593.26	1.916	2.045	5-FFf	0.000	1.266	4.000	1.267	2.021	6.487
50.00	50.00	593.29	1.956	2.072	5-FFf	0.000	1.292	4.000	1.288	2.083	6.543
51.50	51.50	593.32	1.994	2.099	5-FFf	0.000	1.318	4.000	1.309	2.146	6.599
53.00	53.00	593.35	2.035	2.126	5-FFf	0.000	1.318	4.000	1.329	2.208	6.652
54.50	54.50	593.37	2.075	2.153	5-FFf	0.000	1.318	4.000	1.349	2.271	6.705
56.00	56.00	593.40	2.115	2.180	5-FFf	0.000	1.318	4.000	1.369	2.333	6.757
57.50	57.50	593.43	2.154	2.207	5-FFf	0.000	1.318	4.000	1.389	2.396	6.807
59.00	59.00	593.45	2.193	2.233	5-FFf	0.000	1.318	4.000	1.408	2.458	6.857

****

Double Broken-back Culvert

Inlet Elevation (invert): 591.22 ft,

Upper Break Elevation (invert): 589.35 ft,

Lower Break Elevation (invert): 589.26 ft,

Culvert Length: 131.92 ft,

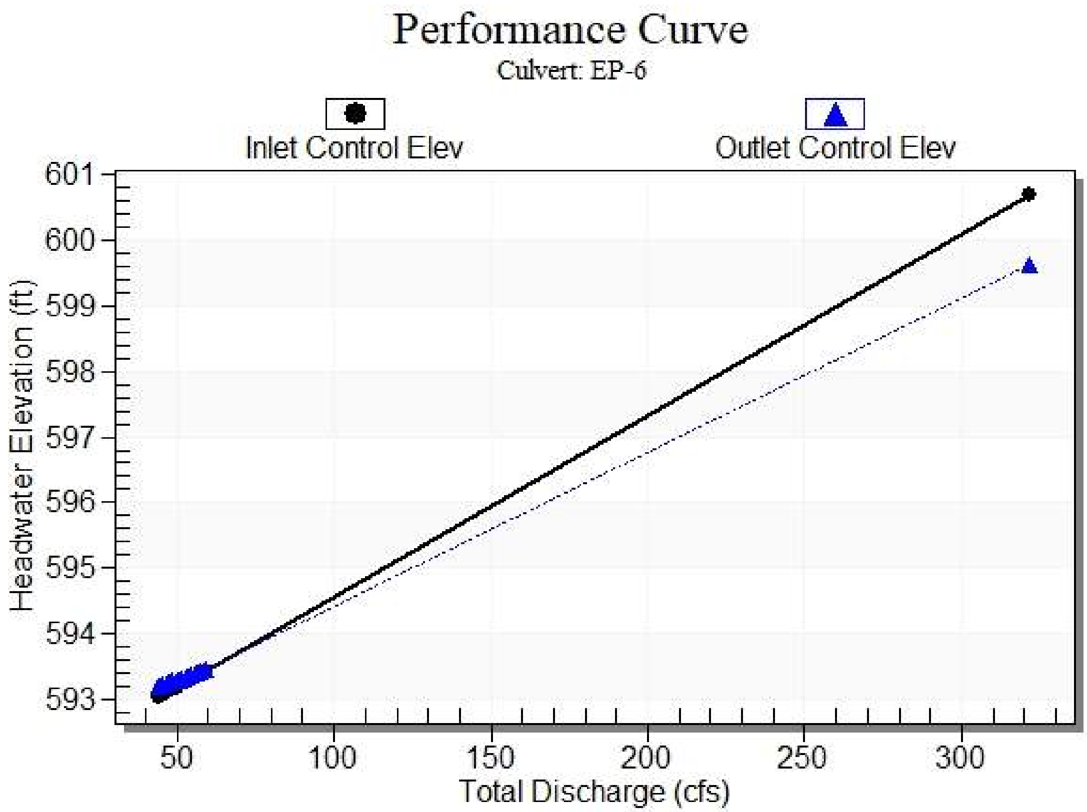
Upper Culvert Section Slope: 0.0377

Steep Culvert Section Slope: 0.0030

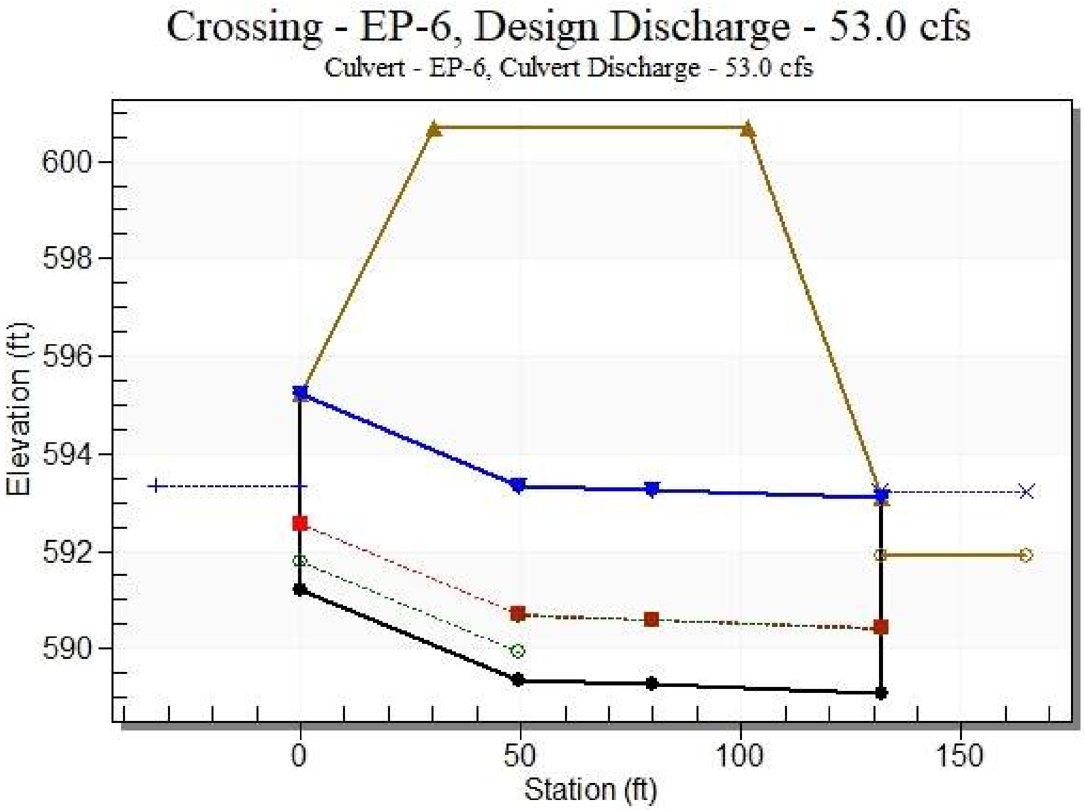
Runout Culvert Section Slope: 0.0031

****

Culvert Performance Curve Plot: EP-6



Water Surface Profile Plot for Culvert: EP-6



Site Data - EP-6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 591.22 ft

Upper Break Station: 49.60 ft

Upper Break Elevation: 589.35 ft

Lower Break Station: 79.70 ft

Lower Break Elevation: 589.26 ft

Outlet Station: 131.90 ft

Outlet Elevation: 589.10 ft

Number of Barrels: 1

Culvert Data Summary - EP-6

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Upper & Middle Section Material: Concrete

Lower Section Material:

Embedment: 0.00 in

Upper & Middle Section Manning's n: 0.0120

Lower Section Manning's n: 0.0120

Culvert Type: Double Broken-back

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 12 - Downstream Channel Rating Curve (Crossing: EP-6)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
44.00	593.10	1.20	6.31	2.10	1.16
45.50	593.12	1.22	6.37	2.14	1.16
47.00	593.15	1.25	6.43	2.18	1.17
48.50	593.17	1.27	6.49	2.21	1.17
50.00	593.19	1.29	6.54	2.25	1.17
51.50	593.21	1.31	6.60	2.29	1.17
53.00	593.23	1.33	6.65	2.32	1.17
54.50	593.25	1.35	6.71	2.36	1.18
56.00	593.27	1.37	6.76	2.39	1.18
57.50	593.29	1.39	6.81	2.43	1.18
59.00	593.31	1.41	6.86	2.46	1.18

Tailwater Channel Data - EP-6

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0280

Channel Manning's n: 0.0350

Channel Invert Elevation: 591.90 ft

Roadway Data for Crossing: EP-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 600.70 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 8 cfs

Design Flow: 9 cfs

Maximum Flow: 11 cfs

Table 13 - Summary of Culvert Flows at Crossing: EP-5

Headwater Elevation (ft)	Total Discharge (cfs)	EP-5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
655.38	8.00	8.00	0.00	1
655.42	8.30	8.30	0.00	1
655.47	8.60	8.60	0.00	1
655.52	8.90	8.90	0.00	1
655.54	9.00	9.00	0.00	1
655.62	9.50	9.50	0.00	1
655.67	9.80	9.80	0.00	1
655.72	10.10	10.10	0.00	1
655.78	10.40	10.40	0.00	1
655.83	10.70	10.70	0.00	1
655.89	11.00	11.00	0.00	1
664.00	32.07	32.07	0.00	Overtopping

Rating Curve Plot for Crossing: EP-5

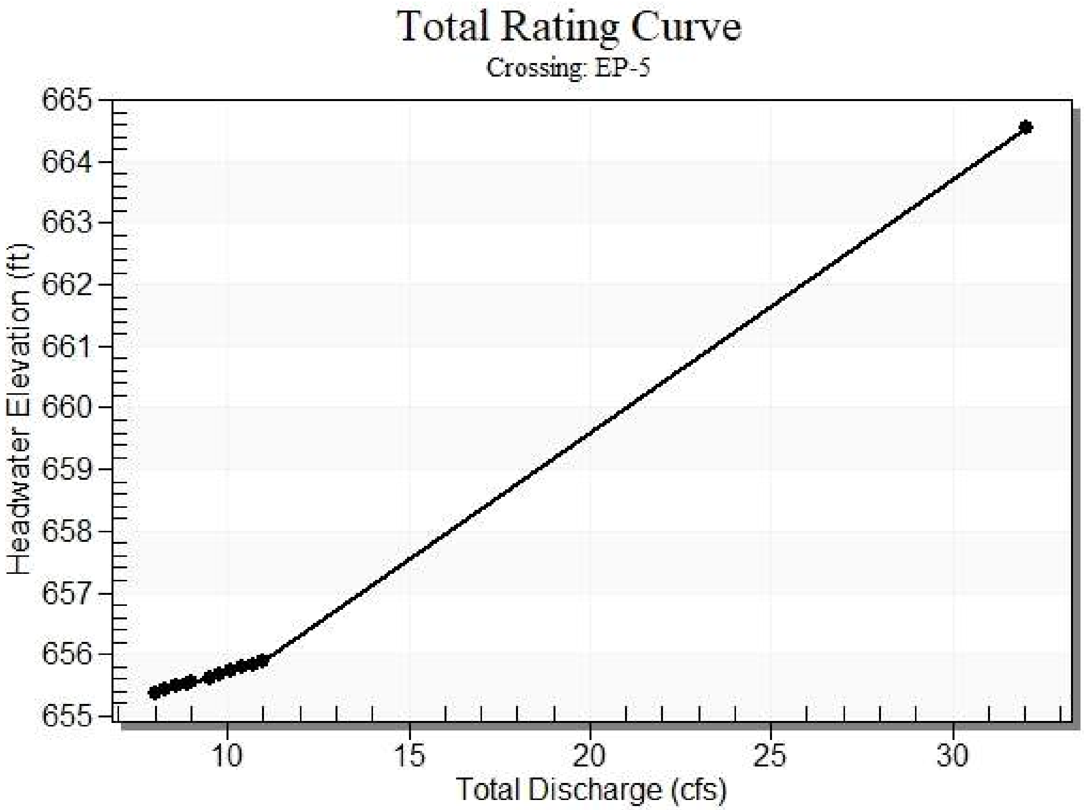


Table 14 - Culvert Summary Table: EP-5

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
8.00	8.00	655.38	1.608	0.0*	5-S2n	0.479	1.092	0.479	0.739	15.903	7.319
8.30	8.30	655.42	1.654	0.0*	5-S2n	0.488	1.112	0.488	0.750	16.075	7.387
8.60	8.60	655.47	1.701	0.0*	5-S2n	0.498	1.131	0.498	0.760	16.238	7.453
8.90	8.90	655.52	1.749	0.0*	5-S2n	0.507	1.150	0.544	0.769	14.874	7.517
9.00	9.00	655.54	1.765	0.0*	5-S2n	0.510	1.156	0.538	0.773	15.275	7.538
9.50	9.50	655.62	1.849	0.0*	5-S2n	0.524	1.189	0.524	0.788	16.679	7.641
9.80	9.80	655.67	1.900	0.0*	5-S2n	0.533	1.206	0.533	0.798	16.826	7.700
10.10	10.10	655.72	1.953	0.0*	5-S2n	0.542	1.223	0.542	0.807	16.973	7.758
10.40	10.40	655.78	2.007	0.0*	5-S2n	0.551	1.239	0.551	0.816	17.085	7.815
10.70	10.70	655.83	2.063	0.0*	5-S2n	0.559	1.255	0.597	0.824	15.778	7.871
11.00	11.00	655.89	2.120	0.0*	5-S2n	0.567	1.269	0.590	0.833	16.452	7.926

* Full Flow Headwater elevation is below inlet invert.

****

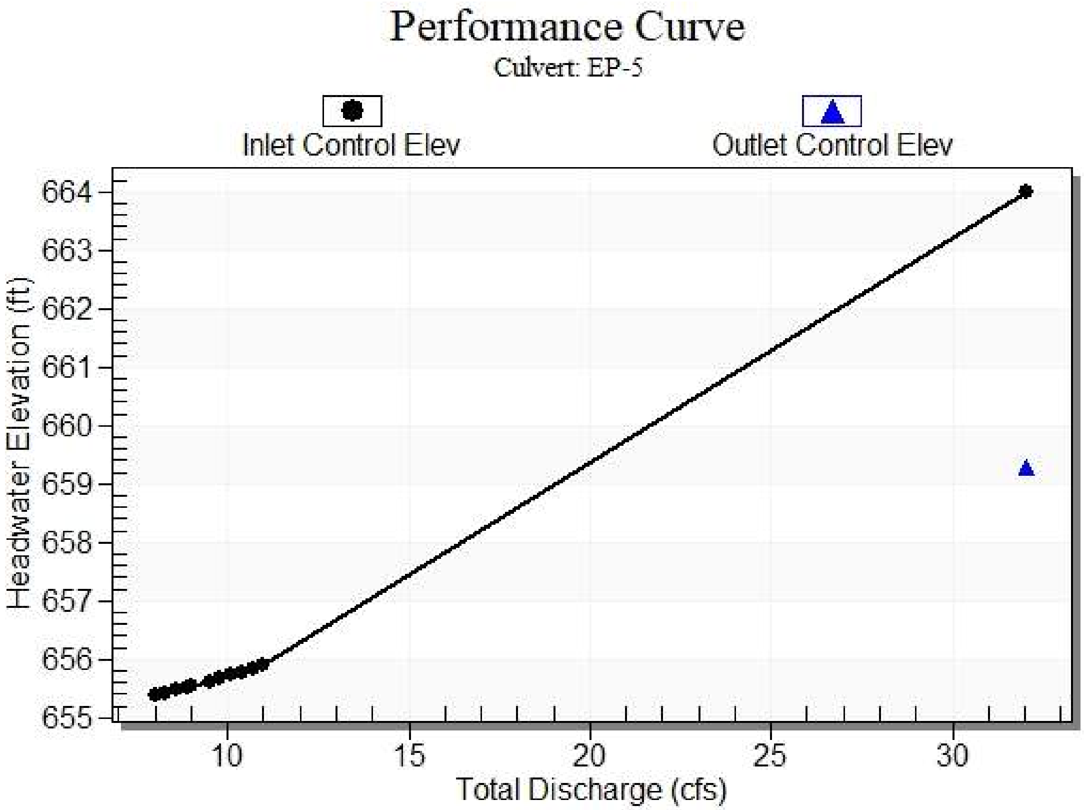
Straight Culvert

Inlet Elevation (invert): 653.77 ft,   Outlet Elevation (invert): 637.79 ft

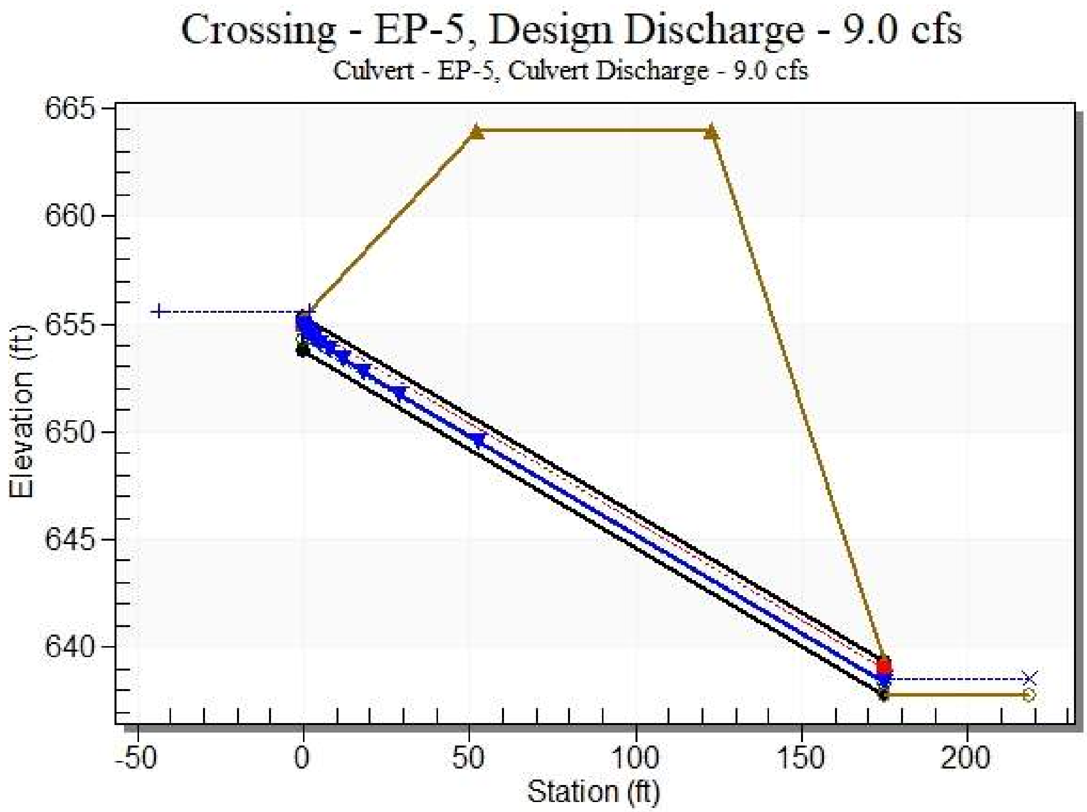
Culvert Length: 175.73 ft,   Culvert Slope: 0.0913

****

Culvert Performance Curve Plot: EP-5



Water Surface Profile Plot for Culvert: EP-5



Site Data - EP-5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 653.77 ft

Outlet Station: 175.00 ft

Outlet Elevation: 637.79 ft

Number of Barrels: 1

Culvert Data Summary - EP-5

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 15 - Downstream Channel Rating Curve (Crossing: EP-5)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
8.00	638.53	0.74	7.32	6.00	2.12
8.30	638.54	0.75	7.39	6.08	2.13
8.60	638.55	0.76	7.45	6.16	2.13
8.90	638.56	0.77	7.52	6.24	2.14
9.00	638.56	0.77	7.54	6.27	2.14
9.50	638.58	0.79	7.64	6.40	2.14
9.80	638.59	0.80	7.70	6.47	2.15
10.10	638.60	0.81	7.76	6.54	2.15
10.40	638.61	0.82	7.82	6.62	2.16
10.70	638.61	0.82	7.87	6.69	2.16
11.00	638.62	0.83	7.93	6.76	2.16

Tailwater Channel Data - EP-5

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.1300

Channel Manning's n: 0.0350

Channel Invert Elevation: 637.79 ft

Roadway Data for Crossing: EP-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 664.00 ft

Roadway Surface: Paved

Roadway Top Width: 71.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 16 - Summary of Culvert Flows at Crossing: CLP8

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CLP-8 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
584.39	10-Year	1.30	1.30	0.00	1
584.46	25-Year	1.60	1.60	0.00	1
584.52	50-Year	1.90	1.90	0.00	1
584.57	100-Year	2.20	2.20	0.00	1
587.42	Overtopping	17.08	17.08	0.00	Overtopping

Rating Curve Plot for Crossing: CLP8

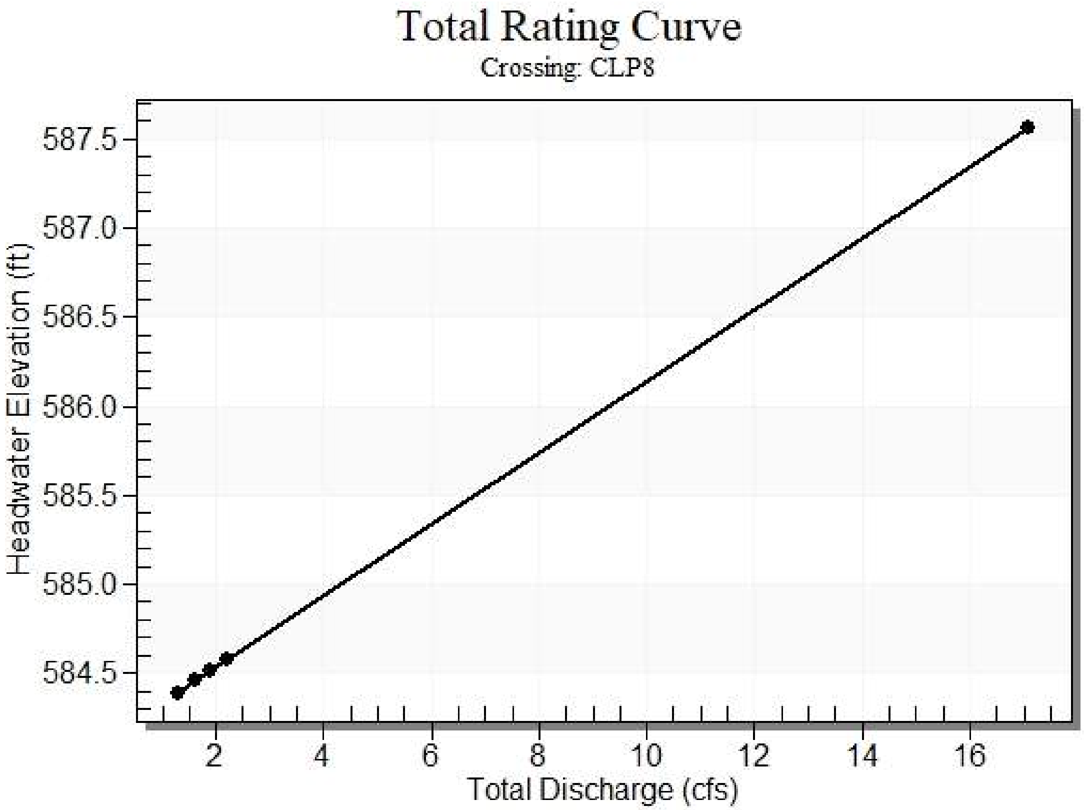


Table 17 - Culvert Summary Table: CLP-8

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10-Year	1.30	1.30	584.39	0.562	0.0*	1-S2n	0.257	0.424	0.269	0.000	5.905	0.000
25-Year	1.60	1.60	584.46	0.627	0.0*	1-S2n	0.285	0.470	0.298	0.000	6.235	0.000
50-Year	1.90	1.90	584.52	0.686	0.0*	1-S2n	0.311	0.516	0.324	0.000	6.540	0.000
100-Year	2.20	2.20	584.57	0.742	0.0*	1-S2n	0.334	0.555	0.349	0.000	6.847	0.000

* Full Flow Headwater elevation is below inlet invert.

****

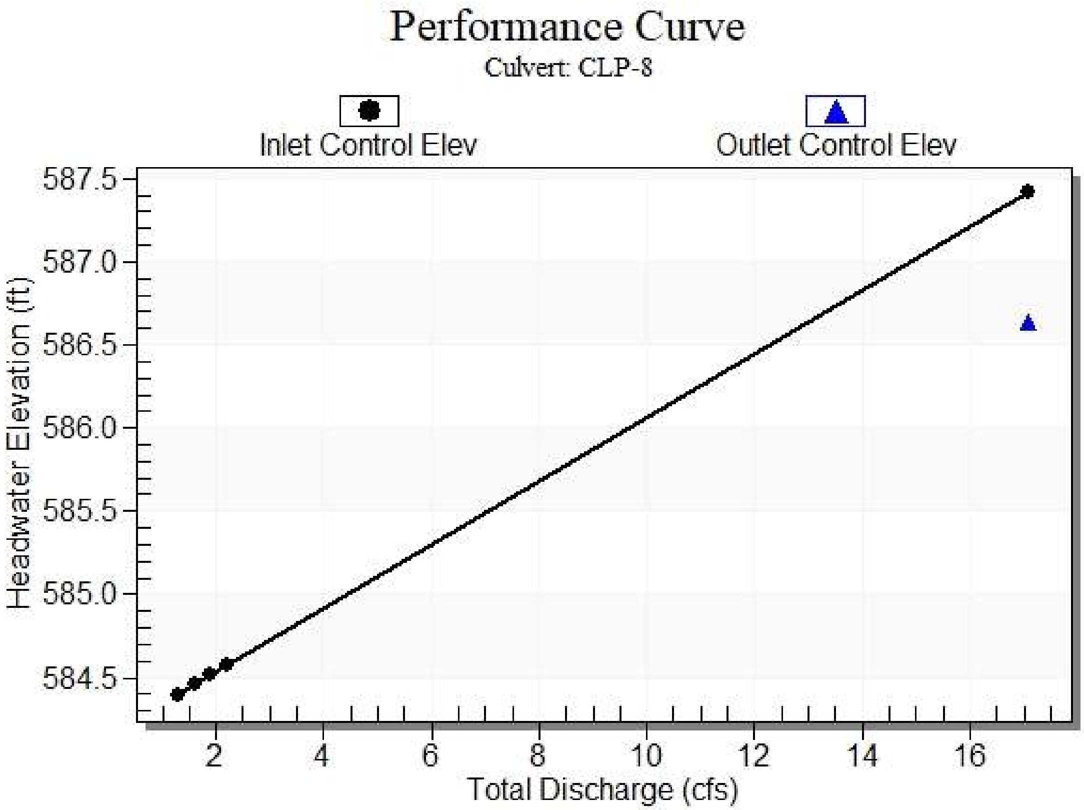
Straight Culvert

Inlet Elevation (invert): 583.83 ft,   Outlet Elevation (invert): 582.00 ft

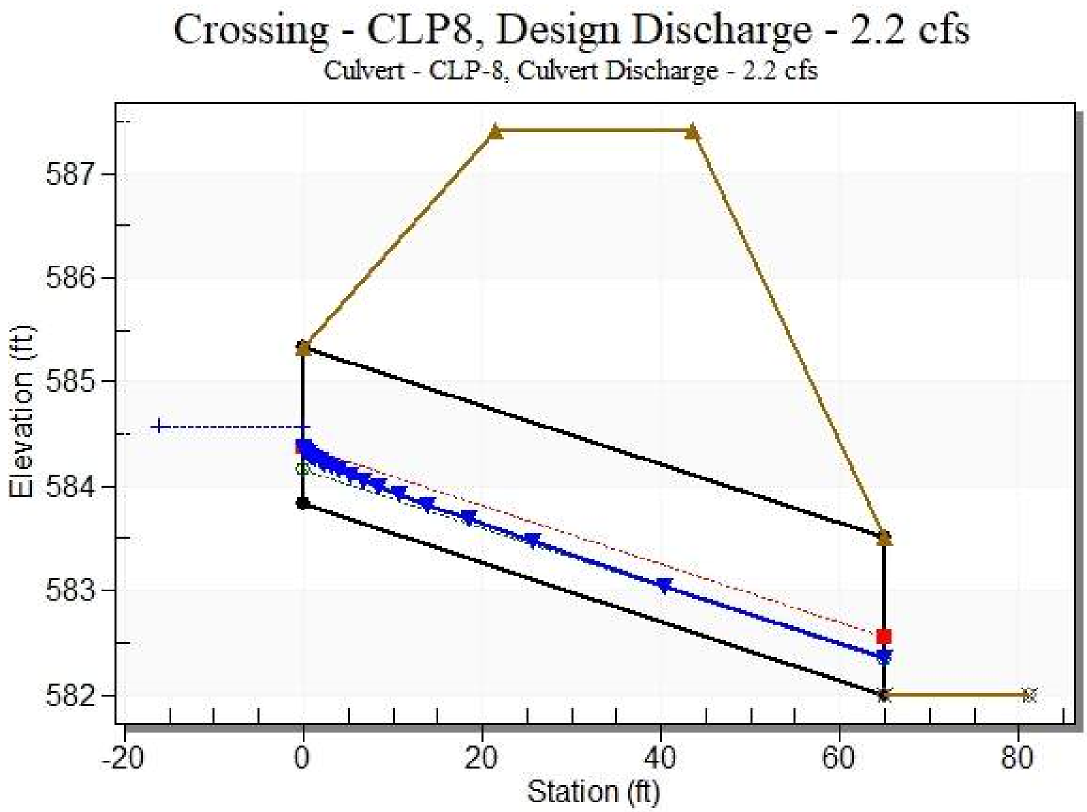
Culvert Length: 65.03 ft,   Culvert Slope: 0.0282

****

Culvert Performance Curve Plot: CLP-8



Water Surface Profile Plot for Culvert: CLP-8



Site Data - CLP-8

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 583.83 ft

Outlet Station: 65.00 ft

Outlet Elevation: 582.00 ft

Number of Barrels: 1

Culvert Data Summary - CLP-8

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 18 - Downstream Channel Rating Curve (Crossing: CLP8)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
1.30	582.00	0.00
1.60	582.00	0.00
1.90	582.00	0.00
2.20	582.00	0.00

Tailwater Channel Data - CLP8

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 582.00 ft

Roadway Data for Crossing: CLP8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 587.42 ft

Roadway Surface: Paved

Roadway Top Width: 22.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5 cfs

Design Flow: 6.3 cfs

Maximum Flow: 8.6 cfs

Table 19 - Summary of Culvert Flows at Crossing: EP9

Headwater Elevation (ft)	Total Discharge (cfs)	EP-9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
661.79	5.00	5.00	0.00	1
661.85	5.36	5.36	0.00	1
661.90	5.72	5.72	0.00	1
661.95	6.08	6.08	0.00	1
661.98	6.30	6.30	0.00	1
662.05	6.80	6.80	0.00	1
662.11	7.16	7.16	0.00	1
662.16	7.52	7.52	0.00	1
662.22	7.88	7.88	0.00	1
662.28	8.24	8.24	0.00	1
662.34	8.60	8.60	0.00	1
667.46	23.66	23.66	0.00	Overtopping

Rating Curve Plot for Crossing: EP9

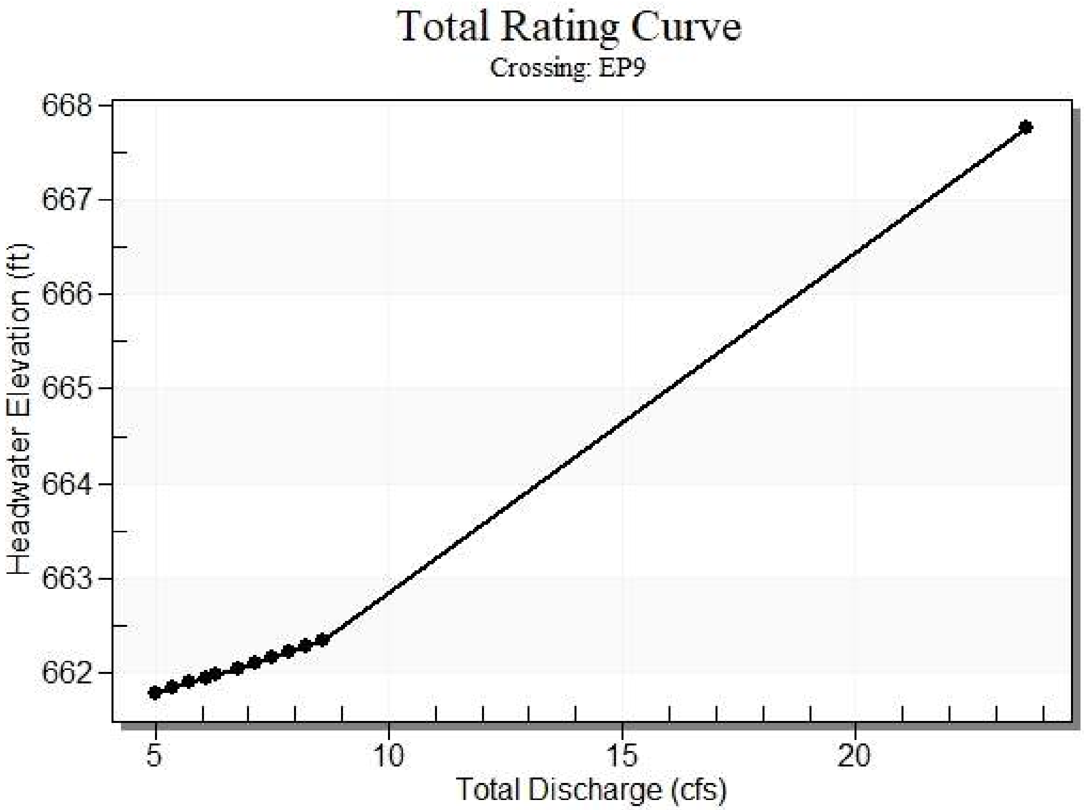


Table 20 - Culvert Summary Table: EP-9

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00	5.00	661.79	1.214	0.0*	1-S2n	0.458	0.856	0.480	0.489	9.897	3.488
5.36	5.36	661.85	1.266	0.0*	1-S2n	0.475	0.889	0.499	0.502	10.087	3.550
5.72	5.72	661.90	1.317	0.0*	1-S2n	0.492	0.919	0.492	0.514	10.968	3.608
6.08	6.08	661.95	1.368	0.0*	1-S2n	0.508	0.948	0.508	0.526	11.169	3.663
6.30	6.30	661.98	1.399	0.0*	1-S2n	0.518	0.965	0.558	0.533	10.159	3.696
6.80	6.80	662.05	1.472	0.0*	1-S2n	0.539	1.007	0.565	0.548	10.788	3.767
7.16	7.16	662.11	1.526	0.0*	5-S2n	0.554	1.033	0.554	0.559	11.654	3.816
7.52	7.52	662.16	1.580	0.0*	5-S2n	0.569	1.059	0.569	0.570	11.815	3.863
7.88	7.88	662.22	1.637	0.0*	5-S2n	0.584	1.084	0.628	0.580	10.850	3.909
8.24	8.24	662.28	1.696	0.0*	5-S2n	0.599	1.108	0.642	0.589	11.038	3.953
8.60	8.60	662.34	1.756	0.0*	5-S2n	0.613	1.131	0.653	0.599	11.258	3.995

* Full Flow Headwater elevation is below inlet invert.

****

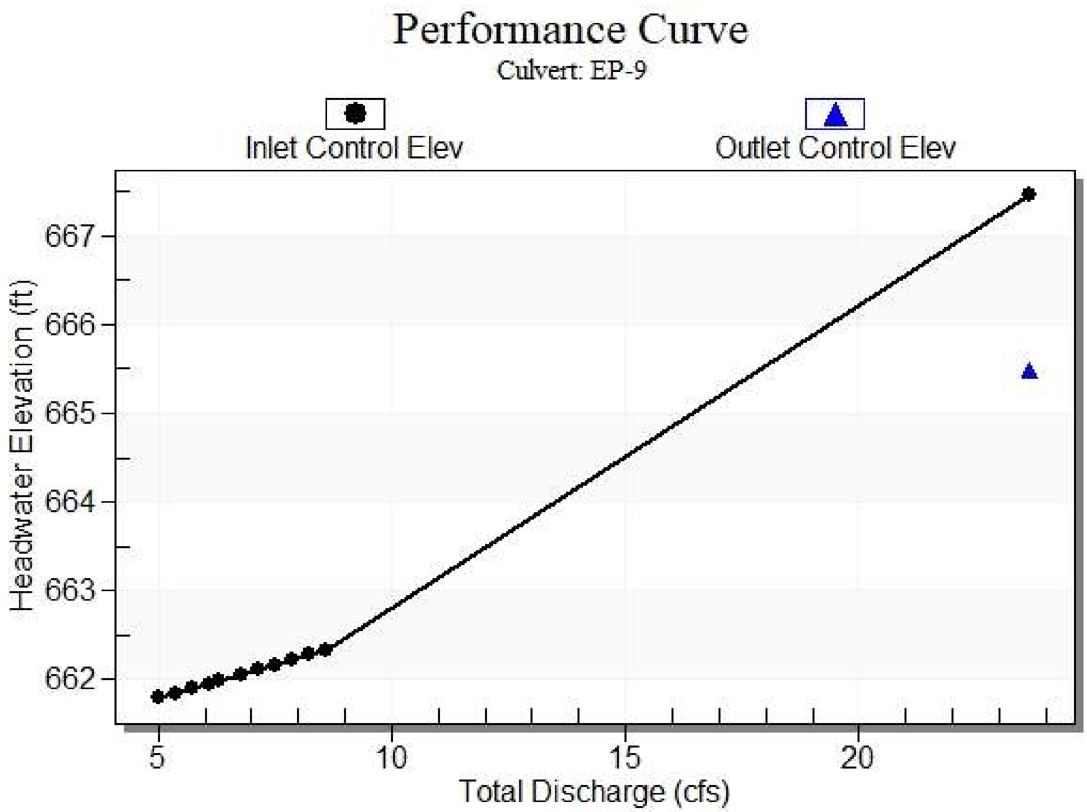
Straight Culvert

Inlet Elevation (invert): 660.58 ft, Outlet Elevation (invert): 657.08 ft

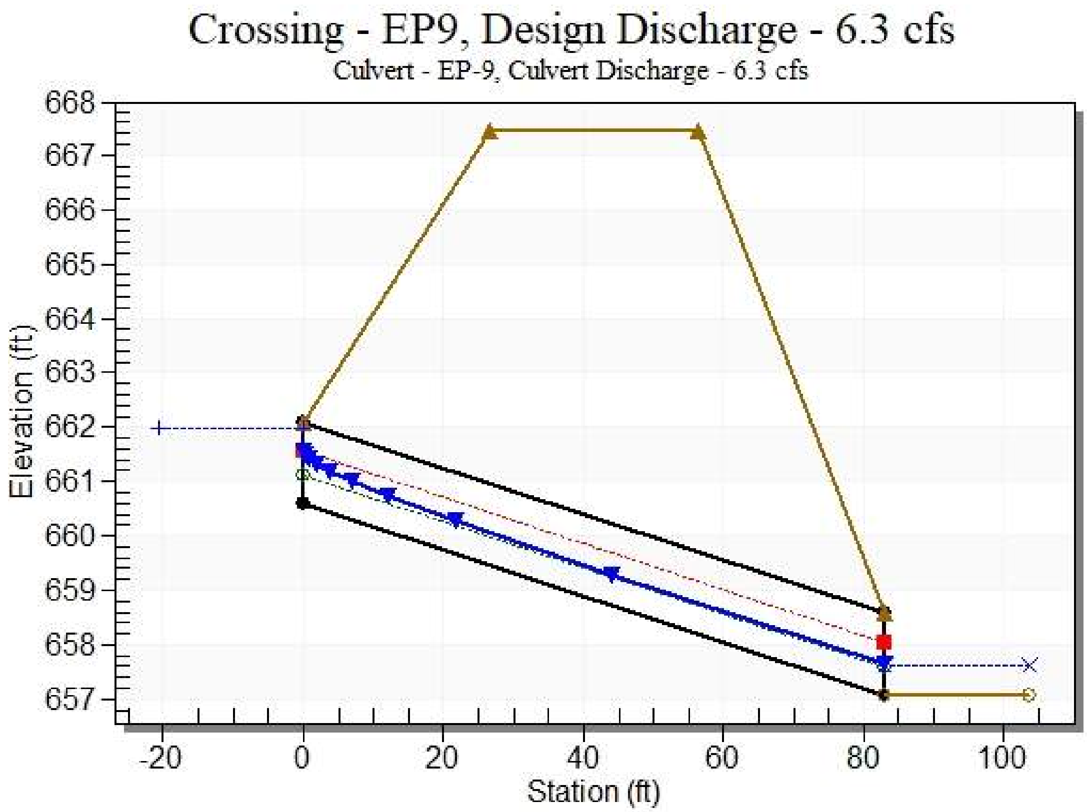
Culvert Length: 83.07 ft, Culvert Slope: 0.0422

****

Culvert Performance Curve Plot: EP-9



Water Surface Profile Plot for Culvert: EP-9



Site Data - EP-9

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 660.58 ft

Outlet Station: 83.00 ft

Outlet Elevation: 657.08 ft

Number of Barrels: 1

Culvert Data Summary - EP-9

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 21 - Downstream Channel Rating Curve (Crossing: EP9)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
5.00	657.57	0.49	3.49	1.37	1.24
5.36	657.58	0.50	3.55	1.41	1.25
5.72	657.59	0.51	3.61	1.44	1.25
6.08	657.61	0.53	3.66	1.48	1.26
6.30	657.61	0.53	3.70	1.50	1.26
6.80	657.63	0.55	3.77	1.54	1.27
7.16	657.64	0.56	3.82	1.57	1.27
7.52	657.65	0.57	3.86	1.60	1.28
7.88	657.66	0.58	3.91	1.63	1.28
8.24	657.67	0.59	3.95	1.66	1.28
8.60	657.68	0.60	3.99	1.68	1.29

Tailwater Channel Data - EP9

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0450

Channel Manning's n: 0.0350

Channel Invert Elevation: 657.08 ft

Roadway Data for Crossing: EP9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 667.46 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9 cfs

Design Flow: 11.3 cfs

Maximum Flow: 15.3 cfs

Table 22 - Summary of Culvert Flows at Crossing: CLP11

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-11 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
620.16	9.00	9.00	0.00	1
620.22	9.63	9.63	0.00	1
620.28	10.26	10.26	0.00	1
620.34	10.89	10.89	0.00	1
620.38	11.30	11.30	0.00	1
620.46	12.15	12.15	0.00	1
620.52	12.78	12.78	0.00	1
620.57	13.41	13.41	0.00	1
620.63	14.04	14.04	0.00	1
620.69	14.67	14.67	0.00	1
620.75	15.30	15.30	0.00	1
636.68	76.18	76.18	0.00	Overtopping

Rating Curve Plot for Crossing: CLP11

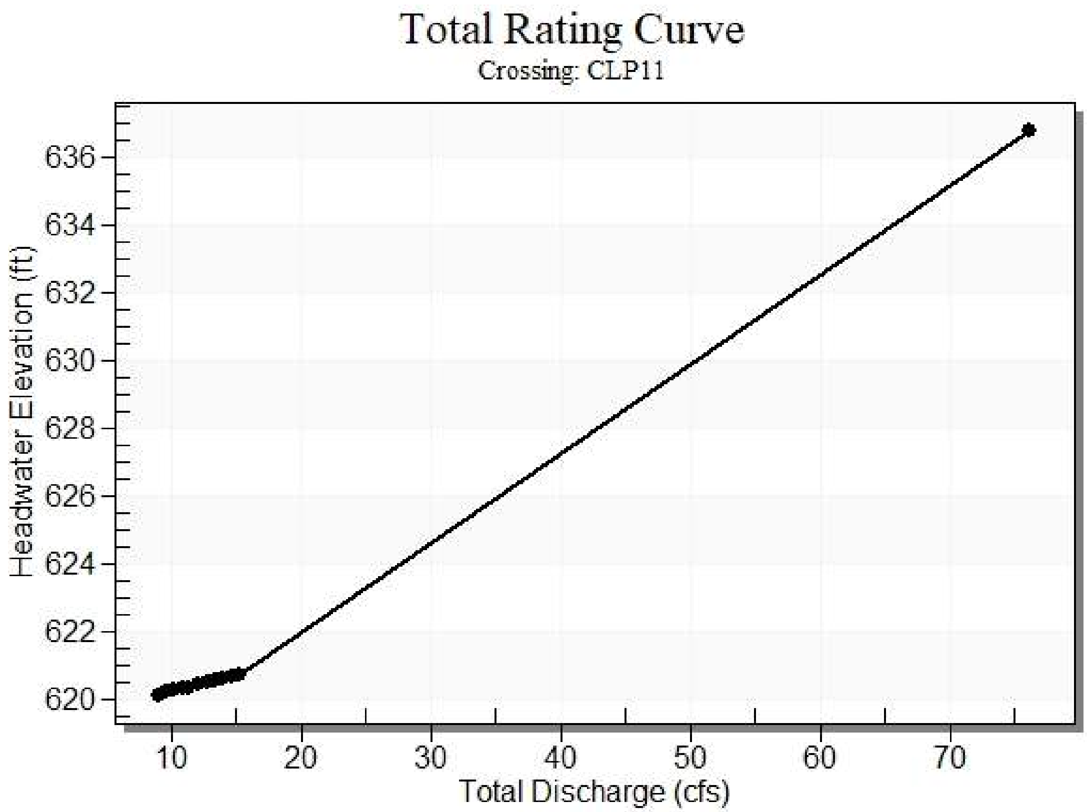


Table 23 - Culvert Summary Table: CLP-11

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00	9.00	620.16	1.462	0.0*	1-S2n	0.477	1.069	0.517	0.403	13.466	4.607
9.63	9.63	620.22	1.524	0.0*	1-S2n	0.493	1.105	0.493	0.414	15.459	4.686
10.26	10.26	620.28	1.583	0.0*	1-S2n	0.510	1.144	0.510	0.424	15.757	4.761
10.89	10.89	620.34	1.642	0.0*	1-S2n	0.525	1.180	0.541	0.433	15.314	4.832
11.30	11.30	620.38	1.680	0.0*	1-S2n	0.535	1.202	0.535	0.439	16.159	4.877
12.15	12.15	620.46	1.758	0.0*	1-S2n	0.555	1.247	0.555	0.452	16.516	4.966
12.78	12.78	620.52	1.815	0.0*	1-S2n	0.570	1.283	0.570	0.460	16.703	5.030
13.41	13.41	620.57	1.873	0.0*	1-S2n	0.584	1.315	0.584	0.469	16.953	5.090
14.04	14.04	620.63	1.931	0.0*	1-S2n	0.598	1.346	0.639	0.477	15.692	5.149
14.67	14.67	620.69	1.989	0.0*	1-S2n	0.612	1.376	0.629	0.485	16.740	5.206
15.30	15.30	620.75	2.049	0.0*	5-S2n	0.626	1.406	0.626	0.492	17.578	5.261

* Full Flow Headwater elevation is below inlet invert.

****

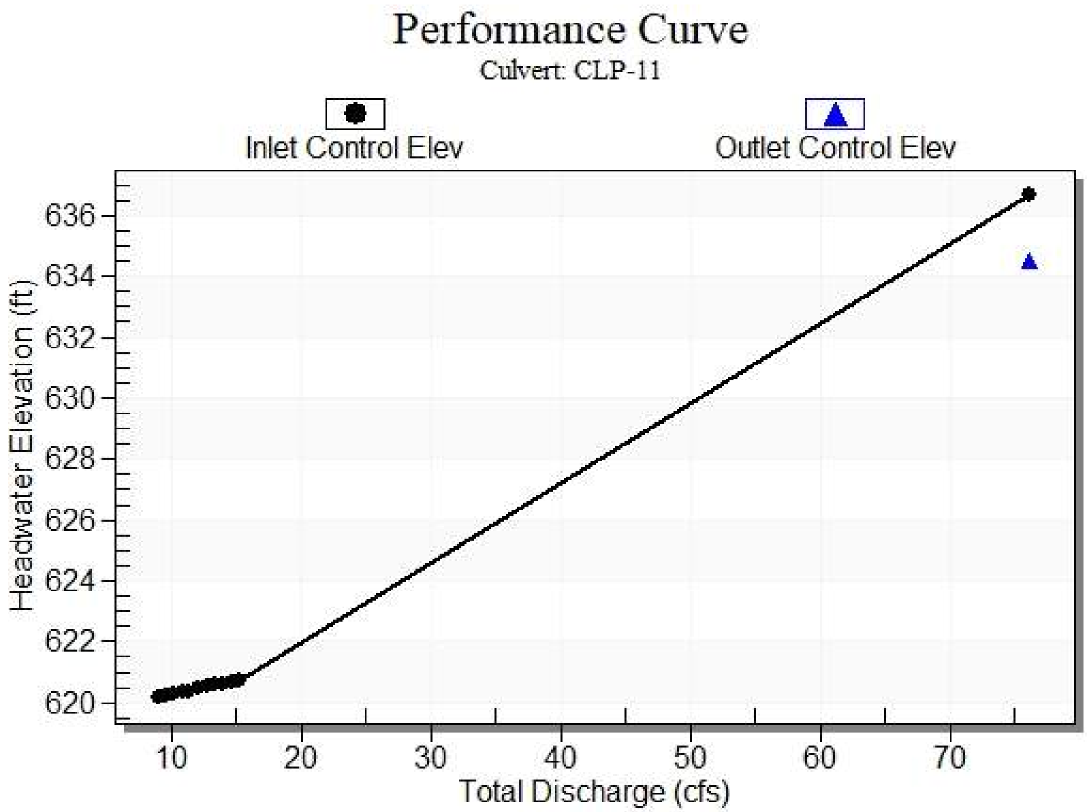
Straight Culvert

Inlet Elevation (invert): 618.70 ft, Outlet Elevation (invert): 606.64 ft

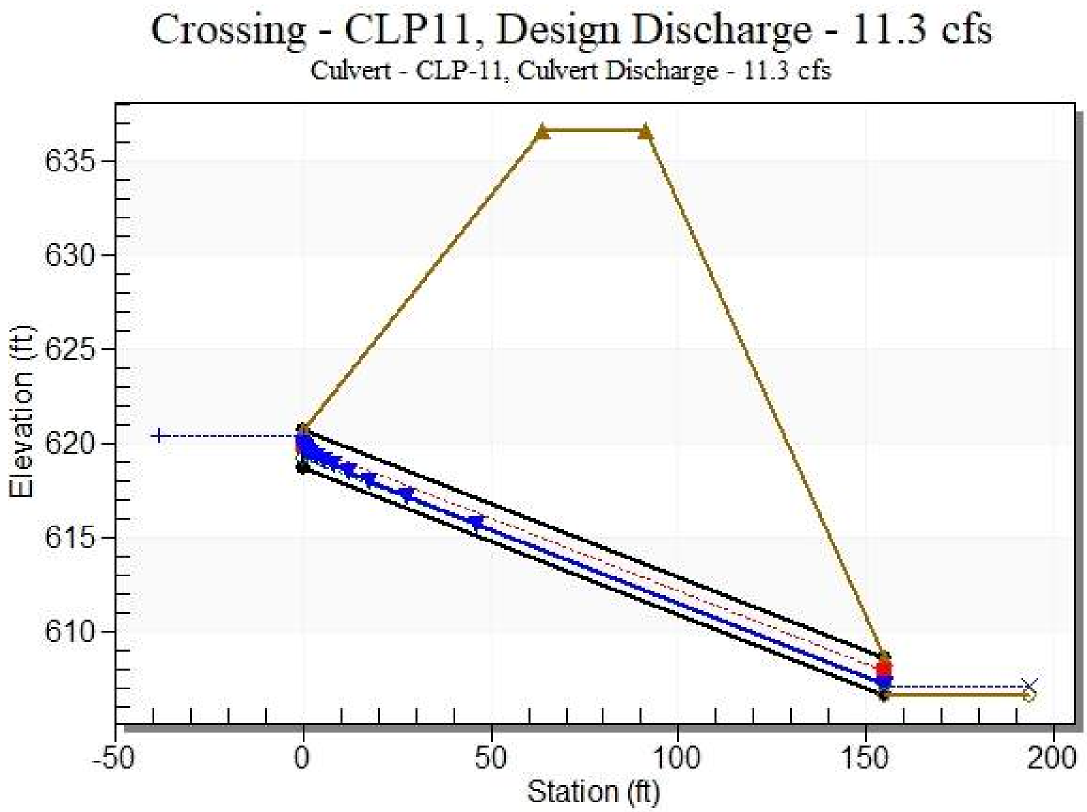
Culvert Length: 155.47 ft, Culvert Slope: 0.0778

****

Culvert Performance Curve Plot: CLP-11



Water Surface Profile Plot for Culvert: CLP-11



Site Data - CLP-11

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 618.70 ft

Outlet Station: 155.00 ft

Outlet Elevation: 606.64 ft

Number of Barrels: 1

Culvert Data Summary - CLP-11

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 24 - Downstream Channel Rating Curve (Crossing: CLP11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
9.00	607.04	0.40	4.61	2.52	1.81
9.63	607.05	0.41	4.69	2.58	1.82
10.26	607.06	0.42	4.76	2.64	1.82
10.89	607.07	0.43	4.83	2.70	1.83
11.30	607.08	0.44	4.88	2.74	1.83
12.15	607.09	0.45	4.97	2.82	1.84
12.78	607.10	0.46	5.03	2.87	1.85
13.41	607.11	0.47	5.09	2.92	1.85
14.04	607.12	0.48	5.15	2.97	1.86
14.67	607.12	0.48	5.21	3.02	1.86
15.30	607.13	0.49	5.26	3.07	1.87

Tailwater Channel Data - CLP11

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 12.00 (_:1)

Channel Slope: 0.1000

Channel Manning's n: 0.0350

Channel Invert Elevation: 606.64 ft

Roadway Data for Crossing: CLP11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 636.68 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2.8 cfs

Design Flow: 3.6 cfs

Maximum Flow: 4.9 cfs

Table 25 - Summary of Culvert Flows at Crossing: CLP12

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
641.73	2.80	2.80	0.00	1
641.77	3.01	3.01	0.00	1
641.81	3.22	3.22	0.00	1
641.85	3.43	3.43	0.00	1
641.88	3.60	3.60	0.00	1
641.92	3.85	3.85	0.00	1
641.95	4.06	4.06	0.00	1
641.98	4.27	4.27	0.00	1
642.01	4.48	4.48	0.00	1
642.05	4.69	4.69	0.00	1
642.08	4.90	4.90	0.00	1
645.01	18.91	18.91	0.00	Overtopping

Rating Curve Plot for Crossing: CLP12

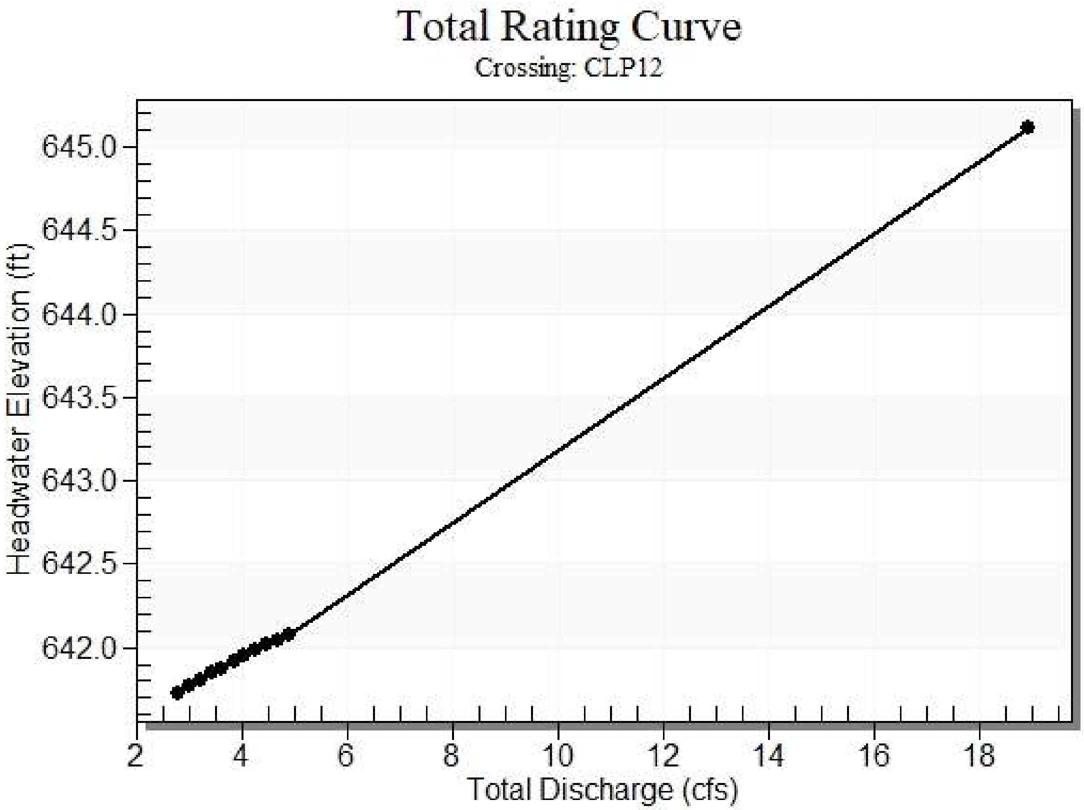


Table 26 - Culvert Summary Table: CLP-12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.80	2.80	641.73	0.871	0.0*	1-S2n	0.415	0.634	0.415	0.436	6.794	4.921
3.01	3.01	641.77	0.911	0.0*	1-S2n	0.431	0.659	0.431	0.447	6.949	5.011
3.22	3.22	641.81	0.949	0.0*	1-S2n	0.446	0.683	0.446	0.459	7.060	5.096
3.43	3.43	641.85	0.986	0.0*	1-S2n	0.461	0.706	0.481	0.470	6.785	5.177
3.60	3.60	641.88	1.015	0.0*	1-S2n	0.473	0.725	0.493	0.479	6.890	5.240
3.85	3.85	641.92	1.057	0.0*	1-S2n	0.490	0.750	0.511	0.491	7.018	5.329
4.06	4.06	641.95	1.090	0.0*	1-S2n	0.504	0.771	0.525	0.501	7.126	5.400
4.27	4.27	641.98	1.123	0.0*	1-S2n	0.517	0.791	0.540	0.510	7.215	5.468
4.48	4.48	642.01	1.155	0.0*	1-S2n	0.531	0.810	0.555	0.519	7.287	5.534
4.69	4.69	642.05	1.186	0.0*	1-S2n	0.544	0.829	0.569	0.528	7.370	5.598
4.90	4.90	642.08	1.217	0.0*	1-S2n	0.557	0.847	0.584	0.537	7.451	5.660

* Full Flow Headwater elevation is below inlet invert.

****

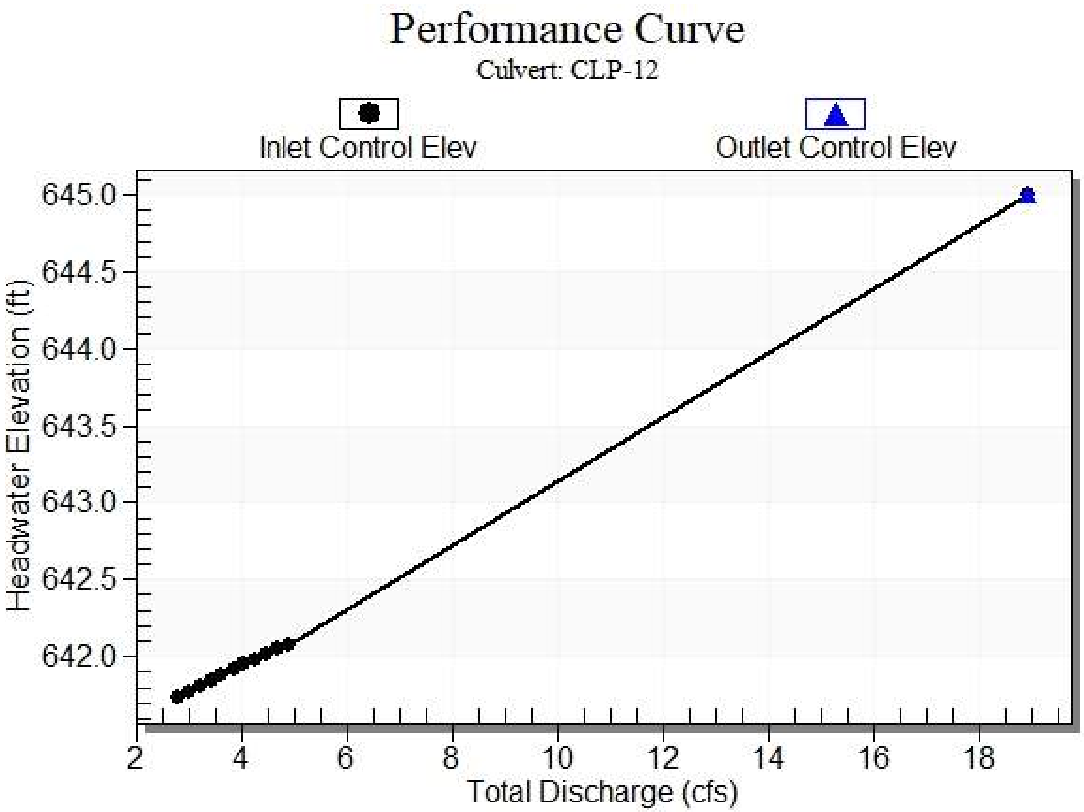
Straight Culvert

Inlet Elevation (invert): 640.86 ft,   Outlet Elevation (invert): 639.60 ft

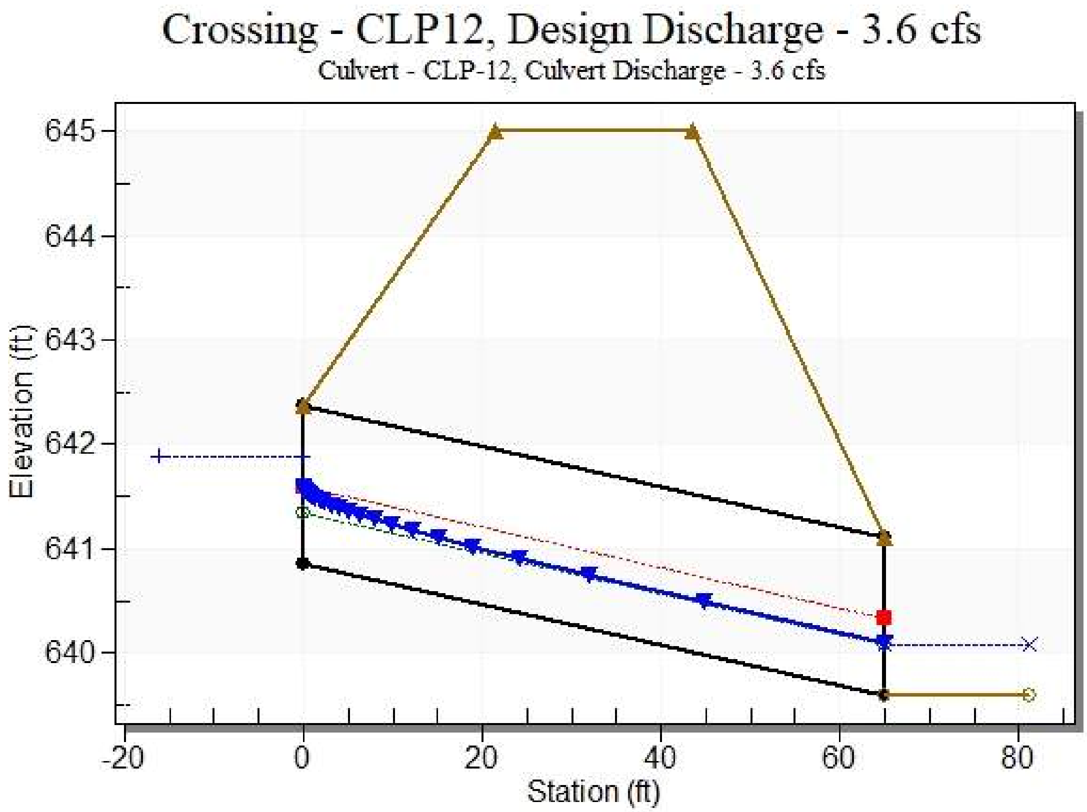
Culvert Length: 65.01 ft,   Culvert Slope: 0.0194

****

Culvert Performance Curve Plot: CLP-12



Water Surface Profile Plot for Culvert: CLP-12



Site Data - CLP-12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 640.86 ft

Outlet Station: 65.00 ft

Outlet Elevation: 639.60 ft

Number of Barrels: 1

Culvert Data Summary - CLP-12

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 27 - Downstream Channel Rating Curve (Crossing: CLP12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.80	640.04	0.44	4.92	2.99	1.86
3.01	640.05	0.45	5.01	3.07	1.87
3.22	640.06	0.46	5.10	3.15	1.87
3.43	640.07	0.47	5.18	3.23	1.88
3.60	640.08	0.48	5.24	3.28	1.89
3.85	640.09	0.49	5.33	3.37	1.90
4.06	640.10	0.50	5.40	3.44	1.90
4.27	640.11	0.51	5.47	3.50	1.91
4.48	640.12	0.52	5.53	3.57	1.91
4.69	640.13	0.53	5.60	3.63	1.92
4.90	640.14	0.54	5.66	3.69	1.92

Tailwater Channel Data - CLP12

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.1100

Channel Manning's n: 0.0350

Channel Invert Elevation: 639.60 ft

Roadway Data for Crossing: CLP12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 645.01 ft

Roadway Surface: Paved

Roadway Top Width: 22.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 1.6 cfs

Design Flow: 2.1 cfs

Maximum Flow: 2.8 cfs

Table 28 - Summary of Culvert Flows at Crossing: CLP13

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-13 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
614.52	1.60	1.60	0.00	1
614.54	1.72	1.72	0.00	1
614.57	1.84	1.84	0.00	1
614.59	1.96	1.96	0.00	1
614.61	2.08	2.08	0.00	1
614.62	2.10	2.10	0.00	1
614.66	2.32	2.32	0.00	1
614.68	2.44	2.44	0.00	1
614.71	2.56	2.56	0.00	1
614.73	2.68	2.68	0.00	1
614.76	2.80	2.80	0.00	1
618.64	20.48	20.48	0.00	Overtopping

Rating Curve Plot for Crossing: CLP13

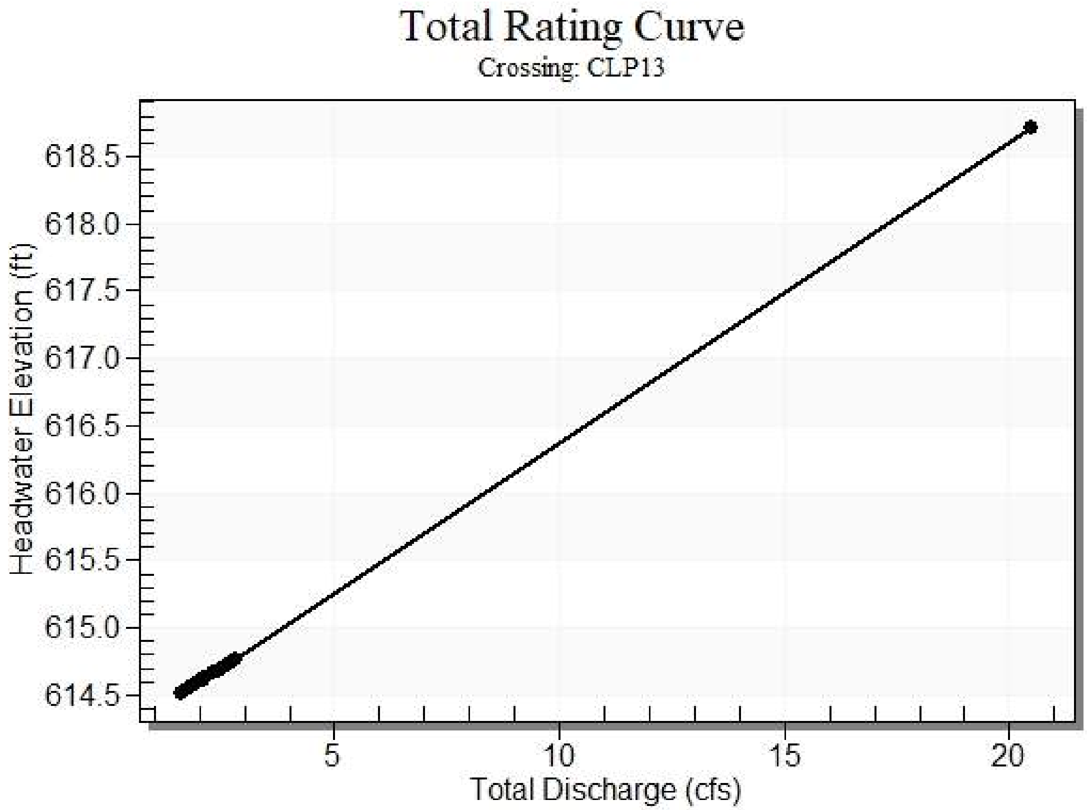


Table 29 - Culvert Summary Table: CLP-13

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.60	1.60	614.52	0.629	0.0*	1-S2n	0.294	0.470	0.294	0.426	6.342	2.202
1.72	1.72	614.54	0.652	0.0*	1-S2n	0.305	0.489	0.317	0.438	6.160	2.242
1.84	1.84	614.57	0.677	0.0*	1-S2n	0.315	0.507	0.315	0.449	6.642	2.280
1.96	1.96	614.59	0.700	0.0*	1-S2n	0.325	0.525	0.339	0.460	6.333	2.316
2.08	2.08	614.61	0.723	0.0*	1-S2n	0.335	0.542	0.349	0.470	6.469	2.351
2.10	2.10	614.62	0.727	0.0*	1-S2n	0.337	0.544	0.351	0.472	6.493	2.357
2.32	2.32	614.66	0.769	0.0*	1-S2n	0.354	0.572	0.369	0.490	6.649	2.416
2.44	2.44	614.68	0.795	0.0*	1-S2n	0.363	0.588	0.378	0.499	6.752	2.447
2.56	2.56	614.71	0.819	0.0*	1-S2n	0.372	0.604	0.387	0.508	6.861	2.476
2.68	2.68	614.73	0.843	0.0*	1-S2n	0.381	0.619	0.396	0.517	6.976	2.505
2.80	2.80	614.76	0.867	0.0*	1-S2n	0.390	0.634	0.401	0.526	7.111	2.532

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

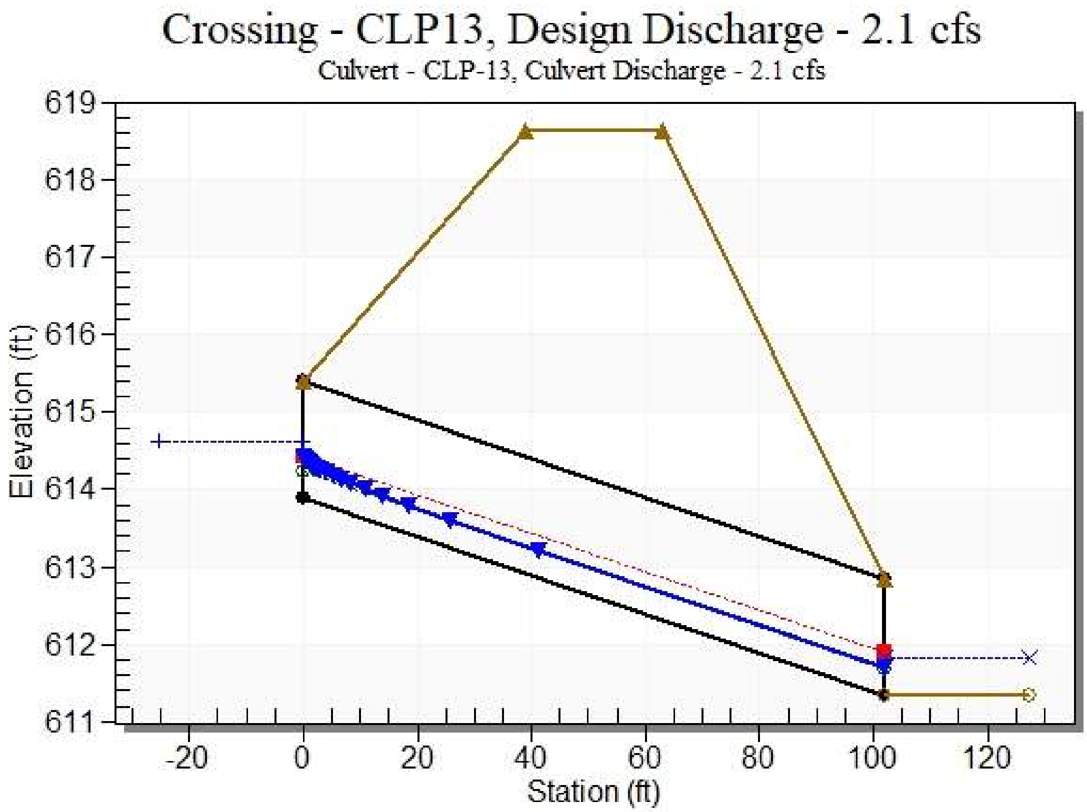
Inlet Elevation (invert): 613.89 ft,   Outlet Elevation (invert): 611.35 ft

Culvert Length: 102.03 ft,   Culvert Slope: 0.0249

****

Culvert Performance Curve Plot: CLP-13

Water Surface Profile Plot for Culvert: CLP-13



Site Data - CLP-13

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 613.89 ft

Outlet Station: 102.00 ft

Outlet Elevation: 611.35 ft

Number of Barrels: 1

Culvert Data Summary - CLP-13

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 30 - Downstream Channel Rating Curve (Crossing: CLP13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
1.60	611.78	0.43	2.20	0.59	0.84
1.72	611.79	0.44	2.24	0.60	0.84
1.84	611.80	0.45	2.28	0.62	0.85
1.96	611.81	0.46	2.32	0.63	0.85
2.08	611.82	0.47	2.35	0.65	0.85
2.10	611.82	0.47	2.36	0.65	0.85
2.32	611.84	0.49	2.42	0.67	0.86
2.44	611.85	0.50	2.45	0.69	0.86
2.56	611.86	0.51	2.48	0.70	0.87
2.68	611.87	0.52	2.50	0.71	0.87
2.80	611.88	0.53	2.53	0.72	0.87

Tailwater Channel Data - CLP13

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0220

Channel Manning's n: 0.0350

Channel Invert Elevation: 611.35 ft

Roadway Data for Crossing: CLP13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 618.64 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 4 cfs

Design Flow: 5 cfs

Maximum Flow: 7 cfs

Table 31 - Summary of Culvert Flows at Crossing: CLP15

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-15 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
621.38	4.00	4.00	0.00	1
621.43	4.30	4.30	0.00	1
621.48	4.60	4.60	0.00	1
621.53	4.90	4.90	0.00	1
621.54	5.00	5.00	0.00	1
621.62	5.50	5.50	0.00	1
621.67	5.80	5.80	0.00	1
621.71	6.10	6.10	0.00	1
621.76	6.40	6.40	0.00	1
621.81	6.70	6.70	0.00	1
621.86	7.00	7.00	0.00	1
624.27	15.61	15.61	0.00	Overtopping

Rating Curve Plot for Crossing: CLP15

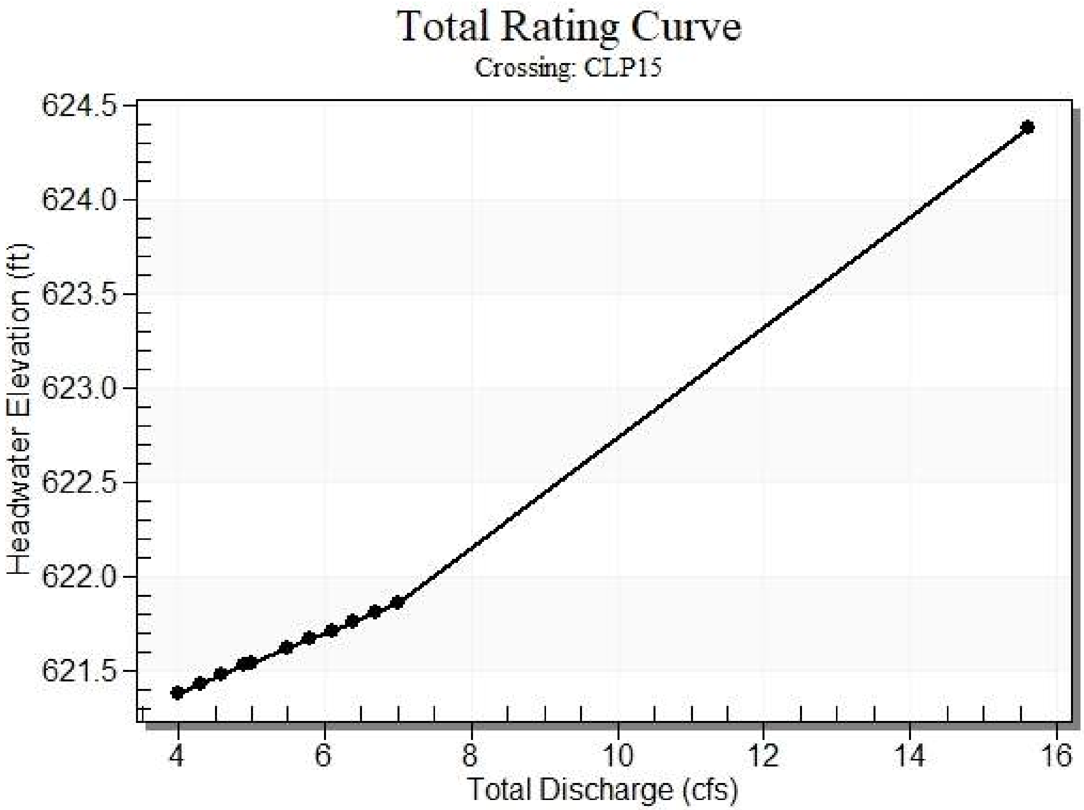


Table 32 - Culvert Summary Table: CLP-15

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
4.00	4.00	621.38	1.093	1.125	2-M2c	0.802	0.765	0.765	0.432	4.414	6.135
4.30	4.30	621.43	1.139	1.173	2-M2c	0.839	0.794	0.794	0.443	4.531	6.247
4.60	4.60	621.48	1.185	1.220	2-M2c	0.877	0.821	0.821	0.455	4.647	6.354
4.90	4.90	621.53	1.229	1.266	2-M2c	0.914	0.847	0.847	0.466	4.763	6.455
5.00	5.00	621.54	1.244	1.282	2-M2c	0.927	0.856	0.856	0.469	4.801	6.487
5.50	5.50	621.62	1.315	1.359	2-M2c	0.991	0.901	0.901	0.486	4.960	6.644
5.80	5.80	621.67	1.357	1.405	2-M2c	1.032	0.926	0.926	0.496	5.067	6.733
6.10	6.10	621.71	1.399	1.453	2-M2c	1.074	0.949	0.949	0.506	5.173	6.818
6.40	6.40	621.76	1.442	1.501	7-M2c	1.120	0.972	0.972	0.515	5.280	6.900
6.70	6.70	621.81	1.484	1.551	7-M2c	1.170	0.999	0.999	0.524	5.359	6.980
7.00	7.00	621.86	1.527	1.599	7-M2c	1.500	1.021	1.021	0.532	5.461	7.057

****

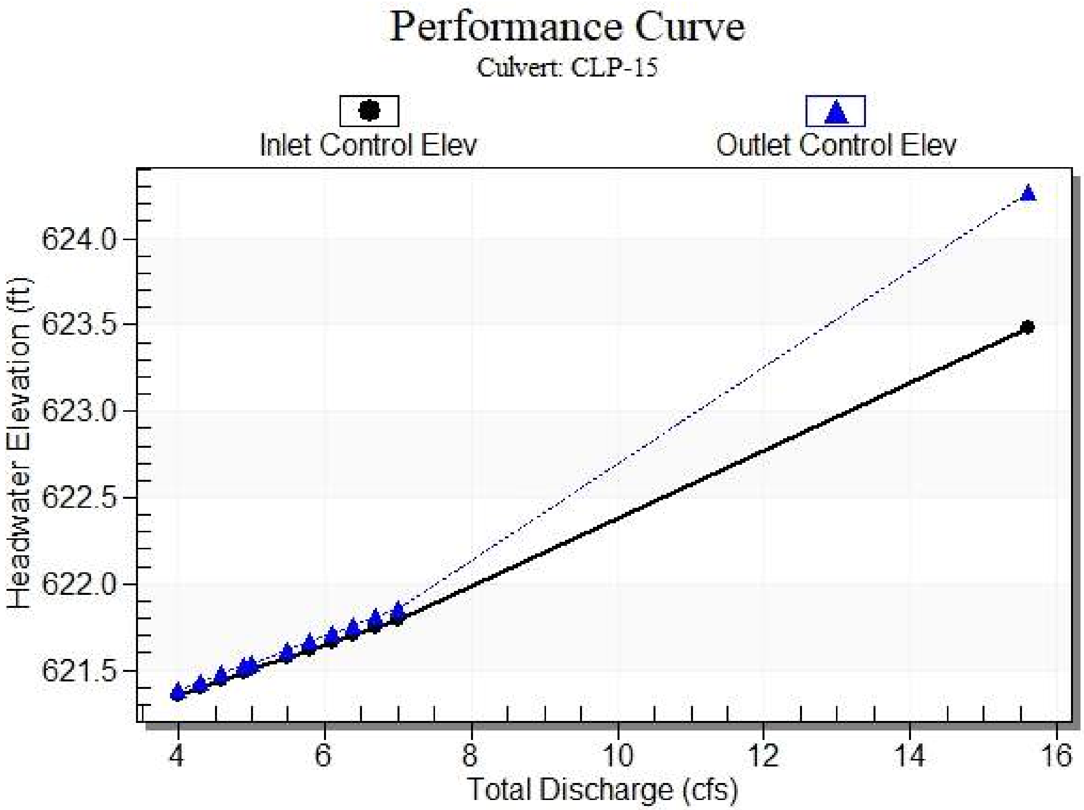
Straight Culvert

Inlet Elevation (invert): 620.26 ft,   Outlet Elevation (invert): 620.00 ft

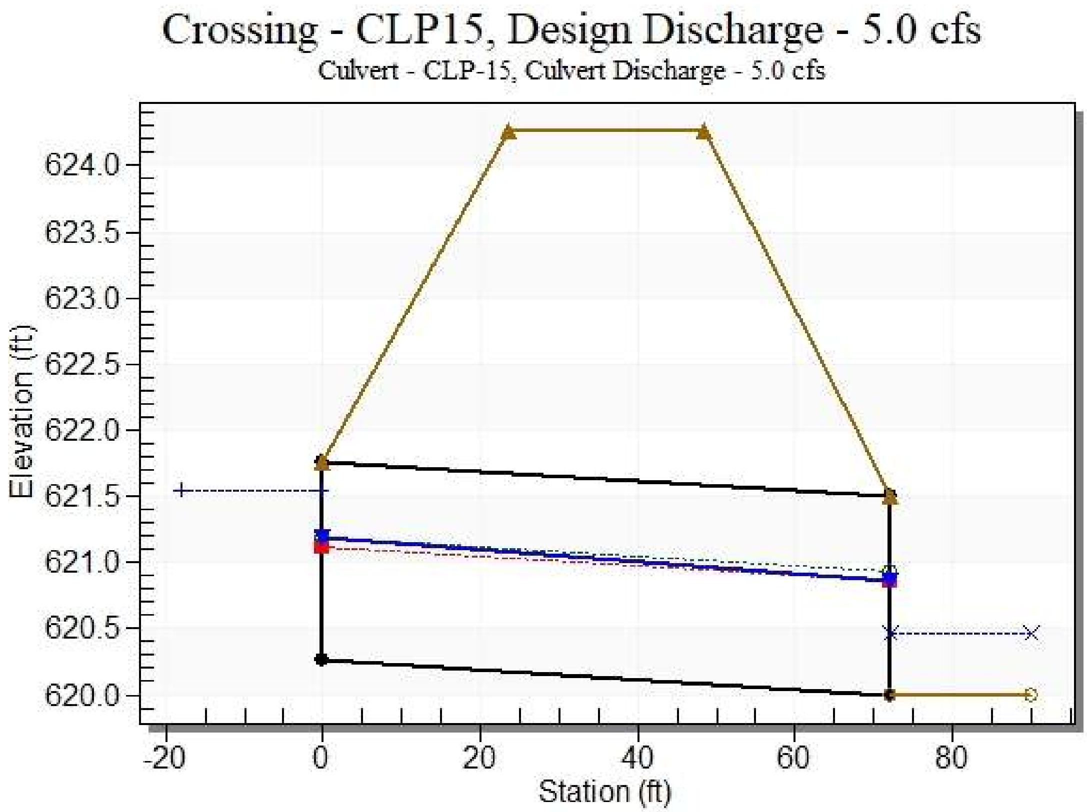
Culvert Length: 72.00 ft,   Culvert Slope: 0.0036

****

Culvert Performance Curve Plot: CLP-15



Water Surface Profile Plot for Culvert: CLP-15



Site Data - CLP-15

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 620.26 ft

Outlet Station: 72.00 ft

Outlet Elevation: 620.00 ft

Number of Barrels: 1

Culvert Data Summary - CLP-15

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 33 - Downstream Channel Rating Curve (Crossing: CLP15)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
4.00	620.43	0.43	6.14	4.58	2.33
4.30	620.44	0.44	6.25	4.70	2.34
4.60	620.45	0.45	6.35	4.82	2.35
4.90	620.47	0.47	6.45	4.94	2.36
5.00	620.47	0.47	6.49	4.98	2.36
5.50	620.49	0.49	6.64	5.16	2.37
5.80	620.50	0.50	6.73	5.26	2.38
6.10	620.51	0.51	6.82	5.36	2.39
6.40	620.51	0.51	6.90	5.46	2.40
6.70	620.52	0.52	6.98	5.56	2.40
7.00	620.53	0.53	7.06	5.65	2.41

Tailwater Channel Data - CLP15

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 3.50 (_:1)

Channel Slope: 0.1700

Channel Manning's n: 0.0350

Channel Invert Elevation: 620.00 ft

Roadway Data for Crossing: CLP15

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 624.27 ft

Roadway Surface: Paved

Roadway Top Width: 25.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 34 - Summary of Culvert Flows at Crossing: CLP16

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CLP-16 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
630.55	10-Year	15.00	15.00	0.00	1
630.85	25-Year	18.00	18.00	0.00	1
631.30	50-Year	22.00	22.00	0.00	1
631.70	100-Year	25.00	25.00	0.00	1
634.09	Overtopping	37.50	37.50	0.00	Overtopping

Rating Curve Plot for Crossing: CLP16

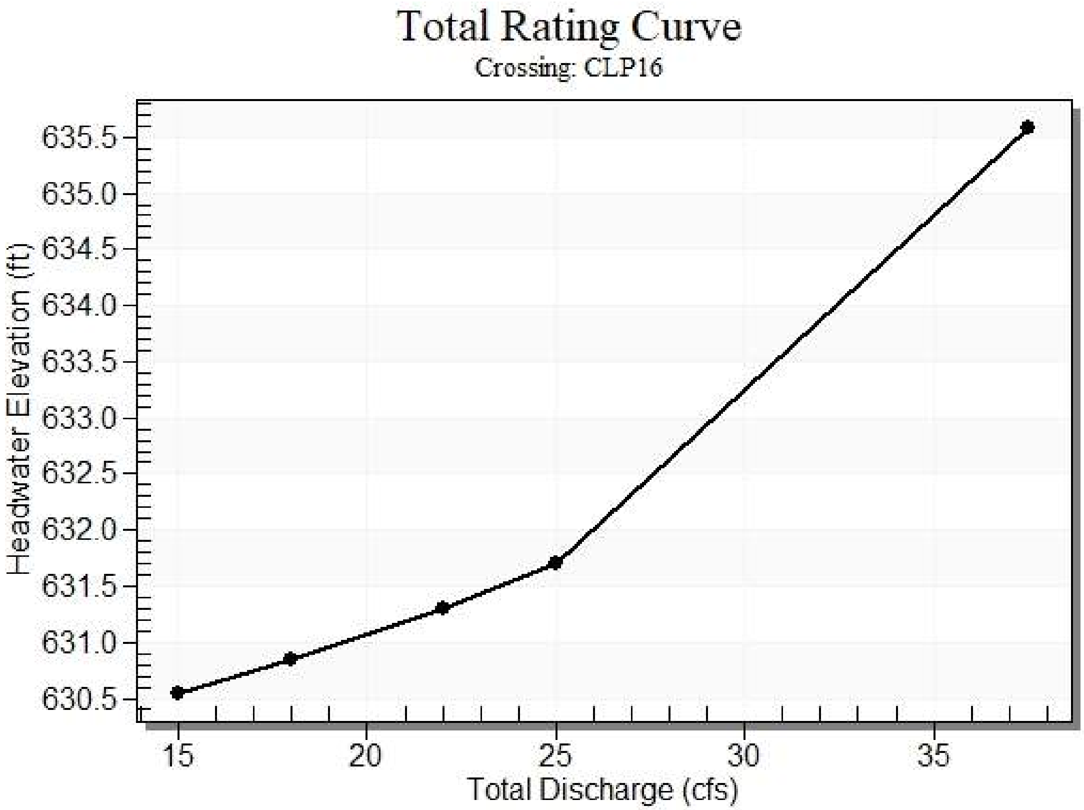


Table 35 - Culvert Summary Table: CLP-16

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10-Year	15.00	15.00	630.55	2.091	0.469	5-S2n	1.221	1.392	1.262	0.919	6.966	2.963
25-Year	18.00	18.00	630.85	2.388	2.257	5-S2n	1.393	1.526	1.436	0.984	7.256	3.101
50-Year	22.00	22.00	631.30	2.839	2.812	7-M2c	2.000	1.674	1.674	1.060	7.834	3.261
100-Year	25.00	25.00	631.70	3.224	3.235	7-M2c	2.000	1.761	1.761	1.112	8.533	3.367

****

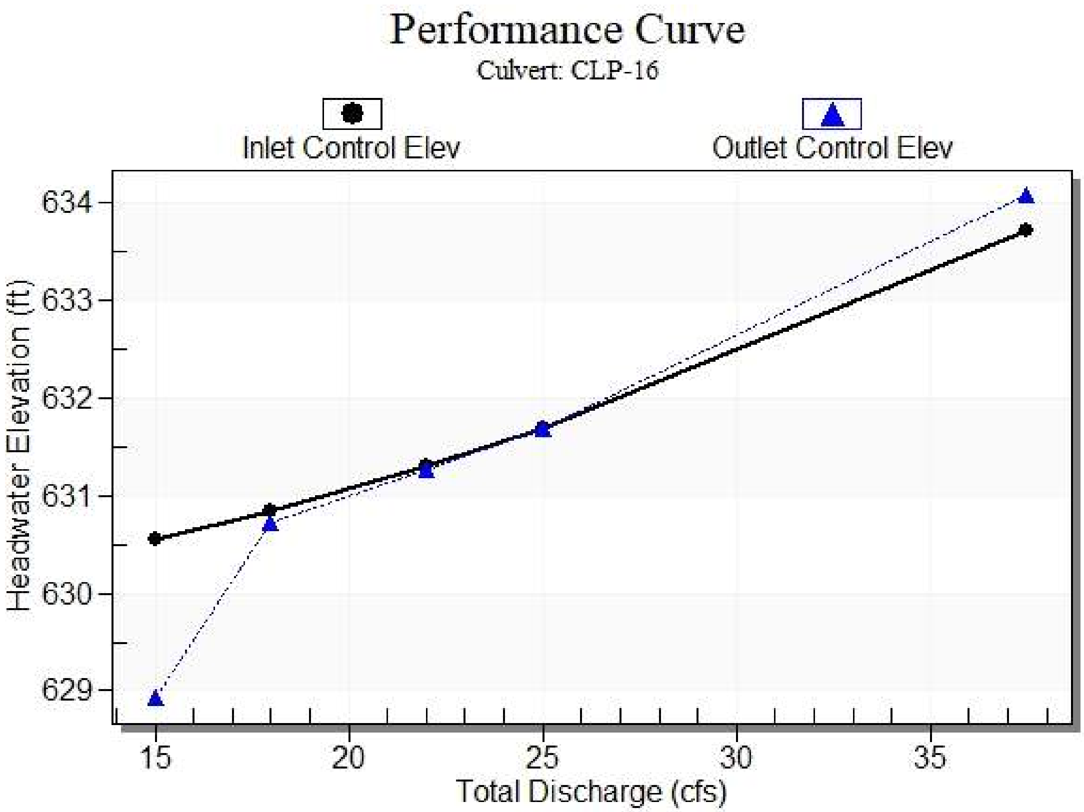
Straight Culvert

Inlet Elevation (invert): 628.46 ft, Outlet Elevation (invert): 628.01 ft

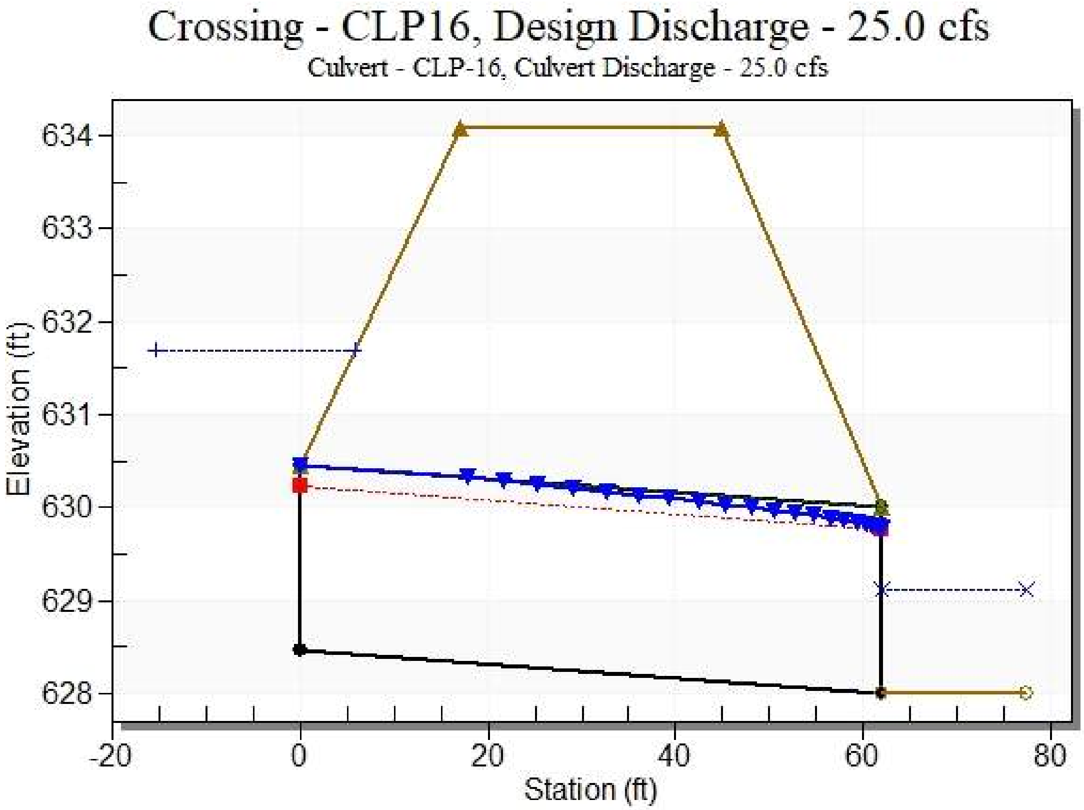
Culvert Length: 62.00 ft, Culvert Slope: 0.0073

****

Culvert Performance Curve Plot: CLP-16



Water Surface Profile Plot for Culvert: CLP-16



Site Data - CLP-16

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 628.46 ft

Outlet Station: 62.00 ft

Outlet Elevation: 628.01 ft

Number of Barrels: 1

Culvert Data Summary - CLP-16

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 36 - Downstream Channel Rating Curve (Crossing: CLP16)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.00	628.93	0.92	2.96	0.80	0.77
18.00	628.99	0.98	3.10	0.86	0.78
22.00	629.07	1.06	3.26	0.93	0.79
25.00	629.12	1.11	3.37	0.97	0.80

Tailwater Channel Data - CLP16

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0140

Channel Manning's n: 0.0350

Channel Invert Elevation: 628.01 ft

Roadway Data for Crossing: CLP16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 634.09 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2 cfs

Design Flow: 3 cfs

Maximum Flow: 4 cfs

Table 37 - Summary of Culvert Flows at Crossing: CLP17

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-17 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
616.32	2.00	2.00	0.00	1
616.36	2.20	2.20	0.00	1
616.40	2.40	2.40	0.00	1
616.44	2.60	2.60	0.00	1
616.48	2.80	2.80	0.00	1
616.52	3.00	3.00	0.00	1
616.56	3.20	3.20	0.00	1
616.59	3.40	3.40	0.00	1
616.63	3.60	3.60	0.00	1
616.66	3.80	3.80	0.00	1
616.69	4.00	4.00	0.00	1
619.00	13.49	13.49	0.00	Overtopping

Rating Curve Plot for Crossing: CLP17

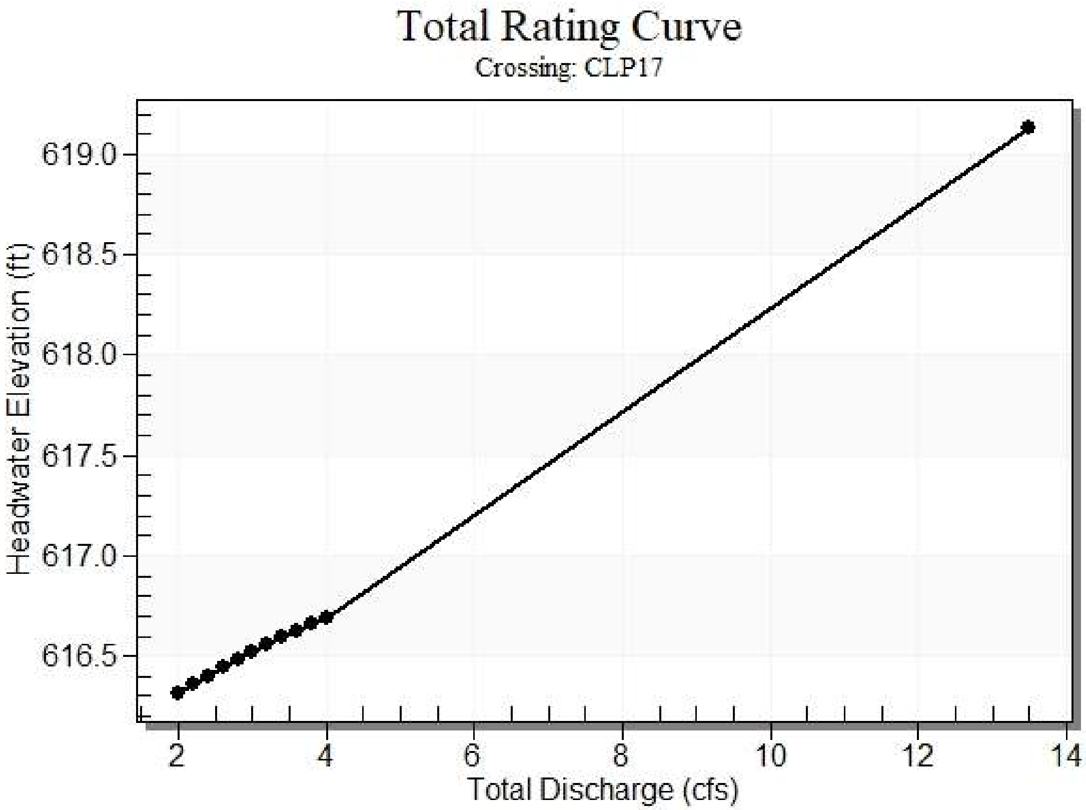


Table 38 - Culvert Summary Table: CLP-17

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.00	2.00	616.32	0.719	0.0*	1-S2n	0.473	0.530	0.473	0.444	4.037	1.690
2.20	2.20	616.36	0.757	0.0*	1-S2n	0.498	0.555	0.512	0.460	4.005	1.731
2.40	2.40	616.40	0.800	0.015	1-S2n	0.521	0.582	0.521	0.476	4.248	1.769
2.60	2.60	616.44	0.842	0.056	1-S2n	0.544	0.609	0.544	0.490	4.347	1.805
2.80	2.80	616.48	0.881	0.096	1-S2n	0.566	0.634	0.566	0.504	4.431	1.838
3.00	3.00	616.52	0.919	0.137	1-S2n	0.588	0.658	0.588	0.517	4.518	1.870
3.20	3.20	616.56	0.956	0.178	1-S2n	0.609	0.681	0.609	0.530	4.592	1.901
3.40	3.40	616.59	0.991	0.219	1-S2n	0.630	0.703	0.647	0.542	4.506	1.930
3.60	3.60	616.63	1.025	0.260	1-S2n	0.651	0.725	0.670	0.554	4.556	1.958
3.80	3.80	616.66	1.058	0.302	1-S2n	0.671	0.745	0.671	0.565	4.801	1.984
4.00	4.00	616.69	1.091	0.344	1-S2n	0.691	0.765	0.691	0.576	4.865	2.010

* Full Flow Headwater elevation is below inlet invert.

****

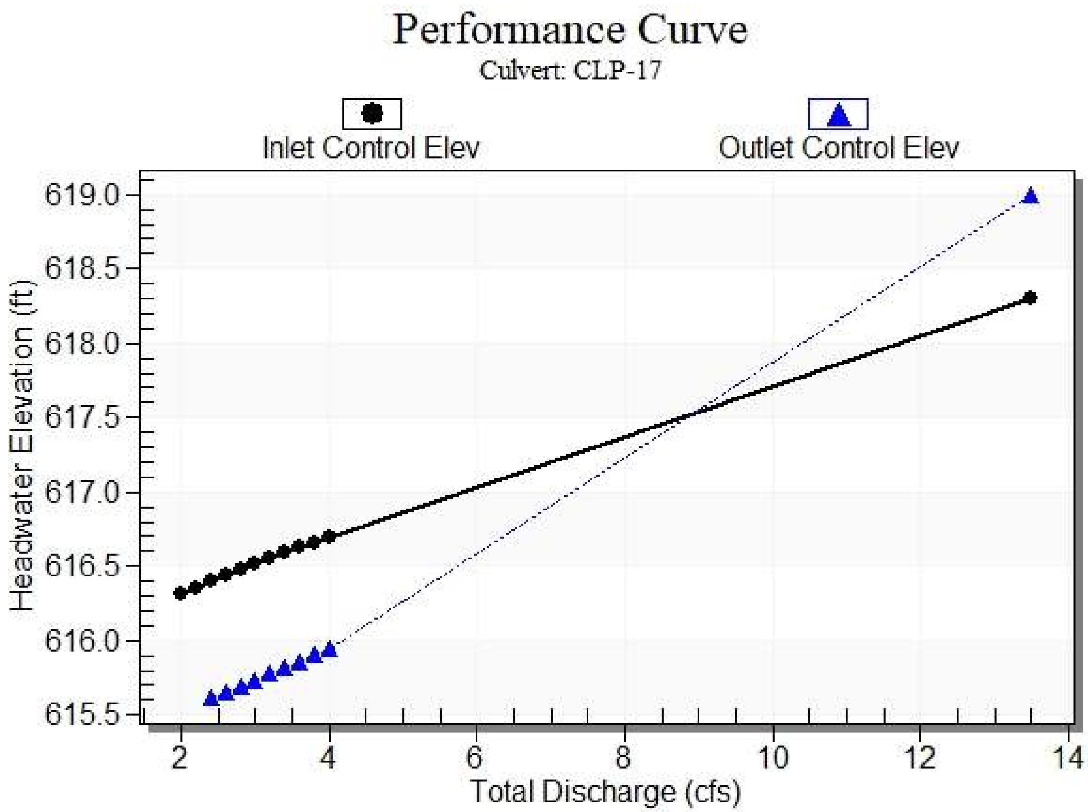
Straight Culvert

Inlet Elevation (invert): 615.60 ft,   Outlet Elevation (invert): 614.95 ft

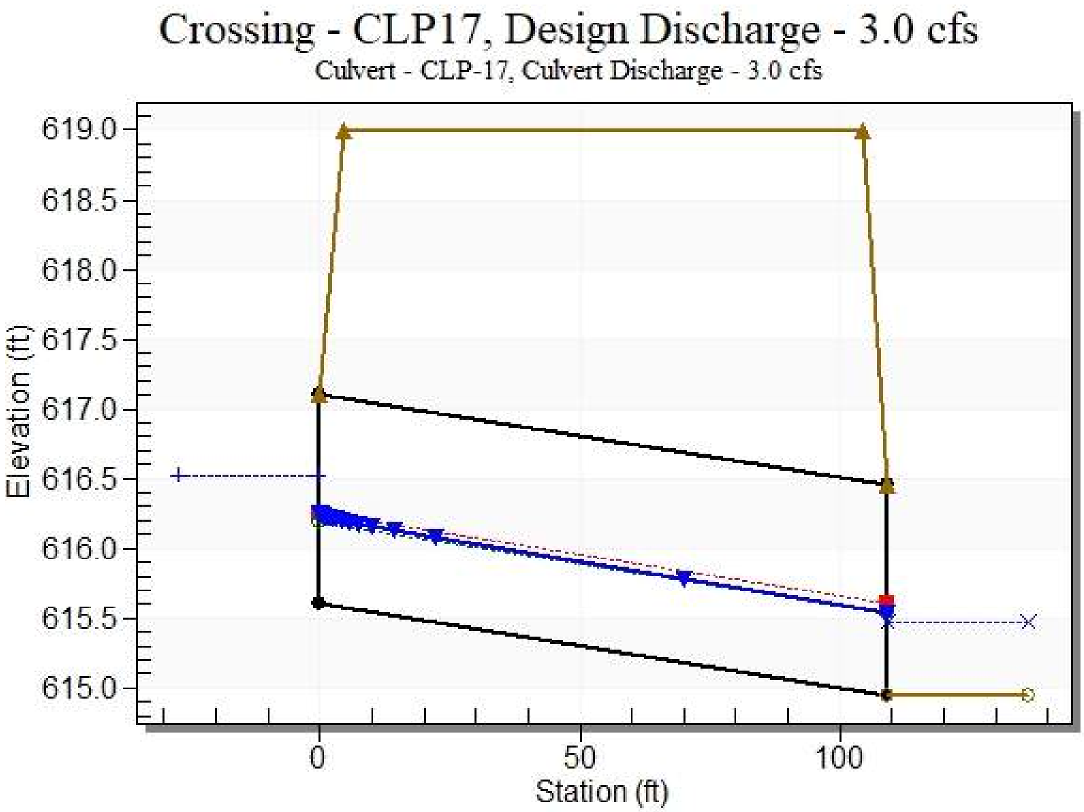
Culvert Length: 109.00 ft,   Culvert Slope: 0.0060

****

Culvert Performance Curve Plot: CLP-17



Water Surface Profile Plot for Culvert: CLP-17



Site Data - CLP-17

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 615.60 ft

Outlet Station: 109.00 ft

Outlet Elevation: 614.95 ft

Number of Barrels: 1

Culvert Data Summary - CLP-17

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 39 - Downstream Channel Rating Curve (Crossing: CLP17)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.00	615.39	0.44	1.69	0.33	0.63
2.20	615.41	0.46	1.73	0.34	0.64
2.40	615.43	0.48	1.77	0.36	0.64
2.60	615.44	0.49	1.80	0.37	0.64
2.80	615.45	0.50	1.84	0.38	0.65
3.00	615.47	0.52	1.87	0.39	0.65
3.20	615.48	0.53	1.90	0.40	0.65
3.40	615.49	0.54	1.93	0.41	0.65
3.60	615.50	0.55	1.96	0.41	0.66
3.80	615.51	0.56	1.98	0.42	0.66
4.00	615.53	0.58	2.01	0.43	0.66

Tailwater Channel Data - CLP17

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0120

Channel Manning's n: 0.0350

Channel Invert Elevation: 614.95 ft

Roadway Data for Crossing: CLP17

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 619.00 ft

Roadway Surface: Paved

Roadway Top Width: 100.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 6 cfs

Design Flow: 7.6 cfs

Maximum Flow: 9.2 cfs

Table 40 - Summary of Culvert Flows at Crossing: CLP14

Headwater Elevation (ft)	Total Discharge (cfs)	CLP-14 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
629.91	6.00	6.00	0.00	1
629.95	6.32	6.32	0.00	1
630.00	6.64	6.64	0.00	1
630.04	6.96	6.96	0.00	1
630.09	7.28	7.28	0.00	1
630.13	7.60	7.60	0.00	1
630.18	7.92	7.92	0.00	1
630.23	8.24	8.24	0.00	1
630.28	8.56	8.56	0.00	1
630.33	8.88	8.88	0.00	1
630.38	9.20	9.20	0.00	1
633.17	19.98	19.98	0.00	Overtopping

Rating Curve Plot for Crossing: CLP14

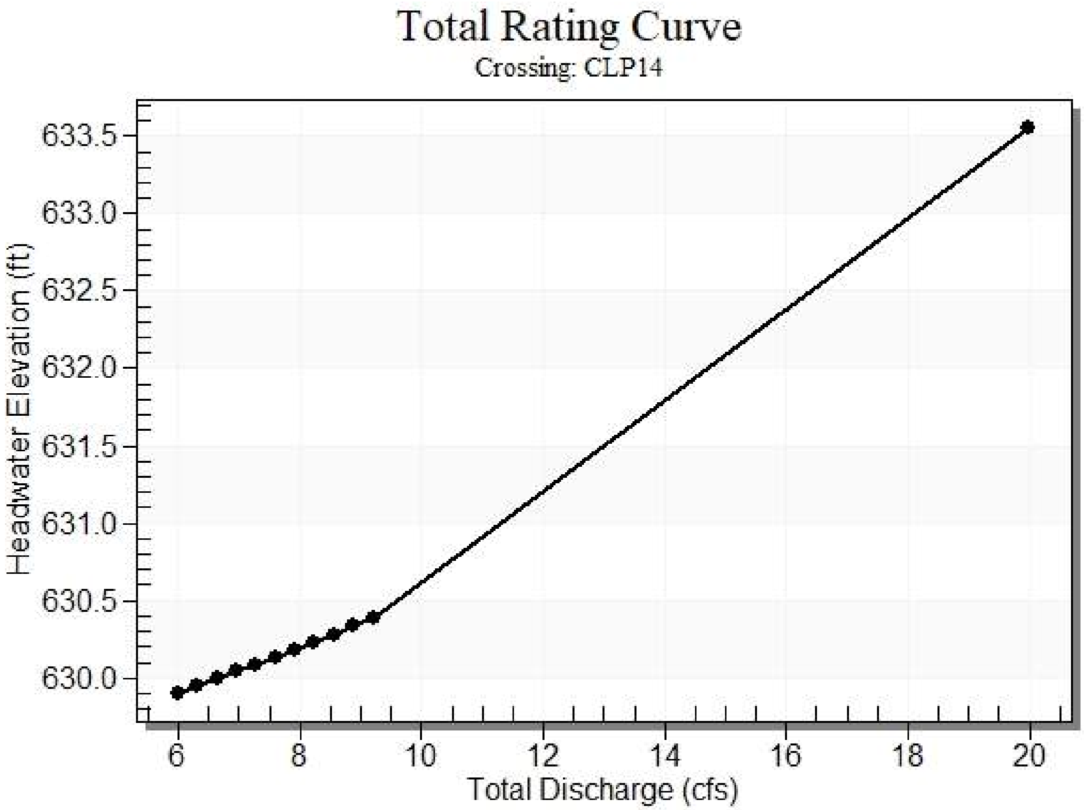


Table 41 - Culvert Summary Table: CLP-14

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
6.00	6.00	629.91	1.375	0.370	1-S2n	0.646	0.942	0.683	0.691	7.411	2.093
6.32	6.32	629.95	1.420	0.435	1-S2n	0.666	0.966	0.704	0.705	7.501	2.120
6.64	6.64	630.00	1.465	0.505	1-S2n	0.685	0.995	0.725	0.718	7.591	2.146
6.96	6.96	630.04	1.511	0.574	5-S2n	0.704	1.019	0.746	0.731	7.678	2.172
7.28	7.28	630.09	1.557	0.644	5-S2n	0.722	1.042	0.766	0.743	7.762	2.196
7.60	7.60	630.13	1.604	0.715	5-S2n	0.741	1.064	0.786	0.755	7.844	2.220
7.92	7.92	630.18	1.652	0.788	5-S2n	0.759	1.087	0.806	0.767	7.923	2.243
8.24	8.24	630.23	1.701	0.862	5-S2n	0.778	1.108	0.826	0.779	8.001	2.265
8.56	8.56	630.28	1.750	1.123	5-S2n	0.796	1.129	0.846	0.790	8.074	2.287
8.88	8.88	630.33	1.802	1.190	5-S2n	0.814	1.149	0.866	0.801	8.145	2.308
9.20	9.20	630.38	1.854	1.259	5-S2n	0.832	1.168	0.885	0.811	8.212	2.329

****

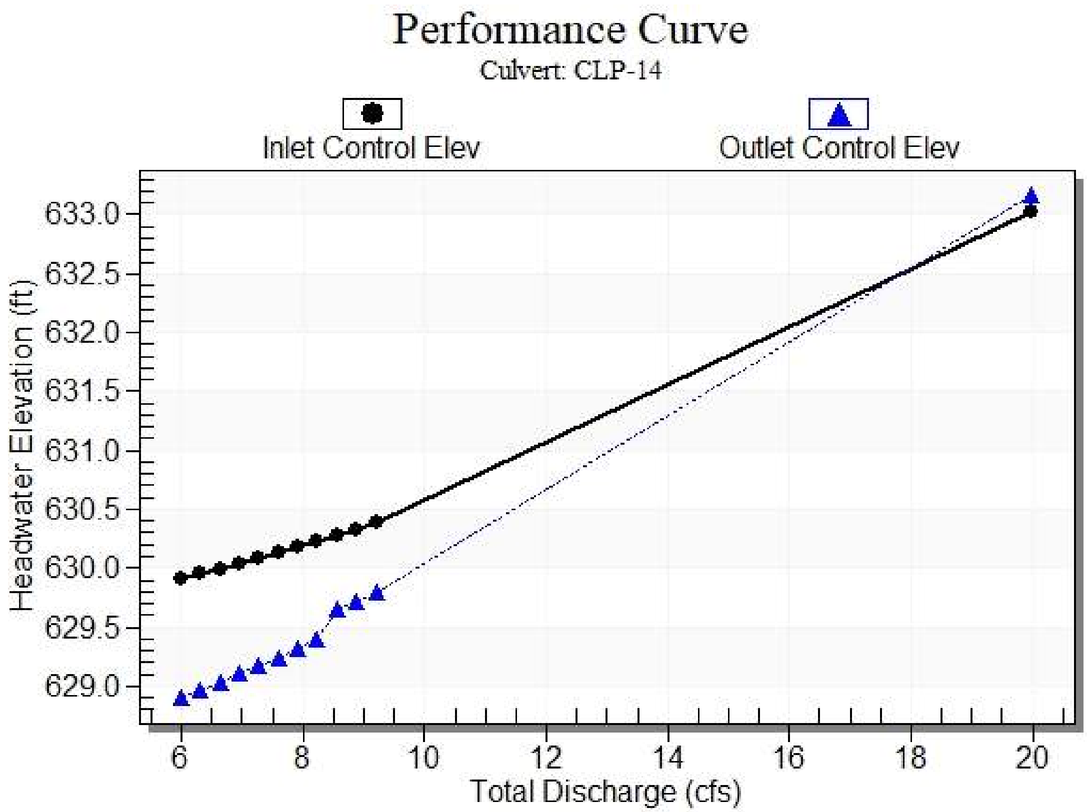
Straight Culvert

Inlet Elevation (invert): 628.53 ft,   Outlet Elevation (invert): 627.59 ft

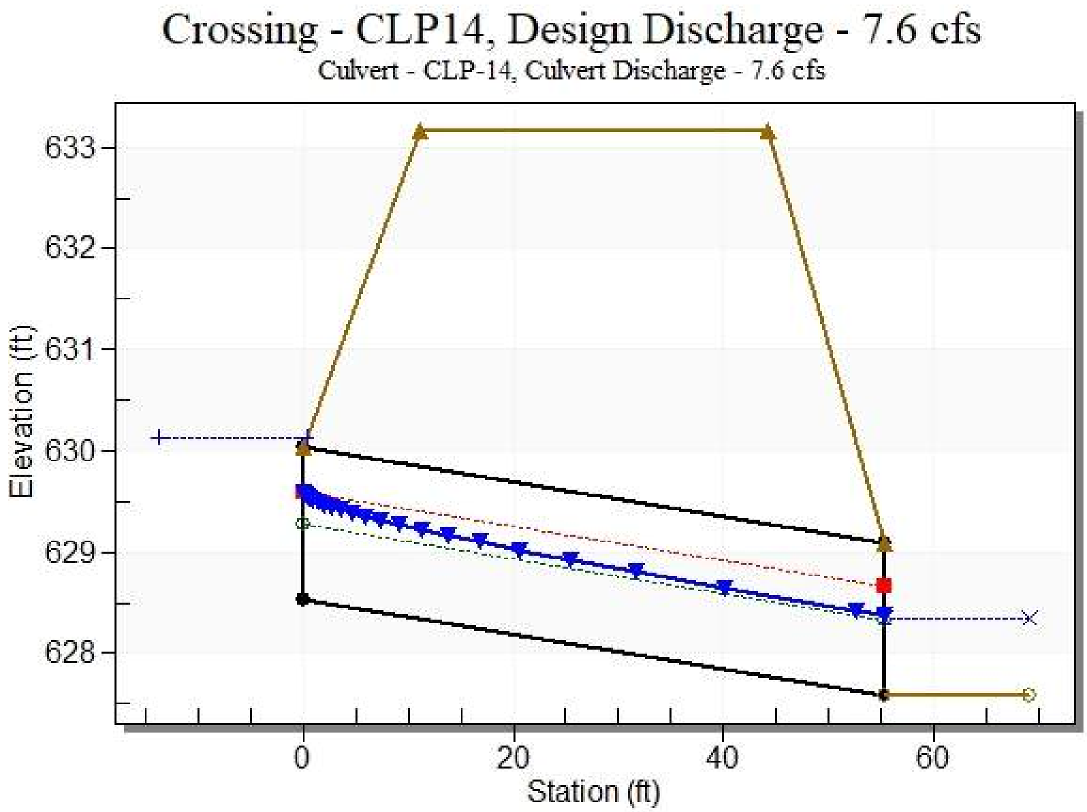
Culvert Length: 55.41 ft,   Culvert Slope: 0.0170

****

Culvert Performance Curve Plot: CLP-14



Water Surface Profile Plot for Culvert: CLP-14



Site Data - CLP-14

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 628.53 ft

Outlet Station: 55.40 ft

Outlet Elevation: 627.59 ft

Number of Barrels: 1

Culvert Data Summary - CLP-14

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 42 - Downstream Channel Rating Curve (Crossing: CLP14)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
6.00	628.28	0.69	2.09	0.44	0.63
6.32	628.29	0.70	2.12	0.45	0.63
6.64	628.31	0.72	2.15	0.46	0.63
6.96	628.32	0.73	2.17	0.47	0.63
7.28	628.33	0.74	2.20	0.47	0.63
7.60	628.35	0.76	2.22	0.48	0.64
7.92	628.36	0.77	2.24	0.49	0.64
8.24	628.37	0.78	2.27	0.50	0.64
8.56	628.38	0.79	2.29	0.50	0.64
8.88	628.39	0.80	2.31	0.51	0.64
9.20	628.40	0.81	2.33	0.52	0.64

Tailwater Channel Data - CLP14

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0102

Channel Manning's n: 0.0350

Channel Invert Elevation: 627.59 ft

Roadway Data for Crossing: CLP14

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 633.17 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

STV 100 Years	STV Incorporated **454 South Anderson Road, Suite 3, BTC 517** Rock Hill, South Carolina 29730-3392 803 980 4970 www.stvinc.com	JOB:	2515776 - US21/SC51 Widening			SHEET
		SUBJECT:	Culvert Scour			1
		CALC'D BY:	GPP	DATE:	22-Sep-21	OF
		CHECK'D BY:		DATE:		1

CULVERT SCOUR AT PIPE EXIT PER HEC-14 SECTION 5.2

Station	D (in)	S (ft/ft)	drop height (ft)	Q (cfs)	PI	S_v (lb/ft^2)	α_u	ρ	C_h	C_s	V (ft/sec)	τ_c	S_{nm} (lb/ft^2)	h_s (depth, ft)	W_s (width, ft)	L_s (length, ft)	V_s (volume, ft^3)	L_m (point of max scour, ft)
33+80	60	0.015	0	185	38	530	180	1.94	1.00	1.00	9.43	9.02	19.1	5.78	24.86	72.49	701.23	29.00
41+06	60	0.01	0	242	18	530	180	1.94	1.00	1.00	12.33	5.84	50.5	6.88	29.33	99.91	1731.92	39.96

NOTES:

1. Shear (S_v) input from project RGER Table 4-3. Plasticity Index (PI) inputs from nearest sampling location where PL/LL was laboratory tested.
2. Scour will be mitigated by rip rap outlet protection. See rip rap calculations in Appendix F
3. Potential for inlet scour will be mitigated by headwall structures

Existing Culvert Assessment
US-21 / SC-51 Widening
Fort Mill, South Carolina

Submitted By:
KCI Technologies
3014 Southcross Blvd.
Rock Hill, South Carolina 29730

Assessment date: January 14, 2022

Prepared by: David Speer, P.E.

Culvert @ Sta. 33+79 US 21

The culvert was constructed as part of SCDOT File No. 46.240 with a plans date December 19, 1940 at approximately Station 319+28.8. It is a 5'x5' single reinforced concrete box culvert with a length of approximately 132 feet with approximately 25 feet of fill above the culvert. The culvert details were not included in the project files on SCDOT's Plans Online. The assessment of the west end of the culvert is in a sump and is almost 100% submerged under water and soil. Only the head wall was visible during the site visit (see figure 1). The east end of the culvert was approximately 90% filled with water and soil. The inside of the culvert was inaccessible (see figure 2).

The visible concrete was competent and no signs of deterioration were present. Additionally, there were no cracks shown in the roadway above or any disturbances in the slopes above the culvert. This indicates that the culvert is intact and its structure has not been compromised. Based on these observations and the fact that the structure has been in place for many years with no disturbance in the roadway above, KCI recommends that the existing culvert be left in place and extended.

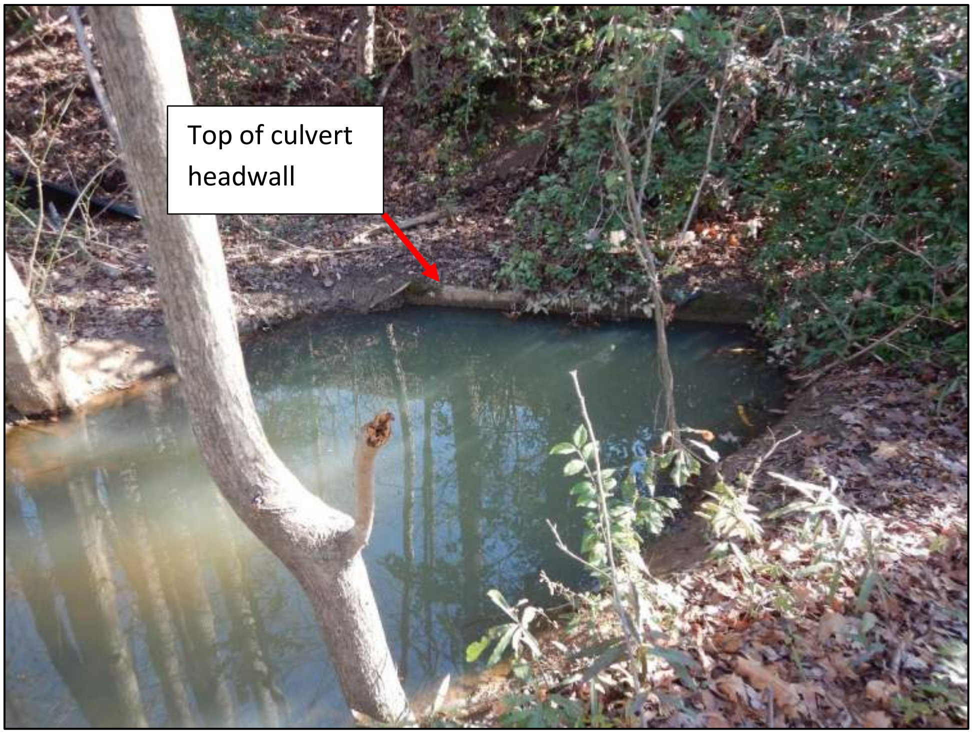


Figure 1: West end of culvert @ sta. 33+79


Figure 2: East end of culvert @ sta. 33+79

Culvert @ Sta. 41+06 US 21

The culvert was constructed as part of SCDOT File No. 46.240 with a plans date December 19, 1940, at approximately Station 326+57.1. It is a 5'x5' single reinforced concrete box culvert with a length of approximately 122 feet with approximately 17 feet of fill above the culvert. The culvert details were not included in the project files on SCDOT's Plans Online. The west end of the culvert did not show any signs of deterioration (see figure 3). On the interior of the culvert, the bottom of the top slab and inside face of the walls did not show any signs of deterioration or water intrusion. The east end of the culvert was inaccessible due to very steep slope and the presence of thick brush.

No signs of significant deterioration were observed during the structural assessment. The pavement and ground above and around the culvert did not show signs of cracking or settlement. Based on these observations, KCI recommends that the existing culvert be left in place and extended.

Figure 3:West End Culvert @ Sta. 41+06

Culvert @ Sta. 316+23 SC 51

The culvert was constructed as part of Federal Aid Project 216 (REOP) with a plans date July 18, 1927, at approximately Station 316+31. It is a 6’x6’ single reinforced concrete box culvert with a length of approximately 30 feet with approximately 4 feet of fill above the culvert The original plans show a 6’x8’ opening, however during a site visit conducted on May 30, 2019, it was determined that the culvert was a 6’x6’ (see figures 4-6). The south end of the culvert did not show any signs of deterioration (see figure 7). Additionally, the north end of the culvert did not show any signs of deterioration (see figure 8). On the interior of the culvert, the bottom of the top slab and inside face of the walls did not show any signs of deterioration or water intrusion (see figure 8-9).

No signs of significant deterioration were observed during the structural assessment. The pavement and ground above and around the culvert did not show signs of cracking or settlement. Based on these observations, KCI recommends that the existing culvert be left in place and extended.

Figure 4: Measuring width of south end of culvert @ sta. 316+23

Figure 5: Measuring to top of soil at south end of culvert @ sta. 316+23

Figure 6: Measuring depth of soil at south end of culvert @ sta. 316+23

Figure 7: South end of culvert @ sta. 316+23

Figure 8: North end of culvert @ sta. 316+23

Figure 9: Inside of culvert @ sta. 316+23

CONCLUSION

Based on the condition of all three of the culverts during the site visits, KCI recommends that these culverts are suitable to be left in place and to have extensions added to the ends to facilitate the widening of the supported roadways.

Appendix E

Pre vs Post Calculations

STV Incorporated	JOB:	US21/SC51 Phase I Widening	1
454 South Anderson Road, Suite 3	SUBJECT:	Outfalls 1,2 & 3 Comparison	SHEET
Rock Hill, South Carolina 29730-3392	CALC'D BY:	GPP DATE: 22-Dec-2023	OF
803 980 4970 o 803 980 4099 f	CHECK'D BY:	SCN DATE: 22-Dec-2023	1

PRE VS. POST OUTFALL COMPARISON

GIVEN:

Outfall Location: Road Name **US 21**

Analysis Point **Outfalls 1, 2 and 3**

Outfall 1						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 2 has been redirected to Outfall 1.
Pre (Existing) Discharge (cfs):	40.0	75.0	96.0	115.0	131.0	
Post (Proposed) Discharge (cfs):	86.0	145.0	182.0	211.0	242.0	

Outfall 2						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 2 has been redirected to Outfall 1.
Pre (Existing) Discharge (cfs):	45.0	108.0	153.0	192.0	233.0	
Post (Proposed) Discharge (cfs):	30.0	84.0	121.0	154.0	188.0	

Outfall 3						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 3 has been redirected to Outfall 6.
Pre (Existing) Discharge (cfs):	106.0	220.0	293.0	354.0	420.0	
Post (Proposed) Discharge (cfs):	112.0	227.0	299.0	360.0	425.0	

Outfall 6						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 3 has been redirected to Outfall 6. Post discharges include new Outfalls 6a and 6b.
Pre (Existing) Discharge (cfs):	24.0	45.0	59.0	69.0	81.0	
Post (Proposed) Discharge (cfs):	18.0	35.0	45.0	54.0	63.0	

Forest Lake (Outfall 2 + 3)						Notes
	2yr	10yr	25yr	50yr	100yr	Based on redirecting Outfall 2 and Outfall 3 areas, overall discharge to Forest Lake has been reduced.
Pre (Existing) Discharge (cfs):	151.0	328.0	446.0	546.0	653.0	
Post (Proposed) Discharge (cfs):	142.0	311.0	420.0	514.0	613.0	
Difference (cfs):	-9.0	-17.0	-26.0	-32.0	-40.0	
Δ %:	**-6.0**	**-5.2**	**-5.8**	**-5.9**	**-6.1**	

REMARKS:

To reduce overall peak discharges to Forest Lake, areas from Outfalls 2 and 3 have been reallocated to adjacent Outfalls 1 and 6 respectively. Please see the accompanying exhibits to see the new pipe system alignments used to accomplish this approach.

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 2			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	50		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0030		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.1910	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.	0.0660		
10. Average velocity, V (figure 3-1)	ft./sec.	4.15		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	6.75		
13. Wetted perimeter, p_w	ft.	9.49		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7113		
15. Channel slope, s	ft./ft.	0.0030		
16. Manning's roughness coefficient, n		0.0450		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	1.45		
17b. Input Velocity, FPS	ft./sec.	1.45		
18. Flow length, L	ft.	755		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.1451	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3361	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.34 Hour

20 min

STV Incorporated
331 East Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 2			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			4.1	252.5
B	Woods	55			0.5	27.5
B	Impervious	98			11.6	1136.8
B	Inudstrial	88				
				Totals ==>	16.2	1416.8

* Use only one CN source per line

CN (weighted) = total product = / total area = 1416.8 / 16.2 = 87.2 Use CN ====> 87

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	2.20	3.68	4.59	5.32	6.08

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 2			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.............................. A_m = 0.025 mi^2 (acres/640)

Runoff curve number........................ CN = 87 (From CN & Runoff worksheet)

Time of concentration...................... T_c = 0.3 hr (From T_c worksheet)

Rainfall distribution...................... = II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed...................... = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.299	0.299	0.299	0.299	0.299
5. Compute I_a/P		0.08	0.06	0.05	0.04	0.04
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	725	800	825	850	850
7. Runoff, Q .... (From CN & Runoff worksheet)	in	2.20	3.68	4.59	5.32	6.08
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	40	75	96	115	131

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331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 1			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L ≤ 300 ft)	ft.	57		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0184		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0126	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)		paved		
8. Flow length, L	ft.	75		
9. Watercourse slope, s	ft./ft.	0.0100		
10. Average velocity, V (figure 3-1)	ft./sec.	2.03		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0102	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	1.77		
13. Wetted perimeter, p_w	ft.	4.71		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.3758		
15. Channel slope, s	ft./ft.	0.0423		
16. Manning's roughness coefficient, n		0.0120		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	13.30		
17b. Input Velocity, FPS	ft./sec.	13.30		
18. Flow length, L	ft.	728		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0152	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0380	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.04 Hour
2 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 1			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			5.4	328.2
B	Woods	55			0.3	14.9
B	Impervious	98			9.9	967.3
B	Inudstrial	88			10.4	915.2
				Totals ==>	25.9	2225.5

* Use only one CN source per line

CN (weighted) = total product = / total area = 2225.5 / 25.9 = 85.9 Use CN ====> 86

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	2.12	3.58	4.49	5.21	5.96

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

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331 East Main Street, Suite 200
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JOB:	US21 SC51 Widening			SHEET 3
SUBJECT:	Outfall 1			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.041 mi^2 (acres/640)

Runoff curve number.......................... CN = 86 (From CN & Runoff worksheet)

Time of concentration.......................... T_c = 0.0 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.326	0.326	0.326	0.326	0.326
5. Compute I_a/P		0.09	0.06	0.05	0.05	0.04
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	1000	1000	1000	1000	1000
7. Runoff, Q (From CN & Runoff worksheet)	in	2.12	3.58	4.49	5.21	5.96
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	86	145	182	211	242

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 2			1
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	GPP	DATE:	8-Dec-23	3

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0360		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2964	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	533		
9. Watercourse slope, s	ft./ft.	0.0660		
10. Average velocity, V (figure 3-1)	ft./sec.	4.15		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0357	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	24.00		
13. Wetted perimeter, p_w	ft.	16.94		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.4168		
15. Channel slope, s	ft./ft.	0.0210		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	7.78		
17b. Input Velocity, FPS	ft./sec.	7.78		
18. Flow length, L	ft.	2051		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0732	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4053	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.41 Hour

24 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 2			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			2.4	148.8
B	Residential 1/3 ac	72			16.3	1171.4
B	Pasture	61			31.6	1927.0
B	Woods	55			12.0	658.9
B	Impervious	98			5.6	552.7
B	Urban Business	92			1.5	139.3
				Totals ==>	69.4	4598.2

* Use only one CN source per line

CN (weighted) = total product = total area = 4598.2 / 69.4 = 66.2 Use CN ====> 66

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency......yr	2	10	25	50	100
Rainfall, P (24-hour)...... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q...... in	0.81	1.81	2.50	3.08	3.70

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 2			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................... A_m = 0.108 mi^2 (acres/640)

Runoff curve number............................ CN = 66 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.4 hr (From T_c worksheet)

Rainfall distribution.................................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.030	1.030	1.030	1.030	1.030
5. Compute I_a/P		0.29	0.20	0.17	0.15	0.14
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	510	550	565	575	580
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.81	1.81	2.50	3.08	3.70
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	45	108	153	192	233

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331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 1			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0360		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2964	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		paved		
8. Flow length, L	ft.	533		
9. Watercourse slope, s	ft./ft.	0.0660		
10. Average velocity, V (figure 3-1)	ft./sec.	5.22		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0284	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	24.00		
13. Wetted perimeter, p_w	ft.	16.94		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	1.4168		
15. Channel slope, s	ft./ft.	0.0210		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	7.78		
17b. Input Velocity, FPS	ft./sec.	7.78		
18. Flow length, L	ft.	2051		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0732	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3980	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) ..... 0.40 Hour

24 min

STV Incorporated
331 East Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 1			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.9	53.7
B	Residential 1/3 ac	72			16.0	1149.8
B	Pasture	61			28.2	1719.6
B	Woods	55			12.0	658.9
B	Impervious	98			1.5	149.9
B	Urban business	92			1.5	138.9
				Totals ==>	60.1	3870.9

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{3870.9}{60.1}$ = 64.5 Use CN ====> **64**

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency...yr	2	10	25	50	100
Rainfall, P (24-hour)..................................... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	0.72	1.66	2.32	2.88	3.48

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

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	SUBJECT:	Outfall 1		
	CALC'D BY:	GPP	DATE: 8-Dec-23	OF 3
	CHECK'D BY:	SCN	DATE: 8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.............................. A_m = 0.094 mi^2 (acres/640)

Runoff curve number........................ CN = 64 (From CN & Runoff worksheet)

Time of concentration...................... T_c = 0.4 hr (From T_c worksheet)

Rainfall distribution...................... = II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed...................... = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.125	1.125	1.125	1.125	1.125
5. Compute I_a/P		0.32	0.22	0.19	0.16	0.15
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	475	540	555	570	575
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.72	1.66	2.32	2.88	3.48
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	32	84	121	154	188

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 3			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.800		
3. Flow length, L (total L ≤ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0410		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4458	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	313		
9. Watercourse slope, s	ft./ft.	0.0895		
10. Average velocity, V (figure 3-1)	ft./sec.	4.83		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0180	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	11.71		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.0248		
15. Channel slope, s	ft./ft.	0.0175		
16. Manning's roughness coefficient, n		0.0450		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.45		
17b. Input Velocity, FPS	ft./sec.	4.45		
18. Flow length, L	ft.	2575		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.1607	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.6245	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.75 Hour
45 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 2			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			19.2	1169.4
B	Cultivated land	75			8.5	634.5
B	Residential 1/3 ac	72			38.1	2746.1
B	Woods	55			14.5	797.0
B	Impervious	98			10.6	1035.9
B	Residentail multi-family	85			37.7	3207.9
				Totals ==>	128.6	9590.7

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{9590.7}{128.6}$ = 74.6 Use CN ====> 75

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	1.32	2.55	3.35	4.01	4.70

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening		SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 2		
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE: 8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................. A_m = 0.201 mi^2 (acres/640)

Runoff curve number........................ CN = 75 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.8 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.667	0.667	0.667	0.667	0.667
5. Compute I_a/P		0.19	0.13	0.11	0.10	0.09
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	400	430	435	440	445
7. Runoff, Q (From CN & Runoff worksheet)	in	1.32	2.55	3.35	4.01	4.70
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	106	220	293	354	420

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 3			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.800		
3. Flow length, L (total L ≤ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0410		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4458	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	313		
9. Watercourse slope, s	ft./ft.	0.0895		
10. Average velocity, V (figure 3-1)	ft./sec.	4.83		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0180	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	12.00		
13. Wetted perimeter, p_w	ft.	11.71		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.0248		
15. Channel slope, s	ft./ft.	0.0175		
16. Manning's roughness coefficient, n		0.0450		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.45		
17b. Input Velocity, FPS	ft./sec.	4.45		
18. Flow length, L	ft.	2575		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.1607	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.6245	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.75 Hour

45 min

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331 East Main Street, Suite 200		SUBJECT:	Outfall 3			2
Rock Hill, South Carolina 29730		CALC'D BY:	GPP	DATE:	8-Dec-23	OF
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RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			13.4	816.2
B	Cultivated land	75			0.0	0.0
B	Woods	55			13.1	721.6
B	Residential 1/3 ac	72			38.1	2746.1
B	Impervious	98			17.0	1669.9
B	Residential multi-family	85			43.7	3712.0
				Totals ==>	125.4	9665.7

* Use only one CN source per line

CN (weighted) = total product = / total area = 9665.7 / 125.4 = 77.1 Use CN ====> 77

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency...yr	2	10	25	50	100
Rainfall, P (24-hour)..................................... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	1.45	2.72	3.55	4.22	4.93

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 3			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.196 mi^2 (acres/640)

Runoff curve number........................ CN = 77 (From CN & Runoff worksheet)

Time of concentration......................... T_c = 0.8 hr (From T_c worksheet)

Rainfall distribution....................................= II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.597	0.597	0.597	0.597	0.597
5. Compute I_a/P		0.17	0.12	0.10	0.09	0.08
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	395	425	430	435	440
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.45	2.72	3.55	4.22	4.93
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	112	227	299	360	425

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 4			1
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
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TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	77		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0210		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1239	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	16.00		
13. Wetted perimeter, p_w	ft.	16.49		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9703		
15. Channel slope, s	ft./ft.	0.0330		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	7.58		
17b. Input Velocity, FPS	ft./sec.	7.58		
18. Flow length, L	ft.	709		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0260	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1499	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.1499 Hour

9 min

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JOB:	US21 SC51 Widening			SHEET	2
SUBJECT:	Outfall 4				
CALC'D BY:	GPP	DATE:	8-Dec-23	OF	3
CHECK'D BY:	SCN	DATE:	8-Dec-23		

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			2.6	157.4
B	Woods	55			0.8	44.0
B	Impervious	98			0.5	48.0
B	Inudstrial	88				
				Totals ==>	3.9	249.4

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{249.4}{3.9} = 64.4$ Use CN ====> $\boxed{64}$

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.........yr	2	10	25	50	100
Rainfall, P (24-hour)......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q......... in	0.72	1.66	2.32	2.88	3.48

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 4			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.006 mi^2 (acres/640)

Runoff curve number.............................. CN = 64 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.1 hr (From T_c worksheet)

Rainfall distribution................................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed................................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.125	1.125	1.125	1.125	1.125
5. Compute I_a/P		0.32	0.22	0.19	0.16	0.15
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	780	830	855	875	880
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.72	1.66	2.32	2.88	3.48
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	3	8	12	15	19

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SUBJECT:	Outfall 4			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	159		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0400		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1710	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	8.00		
13. Wetted perimeter, p_w	ft.	8.94		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.8949		
15. Channel slope, s	ft./ft.	0.0180		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.30		
17b. Input Velocity, FPS	ft./sec.	5.30		
18. Flow length, L	ft.	592		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0310	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2020	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.20 Hour
12 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 4			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			2.9	176.3
B	Woods	55			0.8	44.0
B	Impervious	98			0.7	65.7
B	Inudstrial	88				
		Totals ==>			4.4	286.0

* Use only one CN source per line

CN (weighted) = total product = / total area = 286.0 / 4.4 = 65.6 Use CN ====> **66**

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency...yr	2	10	25	50	100
Rainfall, P (24-hour)... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q... in	0.81	1.81	2.50	3.08	3.70

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

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	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
	CHECK'D BY: SCN	DATE: 8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.007 mi^2 (acres/640)

Runoff curve number........................ CN = 66 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................= II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	1.030	1.030	1.030	1.030	1.030
5. Compute I_a/P		0.29	0.20	0.17	0.15	0.14
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	720	760	775	780	785
7. Runoff, Q (From CN & Runoff worksheet)	in	0.81	1.81	2.50	3.08	3.70
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	4	9	13	16	20

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 5			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3232	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	48.00		
13. Wetted perimeter, p_w	ft.	48.17		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9965		
15. Channel slope, s	ft./ft.	0.0860		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	12.46		
17b. Input Velocity, FPS	ft./sec.	12.46		
18. Flow length, L	ft.	467		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0104	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3336	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour
20 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 5			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.2	70.2
B	Woods	55			3.8	209.6
B	Impervious	98			0.0	3.9
B	Dirt Road	82			0.2	14.8
				Totals ==>	5.2	298.4

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{298.4}{5.2} = 57.6$ Use CN ====> $\boxed{58}$

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency....................yr	2	10	25	50	100
Rainfall, P (24-hour)........... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..................... in	0.46	1.24	1.81	2.30	2.84

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 5			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................. A_m = 0.008 mi^2 (acres/640)

Runoff curve number........................ CN = 58 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.3 hr (From T_c worksheet)

Rainfall distribution...................................= II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.448	1.448	1.448	1.448	1.448
5. Compute I_a/P		0.41	0.28	0.24	0.21	0.19
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	435	560	580	595	605
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.46	1.24	1.81	2.30	2.84
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	2	6	8	11	14

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 5			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.3232	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	48.00		
13. Wetted perimeter, p_w	ft.	48.17		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.9965		
15. Channel slope, s	ft./ft.	0.0860		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	12.46		
17b. Input Velocity, FPS	ft./sec.	12.46		
18. Flow length, L	ft.	467		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0104	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3336	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour

20 min

STV Incorporated		JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200		SUBJECT:	Outfall 5			2
Rock Hill, South Carolina 29730		CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025	www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.8	108.0
B	Woods	55			3.3	181.5
B	Impervious	98			0.2	22.5
B	Dirt Road	82			0.2	13.9
				Totals ==>	5.5	326.0

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{326.0}{5.5}$ = 59.6 Use CN ====> 60

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	0.54	1.37	1.97	2.49	3.05

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 5		SHEET 3
	CALC'D BY: GPP	DATE: 8-Dec-23	OF
	CHECK'D BY: SCN	DATE: 8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.............................. A_m = 0.009 mi^2 (acres/640)

Runoff curve number........................ CN = 60 (From CN & Runoff worksheet)

Time of concentration...................... T_c = 0.3 hr (From T_c worksheet)

Rainfall distribution.......................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.333	1.333	1.333	1.333	1.333
5. Compute I_a/P		0.38	0.26	0.22	0.19	0.17
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	465	570	585	605	610
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.54	1.37	1.97	2.49	3.05
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	2	7	10	13	16

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 1
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 6			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	192		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0270		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2327	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	ft.^{2}	48.13		
13. Wetted perimeter, p_w	ft.	23.85		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	2.0180		
15. Channel slope, s	ft./ft.	0.0270		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	11.17		
17b. Input Velocity, FPS	ft./sec.	11.17		
18. Flow length, L	ft.	683		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0170	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2497	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.25 Hour

15 min

STV Incorporated		JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200		SUBJECT:	Outfall 6			2
Rock Hill, South Carolina 29730		CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025	www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			2.6	156.2
B	Woods	55			2.1	113.9
B	Impervious	98			1.9	186.2
B	Urban business	92			6.1	562.1
				Totals ==>	12.6	1018.3

* Use only one CN source per line

CN (weighted) = total product = / total area = 1018.3 / 12.6 = 80.6 Use CN ====> 81

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.........yr	2	10	25	50	100
Rainfall, P (24-hour)......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q......... in	1.72	3.09	3.96	4.66	5.38

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB: US21 SC51 Widening		SHEET 3
331 East Main Street, Suite 200	SUBJECT: Outfall 6		
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.020 mi^2 (acres/640)

Runoff curve number................................ CN = 81 (From CN & Runoff worksheet)

Time of concentration................................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.. = II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed.................................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.469	0.469	0.469	0.469	0.469
5. Compute I_a/P		0.13	0.09	0.08	0.07	0.06
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	715	745	750	755	760
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.72	3.09	3.96	4.66	5.38
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	24	45	59	69	81

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 6			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.280		
3. Flow length, L (total L ≤ 300 ft)	ft.	237		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0370		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4000	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	254		
9. Watercourse slope, s	ft./ft.	0.0190		
10. Average velocity, V (figure 3-1)	ft./sec.	2.22		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0317	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	4.91		
13. Wetted perimeter, p_w	ft.	7.85		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.6255		
15. Channel slope, s	ft./ft.	0.0099		
16. Manning's roughness coefficient, n		0.0120		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	9.04		
17b. Input Velocity, FPS	ft./sec.	9.04		
18. Flow length, L	ft.	740		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0227	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4545	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.45 Hour
27 min

STV Incorporated		JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200		SUBJECT:	Outfall 6			2
Rock Hill, South Carolina 29730		CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025	www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			2.6	156.2
B	Woods	55			2.1	113.9
B	Impervious	98			1.9	186.2
B	Urban business	92			6.1	562.1
		Totals ==>			12.6	1018.3

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1018.3}{12.6} = 80.6$ Use CN ====> 81

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	1.72	3.09	3.96	4.66	5.38

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening		SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 6		
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE: 8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.............................. A_m = 0.020 mi^2 (acres/640)

Runoff curve number........................ CN = 81 (From CN & Runoff worksheet)

Time of concentration...................... T_c = 0.5 hr (From T_c worksheet)

Rainfall distribution...................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.......................... = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.469	0.469	0.469	0.469	0.469
5. Compute I_a/P		0.13	0.09	0.08	0.07	0.06
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	540	575	580	585	590
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.72	3.09	3.96	4.66	5.38
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	18	35	45	54	63

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 7			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	72		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0370		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0936	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	ft.^{2}	7.68		
13. Wetted perimeter, p_w	ft.	10.12		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.7589		
15. Channel slope, s	ft./ft.	0.0120		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.88		
17b. Input Velocity, FPS	ft./sec.	3.88		
18. Flow length, L	ft.	283		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0203	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1139	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

7 min

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 7			2
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.9	54.9
B	Woods	55				
B	Impervious	98			1.2	121.5
B	Urban business	92			1.2	108.6
				Totals ==>	3.3	285.0

* Use only one CN source per line

CN (weighted) = total product / total area = 285.0 / 3.3 = 85.8 Use CN ====> 86

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..yr	2	10	25	50	100
Rainfall, P (24-hour)........................ in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	2.12	3.58	4.49	5.21	5.96

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 7			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.005 mi^2 (acres/640)

Runoff curve number........................... CN = 86 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.1 hr (From T_c worksheet)

Rainfall distribution.................................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.326	0.326	0.326	0.326	0.326
5. Compute I_a/P		0.09	0.06	0.05	0.05	0.04
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	980	985	990	990	992
7. Runoff, Q .... (From CN & Runoff worksheet)	in	2.12	3.58	4.49	5.21	5.96
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	11	18	23	27	31

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331 Eat Main Street, Suite 200
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803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 7			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	72		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0370		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0936	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	7.68		
13. Wetted perimeter, p_w	ft.	10.12		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7589		
15. Channel slope, s	ft./ft.	0.0120		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.88		
17b. Input Velocity, FPS	ft./sec.	3.88		
18. Flow length, L	ft.	283		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0203	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1139	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

7 min

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 7			2
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.0	59.2
B	Woods	55				
B	Impervious	98			0.7	68.6
B	Urban business	92			1.0	93.8
				Totals ==>	2.7	221.6

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{221.6}{2.7}$ = 82.4 Use CN ====> $\boxed{82}$

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	1.80	3.19	4.06	4.77	5.50

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 7	CALC'D BY: GPP DATE: 8-Dec-23 CHECK'D BY: SCN DATE: 8-Dec-23	SHEET 3 OF 3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................... A_m = 0.004 mi^2 (acres/640)

Runoff curve number........................ CN = 82 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.1 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.439	0.439	0.439	0.439	0.439
5. Compute I_a/P		0.12	0.09	0.07	0.06	0.06
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	965	985	990	993	993
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.80	3.19	4.06	4.77	5.50
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	7	13	17	20	23

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 8			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	115		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0350		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1392	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	3.00		
13. Wetted perimeter, p_w	ft.	6.32		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4747		
15. Channel slope, s	ft./ft.	0.0290		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.41		
17b. Input Velocity, FPS	ft./sec.	4.41		
18. Flow length, L	ft.	454		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0286	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1678	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.17 Hour

10 min

STV Incorporated	JOB:	US21 SC51 Widening		SHEET 2
331 East Main Street, Suite 200	SUBJECT:	Outfall 8		
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23		OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23		

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.4	26.2
B	Woods	55			0.4	20.9
B	Impervious	98			0.2	22.5
B	Urban business	92				
				Totals ==>	1.0	69.7

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{69.7}{1.0}$ = 67.0 Use CN ====> $\boxed{67}$

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.........yr	2	10	25	50	100
Rainfall, P (24-hour)......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q......... in	0.86	1.89	2.59	3.18	3.81

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 8			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................... A_m = 0.002 mi^2 (acres/640)

Runoff curve number............................ CN = 67 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.985	0.985	0.985	0.985	0.985
5. Compute I_a/P		0.28	0.19	0.16	0.14	0.13
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	775	820	825	830	835
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.86	1.89	2.59	3.18	3.81
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	3	3	4	5

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 8			1
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	GPP	DATE:	8-Dec-23	3

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	115		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0350		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1392	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	2.50		
13. Wetted perimeter, p_w	ft.	5.39		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4638		
15. Channel slope, s	ft./ft.	0.0345		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.74		
17b. Input Velocity, FPS	ft./sec.	4.74		
18. Flow length, L	ft.	454		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0266	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1658	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.17 Hour

10 min

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 8			2
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.4	26.2
B	Woods	55			0.4	20.9
B	Impervious	98			0.0	2.0
B	Dirt Road	82			0.2	17.2
		Totals ==>			1.0	66.3

* Use only one CN source per line

CN (weighted) = total product / total area = 66.3 / 1.0 = 63.8 Use CN ====> 64

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.......yr	2	10	25	50	100
Rainfall, P (24-hour)....... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q....... in	0.72	1.66	2.32	2.88	3.48

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 8			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.002 mi^2 (acres/640)

Runoff curve number........................ CN = 64 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution................................ = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.125	1.125	1.125	1.125	1.125
5. Compute I_a/P		0.32	0.22	0.19	0.16	0.15
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	750	805	815	820	825
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.72	1.66	2.32	2.88	3.48
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	2	3	4	5

STV Incorporated
331 Eat Main Street, Suite 200
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803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 9			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0200		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0464	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	438		
9. Watercourse slope, s	ft./ft.	0.0240		
10. Average velocity, V (figure 3-1)	ft./sec.	3.15		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0386	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	6.00		
13. Wetted perimeter, p_w	ft.	12.17		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.4930		
15. Channel slope, s	ft./ft.	0.0400		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.31		
17b. Input Velocity, FPS	ft./sec.	5.31		
18. Flow length, L	ft.	373		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0195	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1045	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.10 Hour

6 min

STV Incorporated	JOB:	US21 SC51 Widening	SHEET 2
331 East Main Street, Suite 200	SUBJECT:	Outfall 9	
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.8	108.6
B	Woods	55				
B	Impervious	98			1.6	153.9
B	Urban business	92				
				Totals ==>	3.4	262.4

* Use only one CN source per line

CN (weighted) = total product / total area = 262.4 / 3.4 = 78.3 Use CN ====> 78

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	1.51	2.81	3.65	4.33	5.04

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 9			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................. A_m = 0.005 mi^2 (acres/640)

Runoff curve number.......................... CN = 78 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.1 hr (From T_c worksheet)

Rainfall distribution................................ = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.......................... = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.564	0.564	0.564	0.564	0.564
5. Compute I_a/P		0.16	0.11	0.09	0.08	0.07
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	985	995	1000	1000	1000
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.51	2.81	3.65	4.33	5.04
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	8	15	19	23	26

STV Incorporated 331 Eat Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 9		SHEET 1
	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
	CHECK'D BY: GPP	DATE: 8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	91		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0330		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0146	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	265		
9. Watercourse slope, s	ft./ft.	0.0190		
10. Average velocity, V (figure 3-1)	ft./sec.	2.80		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0263	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	1.77		
13. Wetted perimeter, p_w	ft.	4.71		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.3758		
15. Channel slope, s	ft./ft.	0.0220		
16. Manning's roughness coefficient, n		0.0120		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	9.59		
17b. Input Velocity, FPS	ft./sec.	9.59		
18. Flow length, L	ft.	189		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0055	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0464	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.05 Hour

3 min

STV Incorporated
331 East Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 9			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.8	108.6
B	Woods	55				
B	Impervious	98			1.6	153.9
B	Dirt Road	82				
				Totals ==>	3.4	262.4

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{262.4}{3.4}$ = 78.3 Use CN ====> $\boxed{78}$

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency...yr	2	10	25	50	100
Rainfall, P (24-hour)…................................. in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	1.51	2.81	3.65	4.33	5.04

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 9			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.. A_m = 0.005 mi^2 (acres/640)

Runoff curve number........................... CN = 78 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.0 hr (From T_c worksheet)

Rainfall distribution.............................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.564	0.564	0.564	0.564	0.564
5. Compute I_a/P		0.16	0.11	0.09	0.08	0.07
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	970	990	1000	1000	1000
7. Runoff, Q (From CN & Runoff worksheet)	in	1.51	2.81	3.65	4.33	5.04
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	8	15	19	23	26

STV Incorporated	JOB:	US21 SC51 Widening	SHEET 1
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 10	
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: GPP	DATE: 8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.350		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0420		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.5489	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	447		
9. Watercourse slope, s	ft./ft.	0.0470		
10. Average velocity, V (figure 3-1)	ft./sec.	3.50		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0355	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	5.00		
13. Wetted perimeter, p_w	ft.	10.20		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4902		
15. Channel slope, s	ft./ft.	0.0550		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	6.21		
17b. Input Velocity, FPS	ft./sec.	6.21		
18. Flow length, L	ft.	523		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0234	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.6078	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.61 Hour

36 min

STV Incorporated
331 East Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET	2
SUBJECT:	Outfall 10			OF	3
CALC'D BY:	GPP	DATE:	8-Dec-23		
CHECK'D BY:	SCN	DATE:	8-Dec-23		

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			3.3	203.1
B	Woods	55			12.4	682.0
B	Impervious	98			1.5	143.1
B	Urban business	92			1.8	162.8
				Totals ==>	19.0	1191.1

* Use only one CN source per line

CN (weighted) = total product = / total area = 1191.1 / 19.0 = 62.8 Use CN ====> 63

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	0.67	1.59	2.23	2.78	3.37

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 10	CALC'D BY: GPP DATE: 8-Dec-23 CHECK'D BY: SCN DATE: 8-Dec-23	SHEET 3 OF 3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................. A_m = 0.030 mi^2 (acres/640)

Runoff curve number.......................... CN = 63 (From CN & Runoff worksheet)

Time of concentration......................... T_c = 0.6 hr (From T_c worksheet)

Rainfall distribution................................ = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	1.175	1.175	1.175	1.175	1.175
5. Compute I_a/P		0.33	0.23	0.19	0.17	0.15
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	365	425	435	445	455
7. Runoff, Q (From CN & Runoff worksheet)	in	0.67	1.59	2.23	2.78	3.37
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	7	20	29	37	45

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 10			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.350		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0420		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.5489	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	447		
9. Watercourse slope, s	ft./ft.	0.0470		
10. Average velocity, V (figure 3-1)	ft./sec.	3.50		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0355	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	5.00		
13. Wetted perimeter, p_w	ft.	10.20		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4902		
15. Channel slope, s	ft./ft.	0.0550		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	6.21		
17b. Input Velocity, FPS	ft./sec.	6.21		
18. Flow length, L	ft.	523		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0234	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.6078	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) ..... 0.61 Hour
36 min

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331 East Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET	2
SUBJECT:	Outfall 10				
CALC'D BY:	GPP	DATE:	8-Dec-23	OF	3
CHECK'D BY:	SCN	DATE:	8-Dec-23		

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			2.9	175.1
B	Woods	55			12.4	682.0
B	Impervious	98			2.5	245.0
B	Urban business	92			1.8	162.8
				Totals ==>	19.5	1264.9

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1264.9}{19.5} = 64.7$ Use CN ====> **65**

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..yr	2	10	25	50	100
Rainfall, P (24-hour)..................................... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	0.76	1.73	2.41	2.98	3.59

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 10	CALC'D BY: GPP DATE: 8-Dec-23 CHECK'D BY: SCN DATE: 8-Dec-23	SHEET 3 OF 3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.031 mi^2 (acres/640)

Runoff curve number......................... CN = 65 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.6 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	1.077	1.077	1.077	1.077	1.077
5. Compute I_a/P		0.31	0.21	0.18	0.16	0.14
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	380	425	440	445	455
7. Runoff, Q (From CN & Runoff worksheet)	in	0.76	1.73	2.41	2.98	3.59
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	9	22	32	40	50

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803 207 2025 www.stvinc.com

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.240		
3. Flow length, L (total L ≤ 300 ft)	ft.	109		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0241		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2255	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	680.00		
13. Wetted perimeter, p_w	ft.	129.66		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	5.2445		
15. Channel slope, s	ft./ft.	0.0370		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	24.72		
17b. Input Velocity, FPS	ft./sec.	24.72		
18. Flow length, L	ft.	2053		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0231	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2486	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.25 Hour

15 min

STV Incorporated	JOB:	US21 SC51 Widening	SHEET 2
331 East Main Street, Suite 200	SUBJECT:	Outfall 11	
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			33.8	2061.2
B	Woods	55			7.6	417.5
B	Impervious	98			9.3	913.4
B	Urban business	92			14.6	1346.9
				Totals ==>	65.3	4738.9

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{4738.9}{65.3} = 72.5$ Use CN ====> 73

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	1.19	2.37	3.16	3.80	4.47

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 11			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.102 mi^2 (acres/640)

Runoff curve number............................ CN = 73 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.740	0.740	0.740	0.740	0.740
5. Compute I_a/P		0.21	0.14	0.12	0.11	0.10
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	680	728	730	732	735
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.19	2.37	3.16	3.80	4.47
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	83	177	235	284	336

STV Incorporated	JOB:	US21 SC51 Widening		SHEET 1
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 11		
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	GPP	DATE: 8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.240		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	109		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0241		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2255	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	384.00		
13. Wetted perimeter, p_w	ft.	124.00		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	3.0968		
15. Channel slope, s	ft./ft.	0.0336		
16. Manning's roughness coefficient, n		0.0250		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	23.21		
17b. Input Velocity, FPS	ft./sec.	23.21		
18. Flow length, L	ft.	2311		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0277	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2531	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.25 Hour

15 min

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RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			33.5	2042.3
B	Woods	55			7.8	431.2
B	Impervious	98			11.4	1115.2
B	Urban business	92			15.1	1387.4
				Totals ==>	67.8	4976.1

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{4976.1}{67.8} = 73.4$ Use CN ====> 73

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	1.19	2.37	3.16	3.80	4.47

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 11			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.106 mi^2 (acres/640)

Runoff curve number............................ CN = 73 (From CN & Runoff worksheet)

Time of concentration.......................... T_c = 0.3 hr (From T_c worksheet)

Rainfall distribution.......................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.740	0.740	0.740	0.740	0.740
5. Compute I_a/P		0.21	0.14	0.12	0.11	0.10
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	680	725	728	731	735
7. Runoff, Q (From CN & Runoff worksheet)	in	1.19	2.37	3.16	3.80	4.47
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	86	182	243	294	348

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331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 14			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0200		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.8218	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	176		
9. Watercourse slope, s	ft./ft.	0.0630		
10. Average velocity, V (figure 3-1)	ft./sec.	4.05		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0121	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0240		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.34		
17b. Input Velocity, FPS	ft./sec.	5.34		
18. Flow length, L	ft.	1777		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0925	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.9264	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.93 Hour

56 min

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 14			2
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			6.5	395.9
B	Woods	55			36.5	2006.4
B	Impervious	98			2.9	285.2
B	Urban business	92			23.0	2113.2
				Totals ==>	68.9	4800.7

* Use only one CN source per line

CN (weighted) = total product = / total area = 4800.7 / 68.9 = 69.7 Use CN ====> 70

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..yr	2	10	25	50	100
Rainfall, P (24-hour)....................................... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	1.02	2.13	2.87	3.49	4.14

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 14	CALC'D BY: GPP DATE: 8-Dec-23 CHECK'D BY: SCN DATE: 8-Dec-23	SHEET 3 OF 3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.108 mi^2 (acres/640)

Runoff curve number............................ CN = 70 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.9 hr (From T_c worksheet)

Rainfall distribution.. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.857	0.857	0.857	0.857	0.857
5. Compute I_a/P		0.24	0.17	0.14	0.13	0.11
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	330	360	370	375	380
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.02	2.13	2.87	3.49	4.14
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	36	82	114	141	169

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 1
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 14			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L ≤ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0200		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.8218	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	176		
9. Watercourse slope, s	ft./ft.	0.0630		
10. Average velocity, V (figure 3-1)	ft./sec.	4.05		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0121	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0240		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.34		
17b. Input Velocity, FPS	ft./sec.	5.34		
18. Flow length, L	ft.	1777		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0925	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.9264	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.93 Hour

56 min

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Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 14			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			3.2	197.0
B	Woods	55			32.3	1778.2
B	Impervious	98			12.3	1208.3
B	Urban business	92			22.4	2064.5
				Totals ==>	70.3	5248.0

* Use only one CN source per line

CN (weighted) = total product = 5248.0 = 74.6 Use CN ====> 75
total area 70.3

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)........ in	3.52	5.12	6.08	6.84	7.62
Runoff, Q........ in	1.32	2.55	3.35	4.01	4.70

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB:	US21 SC51 Widening			SHEET 3
	SUBJECT:	Outfall 14			
	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................. A_m = 0.110 mi^2 (acres/640)

Runoff curve number........................ CN = 75 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.9 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.667	0.667	0.667	0.667	0.667
5. Compute I_a/P		0.19	0.13	0.11	0.10	0.09
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	345	365	375	380	385
7. Runoff, Q (From CN & Runoff worksheet)	in	1.32	2.55	3.35	4.01	4.70
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	50	102	138	167	199

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 15			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	25		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0200		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0514	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	155		
9. Watercourse slope, s	ft./ft.	0.0190		
10. Average velocity, V (figure 3-1)	ft./sec.	2.22		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0194	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	6.00		
13. Wetted perimeter, p_w	ft.	12.17		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4930		
15. Channel slope, s	ft./ft.	0.0350		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.97		
17b. Input Velocity, FPS	ft./sec.	4.97		
18. Flow length, L	ft.	513		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0287	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0994	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.10 Hour
6 min

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Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET	2
SUBJECT:	Outfall 15				
CALC'D BY:	GPP	DATE:	8-Dec-23	OF	3
CHECK'D BY:	SCN	DATE:	8-Dec-23		

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.5	28.1
B	Woods	55			0.2	9.4
B	Impervious	98			0.2	19.6
B	Urban business	92				
				Totals ==>	0.8	57.0

* Use only one CN source per line

CN (weighted) = total product = / total area = 57.0 / 0.8 = 68.7 Use CN ====> 69

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency...yr	2	10	25	50	100
Rainfall, P (24-hour)…................................... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.. in	0.97	2.05	2.78	3.38	4.03

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB:	US21 SC51 Widening			SHEET 3
	SUBJECT:	Outfall 15			
	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.............................. A_m = 0.001 mi^2 (acres/640)

Runoff curve number........................ CN = 69 (From CN & Runoff worksheet)

Time of concentration...................... T_c = 0.1 hr (From T_c worksheet)

Rainfall distribution.......................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.899	0.899	0.899	0.899	0.899
5. Compute I_a/P		0.26	0.18	0.15	0.13	0.12
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	965	980	985	990	995
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.97	2.05	2.78	3.38	4.03
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	3	4	4	5

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331 Eat Main Street, Suite 200
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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 15			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	36		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0090		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0946	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	18.00		
13. Wetted perimeter, p_w	ft.	13.42		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.3413		
15. Channel slope, s	ft./ft.	0.0250		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	8.19		
17b. Input Velocity, FPS	ft./sec.	8.19		
18. Flow length, L	ft.	478		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0162	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1109	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.11 Hour

7 min

STV Incorporated		JOB:	US21 SC51 Widening		SHEET
331 East Main Street, Suite 200		SUBJECT:	Outfall 15		2
Rock Hill, South Carolina 29730		CALC'D BY:	GPP	DATE: 8-Dec-23	OF
803 207 2025	www.stvinc.com	CHECK'D BY:	SCN	DATE: 8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.4	23.2
B	Woods	55				
B	Impervious	98			0.4	41.2
B	Urban business	92				
				Totals ==>	0.8	64.3

* Use only one CN source per line

CN (weighted) = total product = / total area = 64.3 / 0.8 = 80.4 Use CN ====> 80

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	1.65	3.00	3.85	4.55	5.27

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 15			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.. A_m = 0.001 mi^2 (acres/640)

Runoff curve number............................ CN = 80 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.1 hr (From T_c worksheet)

Rainfall distribution.......................................= II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.500	0.500	0.500	0.500	0.500
5. Compute I_a/P		0.14	0.10	0.08	0.07	0.07
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	960	980	983	985	987
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.65	3.00	3.85	4.55	5.27
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	2	4	5	6	7

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 16			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	174		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0120		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.2975	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	211		
9. Watercourse slope, s	ft./ft.	0.0050		
10. Average velocity, V (figure 3-1)	ft./sec.	1.44		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0408	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	6.00		
13. Wetted perimeter, p_w	ft.	12.17		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4930		
15. Channel slope, s	ft./ft.	0.0220		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.94		
17b. Input Velocity, FPS	ft./sec.	3.94		
18. Flow length, L	ft.	1160		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0818	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4200	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.42 Hour
25 min

STV Incorporated	JOB:	US21 SC51 Widening		SHEET 2
331 East Main Street, Suite 200	SUBJECT:	Outfall 16		
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE: 8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.7	39.7
B	Woods	55				
B	Impervious	98			0.6	61.7
B	Urban business	92			1.2	105.8
				Totals ==>	2.4	207.2

* Use only one CN source per line

CN (weighted) = total product / total area = 207.2 / 2.4 = 85.3 Use CN ====> 85

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.....yr	2	10	25	50	100
Rainfall, P (24-hour)..... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..... in	2.03	3.48	4.38	5.10	5.85

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET	3
331 East Main Street, Suite 200	SUBJECT:	Outfall 16				
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF	3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23		

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................... A_m = 0.004 mi^2 (acres/640)

Runoff curve number............................ CN = 85 (From CN & Runoff worksheet)

Time of concentration.......................... T_c = 0.4 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.353	0.353	0.353	0.353	0.353
5. Compute I_a/P		0.10	0.07	0.06	0.05	0.05
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	580	590	595	600	600
7. Runoff, Q (From CN & Runoff worksheet)	in	2.03	3.48	4.38	5.10	5.85
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	4	8	10	12	13

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 16			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	81		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1563	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	217		
9. Watercourse slope, s	ft./ft.	0.0270		
10. Average velocity, V (figure 3-1)	ft./sec.	2.65		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0227	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	50.00		
13. Wetted perimeter, p_w	ft.	22.36		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	2.2361		
15. Channel slope, s	ft./ft.	0.0250		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	11.51		
17b. Input Velocity, FPS	ft./sec.	11.51		
18. Flow length, L	ft.	521		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0126	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1916	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.19 Hour

11 min

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 16			2
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.6	95.2
B	Woods	55				
B	Impervious	98			0.1	8.8
B	Urban business	92				
		Totals ==>			1.7	104.0

* Use only one CN source per line

CN (weighted) = total product = / total area = 104.0 / 1.7 = 63.0 Use CN ====> 63

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	0.67	1.59	2.23	2.78	3.37

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 16			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.............................. A_m = 0.003 mi^2 (acres/640)

Runoff curve number........................ CN = 63 (From CN & Runoff worksheet)

Time of concentration...................... T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution...................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.......................... = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	1.175	1.175	1.175	1.175	1.175
5. Compute I_a/P		0.33	0.23	0.19	0.17	0.15
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	680	750	775	782	790
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.67	1.59	2.23	2.78	3.37
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	3	4	6	7

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 17			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	GPP	DATE:	8-Dec-23	3

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	229		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0440		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2204	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	1.77		
13. Wetted perimeter, p_w	ft.	4.71		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.3758		
15. Channel slope, s	ft./ft.	0.0400		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.43		
17b. Input Velocity, FPS	ft./sec.	4.43		
18. Flow length, L	ft.	103		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0065	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2268	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.23 Hour

14 min

STV Incorporated	JOB:	US21 SC51 Widening	SHEET 2
331 East Main Street, Suite 200	SUBJECT:	Outfall 17	
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.5	93.9
B	Woods	55				
B	Impervious	98			0.3	31.4
B	Urban business	92				
				Totals ==>	1.9	125.3

* Use only one CN source per line

CN (weighted) = total product / total area = 125.3 / 1.9 = 67.4 Use CN ====> 67

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	0.86	1.89	2.59	3.18	3.81

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 17			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.003 mi^2 (acres/640)

Runoff curve number.............................. CN = 67 (From CN & Runoff worksheet)

Time of concentration............................. T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.985	0.985	0.985	0.985	0.985
5. Compute I_a/P		0.28	0.19	0.16	0.14	0.13
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	670	705	720	730	735
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.86	1.89	2.59	3.18	3.81
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	2	4	5	7	8

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 17			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	229		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0440		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2204	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	ft.^{2}	1.77		
13. Wetted perimeter, p_w	ft.	4.71		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.3758		
15. Channel slope, s	ft./ft.	0.0400		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.43		
17b. Input Velocity, FPS	ft./sec.	4.43		
18. Flow length, L	ft.	103		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0065	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2268	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.23 Hour

14 min

STV Incorporated		JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200		SUBJECT:	Outfall 17			2
Rock Hill, South Carolina 29730		CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025	www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.3	78.1
B	Woods	55				
B	Impervious	98			0.1	10.8
B	Urban business	92				
				Totals ==>	1.4	88.9

* Use only one CN source per line

CN (weighted) = total product = / total area = 88.9 / 1.4 = 63.9 Use CN ====> 64

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	0.72	1.66	2.32	2.88	3.48

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET	3
331 East Main Street, Suite 200	SUBJECT:	Outfall 17				
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF	3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23		

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................... A_m = 0.002 mi^2 (acres/640)

Runoff curve number........................ CN = 64 (From CN & Runoff worksheet)

Time of concentration......................... T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	1.125	1.125	1.125	1.125	1.125
5. Compute I_a/P		0.32	0.22	0.19	0.16	0.15
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	650	700	715	735	740
7. Runoff, Q (From CN & Runoff worksheet)	in	0.72	1.66	2.32	2.88	3.48
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	3	4	5	6

STV Incorporated
331 Eat Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 18			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	GPP	DATE:	8-Dec-23	3

TIME OF CONCENTRATION (T_c)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	212		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0510		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1953	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	3.00		
13. Wetted perimeter, p_w	ft.	6.32		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4747		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.95		
17b. Input Velocity, FPS	ft./sec.	2.95		
18. Flow length, L	ft.	186		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0175	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2128	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.21 Hour

13 min

STV Incorporated	JOB:	US21 SC51 Widening	SHEET 2
331 East Main Street, Suite 200	SUBJECT:	Outfall 18	
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.5	28.7
B		55				
B	Impervious	98			0.1	5.9
B	Residential 1/3 ac	72			0.5	36.0
				Totals ==>	1.0	70.6

* Use only one CN source per line

CN (weighted) = total product / total area = 70.6 / 1.0 = 68.5 Use CN ====> 68

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.....yr	2	10	25	50	100
Rainfall, P (24-hour)..... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..... in	0.91	1.97	2.68	3.28	3.92

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated 331 East Main Street, Suite 200 Rock Hill, South Carolina 29730 803 207 2025 www.stvinc.com	JOB: US21 SC51 Widening SUBJECT: Outfall 18	SHEET 3	
	CALC'D BY: GPP DATE: 8-Dec-23 CHECK'D BY: SCN DATE: 8-Dec-23	OF 3	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................. A_m = 0.002 mi^2 (acres/640)

Runoff curve number........................ CN = 68 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.941	0.941	0.941	0.941	0.941
5. Compute I_a/P		0.27	0.18	0.15	0.14	0.12
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	720	745	770	775	780
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.91	1.97	2.68	3.28	3.92
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	2	3	4	5

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 18			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_c)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	212		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0510		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1953	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	3.00		
13. Wetted perimeter, p_w	ft.	6.32		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4747		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	2.95		
17b. Input Velocity, FPS	ft./sec.	2.95		
18. Flow length, L	ft.	186		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0175	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2128	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.21 Hour

13 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 18			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			0.5	28.7
B	Woods	55				
B	Impervious	98			0.1	5.9
B	Residential 1/3 ac	72			0.5	36.0
				Totals ==>	1.0	70.6

* Use only one CN source per line

CN (weighted) = total product / total area = 70.6 / 1.0 = 68.5 Use CN ====> 68

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.........yr	2	10	25	50	100
Rainfall, P (24-hour)......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q......... in	0.91	1.97	2.68	3.28	3.92

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 18			3
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.................................... A_m = 0.002 mi^2 (acres/640)

Runoff curve number........................ CN = 68 (From CN & Runoff worksheet)

Time of concentration........................ T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.............................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................ = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.941	0.941	0.941	0.941	0.941
5. Compute I_a/P		0.27	0.18	0.15	0.14	0.12
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	705	745	760	765	775
7. Runoff, Q (From CN & Runoff worksheet)	in	0.91	1.97	2.68	3.28	3.92
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	1	2	3	4	5

STV Incorporated	JOB:	US21 SC51 Widening		SHEET 1
331 Eat Main Street, Suite 200	SUBJECT:	Outfall 19		
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE: 8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	GPP	DATE: 8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	153		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \dfrac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2599	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \dfrac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	6.00		
13. Wetted perimeter, p_w	ft.	12.17		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4930		
15. Channel slope, s	ft./ft.	0.0340		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.90		
17b. Input Velocity, FPS	ft./sec.	4.90		
18. Flow length, L	ft.	1169		
19. $T_t = \dfrac{L}{3600\,V}$ Compute T_t	hr.	0.0663	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3262	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour

20 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 19			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			9.8	597.8
B	Woods	55			0.4	23.1
B	Impervious	98			4.9	483.1
B	Cultivated land	78			7.5	582.7
				Totals ==>	22.6	1686.7

* Use only one CN source per line

CN (weighted) = total product / total area = 1686.7 / 22.6 = 74.6 Use CN ====> 75

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency............yr	2	10	25	50	100
Rainfall, P (24-hour)............ in	3.52	5.12	6.08	6.84	7.62
Runoff, Q............ in	1.32	2.55	3.35	4.01	4.70

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

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	SUBJECT:	Outfall 19			
	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.. A_m = 0.035 mi^2 (acres/640)

Runoff curve number............................ CN = 75 (From CN & Runoff worksheet)

Time of concentration.............................. T_c = 0.3 hr (From T_c worksheet)

Rainfall distribution...= II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.667	0.667	0.667	0.667	0.667
5. Compute I_a/P		0.19	0.13	0.11	0.10	0.09
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	605	630	645	655	660
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.32	2.55	3.35	4.01	4.70
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	28	57	76	93	110

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 19			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	153		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2599	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	6.00		
13. Wetted perimeter, p_w	ft.	12.17		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4930		
15. Channel slope, s	ft./ft.	0.0340		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.90		
17b. Input Velocity, FPS	ft./sec.	4.90		
18. Flow length, L	ft.	1169		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0663	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3262	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour

20 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 19			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			7.4	453.2
B	Woods	55				
B	Impervious	98			5.3	514.5
B	Residential 1/3 ac	72				
				Totals ==>	12.7	967.7

* Use only one CN source per line

CN (weighted) = total product / total area = 967.7 / 12.7 = 76.3 Use CN ====> 76

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency.......yr	2	10	25	50	100
Rainfall, P (24-hour)....... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q....... in	1.38	2.63	3.45	4.12	4.81

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB: US21 SC51 Widening		SHEET 3
331 East Main Street, Suite 200	SUBJECT: Outfall 19		
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23	OF
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23	3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.. A_m = 0.020 mi^2 (acres/640)

Runoff curve number.............................. CN = 76 (From CN & Runoff worksheet)

Time of concentration............................ T_c = 0.3 hr (From T_c worksheet)

Rainfall distribution.................................... = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed.............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.632	0.632	0.632	0.632	0.632
5. Compute I_a/P		0.18	0.12	0.10	0.09	0.08
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	610	627	655	660	665
7. Runoff, Q .... (From CN & Runoff worksheet)	in	1.38	2.63	3.45	4.12	4.81
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	17	33	45	54	63

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 20			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	GPP	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☑ Present ☐ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	107		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1953	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	ft.^{2}	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.93		
17b. Input Velocity, FPS	ft./sec.	3.93		
18. Flow length, L	ft.	120		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0085	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2038	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.20 Hour

12 min

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JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 20			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF
CHECK'D BY:	SCN	DATE:	8-Dec-23	3

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☑ Present ☐ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.5	93.9
B	Woods	55				
B	Impervious	98			0.2	22.5
B	Cultivated land	78			0.4	27.3
				Totals ==>	2.1	143.8

* Use only one CN source per line

CN (weighted) = total product = / total area = 143.8 / 2.1 = 67.8 Use CN ====> 68

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour)..........in	3.52	5.12	6.08	6.84	7.62
Runoff, Q..........in	0.91	1.97	2.68	3.28	3.92

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening			SHEET 3
331 East Main Street, Suite 200	SUBJECT:	Outfall 20			
Rock Hill, South Carolina 29730	CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
803 207 2025 www.stvinc.com	CHECK'D BY:	SCN	DATE:	8-Dec-23	

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☑ Present ☐ Developed

1. Data

Drainage area.................................. A_m = 0.003 mi^2 (acres/640)

Runoff curve number........................ CN = 68 (From CN & Runoff worksheet)

Time of concentration........................T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................. = II (I, IA, II, III)

Pond and swamp areas spread thoroughout watershed............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a .... (Use CN with table 4-1)	in	0.941	0.941	0.941	0.941	0.941
5. Compute I_a/P		0.27	0.18	0.15	0.14	0.12
6. Unit peak discharge, q_u .... (Use T_c and I_a/P with exhibit 4-II)	csm/in	720	760	777	780	790
7. Runoff, Q .... (From CN & Runoff worksheet)	in	0.91	1.97	2.68	3.28	3.92
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p .... (Where $q_p = q_u A_m Q F_p$)	ft^3/s	2	5	7	8	10

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JOB:	US21 SC51 Widening			SHEET 1
SUBJECT:	Outfall 20			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

TIME OF CONCENTRATION (T_C)

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	107		
4. Two-year 24-hour rainfall, P_2	in.	3.52		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1953	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	9.00		
13. Wetted perimeter, p_w	ft.	12.37		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.7276		
15. Channel slope, s	ft./ft.	0.0130		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.93		
17b. Input Velocity, FPS	ft./sec.	3.93		
18. Flow length, L	ft.	120		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0085	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2038	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.20 Hour
12 min

STV Incorporated
331 East Main Street, Suite 200
Rock Hill, South Carolina 29730
803 207 2025 www.stvinc.com

JOB:	US21 SC51 Widening			SHEET 2
SUBJECT:	Outfall 20			
CALC'D BY:	GPP	DATE:	8-Dec-23	OF 3
CHECK'D BY:	SCN	DATE:	8-Dec-23	

RUNOFF CURVE NUMBER AND RUNOFF

Check one: ☐ Present ☑ Developed

Runoff Curve Number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN* Table 2-2	CN* Figure 2-3	CN* Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
B	Grass	61			1.6	98.2
B	Woods	55				
B	Impervious	98			0.5	48.0
B	Residential 1/3 ac	72				
				Totals ==>	2.1	146.2

* Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{146.2}{2.1} = 69.6$ Use CN ====> $\boxed{70}$

Runoff

	Storm # 1	Storm # 2	Storm # 3	Storm # 4	Storm # 5
Frequency..........yr	2	10	25	50	100
Rainfall, P (24-hour).......... in	3.52	5.12	6.08	6.84	7.62
Runoff, Q.......... in	1.02	2.13	2.87	3.49	4.14

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

STV Incorporated	JOB:	US21 SC51 Widening		SHEET
331 East Main Street, Suite 200	SUBJECT:	Outfall 19		3
Rock Hill, South Carolina 29730	CALC'D BY: GPP	DATE: 8-Dec-23		OF
803 207 2025 www.stvinc.com	CHECK'D BY: SCN	DATE: 8-Dec-23		3

GRAPHICAL PEAK DISCHARGE METHOD

Check one: ☐ Present ☑ Developed

1. Data

Drainage area.. A_m = 0.003 mi^2 (acres/640)

Runoff curve number............................ CN = 70 (From CN & Runoff worksheet)

Time of concentration.......................... T_c = 0.2 hr (From T_c worksheet)

Rainfall distribution.................................... = II (I, IA, II, III)

Pond and swamp areas spread
thoroughout watershed............................. = 0.0 percent of A_m (0) acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
2. Frequency	yr	2	10	25	50	100
3. Rainfall, P (24-hour)	in	3.52	5.12	6.08	6.84	7.62
4. Initial abstraction, I_a (Use CN with table 4-1)	in	0.857	0.857	0.857	0.857	0.857
5. Compute I_a/P		0.24	0.17	0.14	0.13	0.11
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4-II)	csm/in	730	770	780	785	800
7. Runoff, Q (From CN & Runoff worksheet)	in	1.02	2.13	2.87	3.49	4.14
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)		1.00	1.00	1.00	1.00	1.00
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	2	5	7	9	11

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
STV INCORPORATED

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

400 0 400 800

FIGURE 8A

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
DRAINAGE AREA – PRE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
1			
2			
3			
4			
5			
6			

norlegsc
8/4/2021

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
1			
2			
3			
4			
5			
6			

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C00338

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

400 0 400 800

FIGURE 8B
12-21-20 Update

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51 DRAINAGE AREA - POST

norlegsc
I:\Projects\2515776\2515776_000\90_CAD Models and Sheets\04_CT_Transportation\Hydro\Design\Pre vs. Post Analysis\2515776 04-POST.dgn
8/4/2021

STV Incorporated
454 South Anderson Road, Suite 3
Rock Hill, South Carolina 29730-3392
803 980 4970 o   803 980 4099 f

JOB:	US21/SC51 Phase I Widening			1
SUBJECT:	Outfalls 1,2 & 3 Comparison			SHEET
CALC'D BY:	GPP	DATE:	22-Dec-2023	OF
CHECK'D BY:	SCN	DATE:	22-Dec-2023	1

PRE VS. POST OUTFALL COMPARISON

GIVEN:

Outfall Location: Road Name **US 21**

Analysis Point **Outfalls 1, 2 and 3**

Outfall 1						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 2 has been redirected to Outfall 1.
Pre (Existing) Discharge (cfs):	40.0	75.0	96.0	115.0	131.0	
Post (Proposed) Discharge (cfs):	86.0	145.0	182.0	211.0	242.0	

Outfall 2						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 2 has been redirected to Outfall 1.
Pre (Existing) Discharge (cfs):	45.0	108.0	153.0	192.0	233.0	
Post (Proposed) Discharge (cfs):	30.0	84.0	121.0	154.0	188.0	

Outfall 3						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 3 has been redirected to Outfall 6.
Pre (Existing) Discharge (cfs):	106.0	220.0	293.0	354.0	420.0	
Post (Proposed) Discharge (cfs):	112.0	227.0	299.0	360.0	425.0	

Outfall 6						Notes
	2yr	10yr	25yr	50yr	100yr	Area from Outfall 3 has been redirected to Outfall 6. Post discharges include new Outfalls 6a and 6b.
Pre (Existing) Discharge (cfs):	24.0	45.0	59.0	69.0	81.0	
Post (Proposed) Discharge (cfs):	18.0	35.0	45.0	54.0	63.0	

Forest Lake (Outfall 2 + 3)						Notes
	2yr	10yr	25yr	50yr	100yr	Based on redirecting Outfall 2 and Outfall 3 areas, overall discharge to Forest Lake has been reduced.
Pre (Existing) Discharge (cfs):	151.0	328.0	446.0	546.0	653.0	
Post (Proposed) Discharge (cfs):	142.0	311.0	420.0	514.0	613.0	
Difference (cfs):	-9.0	-17.0	-26.0	-32.0	-40.0	
Δ %:	**-6.0**	**-5.2**	**-5.8**	**-5.9**	**-6.1**	

REMARKS:

To reduce overall peak discharges to Forest Lake, areas from Outfalls 2 and 3 have been reallocated to adjacent Outfalls 1 and 6 respectively. Please see the accompanying exhibits to see the new pipe system alignments used to accomplish this approach.

Peters, Guy P.

From:	Bostic, Tameika L. <BosticTL@scdot.org>
Sent:	Thursday, November 12, 2020 1:33 PM
To:	Carlsten, Christopher E.; Peters, Guy P.
Cc:	Hamilton, Patrick
Subject:	US-21/SC-51 Widening (0042332) Dam Impacts
Attachments:	D3645_Inundation_Mapbook.pdf; D3645 Crest.jpg; D3645Aux.jpg; D3645Primary Outfall.jpg; US 21 Forest Lake.JPG

****This e-mail is from outside STV****

Gentlemen:

Happy Thursday and hope you are doing well. For the project in the subject line, DHEC has alerted us to a concern with the Lake Forest Dam, which is located approximately 2200 ft from the existing ROW of US-21. I have attached several items to this email concerning the property. Please see the exert from the original email below regarding this issue.

I wanted to make you aware of a concern that was initially raised by a dam owner we are currently working with in York County. Based on the current condition of the dam, the Department shares their concerns with the likely increase in runoff from the widening of US21 from 2 lanes to 5 lanes and potential impacts to the dam. The dam is known to us as Forest Lake (D3645). There are several homes located below the dam; therefore, it is classified as High Hazard based on potential loss of life which may result from failure of the dam.

As shown in the screen grab from SCDOT's project viewer, Lake Forest Dam is located approximately 2200 feet from the existing right-of-way of US21. DHEC Dam Safety has been trying to work with the dam's owner to address significant deficiencies in the primary outlet control structure and auxiliary spillway. It appears from our inspections that the primary is not functioning, which has resulted in increased flows through the auxiliary. These continuous flows have now resulted in head cutting of the earthen spillway, which has progressed since December 2019. The owner is currently working to install interim measures to lower the water level; and, we will be increasing our compliance/enforcement activities to have them engage a professional engineer to work on a plan for repair.

As SCDOT's engineers and consultants work on the design for widening of US21, the department would ask that particular attention be paid and consideration be made for the lack of capacity at Forest Lake Dam. Section 72-425.D(4)(a)(1) of the Standards for Stormwater Management and Sediment Reduction Regulations requires such an analysis and is critical given the potential impacts from failure of this dam due to hydrologic loadings in its present condition.

If SCDOT needs any of the data we have on this dam (inspections, etc,), please don't hesitate to let us know. Included are a few photos from a routine monitoring visit in July, as well as the DSS Wise Lite Inundation Mapbook our staff developed. We would welcome discussing this issue with you as the project is further developed.

Thank you ☺

"Make your dreams happen."

Tameika L. Bostic, EIT
Assistant Program Manager – Midlands
SCDOT
955 Park St. – Room 418
Columbia, SC 29201
(o) 803-737-0457

Peters, Guy P.

From:	Sheri A. Williamson
Sent:	Thursday, April 18, 2013 3:35 PM
To:	Guy P. Peters; Christopher T. Carbuto
Subject:	FW: Forest Lake Community and Surrounding Construction

Just want to keep you in the loop.

From: Leazer, Phil [mailto:phil.leazer@yorkcountygov.com]
Sent: Thursday, April 18, 2013 3:34 PM
To: Johnson Michael
Cc: Sheri A. Williamson; Moss, Steven; Hamilton, Patrick
Subject: FW: Forest Lake Community and Surrounding Construction

FYI…..

From: Markle, Korey [HDS] [mailto:Korey.Markle@hdsupply.com]
Sent: Thursday, April 18, 2013 3:22 PM
To: Leazer, Phil
Subject: RE: Forest Lake Community and Surrounding Construction

Phil,

Thank you very much for the reply. I understand Pennies For Progress and the York County Stormwater Department are aware of our situation. It is comforting to hear that the Design Engineer will consider the drainage basin in its highway design. I did not want to come across as being upset, I just wanted the county to realize we are here, and we don't want to be forgotten when the time comes. I believe our discharge pipe through the dam is 15". A short site visit will make obvious the amount of property that feeds our lake. It is very concerning to say the least.

We are having a neighborhood meeting soon and I will include some of this information to the residents. Just that the county is aware of the growth impact to our lake. I will not go into the future highway plans.

Your reply was very timely and I sincerely appreciate your attention to this. Feel free to contact me anytime concerning this or any other issues that affect our community.

Thank you,

Korey Markle
Account Manager
HD Supply Waterworks
901 Crafters Lane
Pineville NC 28134
704-507-6356 office
704-393-8893 fax
704-507-6356 mobile

From: Leazer, Phil [mailto:phil.leazer@yorkcountygov.com]
Sent: Thursday, April 18, 2013 3:03 PM
To: Markle, Korey [HDS]; 'korey.markle@gmail.com'
Cc: Johnson Michael; Sheri A. Williamson (Sheri.Williamson@stvinc.com); Moss, Steven; Culver, Jennifer
Subject: RE: Forest Lake Community and Surrounding Construction
Importance: High

Dear Mr. Markle,

My name is Phil Leazer and I work for the York County Engineering Department. I have been assigned to the Pennies for Progress Program, York County's large-scale roadway improvement program. We are in receipt of an email you sent to Councilman Michael Johnson regarding the Forest Lake Community and would like to offer the following:

First let me start by apologizing to both you and Councilman Johnson. We have been a little overwhelmed here in this office of late and are woefully behind on responding to emails. We apologize for the delay in getting back to you on this very important issue.

You are very much correct, the York County Pennies for Progress Program is beginning to look at the possibility of widening US 21 from the Captain Steve's restaurant at Springfield Parkway north to SC 51. We have started to gather very preliminary information along this corridor that we will use to develop a concept plan for this work. (Concept plan being nothing more than what kind of roadway facility is needed along this corridor.) Once this concept plan is complete, we will then have a better idea of what areas a widened roadway may impact.

We have already been in discussions with the York County Stormwater Department about the Forest Lake Area even before your email. We too share the same concerns as you and want to make sure what we may end up doing on US 21 does not negatively affect downstream and probably more importantly the 15 acres lake that defines your neighborhood. As soon as we got your email, we contacted the engineering design firm that we have working on this project and let them know we need to coordinate with the Forest Lake Development as we move beyond the concept plan stage of this project. With your permission we will add you to our list of property owners to coordinate with to make sure we get you all the information you need to feel more comfortable with the project.

Again, I apologize for the delay in getting back to you on this issue.

If you have any questions or comments, or would like to discuss this any further, please do not hesitate to contact me at any of the outlets below.

Thanks you for giving us the opportunity to answer your questions and bring you in on this project.

Phil Leazer
York County Engineering
Pennies for Progress Division
(803) 818-5763 office direct
(803) 684-8571 Engineering Offices
Phil.leazer@yorkcountygov.com

From: Johnson Michael
Sent: Monday, April 08, 2013 2:28 PM
To: Leazer, Phil; Pettine, David
Subject: Fwd: Forest Lake Community and Surrounding Construction

Gentleman:

Received this today. Would appreciate some feedback so I can advise him properly.

Michael Johnson
District One

Sent from my iPad

Begin forwarded message:

> **From:** "Markle, Korey [HDS]" <Korey.Markle@hdsupply.com>
> **Date:** April 8, 2013, 10:20:17 AM EDT
> **To:** "michael.johnson@yorkcountygov.com" <michael.johnson@yorkcountygov.com>
> **Cc:** Wendy Markle <markles@comporium.net>, "Markle, Korey [HDS]" <Korey.Markle@hdsupply.com>, Dale Stickney <dstick_2@hotmail.com>, "rmccurry@besc.com" <rmccurry@besc.com>
> **Subject: Forest Lake Community and Surrounding Construction**
>
> Mr. Johnson,
>
> I need your help. I am the President of the Forest Lake Community Club. Our subdivision is located just north of Captain Steve's Fish Camp on the west side of Hwy 21 By-Pass at the intersection of Gold Hill Rd. We are experiencing drainage problems caused by new and recent development, and now we see signs of future development coming. We need the County's help in fixing drainage problems that are a direct result from this upstream development. I don't know the State laws, but I understand one cannot discharge rainfall runoff onto adjacent properties resulting in damage to that property. We feel this is what the County has allowed to happen to us.
>
> Our neighborhood has a 15 acre lake. It is fed by a pipe that comes under Hwy 21. Since the construction of the Apartment buildings on the corner of Gold Hill Rd and Hwy 21 on the east side, we have experienced a huge increase in the amount of water coming into our lake. This development's erosion run off has contaminated our lake's water with silt and literally filled-in the upper end of the lake. On top of that, the increased run off from the complex's impervious area has over taxed the lake's existing drainage system. We now experience conditions that exceed our lakes drainage system capabilities. This additional volume bypasses the lakes outlet drainage system, thus relying on the emergency overflow around the dam. This situation is fine for emergencies, but we are now experiencing these "emergencies" nearly every rainfall. Before the complex was built, I had only seen an overflow condition once in over ten years. This upstream development is the cause and will eventually cause the dam to fail.
>
> Recently we have seen surveyors and underground locations marking the right-of-way of Hwy 21. This is done for engineering purposes when future developments are being designed. If this is for a highway widening, or any other development increasing impervious area, the impact on the lake will become exponential. I find it unacceptable that we (Forest Lake) have not been contacted by any local Government Department about any of these projects, we only see the surveyors flagging trees and running their control, even on our private property. I understand how a drainage system works and how it can impact existing downstream infrastructure. If Hwy 21 is improved to something similar to Gold Hill Rd, the impact to our dam would be catastrophic. A quick look at Google Maps will show there are 6 or more houses located directly behind and downstream of this dam. The results of a dam breach are unthinkable.
>
> It is incomprehensible that York County's Engineering and Zoning Departments did not consider the impact of this, and the future development, would and will have on the existing creeks and eco systems down-stream, especially when they immediately feed a lake. I am all for growth and future development

in York County. And I would love to see Hwy 21 By-Pass improved, and any other development projects scheduled for this area. But we need to make sure our lake's discharge drainage system is included in the scope of such projects, because we are directly impacted by them.

I feel this could be a long hard fight for us, so we must have the support of our local representatives, most importantly you. If you would like to discuss this or even come make a site visit, we would love to have you. Feel free to contact me anytime.

Respectfully,

Korey Markle
495 Forest Way Drive
Fort Mill SC 29715
803-548-6047 home
704-507-6356 mobile
markles@comporium.net
korey.markle@gmail.com

Appendix F

Erosion and Sediment Control Calculations

SCDOT
South Carolina Department of Transportation

EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
US 21	22+45	LT	STEELE CREEK	CATAWBA RIVER
US 21	34+56	LT	STEELE CREEK	CATAWBA RIVER
US 21	39+49	LT	STEELE CREEK	CATAWBA RIVER
US 21	66+89	LT	STEELE CREEK	CATAWBA RIVER
US 21	67+96	LT	STEELE CREEK	CATAWBA RIVER
US 21	73+45	LT	STEELE CREEK	CATAWBA RIVER
US 21	116+69	LT	STEELE CREEK	CATAWBA RIVER
US 21	122+69	LT	STEELE CREEK	CATAWBA RIVER
US 21	123+75	LT	STEELE CREEK	CATAWBA RIVER
US 21	34+07	RT	STEELE CREEK	CATAWBA RIVER
US 21	41+34	RT	STEELE CREEK	CATAWBA RIVER
US 21	42+54	RT	STEELE CREEK	CATAWBA RIVER
US 21	101+25	RT	SUGAR CREEK	CATAWBA RIVER
US 21 BUSSINESS	22+04	RT	STEELE CREEK	CATAWBA RIVER
OLDNACL	17+23	RT	SUGAR CREEK	CATAWBA RIVER
OLDNACL	13+25	LT	STEELE CREEK	CATAWBA RIVER
FLINTHILL	12+43	RT	SUGAR CREEK	CATAWBA RIVER

SOIL TYPES

ROAD / ROUTE	STATION TO	STATION	SOIL PARTICLE SIZE (COARSE / FINE)	ZONE
US 21	10+00	137+14	FINE	BLUE RIDGE
SC 51	295+62	342+91	FINE	BLUE RIDGE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO	STATION	SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1 FRONT	BACK	MSY
US 21	15+00	17+50	LT	2.5		2		0.155
US 21	17+50	21+00	LT	5		2		0.435
US 21	21+00	23+50	LT	19		2		1.180
US 21	23+50	31+50	LT	3		2		0.596
US 21	31+50	36+00	LT	17.5		2		1.957
US 21	36+00	37+50	LT	10		2		0.373
US 21	37+50	42+00	LT	16		2		1.789
US21	44+00	45+00	LT	2		2		0.050
US21	45+00	46+00	LT	16			2.0	0.398
US21	46+00	50+00	LT	28			2.0	2.783
US21	50+00	53+50	LT	22			2.0	1.913
US21	54+00	57+50	LT	7		2		0.609
US21	58+00	59+50	LT	3		2		0.112
US21	60+00	60+50	LT	2		2		0.025
US21	64+50	66+00	LT	3.5		2		0.130
							TOTAL	12.503

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO	STATION	SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1) FRONT	BACK	DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
FLINT	19+00	19+50	LT	2.3	6	2		1	0.106		
FLINT	19+50	20+77	LT	2.9	4	2		1	0.260		
FLINT	21+00	22+00	RT	1.3	6	2		1	0.120		
FLINT	22+00	22+50	RT	2.1	4	2		1	0.074		
US21	18+20	18+50	LT	1	4	2		1	0.021		
FERNFOREST	10+50	11+00	RT	1.2	4	2		1	0.042		
US21	21+00	21+50	LT	1	2	2		2		0.025	
LAKESBLVD	11+00	12+31	RT	0.5	6	2		1	0.061		
BAXTER	14+00	14+21	LT	1	4	2		1	0.015		
GARRISON	11+00	12+00	LT	1	6	2		1	0.092		
GOLDHILL	14+11	14+50	LT	0.6	4	2		1	0.017		
GOLDHILL	14+27	15+00	RT	1	4	2		1	0.052		
GOLDHILL	16+00	16+50	RT	1	4	2		1	0.035		
OLD NACL	18+00	19+50	LT	0.7	4	2		1	0.074		
LAKESHORE	13+00	13+50	LT	0.4	4	2		1	0.014		
								TOTALS	0.984	0.025	

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO	STATION	SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
US 21	15+00	15+25	LT	10	25	20	
US 21	15+88	17+62	LT	10	80	40	
US 21	18+02	18+42	LT	10	75	20	
US 21	19+19	19+95	LT	10	150	20	
US 21	20+25	21+96	LT	10	25	80	
US 21	24+13	27+13	LT	10	150	30	
US 21	28+79	31+42	LT	10	150	30	
US21	41+00	42+00	LT	10	25	40	
US21	43+50	44+25	LT	10	25	40	
US21	53+95	54+25	LT	10	30	20	
US21	54+97	55+27	LT	10	30	20	
US21	56+12	57+33	LT	10	30	50	
US21	58+00	59+50	LT	10	75	30	
US21	105+50	107+75	LT	10	120	20	
US21	110+00	111+50	LT	10	150	10	
US 21	19+18	20+11	RT	10	100	20	
US21	38+00	38+50	RT	10	50	20	
US21	40+11	41+34	RT	10	25	60	
US21	50+86	53+86	RT	10	150	30	
US21	64+00	64+42	RT	10	50	10	
US21	65+46	66+50	RT	10	30	40	
US21	66+87	67+13	RT	10	25	20	
US21	134+28	135+50	RT	10	150	20	
AMELIA	10+90	11+48	LT	10	30	30	
FERNFOREST	10+54	10+72	RT	10	30	10	
FERNFOREST	10+94	11+20	RT	10	30	10	
LAKESHORE	13+00	13+50	LT	10	25	20	
EX-FOREST	11+16	12+75	LT	10	40	50	
OLD-NACL	10+50	13+28	RT	10	150	30	
OLD-NACL	13+66	14+40	RT	10	100	20	
OLD-NACL	15+42	17+00	RT	10	150	20	
OLD-NACL	17+44	20+20	RT	10	150	20	
OLD-NACL	15+45	16+95	LT	10	150	10	
EX-GOLDHILL	32+31	32+82	LT	10	50	30	
EX-GOLDHILL	33+86	35+23	RT	10	130	20	
EX-GOLDHILL	22+75	23+64	RT	10	90	10	
GOLDHILL-REALIGN	14+50	18+00	RT	10	60	70	
GOLDHILL-REALIGN	19+50	21+00	RT	10	150	20	
GOLDHILL-REALIGN	27+00	31+35	RT	10	150	40	
GOLDHILL-REALIGN	14+22	14+52	LT	10	25	20	
GOLDHILL-REALIGN	15+16	15+99	LT	10	60	20	
GOLDHILL-REALIGN	17+37	22+01	LT	10	150	40	
Baxter	14+22	14+40	LT	10	25	20	
GARRISONFARM	11+04	11+39	RT	10	25	20	
GARRISONFARM	11+22	11+50	LT	10	25	20	
Lakes BLVD	11+00	12+46	RT	10	25	60	
Lakes BLVD	10+84	11+62	LT	10	25	50	
TERRYS	11+47	11+97	RT	10	50	10	
					TOTAL	1350FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH
4	OLDUS21BUS	14+25	LT	DRAINED	120	4	4	3	12	4	B	284	0.75	N/A	N/A	N/A
5	OLDSC51	304+35	LT	DRAINED	90	15	4	3	12	4	B	307	0.75	N/A	N/A	N/A
6	SC 51	314+80	RT	DRAINED	175	20	3	3	14	7	B	506	0.75	N/A	N/A	N/A

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FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

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South Carolina Department of Transportation

EROSION CONTROL DATA SHEET

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	OUTFALL DITCH SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
ANDREW	01+95	LT	MCCULLOUGH BRANCH	CATAWBA RIVER
FLINT	23+05	RT	SUGAR CREEK	CATAWBA RIVER
EXIST. SPRINGHILL	23+53	LT	MCCULLOUGH BRANCH	CATAWBA RIVER
GOLDHILL REALIGN	23+92	LT	STEELE CREEK	CATAWBA RIVER
GOLDHILL REALIGN	14+07	LT	STEELE CREEK	CATAWBA RIVER
SC 51	316+33	RT	SUGAR CREEK	CATAWBA RIVER

SOIL TYPES

ROAD / ROUTE	STATION TO	STATION	SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO	STATION	SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1 FRONT	SLOPES x : 1 BACK	MSY
US21	66+00	68+00	LT	18		2		0.894
US-21	68+50	69+00	LT	1.5		2		0.019
US-21	69+00	70+00	LT	1		2		0.025
US-21	70+00	72+00	LT	5.5		2		0.273
US-21	72+50	74+50	LT	15		2		0.745
US-21	76+50	82+00	LT	2.5		2		0.342
US-21	84+00	85+50	LT	4			2.0	0.149
US-21	85+50	95+00	LT	3.75			2.0	0.885
US-21	96+50	107+50	LT	4.7		2		1.284
US-21	109+00	112+00	LT	4.7		2		0.350
US-21	113+50	128+00	LT	24		2		8.646
US-21	128+00	117+00	LT	2		2		0.547
US-21	117+50	118+50	LT	11		2		0.273
US-21	120+00	124+50	LT	25		2		2.795
US-21	125+00	134+00	LT	3		2		0.671
							TOTAL	17.899

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO	STATION	SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1) FRONT	SLOPES (x : 1) BACK	DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO	STATION	SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
ANDREW	00+54	01+82	LT	10	100	20	
ANDREW	01+06	01+72	RT	10	150	20	
ANDREW	02+49	05+23	RT	10	60	50	
US21 (Tail Ditch)	135+20	135+30	LT	10	50	20	
US21 (Tail Ditch)	134+32	135+49	RT	10	150	20	
SC51	306+99	307+72	LT	10	50	20	
SC51	308+61	309+62	LT	10	90	20	
SC51	310+36	310+99	LT	10	150	10	
SC51	336+88	340+00	LT	10	150	30	
SC51	303+41	308+75	RT	10	75	90	
SC51	308+95	310+25	RT	10	45	30	
FLINT2	16+70	22+50	RT	10	80	80	
FLINT2	16+67	21+53	LT	10	80	70	
EX-FLINT	15+10	19+71	LT	10	75	70	
EX-FLINT	14+86	16+94	RT	10	150	30	
EX-FLINT	16+94	19+04	RT	10	120	30	
EX-FLINT	10+94	11+40	LT	10	150	10	
EX-FLINT	11+21	11+91	RT	10	150	10	
EX-FLINT	16+36	18+82	RT	10	50	60	
SPRINGHILL	23+97	29+97	LT	10	150	50	
SPRINGHILL	24+00	30+00	RT	10	150	50	
EX-SPRINGHILL	14+82	16+06	RT	10	150	10	
EX-SPRINGHILL	22+57	22+76	RT	10	150	10	
EX-SPRINGHILL	16+33	17+81	LT	10	150	20	
EX-SPRINGHILL	18+98	19+89	LT	10	150	10	
EX-SPRINGHILL	20+86	23+50	LT	10	150	20	
EX-SPRINGHILL	23+90	24+47	LT	10	150	10	
					TOTAL	870FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

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EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH		NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
	STATION	SIDE		

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
US 21	15+50	24+50	RT	1		2		0.224
US 21	24+50	27+50	RT	3		2		0.224
US-21	29+00	30+00	RT	1.75		2		0.043
US-21	30+00	31+00	RT	23			2.0	0.571
US-21	31+00	33+00	RT	1.5		2		0.075
US-21	33+00	35+00	RT	17		2		0.845
US-21	35+00	35+50	RT	7.5		2		0.093
US-21	36+50	39+00	RT	1.8		2		0.112
US-21	40+00	45+00	RT	17.8		2		2.211
US-21	45+00	45+50	RT	4		2		0.050
US-21	46+50	49+00	RT	2.4		2		0.149
US-21	49+00	55+00	RT	8.7		2		1.297
US-21	55+00	57+00	RT	11.5		2		0.571
US-21	58+00	59+00	RT	5		2		0.124
US-21	59+00	62+00	RT	2.5		2		0.186
							TOTAL	**6.775**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

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EROSION CONTROL DATA SHEET

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	OUTFALL DITCH SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1 FRONT	SLOPES x : 1 BACK	MSY
US-21	64+00	67+50	RT	8		2		0.696
US-21	67+50	78+00	RT	4.2		2		1.096
US-21	78+00	80+00	RT	9.5		2		0.472
US-21	80+00	82+00	RT	4.75		2		0.236
US-21	83+50	89+00	RT	5		2		0.683
US-21	91+00	95+50	RT	1.75		2		0.196
US-21	95+50	97+00	RT	4.3		2		0.160
US-21	98+00	107+50	RT	5.75		2		1.357
US-21	109+50	116+00	RT	1.6		2		0.258
US-21	116+50	122+00	RT	6.75		2		0.922
US-21	122+50	124+50	RT	10		2		0.497
US-21	124+50	128+50	RT	3.6		2		0.358
US-21	130+00	130+50	RT	1		2		0.012
OLD SC-51	302+50	303+00	LT	2.2		4		0.050
OLD SC-51	303+00	307+50	LT	3.75		4	2.0	1.192
							TOTAL	**8.186**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1) FRONT	SLOPES (x : 1) BACK	DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

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EROSION CONTROL DATA SHEET

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH		NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
	STATION	SIDE		

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
OLD SC-51	307+50	308+15	LT	1		6		0.044
OLD SC-51	308+15	308+30	LT	1		4		0.007
OLD SC-51	315+50	316+00	LT	2		6		0.068
OLD SC-51	302+50	303+00	RT	1		2		0.012
OLD SC-51	303+00	308+50	RT	1.4		4	2.0	0.544
OLD SC-51	315+50	316+00	RT	1.2		6		0.041
OLD SC-51	316+00	316+16	RT	1		50		0.089
SPRINGHILL	23+51	30+00	LT	1		6	2.0	0.600
SPRINGHILL	23+51	30+00	LT	2.1			2.0	0.339
SPRINGHILL	23+51	30+50	RT	1		6	2.0	0.646
SPRINGHILL	28+50	30+20	RT	1.2			2.0	0.051
FLINT2	16+51	19+00	LT	2.1		6	2.0	0.484
FLINT2	20+77	21+00	LT	1.9		4	2.0	0.031
FLINT2	21+00	22+00	LT	3.1		6		0.210
FLINT2	22+00	23+00	LT	3.1		4		0.142
							TOTAL	**3.306**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

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EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	OUTE/ROA NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
FLINT2	16+50	17+00	RT	1.5		4		0.034
FLINT2	17+00	21+00	RT	1.5		6	2.0	0.555
FERN FOREST	11+00	11+50	RT	1		6		0.034
FERN FOREST	11+00	12+00	LT	1		4		0.046
LAKESBLVD	11+00	12+00	LT	1		6	2.0	0.097
TERRYS	11+50	12+00	LT	2		4	1.0	0.062
TERRYS	11+50	12+00	RT	2		4	1.0	0.062
GARRISONFARM	11+00	12+00	RT	1.5		6	2.0	0.139
GARRISONFARM	11+00	11+50	LT	1.5		6	2.0	0.069
AMELIA	10+50	12+00	LT	1		4	2.0	0.106
AMELIA	10+50	12+00	LT	2			2.0	0.075
AMELIA	10+50	11+80	RT	1		6		0.088
AMELIA	11+80	12+00	RT	1		12		0.027
BAXTER	14+21	14+50	LT	3		4	2.0	0.061
BAXTER	14+50	14+79	LT	1.8		4	1.0	0.029
							TOTAL	**1.482**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

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EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH		NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
	STATION	SIDE		

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
BAXTER	14+00	14+50	RT	2		6		0.068
BAXTER	14+50	14+79	RT	2.5		4		0.033
ANDREW	00+50	01+50	LT	0.75		2	2.0	0.037
ANDREW	00+50	01+50	LT	3.75		2		0.093
ANDREW	01+50	02+00	LT	0.75		4	2.0	0.026
ANDREW	01+50	02+50	LT	3		4		0.137
ANDREW	02+50	03+00	LT	2.5		6		0.084
ANDREW	03+00	03+50	LT	1		4	2.0	0.035
ANDREW	03+00	03+50	LT	2.2		4		0.050
ANDREW	03+50	03+90	LT	1		4		0.018
ANDREW	00+50	01+00	RT	2		6		0.068
ANDREW	01+00	01+50	RT	0.75		2	2.0	0.019
ANDREW	01+00	01+50	RT	2.8		2		0.035
ANDREW	01+50	02+00	RT	1		6	2.0	0.046
ANDREW	01+50	02+50	RT	2		6		0.135
						TOTAL		**0.886**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

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EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
ANDREW	02+50	03+90	RT	1.3		6	2.0	0.168
ANDREW	03+50	03+90	RT	1.5			2.0	0.015
GARRISON	11+00	12+00	RT	1.5		6	2.0	0.139
GOLDHILL-REALIGN	14+00	14+50	LT	2		4		0.046
GOLDHILL-REALIGN	14+50	19+00	LT	1.85		4	2.0	0.588
GOLDHILL-REALIGN	14+50	19+00	LT	1.1		4		0.227
GOLDHILL-REALIGN	19+00	22+50	LT	5		4	2.0	1.237
GOLDHILL-REALIGN	22+50	23+00	LT	10		4		0.229
GOLDHILL-REALIGN	23+00	25+50	LT	25		2		1.553
GOLDHILL-REALIGN	25+50	26+50	LT	10		4		0.458
GOLDHILL-REALIGN	26+50	27+00	LT	2.9		6		0.098
GOLDHILL-REALIGN	27+00	28+50	LT	10		4		0.687
GOLDHILL-REALIGN	28+50	32+00	LT	3.6		4	2.0	0.890
GOLDHILL-REALIGN	28+50	32+00	LT	5.2			2.0	0.452
GOLDHILL-REALIGN	32+00	32+39	LT	5.5		2		0.053
							TOTAL	**6.840**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

8/4/2021
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SCDOT
South Carolina Department of Transportation

EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH		NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
	STATION	SIDE		

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
GOLDHILL-REALIGN	15+50	16+00	RT	3		4	2.0	0.106
GOLDHILL-REALIGN	16+50	19+00	RT	4		4		0.458
GOLDHILL-REALIGN	20+50	22+50	RT	3			2.0	0.149
GOLDHILL-REALIGN	23+00	23+50	RT	3.1		6		0.105
GOLDHILL-REALIGN	23+50	24+00	RT	6.7		4		0.153
GOLDHILL-REALIGN	24+00	26+00	RT	19.5		2		0.969
GOLDHILL-REALIGN	26+00	26+50	RT	5		4		0.115
GOLDHILL-REALIGN	26+50	27+00	RT	1		6		0.034
GOLDHILL-REALIGN	27+00	32+00	RT	4		4	2.0	1.413
GOLDHILL-REALIGN	28+50	32+00	RT	9			2.0	0.783
GOLDHILL-REALIGN	32+00	32+39	RT	7.1		2		0.069
EX FLINT	10+00	11+50	LT	1		4	2.0	0.106
EX FLINT	11+50	12+50	LT	1		2	6.0	0.092
OLD US-21 BUS	11+00	15+00	LT	5		6		1.352
OLD US-21 BUS	16+00	17+00	LT	5.7		4		0.261
							TOTAL	**6.165**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

8/4/2021
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SCDOT
South Carolina Department of Transportation

EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH STATION	SIDE	NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
OLD US-21 BUS	17+00	20+50	LT	4.9		6		1.159
OLD US-21 BUS	11+00	15+00	RT	2.2		6		0.595
OLD US-21 BUS	16+00	21+92	RT	4		6		1.600
OLD US-21 BUS	21+92	24+80	RT	1.9		2	2	0.272
OLD NACL	10+50	11+00	LT	2.1		4		0.048
OLD NACL	11+00	13+50	LT	1.9		6		0.321
OLD NACL	13+50	14+50	LT	0.75		6	2	0.069
OLD NACL	19+50	19+98	LT	1.7		4	2	0.058
OLD NACL	10+50	11+00	RT	2.5		4		0.057
OLD NACL	11+00	12+00	RT	2.6		6		0.176
OLD NACL	12+00	13+00	RT	3.2		6	2	0.296
OLD NACL	13+00	13+50	RT	2.8		4	2	0.099
OLD NACL	13+50	13+97	RT	1		6	2	0.043
OLD NACL	13+97	14+50	RT	1.6		4	2	0.060
OLD NACL	18+00	19+98	RT	2.55		4	2	0.357
							TOTAL	**5.210**

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

8/4/2021
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SCDOT
South Carolina Department of Transportation

EROSION CONTROL DATA SHEET

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.
3	S.C.	YORK	0042332	US21	

RECEIVING WATERS

ROAD / ROUTE	OUTFALL DITCH		NAME OF RECEIVING WATERS	NAME OF ULTIMATE RECEIVING WATERS
	STATION	SIDE		

SOIL TYPES

ROAD / ROUTE	STATION TO STATION		SOIL PARTICLE SIZE (COARSE / FINE)	ZONE

TEMPORARY EROSION CONTROL BLANKET

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF BLANKET (FT)	DITCH BOTTOM WIDTH (FT)	SLOPES x : 1		MSY
						FRONT	BACK	
US21 (Tail Ditch)	00+00	00+77	LT	3		4	2	0.163
LAKESHORE	13+00	13+50	LT	3.76			2	0.047
LAKESHORE	13+50	14+13	LT	1.3		6	2	0.076
LAKESHORE	12+70	13+00	RT	1		6		0.020
							TOTAL	0.306

TURF REINFORCED MATTING (TRM)

ROAD / ROUTE	STATION TO STATION		SIDE	DEPTH OF MAT (FT)	SLOPES (x : 1)		DITCH BOTTOM WIDTH (FT)	TYPE	TYPE 1 (MSY)	TYPE 2 (MSY)	TYPE 3 (MSY)
					FRONT	BACK					
								TOTALS			

SEDIMENT TUBES IN DITCHES

ROAD / ROUTE	STATION TO STATION		SIDE	AVERAGE LENGTH	SPACING (FT)	TOTAL	COMMENTS
					TOTAL	0FT	

SEDIMENT DAM

NO	ROAD / ROUTE	STATION	SIDE	DRAINED OR NOT DRAINED	LENGTH OF SILT BASIN	WIDTH OF SILT BASIN	DAM HEIGHT	SIDE SLOPE OF SILT BASIN	SPILLWAY BOTTOM WIDTH	DAM BOTTOM WIDTH	RIP RAP CLASS	TOTAL STORAGE VOLUME	SEDIMENT STORAGE HEIGHT	OUTFALL CHANNEL WIDTH	OUTFALL CHANNEL DEPTH	OUTFALL CHANNEL LENGTH

8/4/2021
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SEDIMENT DAMS ARE DESIGNED PER SCDOT STANDARD DRAWING 815-405-01

STV Incorporated	JOB: US 21 & SC 51	7
Consulting Engineers	SUBJECT: Sediment Dam/Basin Design	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 26-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHECK'D BY: SCN DATE: 10-Feb-17	10

Sediment Dam/Basin Design

Sediment Dam 4

Location: OLDUS21BUSINESS Sta. 14+25 Lt		
Total Drainage Area	5.05	AC
Total Disturbed Area	0.64	AC
Region	Upper State	
Sediment Storage Rate*	15.40	CY/Disturbed Acre
Sediment Storage Volume	10	CY
Runoff Storage Volume*	269	CY
Class of Sediment Dam Riprap	Class B	
Spillway Width	12	FT
Spillway Depth	1 ft	
Spillway Side Slope	2:1	
Rock Dam Height	4.0	FT
Rock Dam Bottom width	4.0	FT
Sediment Storage Height	0.75	FT
Length of Basin	**120**	**FT**
Width of Basin	**4**	**FT**
Upstream and Downstream slope of placed Riprap	2:1	
Required Storage Volume	279	CY
Provided Storage Volume	**284**	**CY**

* SCDOT Stormwater Quality Design Manual Appendix B

Total Storage Volume

	TRAPEZOIDAL CHANNEL
BOTTOM WIDTH (FT)	4.00
DEPTH (FT)	4.00
SLOPE (?H:1V)	3.00
Length (FT)	120.00
AREA (SQ FT)	64.00
Volume (CY)	284.4

STV

STV Incorporated	JOB:	US 21 & SC 51			8
Consulting Engineers	SUBJECT:	Sediment Dam/Basin Design			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	26-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHECK'D BY:	SCN	DATE:	10-Feb-17	10

Sediment Dam/Basin Design

Sediment Dam 5

Location: OLDSC51 Sta. 304+35 Lt		
Total Drainage Area	5.00	AC
Total Disturbed Area	1.25	AC
Region	Upper State	
Sediment Storage Rate*	15.40	CY/Disturbed Acre
Sediment Storage Volume	19	CY
Runoff Storage Volume*	277	CY
Class of Sediment Dam Riprap	Class B	
Spillway Width	12	FT
Spillway Depth	1 ft	
Spillway Side Slope	2:1	
Rock Dam Height	4.0	FT
Rock Dam Bottom width	4.0	FT
Sediment Storage Height	0.75	FT
Length of Basin	**90**	**FT**
Width of Basin	**15**	**FT**
Upstream and Downstream slope of placed Riprap	2:1	
Required Storage Volume	296	CY
Provided Storage Volume	**307**	**CY**

* SCDOT Stormwater Quality Design Manual Appendix B

Total Storage Volume

	TRAPEZOIDAL CHANNEL
BOTTOM WIDTH (FT)	15.00
DEPTH (FT)	4.00
SLOPE (?H:1V)	2.00
Length (FT)	90.00
AREA (SQ FT)	92.00
Volume (CY)	306.7

STV Incorporated	JOB: US 21 & SC 51		9
Consulting Engineers	SUBJECT: Sediment Dam/Basin Design		SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 26-Jul-16	OF
Rock Hill, SC, 29730 (803) 980-4970	CHECK'D BY: SCN	DATE: 10-Feb-17	10

Sediment Dam/Basin Design

Sediment Dam 6

Location: SC 51 Sta. 314+80 Rt		
Total Drainage Area	8.01	AC
Total Disturbed Area	1.43	AC
Region	Upper State	
Sediment Storage Rate*	15.40	CY/Disturbed Acre
Sediment Storage Volume	22	CY
Runoff Storage Volume*	424	CY
Class of Sediment Dam Riprap	Class B	
Spillway Width	14	FT
Spillway Depth	1 ft	
Spillway Side Slope	2:1	
Rock Dam Height	3.0	FT
Rock Dam Bottom width	7.0	FT
Sediment Storage Height	0.75	FT
Length of Basin	**175**	**FT**
Width of Basin	**20**	**FT**
Upstream and Downstream slope of placed Riprap	2:1	
Required Storage Volume	446	CY
Provided Storage Volume	**506**	**CY**

* SCDOT Stormwater Quality Design Manual Appendix B

Total Storage Volume

	TRAPEZOIDAL CHANNEL
BOTTOM WIDTH (FT)	20.00
DEPTH (FT)	3.00
SLOPE (?H:1V)	2.00
Length (FT)	175.00
AREA (SQ FT)	78.00
Volume (CY)	505.6

Hydraulic Analysis Report
Culvert Outfalls

Project Data

Project Title:

Designer:

Project Date: Monday, June 06, 2016

Project Units: U.S. Customary Units

Notes:

Riprap Analysis: Culvert EP-2

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 154 cfs

Culvert Diameter: 5 ft

Normal Depth in Culvert: 1.85 ft

Tailwater Depth: 6.68 ft

If tailwater is unknown, use 0.4D

flow is subcritical

Result Parameters

Tailwater Depth Used in Computations: 6.68 ft

Culvert Diameter Used in Computations: 5 ft

Computed D50: 3.42899 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 20 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 28.3333 ft

No channel used in calculations

Riprap Analysis: Culvert EP-3

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 204 cfs

Culvert Diameter: 5 ft

Normal Depth in Culvert: 2.72 ft

Tailwater Depth: 2.23 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 2.23 ft

Culvert Diameter Used in Computations: 5 ft

Computed D50: 14.9434 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS IV

Riprap Class Order: 4

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 30 in

d85: 21 in

d50: 15.5 in

d15: 10.5 in

Layout Recommendations

Apron Length: 30 ft

Apron Depth: 2.84167 ft

Apron Width (at end): 35 ft

No channel used in calculations

Riprap Analysis: Culvert CLP-4

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 42 cfs

Culvert Diameter: 3 ft

Normal Depth in Culvert: 1.23 ft

Tailwater Depth: 1.31 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 1.31 ft

Culvert Diameter Used in Computations: 3 ft

Computed D50: 6.11093 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 12 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 17 ft

No channel used in calculations

Riprap Analysis: Culvert EP-5

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 8 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.48 ft

Tailwater Depth: 0.74 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 0.74 ft

Culvert Diameter Used in Computations: 1.5 ft

Computed D50: 2.9875 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 8.5 ft

No channel used in calculations

Riprap Analysis: Culvert EP-6

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 44 cfs

Culvert Diameter: 4 ft

Normal Depth in Culvert: 0.51 ft

Tailwater Depth: 1.2 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 1.6 ft

Culvert Diameter Used in Computations: 4 ft

Computed D50: 3.62753 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 16 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 22.6667 ft

No channel used in calculations

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			1
Consulting Engineers	SUBJECT:	Outlet Protection EP-2			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	24-Apr-17	4

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **33+79 EP-2** Road Name **US 21**

From Charts - Length (L_a) = **65** ft.

Width 1 (W_1) = 3 * D_o = 15.0 ft.

Width 2 (W_2) = **40** ft.

Pipe Size (D_o) = **60** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 3566.1 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 222.88 Tons, use ===> **223 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 239.62 s.y., use ===> **240 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730

JOB: US 21/ SC 51 Phase I Widening

SUBJECT: Outlet Protection EP-3

CALC'D BY: PRJ DATE: 7-Jul-16

CHECK'D BY: SCN DATE: 24-Apr-17

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **41+06 EP-3** Road Name **US 21**

From Charts - Length (L_a) = **32** ft.

Width 1 (W_1) = 3 * D_o = 15.0 ft.

Width 2 (W_2) = **35** ft.

Pipe Size (D_o) = **60** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 2160.0 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 135.00 Tons, use ===> **135 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 123.09 s.y., use ===> **124 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection CLP-4			3 SHEET
	CALC'D BY: PRJ CHECK'D BY: SCN	DATE: 7-Jul-16 DATE: 24-Apr-17		OF 4

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **66+74 CLP-4** Road Name **US 21**

From Charts - Length (L_a) = **14** ft.

Width 1 (W_1) = 3 * D_o = 9.0 ft.

Width 2 (W_2) = **17** ft.

Pipe Size (D_o) = **36** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 363.1 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 22.69 Tons, use ===> **23 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 32.19 s.y., use ===> **33 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Since we are combining the rip rap for use Type C riprap

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection EP-6 CALC'D BY: PRJ/SCN DATE: 19-Oct-20 CHECK'D BY: SCN DATE: 19-Oct-20	4 SHEET OF 4

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **316+23 EP-6** Road Name **SC 51**

From Charts - Length (L_a) = **16** ft.

Width 1 (W_1) = 3 * D_o = 12.0 ft.

Pipe Size (D_o) = **48** "

Width 2 (W_2) = **24** ft.

Flows for culvert and two incoming 42" RCP's added together

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 777.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 48.60 Tons, use ===> **49 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 52.40 s.y., use ===> **53 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

Hydraulic Analysis Report
Side Road Outfalls Protection

Project Data

Project Title:

Designer:

Project Date: Friday, June 24, 2016

Project Units: U.S. Customary Units

Notes:

Riprap Analysis: CLP-8

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 1.6 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.29 ft

Tailwater Depth: 0 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 0.6 ft

Culvert Diameter Used in Computations: 1.5 ft

Computed D50: 0.430951 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 8.5 ft

No channel used in calculations

Riprap Analysis: EP-9

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 6.3 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.52 ft

Tailwater Depth: 0.53 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.53 ft

Culvert Diameter Used in Computations: 1.01 ft

Computed D50: 5.13993 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 7.03 ft

No channel used in calculations

Riprap Analysis: CLP-11

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 11.3 cfs

Culvert Diameter: 2 ft

Normal Depth in Culvert: 0.53 ft

Tailwater Depth: 0.44 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.506 ft

Culvert Diameter Used in Computations: 1.265 ft

Computed D50: 8.69043 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS II

Riprap Class Order: 2

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 18 in

d85: 13 in

d50: 9.5 in

d15: 7 in

Layout Recommendations

Apron Length: 8 ft

Apron Depth: 2.6125 ft

Apron Width (at end): 9.12833 ft

No channel used in calculations

Riprap Analysis: CLP-12

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 3.6 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.47 ft

Tailwater Depth: 0.48 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.48 ft

Culvert Diameter Used in Computations: 0.985 ft

Computed D50: 2.78263 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 6.955 ft

No channel used in calculations

Riprap Analysis: CLP-13

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 2.1 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.34 ft

Tailwater Depth: 0.47 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.47 ft

Culvert Diameter Used in Computations: 0.92 ft

Computed D50: 1.51712 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 6.76 ft

No channel used in calculations

Riprap Analysis: CLP-14

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 7.6 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.74 ft

Tailwater Depth: 0.76 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.76 ft

Culvert Diameter Used in Computations: 1.12 ft

Computed D50: 4.01041 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 7.36 ft

No channel used in calculations

Riprap Analysis: CLP-15

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 5 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.93 ft

Tailwater Depth: 0.47 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.486 ft

Culvert Diameter Used in Computations: 1.215 ft

Computed D50: 3.21931 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 7.645 ft

No channel used in calculations

Riprap Analysis: CLP-16

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 15 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 1.252 ft

Tailwater Depth: 0.8 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.8 ft

Culvert Diameter Used in Computations: 1.376 ft

Computed D50: 7.16828 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS II

Riprap Class Order: 2

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 18 in

d85: 13 in

d50: 9.5 in

d15: 7 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 2.6125 ft

Apron Width (at end): 8.128 ft

No channel used in calculations

Riprap Analysis: CLP-17

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 3 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.59 ft

Tailwater Depth: 0.52 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.52 ft

Culvert Diameter Used in Computations: 1.045 ft

Computed D50: 1.86156 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 7.135 ft

No channel used in calculations

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening			1
Consulting Engineers	SUBJECT: Outlet Protection CLP-8			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16		OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE: 24-Apr-17		9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **12+86 CLP-8** Road Name **LAKESHORE**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft. Pipe Size (D_o) = **18** "

Width 2 (W_2) = **9** ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 161.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 10.10 Tons, use ===> **11 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 17.31 s.y., use ===> **18 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening		2
Consulting Engineers	SUBJECT: Outlet Protection EP-9		SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE: 24-Apr-17	9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **11+88 EP-9** Road Name **TERRYS**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **8** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			3
Consulting Engineers	SUBJECT:	Outlet Protection CLP-11			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	24-Apr-17	9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **24+20 CLP-11** Road Name **GOLDHILL**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Pipe Size (D_o) = **24** "

Width 2 (W_2) = **10** ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 216.0 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 13.50 Tons, use ===> **14 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 19.69 s.y., use ===> **20 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening			4
Consulting Engineers	SUBJECT: Outlet Protection CLP-12			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE:	24-Apr-17	9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **14+21 CLP-12** Road Name **BAXTER**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft. Pipe Size (D_o) = **18** "

Width 2 (W_2) = **8** ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			5
Consulting Engineers	SUBJECT:	Outlet Protection CLP-13			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	24-Apr-17	9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **1+88 CLP-13** Road Name **ANDREW**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **8** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **17+23** Road Name **OLD NATION ROAD**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **8** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730

JOB: US 21/ SC 51 Phase I Widening
SUBJECT: Outlet Protection CLP-15
CALC'D BY: PRJ DATE: 7-Jul-16
CHECK'D BY: SCN DATE: 24-Apr-17

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **14+18 CLP-15** Road Name **GOLDHILL**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **8** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			8
Consulting Engineers	SUBJECT:	Outlet Protection CLP-16			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	27-Apr-17	9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **13+28 CLP-16** Road Name **OLD NATION ROAD**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Pipe Size (D_o) = **24** "

Width 2 (W_2) = **8** ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 139.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 8.73 Tons, use ===> **9 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 15.31 s.y., use ===> **16 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening			9
Consulting Engineers	SUBJECT: Outlet Protection CLP-17			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE:	27-Apr-17	9

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **23+39 CLP-17** Road Name **EXISTING SPRINGHILL**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Pipe Size (D_o) = **18** "

Width 2 (W_2) = **8** ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

Hydraulic Analysis Report
System Outfalls Protection

Project Data

Project Title:

Designer:

Project Date: Monday, June 06, 2016

Project Units: U.S. Customary Units

Notes:

Riprap Analysis: outlet 1

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 18.448 cfs

Culvert Diameter: 2.5 ft

Normal Depth in Culvert: 0.62 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 1.56 ft

Computed D50: 6.39206 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 10 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 11.3467 ft

No channel used in calculations

Riprap Analysis: outlet 2

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 10.677 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 1.5 ft

Tailwater Depth: 0.6 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.6 ft

Culvert Diameter Used in Computations: 1.5 ft

Computed D50: 5.4142 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 8.5 ft

No channel used in calculations

Riprap Analysis: outlet 3

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 18.824 cfs

Culvert Diameter: 2.5 ft

Normal Depth in Culvert: 0.7 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 1.6 ft

Computed D50: 6.34839 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 10 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 11.4667 ft

No channel used in calculations

Riprap Analysis: outlet 4

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 10.198 cfs

Culvert Diameter: 2 ft

Normal Depth in Culvert: 0.92 ft

Tailwater Depth: 0.8 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.8 ft

Culvert Diameter Used in Computations: 1.46 ft

Computed D50: 3.95975 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 8 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 9.71333 ft

No channel used in calculations

Riprap Analysis: outlet 5

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 10.443 cfs

Culvert Diameter: 2 ft

Normal Depth in Culvert: 0.67 ft

Tailwater Depth: 0.8 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.8 ft

Culvert Diameter Used in Computations: 1.335 ft

Computed D50: 4.60514 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 8 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 9.33833 ft

No channel used in calculations

Riprap Analysis: outfall-EXOP-532

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 3.671 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.45 ft

Tailwater Depth: 0.6 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.6 ft

Culvert Diameter Used in Computations: 0.975 ft

Computed D50: 2.31613 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 6.925 ft

No channel used in calculations

Riprap Analysis: outlet 7

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 33.4 cfs

Culvert Diameter: 3 ft

Normal Depth in Culvert: 1.447 ft

Tailwater Depth: 1.2 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1.2 ft

Culvert Diameter Used in Computations: 2.2235 ft

Computed D50: 7.32778 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS II

Riprap Class Order: 2

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 18 in

d85: 13 in

d50: 9.5 in

d15: 7 in

Layout Recommendations

Apron Length: 12 ft

Apron Depth: 2.6125 ft

Apron Width (at end): 14.6705 ft

No channel used in calculations

Riprap Analysis: outlet 9

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 45.864 cfs

Culvert Diameter: 3.5 ft

Normal Depth in Culvert: 0.89 ft

Tailwater Depth: 1.4 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1.4 ft

Culvert Diameter Used in Computations: 2.195 ft

Computed D50: 9.75281 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS III

Riprap Class Order: 3

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 24 in

d85: 17 in

d50: 12.5 in

d15: 9 in

Layout Recommendations

Apron Length: 14 ft

Apron Depth: 3.4375 ft

Apron Width (at end): 15.9183 ft

No channel used in calculations

Riprap Analysis: outlet 10

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 32.9 cfs

Culvert Diameter: 3.5 ft

Normal Depth in Culvert: 0.92 ft

Tailwater Depth: 1.4 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1.4 ft

Culvert Diameter Used in Computations: 2.21 ft

Computed D50: 6.20609 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 14 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 15.9633 ft

No channel used in calculations

Riprap Analysis: outlet 4a

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 12.967 cfs

Culvert Diameter: 2 ft

Normal Depth in Culvert: 0.85 ft

Tailwater Depth: 0.8 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.8 ft

Culvert Diameter Used in Computations: 1.425 ft

Computed D50: 5.63401 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 8 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 9.60833 ft

No channel used in calculations

Riprap Analysis: outlet 4b

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 32.096 cfs

Culvert Diameter: 2.5 ft

Normal Depth in Culvert: 0.862 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 1.681 ft

Computed D50: 12.1074 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS III

Riprap Class Order: 3

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 24 in

d85: 17 in

d50: 12.5 in

d15: 9 in

Layout Recommendations

Apron Length: 12.5 ft

Apron Depth: 2.5 ft

Apron Width (at end): 13.3763 ft

No channel used in calculations

Riprap Analysis: outlet 12

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 4.133 cfs

Culvert Diameter: 2.5 ft

Normal Depth in Culvert: 0.33 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 1.415 ft

Computed D50: 0.990573 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 10 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 10.9117 ft

No channel used in calculations

Riprap Analysis: outlet 14

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 15.528 cfs

Culvert Diameter: 2.5 ft

Normal Depth in Culvert: 1.25 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 1.875 ft

Computed D50: 3.97521 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 10 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 12.2917 ft

No channel used in calculations

Riprap Analysis: outfall 13

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 9.351 cfs

Culvert Diameter: 2.5 ft

Normal Depth in Culvert: 0.56 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 1.53 ft

Computed D50: 2.65112 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 10 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 11.2567 ft

No channel used in calculations

Riprap Analysis: outlet 4c

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 10.476 cfs

Culvert Diameter: 2 ft

Normal Depth in Culvert: 2 ft

Tailwater Depth: 0.8 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.8 ft

Culvert Diameter Used in Computations: 2 ft

Computed D50: 2.69777 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 8 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 11.3333 ft

No channel used in calculations

Riprap Analysis: outlet 15

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 7.4 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.78 ft

Tailwater Depth: 0.6 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 0.6 ft

Culvert Diameter Used in Computations: 1.5 ft

Computed D50: 3.32081 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 8.5 ft

No channel used in calculations

Riprap Analysis: outlet 20

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 0.769 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.26 ft

Tailwater Depth: 1 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 1 ft

Culvert Diameter Used in Computations: 0.88 ft

Computed D50: 0.198213 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 6.64 ft

No channel used in calculations

Riprap Analysis: outlet 16

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 1.211 cfs

Culvert Diameter: 1.5 ft

Normal Depth in Culvert: 0.32 ft

Tailwater Depth: 0.6 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.6 ft

Culvert Diameter Used in Computations: 0.91 ft

Computed D50: 0.578798 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 6 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 6.73 ft

No channel used in calculations

Riprap Analysis: outlet OP-39

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 40 cfs

Culvert Diameter: 3 ft

Normal Depth in Culvert: 1.7 ft

Tailwater Depth: 2.1 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 2.1 ft

Culvert Diameter Used in Computations: 3 ft

Computed D50: 3.57196 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 12 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 17 ft

No channel used in calculations

Riprap Analysis: outlet OP-41

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 7.268 cfs

Culvert Diameter: 2 ft

Normal Depth in Culvert: 0.47 ft

Tailwater Depth: 0.8 ft

If tailwater is unknown, use 0.4D

flow is supercritical

Result Parameters

Tailwater Depth Used in Computations: 0.8 ft

Culvert Diameter Used in Computations: 1.235 ft

Computed D50: 3.151 in

Riprap Class

Riprap shape should be angular

Riprap Class Name: CLASS I

Riprap Class Order: 1

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

Layout Recommendations

Apron Length: 8 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 9.03833 ft

No channel used in calculations

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection Outfall-1 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: SCN DATE: 24-Apr-17	1 SHEET OF 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **41+29** Road Name **US 21 (RT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 7.5 ft.

Width 2 (W_2) = **12** ft.

Pipe Size (D_o) = **30** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 233.4 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 14.59 Tons, use ===> **15 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 22.64 s.y., use ===> **23 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection Outfall-2 CALC'D BY: PRJ DATE: 12-Feb-18 CHECK'D BY: SCN DATE: 13-Feb-18	2 SHEET OF 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **42+75** Road Name **US 21 (RT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **9** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 161.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 10.10 Tons, use ===> **11 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 17.31 s.y., use ===> **18 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			3
Consulting Engineers	SUBJECT:	Outlet Protection Outfall-3			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	24-Apr-17	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **40+82** Road Name **US 21 (LT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 7.5 ft.

Width 2 (W_2) = **15** ft.

Pipe Size (D_o) = **30** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 269.3 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 16.83 Tons, use ===> **17 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 25.31 s.y., use ===> **26 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection Outfall-4 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: SCN DATE: 24-Apr-17	4 SHEET OF 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **66+75** Road Name **US 21 (LT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Width 2 (W_2) = **10** ft.

Pipe Size (D_o) = **24** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 191.5 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 11.97 Tons, use ===> **12 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 19.53 s.y., use ===> **20 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening	5
Consulting Engineers	SUBJECT:	Outlet Protection Outfall-4a	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE: 27-Apr-17	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **67+99** Road Name **US 21 (LT)**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Width 2 (W_2) = **10** ft.

Pipe Size (D_o) = **24** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 159.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 9.98 Tons, use ===> **10 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 16.87 s.y., use ===> **17 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening			6
Consulting Engineers	SUBJECT: Outlet Protection Outfall-4b			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE:	24-Apr-17	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **73+45** Road Name **US 21 (LT)**

From Charts - Length (L_a) = **15** ft.

Width 1 (W_1) = 3 * D_o = 7.5 ft.

Width 2 (W_2) = **14** ft.

Pipe Size (D_o) = **30** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 435.4 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 27.21 Tons, use ===> **28 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 33.37 s.y., use ===> **34 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection Outfall-5 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: SCN DATE: 24-Apr-17	7 SHEET OF 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **101+29** Road Name **US 21 (RT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Width 2 (W_2) = **10** ft.

Pipe Size (D_o) = **24** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 191.5 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 11.97 Tons, use ===> **12 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 19.53 s.y., use ===> **20 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			8
Consulting Engineers	SUBJECT:	Outlet Protection Outfall-7			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	24-Apr-17	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. 123+79   Road Name US 21 (LT)

From Charts - Length (L_a) = 12 ft.

Width 1 (W_1) = 3 * D_o = 9.0 ft.   Pipe Size (D_o) = 36 "

Width 2 (W_2) = 14 ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class C (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 372.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 23.29 Tons, use ===> 24 TONS

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 29.43 s.y., use ===> 30 SY

SCDOT Geotextile Type C (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class 2 (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening	9
Consulting Engineers	SUBJECT: Outlet Protection Outfall-9	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN DATE: 24-Apr-17	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **316+19**   Road Name **SC 51 (RT)**

From Charts - Length (L_a) = **20** ft.

Width 1 (W_1) = 3 * D_o = 10.5 ft.   Pipe Size (D_o) = **42** "

Width 2 (W_2) = **20** ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 823.5 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 51.47 Tons, use ===> **52 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 55.04 s.y., use ===> **56 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening		10
Consulting Engineers	SUBJECT: Outlet Protection Outfall-10		SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC, 29730	CHECK'D BY: SCN	DATE: 24-Apr-17	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **316+30** Road Name **SC 51 (RT)**

From Charts - Length (L_a) = **16** ft.

Width 1 (W_1) = 3 * D_o = 10.5 ft.

Width 2 (W_2) = **18** ft.

Pipe Size (D_o) = **42** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 615.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 38.48 Tons, use ===> **39 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 43.48 s.y., use ===> **44 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening — 11 SHEET SUBJECT: Outlet Protection Outfall-12 CALC'D BY: PRJ DATE: 7-Jul-16 — OF CHECK'D BY: SCN DATE: 27-Apr-17 — 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. 34+10 Road Name US 21 (RT)

From Charts - Length (L_a) = 15 ft.

Width 1 (W_1) = 3 * D_o = 7.5 ft. Pipe Size (D_o) = 30 "

Width 2 (W_2) = 18 ft.

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class B (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 381.5 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 23.85 Tons, use ===> 24 TONS

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 33.55 s.y., use ===> 34 SY

SCDOT Geotextile Type C (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class 2 (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening				12
Consulting Engineers	SUBJECT:	Outlet Protection Outfall-14				SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16		OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	27-Apr-17		20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **12+44** Road Name **FLINT HILL ROAD (RT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 7.5 ft.

Width 2 (W_2) = **15** ft.

Pipe Size (D_o) = **30** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 269.3 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 16.83 Tons, use ===> **17 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 25.31 s.y., use ===> **26 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			13
Consulting Engineers	SUBJECT:	Outlet Protection Outfall-13			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Sep-19	OF
Rock Hill, SC, 29730	CHECK'D BY:	SCN	DATE:	10-Sep-19	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **21+92** Road Name **US 21B (RT)**

From Charts - Length (L_a) = **12** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Width 2 (W_2) = **15** ft.

Pipe Size (D_o) = **24** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 251.4 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 15.71 Tons, use ===> **16 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 23.98 s.y., use ===> **24 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB:	US 21/ SC 51 Phase I Widening			14
Consulting Engineers	SUBJECT:	Outlet Protection Outfall-4c			SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY:	SCN	DATE:	25-Mar-21	OF
Rock Hill, SC, 29730	CHECK'D BY:	GPP	DATE:	25-Mar-21	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **17+00** Road Name **US 21B (LT)**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Width 2 (W_2) = **12** ft.

Pipe Size (D_o) = **24** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 179.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 11.22 Tons, use ===> **12 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 18.42 s.y., use ===> **19 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730

SUBJECT: Outlet Protection Outfall-15

CALC'D BY: PRJ DATE: 7-Sep-19
CHECK'D BY: SCN DATE: 10-Sep-19

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **21+48** Road Name **FLINT HILL ROAD (LT)**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **10** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 144.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 9.04 Tons, use ===> **10 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 15.70 s.y., use ===> **16 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection Outfall-17 CALC'D BY: PRJ DATE: 7-Sep-19 CHECK'D BY: SCN DATE: 10-Sep-19	16 SHEET OF 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **18+67** Road Name **OLDNACL (RT)**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **8** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated Consulting Engineers 454 S Anderson Rd, Suite 3, BTC 517 Rock Hill, SC, 29730	JOB: US 21/ SC 51 Phase I Widening SUBJECT: Outlet Protection Outfall-16 CALC'D BY: PRJ DATE: 7-Sep-19 CHECK'D BY: SCN DATE: 10-Sep-19	17 SHEET OF 20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **18+61** Road Name **GOLDHILL REALIGNMENT (RT)**

From Charts - Length (L_a) = **10** ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = **8** ft.

Pipe Size (D_o) = **18** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **B** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> **8 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> **15 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV Incorporated
Consulting Engineers
454 S Anderson Rd, Suite 3, BTC 517
Rock Hill, SC, 29730

JOB: US 21/ SC 51 Phase I Widening
SUBJECT: Outlet Protection Outfall-17
CALC'D BY: SCN DATE: 6-Apr-21
CHECK'D BY: GPP DATE:

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. 17+21 Road Name OLDNACL (RT)

From Charts - Length (L_a) = 10 ft.

Width 1 (W_1) = 3 * D_o = 4.5 ft.

Width 2 (W_2) = 8 ft.

Pipe Size (D_o) = 18 "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class B (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 124.7 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 7.79 Tons, use ===> 8 TONS

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 14.15 s.y., use ===> 15 SY

SCDOT Geotextile Type C (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class 2 (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening	19
Consulting Engineers	SUBJECT: Outlet Protection Outfall OP-39	SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: SCN DATE: 6-Apr-21	OF
Rock Hill, SC, 29730	CHECK'D BY: GPP DATE:	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **22+00** Road Name **US 21 (LT)**

From Charts - Length (L_a) = **48** ft.

Width 1 (W_1) = 3 * D_o = 9.0 ft.

Width 2 (W_2) = **17** ft.

Pipe Size (D_o) = **36** "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class **C** (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 1.30 ft. d_{max} = 1.80 ft.

Thickness (T) = 1.5 * d_{max} = 2.70 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 1684.8 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 105.30 Tons, use ===> **106 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 105.93 s.y., use ===> **106 SY**

SCDOT Geotextile Type **C** (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class **2** (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

STV

STV Incorporated	JOB: US 21/ SC 51 Phase I Widening		20
Consulting Engineers	SUBJECT: Outlet Protection Outfall OP-41		SHEET
454 S Anderson Rd, Suite 3, BTC 517	CALC'D BY: SCN	DATE: 6-Apr-21	OF
Rock Hill, SC, 29730	CHECK'D BY: GPP	DATE:	20

DETERMINE RIP RAP APRON QUANTITY

GIVEN:

Outlet Protection for Pipe @ Sta. **33+65** Road Name **US 21 (LT)**

From Charts - Length (L_a) = 10 ft.

Width 1 (W_1) = 3 * D_o = 6.0 ft.

Width 2 (W_2) = 10 ft.

Pipe Size (D_o) = 24 "

SOLUTION:

From Riprap Apron Design Charts Determine d_{50} Riprap Size

SCDOT Riprap Class B (Round up to match SCDOT riprap class - see Table #1 below)

d_{50} = 0.75 ft. d_{max} = 1.33 ft.

Thickness (T) = 1.5 * d_{max} = 2.00 ft.

Volume of Riprap = L_a * 0.5(W_1 + W_2) * T = 159.6 c.f.

Weight of Riprap = Vol. * (125 lbs./c.f.) / (2000 lbs./ton) = 9.98 Tons, use ===> **10 TONS**

DETERMINE GEOTEXTILE QUANTITY, TYPE, AND CLASS

SOLUTION:

Quantity of Geotextile

[L_a * 0.5(W_1 + W_2) + T(2L_a + W_1 + W_2)] / (9 s.f./s.y.) = 16.87 s.y., use ===> **17 SY**

SCDOT Geotextile Type C (see "Map of Recommended Geotextiles for Erosion Control")

SCDOT Geotextile Class 2 (In most cases will be Class 2; see SCDOT 2007 Specs., p.829)

Riprap Class	d_{50} Rock Size (ft.)	d_{max} (ft.)
A	0.50	0.75
B	0.75	1.33
C	1.30	1.80
D	1.80	2.25
E	2.25	2.85
F	2.85	3.60

TABLE #1: Riprap Class (From SCDOT 2007 Specs., P.825-826)

Appendix G

Closed Drainage System Calculations

Region 3 US 21 use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comment
SYSTEM-1								
HIGH POINT								
CB-103	36+63.16	17	2.08	1.23	0.06	2614	12600	
CB-200a	38+80.00	17	2.08	1.23	0.21	9148	12600	
CB-200	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-201	41+20.00	17	2.08	0.99	0.15	6534	11600	
SYSTEM-2								
HIGH POINT								
CB-236	61+30.53	17	2.78	0.99	0.22	9583	17000	
CB-210	60+00.00	17	2.78	1.95	0.17	7405	21500	
CB-215	57+82.29	17	2.08	2.83	0.24	10454	16600	
CB-208	56+40.00	17	2.08	2.83	0.14	6098	16600	
CB-206	53+00.00	17	2.08	2.83	0.33	14375	16600	
CB-204a	48+23.84	17	2.08	2.83	0.17	7405	16600	
CB-204	49+90.97	17	2.08	2.83	0.30	13068	16600	
CB-216	46+42.36	17	2.08	2.83	0.19	8276	16600	
CB-202	45+00.00	17	2.08	2.83	0.14	6098	16600	
CB-212	42+58.15	17	2.08	2.30	0.24	10454	15800	
SYSTEM-3								
HIGH POINT								
CB-242a	62+11.09	17	2.08	0.83	0.14	6098	10700	
CB-211a	61+52.44	17	2.08	0.83	0.17	7405	10700	
CB-211b	60+79.19	17	2.08	1.37	0.23	10019	13000	
CB-211	60+00.07	17	2.08	1.95	0.24	10454	15100	
CB-209	57+68.00	17	2.08	2.83	0.21	9148	16600	
CB-207a	54+60.75	17	2.08	2.83	0.31	13504	16600	
CB-207b	53+56.08	17	2.08	2.83	0.35	15246	16600	
CB-207	53+00.00	17	2.08	2.83	0.31	13504	16600	
CB-207c	52+43.61	17	2.08	2.83	0.38	16553	16600	
CB-207d	51+74.81	17	2.08	2.83	0.37	16117	16600	
CB-205a	51+00.00	17	2.08	2.83	0.38	16553	16600	
CB-205b	50+36.05	17	2.08	2.83	0.37	16117	16600	
CB-205c	49+68.70	17	2.08	2.83	0.37	16117	16600	
CB-205	49+00.00	17	2.08	2.83	0.37	16117	16600	
CB-241a	48+23.94	17	2.08	2.83	0.37	16117	16600	
CB-241b	47+55.73	17	2.08	2.83	0.31	13504	16600	
CB-241	46+98.66	17	2.08	2.83	0.28	12197	16600	
CB-203a	46+20.99	17	2.08	2.83	0.35	15246	16600	
CB-203b	45+59.72	17	2.08	2.83	0.27	11761	16600	
CB-203	45+00.00	17	2.08	2.83	0.24	10454	16600	
CB-213	43+66.03	17	2.08	2.83	0.14	6098	16600	
CB-214b	41+80.48	17	2.08	1.56	0.23	10019	13800	
CB-214a	40+94.84	17	2.08	0.76	0.09	3877	10150	
HIGH POINT								
CB-016	3590.89	17	2.08	1.22	0.25	10890	12450	
CB-017	3788.88	17	2.08	1.22	0.21	9147.6	12450	
CB-018	3950.28	17	2.08	0.612	0.17	7405.2	9100	
CB-019	Analysed as Weir no spread for Type 18 structure							LOW POINT

Region 3 US 21 use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comment
SYSTEM-4								
HIGH POINT								
CB-501	64+34.17	17	2.78	1.24	0.23	10019	18800	
CB-501a	65+43.56	17	2.78	1.29	0.24	10454	18950	
CB-502	66+60.31	17	2.78	1.10	0.10	4543	12000	
CB-502b	67+38.91	17	2.08	0.65	0.15	6347	9400	
CB-502a	68+07.79	17	2.08	0.27	0.08	3485	6000	
CB-503	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-506	78+44.69	17	2.08	0.96	0.18	7841	11300	
CB-506a	77+67.03	17	2.08	1.76	0.33	14375	14400	
CB-506b	77+41.16	17	2.08	1.76	0.33	14375	14400	
CB-506c	76+83.36	17	2.08	1.76	0.33	13496	14400	
CB-516	76+18.94	17	2.08	1.76	0.32	14268	14400	
CB-505	73+50.05	17	2.08	1.76	0.23	10019	14400	
CB-519	73+46.91	1	2.08	1.76	0.02	871	14400	
CB-504	70+95.56	17	2.08	1.76	0.31	13504	14400	
CB-504a	69+81.72	17	2.08	0.69	0.15	6534	9600	
HIGH POINT								
CB-600a	80+39.01	17	2.08	1.22	0.26	11326	11800	
CB-600b	80+85.61	17	2.08	1.22	0.26	11326	11800	
CB-600c	81+54.29	17	2.08	1.22	0.26	11326	11800	
CB-600	81+86.06	17	2.08	1.22	0.26	11326	11800	
CB-601a	83+53.82	17	2.78	1.22	0.25	10890	18400	
CB-601	84+00.00	17	2.78	1.22	0.11	4792	18400	
CB-602	85+40.95	17	2.78	1.22	0.25	10890	18400	
CB-602b	86+17.84	17	2.78	1.22	0.24	10454		CB-1 for driveway
CB-602a	87+11.67	17	2.78	1.22	0.27	11761	18400	
CB-603	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-700	96+56.84	17	2.08	2.18	0.13	5663	15400	
CB-606	94+26.36	17	2.08	2.18	0.33	14375	15400	
CB-605	92+23.33	17	2.08	2.18	0.27	11761	15400	
CB-604	90+63.18	17	2.08	2.18	0.35	15351	15400	
CB-604b	89+04.61	17	2.08	1.94	0.32	13743	15200	
CB-604a	88+26.64	17	2.08	0.99	0.10	4356	11600	
HIGH POINT								
CB-507	65+33.59	17	2.08	1.29	0.18	7841	12600	
CB-508	67+82.31	17	2.08	1.29	0.21	9148	12600	
CB-517	66+66.09	1	2.08	1.06	0.09	3920	11800	
CB-518	Analysed as Weir no spread for Type 1 structure							LOW POINT
CB-509	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-515	78+35.29	17	2.08	1.01	0.19	8276	11600	
CB-514	77+22.99	17	2.08	1.69	0.10	4356	14200	
CB-513	75+87.00	17	2.08	1.76	0.14	6098	14400	
CB-512	74+52.95	17	2.08	1.76	0.13	5663	14400	
CB-512a	73+48.38	17	2.08	1.76	0.10	4356	14400	
CB-511	71+80.59	17	2.08	1.76	0.18	7841	14400	
CB-510	69+11.94	17	2.08	1.76	0.25	10890	14400	

Region 3 US 21 use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comment
HIGH POINT								
CB-607	81+86.94	17	2.08	1.08	0.23	10019	11700	
CB-608	84+03.98	17	2.08	1.22	0.24	10454	12500	
CB-609	85+43.35	17	2.08	1.22	0.13	5663	12500	
CB-609a	87+04.94	17	2.78	0.49	0.19	8276	12100	
CB-610	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-706	96+60.71	17	2.08	2.18	0.18	7841	15400	
CB-614	94+25.20	17	2.08	2.18	0.22	9583	15400	
CB-613	92+92.33	17	2.08	2.18	0.12	5227	15400	
CB-618	92+88.49	1	2.08	2.18	0.07	3049	14600	
CB-617	90+90.46	1	2.08	2.18	0.06	2614	14600	
CB-612	91+77.48	17	2.08	2.18	0.10	4356	15400	
CB-611	88+86.76	17	2.78	1.72	0.34	14810	20800	
CB-611a	87+96.05	17	2.78	0.62	0.12	5227	13500	
SYSTEM-5								
HIGH POINT								
CB-701a	98+95.10	17	2.08	0.25	0.10	4356	5800	
CB-702A	99+43.78	1	2.08	0.25	0.04	1742	5750	
CB-701	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-703	103+64.98	17	2.08	1.37	0.14	6098	13000	
CB-702	101+74.45	17	2.08	0.72	0.19	8276	9800	
CB-701b	100+19.63	17	2.08	0.72	0.15	6534	9800	
HIGH POINT								
CB-707a	99+23.94	17	2.08	0.15	0.11	4792	5400	
CB-707	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-710a	105+41.74	17	2.08	1.06	0.15	6534	11800	
CB-709	103+64.98	17	2.08	1.37	0.17	7405	13000	
CB-708	101+74.44	17	2.08	0.72	0.19	8276	9800	
CB-707b	100+19.74	17	2.08	0.72	0.15	6534	9800	
SYSTEM-6								
HIGH POINT								
CB-705	107+00.00	17	2.08	1.13	0.24	10454	11900	
CB-704	105+15.00	17	2.08	1.13	0.19	8276	11900	
CB-704A	105+14.82	1	2.08	1.13	0.03	1307	13500	
HIGH POINT								
CB-710	107+01.38	17	2.08	1.06	0.22	9583	11800	
HIGH POINT								
CB-800	110+06.87	17	2.08	0.28	0.13	5663	9200	
CB-801	112+02.34	17	2.08	0.84	0.22	9583	10800	
CB-802	114+60.32	17	2.08	1.36	0.25	10890	12900	
CB-803	116+62.72	17	2.08	1.36	0.20	8712	12900	
CB-804	118+90.51	17	2.08	1.36	0.23	10019	12900	
CB-805	121+90.86	17	2.08	1.36	0.29	12632	12900	
CB-806	124+15.74	17	2.08	1.36	0.22	9583	12900	
CB-806A	125+11.07	17	2.08	1.36	0.09	3920	12900	
CB-900	126+68.43	17	2.08	1.36	0.16	6970	12900	
CB-901	129+10.41	17	2.08	1.21	0.26	11326	12400	
CB-902	131+10.22	17	2.08	1.21	0.22	9583	12400	
CB-903	134+07.56	17	3.73	1.21	0.43	18731	26635	

Region 3 US 21 use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comment
HIGH POINT								
CB-801b	110+68.52	1	2.08	0.45	0.02	784	7700	
CB-807	110+64.12	17	2.08	0.44	0.14	6098	7600	
CB801a	112+61.39	1	2.08	1.00	0.01	566	11600	
CB-808	113+55.50	17	2.08	1.28	0.25	10890	12500	
CB-809	115+55.41	17	2.08	1.36	0.21	9148	12900	
CB-816	116+57.13	17	2.08	1.36	0.10	4356	12900	
CB-810	117+90.10	17	2.08	1.36	0.13	5663	12900	
CB-811	119+76.21	17	2.08	1.36	0.18	7841	12900	
CB-812	121+91.10	17	2.08	1.36	0.21	9148	12900	
CB-813	123+92.67	17	2.08	1.36	0.20	8712	12900	
CB-904	125+41.49	17	2.78	1.36	0.18	7841	12900	
CB-905a	127+04.57	17	2.78	1.36	0.24	10454	12900	
CB-905	128+12.11	17	2.78	1.31	0.29	12632	18800	
CB-906a	130+02.51	17	2.78	1.21	0.28	12197	18000	
CB-906	130+79.23	17	1.30	1.21	0.10	4356	5400	
CB-907	Structure is on the super							Super
HIGH POINT								
CB-908	130+80.44	1	1.28	1.21	0.05	2178	5400	
CB-909	132+82.58	1	2.59	1.21	0.19	8276	12400	
CB-910	134+08.82	1	3.73	1.21	0.12	5227	17250	
SYSTEM-12								
HIGH POINT								
CB-036	16+57.52	1	2.08	1.13	0.01	536	10900	
CB-041	15+59.81	1	2.08	0.81	0.01	222	10400	
CB-020	15+57.34	17	2.08	0.80	0.06	2614	10200	
CB-021	16+38.76	17	2.08	1.07	0.07	3093	11600	
CB-024	17+52.20	17	2.08	1.28	0.25	11814	12500	
CB-025	18+36.29	17	2.08	1.25	0.24	10454	12700	
CB-026	21+80.00	17	2.08	1.16	0.18	7671	12100	
CB-028	20+26.34	17	2.08	1.16	0.20	8712	12100	
CB-027	21+80.00	17	2.08	1.16	0.17	7475	12100	
CB-030	22+44.17	17	2.08	1.16	0.13	5772	12100	
CB-032	24+32.75	17	2.08	1.16	0.25	10890	12100	
CB-033	26+41.38	17	2.08	1.16	0.27	11761	12100	
CB-034	27+39.01	17	2.08	1.16	0.14	6098	12100	
CB-035	10+74.44	17	1.32	3.95	0.07	3049	17700	
CB-113a	10+76.57	17	2.08	4.02	0.10	4356	17800	
CB-113b	28+68.31	17	2.08	1.23	0.14	6098	12600	
CB-113	29+44.43	17	2.08	1.23	0.13	5663	12600	
CB-108	30+25.05	17	2.08	1.23	0.11	4792	12600	
CB-109	31+65.69	17	2.08	1.23	0.24	10454	12600	
CB-110	33+12.03	17	2.08	1.23	0.15	6534	12600	
CB-110a	34+07.30	17	2.08	1.23	0.10	4487	12600	
CB-111	35+31.25	17	2.08	1.23	0.13	5663	12600	
CB-105	29+73.25	1	2.08	1.23	0.02	697	12400	
CB-106	31+68.11	1	2.08	1.23	0.02	784	12400	
SYSTEM-17								
HIGH POINT								
CB-005	24+65.36	17	2.08	1.16	0.24	10454	12100	
CB-006	27+28.70	17	2.08	1.16	0.25	10890	12100	
CB-037	27+34.46	1	2.08	1.16	0.03	1220	11000	
CB-010	28+55.79	17	2.08	1.22	0.18	7841	12450	
CB-012	29+66.01	17	2.08	1.22	0.11	4792	12450	
CB-013	31+55.14	17	2.08	1.22	0.19	8276	12450	
CB-015	33+62.35	17	2.08	1.22	0.22	9583	12450	

Region 3 US 21 use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comment
SYSTEM-18								
HIGH POINT								
CB-001	15+74.17	17	2.08	0.86	0.17	7405	10800	
CB-002	18+27.13	17	2.08	1.26	0.26	11326	12400	
CB-003	20+24.53	17	2.08	1.16	0.21	9148	12100	
CB-004	22+42.02	17	2.08	1.16	0.12	5258	12100	

Region 3 US 21 BUSINESS use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comments
SYSTEM-13								
HIGH POINT								
CB-235	11+05.26	17	1.87	2.07	0.11	4792	15400	
CB-234	12+82.12	17	1.15	0.92	0.18	7841	11200	
HIGH POINT								
CB-230	11+33.55	17	2.08	2.07	0.18	7841	15400	
CB-229	12+81.99	17	2.08	0.92	0.21	9148	11200	
CB-229a	13+49.63	17	2.08	0.46	0.09	3920	7800	
CB-232	13+94.67	17	2.08	0.46	0.16	6970	7800	
CB-228	14+50.31	17	2.09	0.46	0.12	5227	7800	
CB-227a	15+87.77	17	3.68	0.46	0.30	13068	20500	
CB-227	17+00.87	17	3.68	0.46	0.20	8712	20500	
CB-244	18+29.94	17	3.68	0.46	0.46	20038	20500	
CB-226	19+51.28	17	3.68	0.46	0.17	7405	20500	
CB-246	20+27.32	17	2.08	0.63	0.09	3920	9200	

Region 3 REGENT PARKWAY use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comments
SYSTEM-12								
HIGH POINT								
CB-620	13+80.45	17	3.15	1.80	0.39	16988	21200	
CB-622	Structure is on the super							Super

Region 3 FLINT HILL use Cross drain 2.08%

Structure No.	STA	Structure Type	Cross Slope (%)	Road Grade (%)	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart (SF)	Comments
SYSTEM-14								
HIGH POINT								
CB-1405	13+20.52	17	2.08	1.41	0.05	2178	13400	
CB-1403	Analysed as Weir no spread for Type 1 structure							LOW POINT
CB-1404	Analysed as Weir no spread for Type 1 structure							LOW POINT

Region 3 SC 51

Structure No.	STA	Structure Type	Cross Slope	Road Grade	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart	Comments
SYSTEM-9								
HIGH POINT								
CB-911a	297+08.12	17	2.78	0.44	0.26	11326	11400	
CB-911	297+74.63	17	2.78	0.44	0.26	11326	11400	
CB-1001b	298+42.91	17	2.78	0.44	0.25	10890	11400	
CB-1001a	299+27.96	17	3.08	0.44	0.26	11326	11400	
CB-1001	299+85.62	17	3.85	0.44	0.44	19166	20000	
CB-1002	301+71.67	17	3.85	1.51	0.69	30056	34000	
CB-1003a	302+96.06	17	3.06	2.71	0.60	26136	53000	
CB-1003	303+72.96	17	2.78	3.33	0.37	16117	24000	
CB-1004a	304+20.09	17	2.78	3.33	0.36	15682	24000	
CB-1004b	304+55.31	17	2.78	3.33	0.39	16988	24000	
CB-1004c	304+97.43	17	2.78	3.33	0.35	15246	24000	
CB-1004d	305+23.79	17	2.78	3.33	0.33	14375	24000	
CB-1004	305+50.79	17	2.78	3.33	0.39	16988	17200	
CB-1005	307+76.52	17	2.08	3.33	0.39	16988	17200	
CB-1006	309+58.17	17	2.08	3.33	0.19	8276	17200	
CB-1007	310+98.52	17	2.08	3.33	0.14	6098	17200	
CB-1007a	311+92.95	17	2.08	3.33	0.23	10019	17200	
CB-1008	313+10.11	17	2.08	3.33	0.37	16117	17200	
CB-1101	314+87.71	17	2.08	1.93	0.28	12197	15100	
CB-1102	315+93.54	17	2.08	0.67	0.10	4356	9600	
HIGH POINT								
CB-1017	306+02.33	17	1.82	3.33	0.11	4792	17200	
CB-1018	308+61.04	17	2.08	3.33	0.27	11761	17200	
CB-1019	310+23.24	17	2.08	3.33	0.16	6970	17200	
CB-1020	311+76.22	17	2.08	3.33	0.16	6970	17200	
CB-1103	314+09.29	17	2.08	2.86	0.24	10454	16600	
CB-1104	315+93.54	17	2.08	0.67	0.19	8276	9600	
SYSTEM-10								
HIGH POINT								
CB-1111	326+65.26	17	2.08	0.72	0.18	7841	9800	
CB-1110	324+97.51	17	2.08	1.50	0.22	9583	13800	
CB-1109a	323+75.00	17	2.08	1.96	0.31	13678	15200	
CB-1109	322+82.00	17	2.08	2.50	0.37	16117	16200	
CB-1108	321+10.79	17	2.08	2.50	0.20	8712	16200	
CB-1107	319+59.80	17	2.08	2.50	0.32	13839	16200	
CB-1106a	317+91.34	17	2.08	1.68	0.21	9148	14400	
CB-1106	316+85.81	17	2.08	0.43	0.08	3485	7500	
CB-1105	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-1200b	328+73.25	17	2.00	0.26	0.06	2614	5400	
CB-1200a	329+54.84	17	1.11	0.31	0.08	3485	5400	
HIGH POINT								
CB-1203	337+47.23	17	1.55	1.10	0.08	3485	5400	
CB-1204	340+00.33	17	2.08	1.30	0.26	11326	12900	

Region 3 SC 51

Structure No.	STA	Structure Type	Cross Slope	Road Grade	Drain Area (Ac)	Drain Area (SF)	Drain Area per Chart	Comments
HIGH POINT								
CB-1117	326+64.70	17	2.08	0.72	0.17	7405	9800	
CB-1116	324+97.51	17	2.08	1.50	0.17	7405	13800	
CB-1115	322+67.71	17	2.08	2.50	0.22	9583	16200	
CB-1114	320+97.47	17	2.08	2.50	0.19	8276	16200	
CB-1113	319+54.64	17	2.08	2.50	0.08	3485	16200	
CB-1112	316+85.81	17	2.08	0.43	0.17	7405	7500	
CB-1112a	318+04.58	17	2.08	1.84	0.19	8276	15000	
HIGH POINT								
CB-1205a	329+27.63	17	2.08	0.31	0.12	5227	6400	
HIGH POINT								
CB-1207a	334+91.69	17	2.45	0.58	0.20	8712	13200	
CB-1207	333+65.70	17	2.45	1.38	0.26	11326	18500	
CB-1206b	333+09.21	17	2.45	1.49	0.12	5227	19900	
CB-1206a	332+23.39	17	2.45	1.03	0.17	7405	17200	
CB-1206	331+46.13	17	2.08	0.61	0.18	7841	9100	
CB-1205	Analysed as Weir no spread for Type 18 structure							LOW POINT
HIGH POINT								
CB-1216	336+46.40	17	2.08	0.42	0.14	6098	7400	
CB-1208	337+47.30	17	2.08	1.06	0.13	5663	11800	
CB-1209	339+33.50	17	2.08	1.30	0.19	8276	12900	

	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: US 21 / SC 51 Improvements SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 6

GEOPAK Output Tables

GEOPAK Output Type: **Area**

Area ID	Tc Used	Discharge	Intensity	Composite c value	Composite Area	Notes
CB-001	5	1.09	7.76	0.83	0.17	
CB-002	5	1.63	7.76	0.81	0.26	
CB-003	5	1.47	7.76	0.90	0.21	
CB-004	5	0.84	7.76	0.90	0.12	
CB-005	5	1.19	7.76	0.90	0.17	
CB-006	5	1.53	7.76	0.79	0.25	
CB-008	5	0.52	7.76	0.74	0.09	
CB-009	5	0.44	7.76	0.71	0.08	
CB-010	5	1.15	7.76	0.82	0.18	
CB-012	5	0.70	7.76	0.82	0.11	
CB-013	5	1.18	7.76	0.80	0.19	
CB-015	5	1.42	7.76	0.83	0.22	
CB-016	5	1.53	7.76	0.79	0.25	
CB-017	5	1.29	7.76	0.79	0.21	
CB-018	5	1.04	7.76	0.79	0.17	
CB-019	5	0.86	7.76	0.79	0.14	
CB-020	5	0.35	7.76	0.75	0.06	
CB-021	5	0.45	7.76	0.81	0.07	
CB-024	5	1.67	7.76	0.86	0.25	
CB-025	5	1.49	7.76	0.80	0.24	
CB-026	5	1.26	7.76	0.90	0.18	
CB-027	5	1.19	7.76	0.90	0.17	
CB-028	5	1.33	7.76	0.86	0.20	
CB-030	5	0.93	7.76	0.90	0.13	
CB-032	5	1.26	7.76	0.90	0.18	
CB-033	5	1.57	7.76	0.75	0.27	
CB-034	5	0.74	7.76	0.68	0.14	
CB-035	5	0.36	7.76	0.67	0.07	
CB-036	5	0.14	7.76	0.90	0.02	
CB-037	5	0.20	7.76	0.90	0.03	
CB-103	5	0.42	7.76	0.90	0.06	
CB-105	5	0.11	7.76	0.90	0.02	
CB-106	5	0.13	7.76	0.90	0.02	
CB-108	5	0.56	7.76	0.66	0.11	
CB-109	5	1.17	7.76	0.63	0.24	
CB-110	5	1.04	7.76	0.90	0.15	
CB-111	5	0.91	7.76	0.90	0.13	
CB-113	5	0.61	7.76	0.60	0.13	
CB-200	5	1.89	7.76	0.90	0.27	
CB-201	5	1.05	7.76	0.90	0.15	
CB-202	5	0.98	7.76	0.90	0.14	
CB-203	6	0.76	7.49	0.42	0.24	
CB-204	5	2.10	7.76	0.90	0.30	
CB-205	13	0.83	5.61	0.40	0.37	
CB-206	5	2.30	7.76	0.90	0.33	
CB-207	20	0.59	4.60	0.41	0.31	
CB-208	5	0.98	7.76	0.90	0.14	
CB-209	5	1.47	7.76	0.90	0.21	
CB-210	5	1.19	7.76	0.90	0.17	
CB-211	7	0.80	6.98	0.48	0.24	
CB-212	5	1.68	7.76	0.90	0.24	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: US 21 / SC 51 Improvements SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 6

GEOPAK Output Tables

GEOPAK Output Type: **Area**

Area ID	Tc Used	Discharge	Intensity	Composite c value	Composite Area	Notes
CB-213	5	0.98	7.76	0.90	0.14	
CB-215	5	1.68	7.76	0.90	0.24	
CB-216	5	1.33	7.76	0.90	0.19	
CB-226	5	1.06	7.76	0.80	0.17	
CB-227	5	1.40	7.76	0.90	0.20	
CB-228	5	0.65	7.76	0.70	0.12	
CB-229	5	1.03	7.76	0.63	0.21	
CB-230	5	1.17	7.76	0.84	0.18	
CB-232	5	0.87	7.76	0.70	0.16	
CB-233	5	0.91	7.76	0.90	0.13	
CB-234	5	1.06	7.76	0.76	0.18	
CB-235	5	0.71	7.76	0.83	0.11	
CB-236	5	1.54	7.76	0.90	0.22	
CB-241	7	1.13	7.18	0.56	0.28	
CB-244	5	3.03	7.76	0.85	0.46	
CB-246	5	0.63	7.76	0.90	0.09	
CB-501	14	0.87	5.43	0.70	0.23	
CB-502	5	0.70	7.76	0.90	0.10	
CB-503	5	1.89	7.76	0.90	0.27	
CB-504	5	1.95	7.76	0.81	0.31	
CB-505	5	1.61	7.76	0.90	0.23	
CB-506	5	1.26	7.76	0.90	0.18	
CB-507	5	1.26	7.76	0.90	0.18	
CB-508	5	1.47	7.76	0.90	0.21	
CB-509	5	0.77	7.76	0.90	0.11	
CB-510	5	0.91	7.76	0.90	0.13	
CB-511	5	1.26	7.76	0.90	0.18	
CB-512	5	0.91	7.76	0.90	0.13	
CB-513	5	0.98	7.76	0.90	0.14	
CB-514	5	0.70	7.76	0.90	0.10	
CB-515	5	1.33	7.76	0.90	0.19	
CB-516	7	1.75	7.18	0.74	0.33	
CB-517	5	0.63	7.76	0.90	0.09	
CB-518	5	0.35	7.76	0.90	0.05	
CB-519	5	0.14	7.76	0.90	0.02	
CB-520	5	0.13	7.76	0.90	0.02	
CB-521	5	0.24	7.76	0.90	0.04	
CB-524	5	0.21	7.76	0.90	0.03	
CB-600	12	0.68	5.80	0.45	0.26	
CB-601	5	0.77	7.76	0.90	0.11	
CB-602	5	1.21	7.76	0.60	0.26	
CB-603	5	0.77	7.76	0.90	0.11	
CB-604	6	1.32	7.35	0.53	0.34	
CB-605	5	1.89	7.76	0.90	0.27	
CB-606	5	2.30	7.76	0.90	0.33	
CB-607	5	1.61	7.76	0.90	0.23	
CB-608	5	1.68	7.76	0.90	0.24	
CB-609	5	0.91	7.76	0.90	0.13	
CB-610	5	0.70	7.76	0.90	0.10	
CB-611	5	2.37	7.76	0.90	0.34	
CB-612	5	0.70	7.76	0.90	0.10	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: US 21 / SC 51 Improvements SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 6

GEOPAK Output Tables

GEOPAK Output Type: **Area**

Area ID	Tc Used	Discharge	Intensity	Composite c value	Composite Area	Notes
CB-613	5	0.84	7.76	0.90	0.12	
CB-614	5	1.54	7.76	0.90	0.22	
CB-617	5	0.42	7.76	0.90	0.06	
CB-618	5	0.49	7.76	0.90	0.07	
CB-620	5	2.36	7.76	0.78	0.39	
CB-622	5	0.19	7.76	0.40	0.06	
CB-700	5	0.91	7.76	0.90	0.13	
CB-701	5	0.98	7.76	0.90	0.14	
CB-702	5	1.33	7.76	0.90	0.19	
CB-703	5	1.01	7.76	0.90	0.14	
CB-704	5	1.12	7.76	0.90	0.16	
CB-705	5	1.61	7.76	0.90	0.23	
CB-706	5	1.47	7.76	0.90	0.21	
CB-707	5	0.77	7.76	0.90	0.11	
CB-708	5	1.33	7.76	0.90	0.19	
CB-709	5	1.19	7.76	0.90	0.17	
CB-710	5	1.54	7.76	0.90	0.22	
CB-800	5	0.91	7.76	0.90	0.13	
CB-801	5	1.54	7.76	0.90	0.22	
CB-802	5	1.75	7.76	0.90	0.25	
CB-803	5	1.40	7.76	0.90	0.20	
CB-804	5	1.61	7.76	0.90	0.23	
CB-805	5	2.03	7.76	0.90	0.29	
CB-806	5	1.54	7.76	0.90	0.22	
CB-807	5	0.98	7.76	0.90	0.14	
CB-808	5	1.75	7.76	0.90	0.25	
CB-809	5	1.47	7.76	0.90	0.21	
CB-810	5	0.91	7.76	0.90	0.13	
CB-811	5	1.26	7.76	0.90	0.18	
CB-812	5	1.47	7.76	0.90	0.21	
CB-813	5	1.40	7.76	0.90	0.20	
CB-816	5	0.70	7.76	0.90	0.10	
CB-900	5	1.12	7.76	0.90	0.16	
CB-901	5	1.82	7.76	0.90	0.26	
CB-902	5	1.54	7.76	0.90	0.22	
CB-903	5	3.00	7.76	0.90	0.43	
CB-904	5	1.26	7.76	0.90	0.18	
CB-905	5	1.94	7.76	0.86	0.29	
CB-906	5	0.70	7.76	0.90	0.10	
CB-907	5	0.42	7.76	0.90	0.06	
CB-908	5	0.35	7.76	0.90	0.05	
CB-909	5	1.33	7.76	0.90	0.19	
CB-910	5	0.84	7.76	0.90	0.12	
CB-911	5	2.31	7.76	0.85	0.35	
DI-007	5	2.54	7.76	0.39	0.84	
DI-011	5	1.03	7.76	0.34	0.39	
DI-014	5	4.84	7.76	0.38	1.64	
DI-022	5	2.35	7.76	0.55	0.55	
DI-023	5	0.42	7.76	0.70	0.08	
DI-026	5	2.68	7.76	0.69	0.50	
DI-027	5	5.54	7.76	0.60	1.19	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: US 21 / SC 51 Improvements SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 6

GEOPAK Output Tables

GEOPAK Output Type: **Area**

Area ID	Tc Used	Discharge	Intensity	Composite c value	Composite Area	Notes
DI-029	5	3.56	7.76	0.90	0.51	
DI-100	7	13.91	7.05	0.60	3.29	
DI-219	11	2.28	6.00	0.21	1.81	
DI-220	8	1.17	6.66	0.20	0.88	
DI-221	11	1.44	6.00	0.25	0.96	
DI-222	17	1.00	4.98	0.25	0.80	
DI-239	5	7.97	7.76	0.65	1.58	
DI-525	5	0.77	7.76	0.68	0.15	
DI-714	8	0.29	6.83	0.20	0.21	
DI-715	10	0.17	6.23	0.20	0.14	
DI-913	5	0.73	7.76	0.85	0.11	
DI-914	5	1.06	7.76	0.85	0.16	
CB-1001	8	2.69	6.86	0.80	0.49	
CB-1002	9	2.30	6.53	0.56	0.63	
CB-1003	15	0.81	5.27	0.45	0.34	
CB-1004	27	0.54	3.95	0.35	0.39	
CB-1005	26	0.64	4.03	0.41	0.39	
CB-1006	5	1.33	7.76	0.90	0.19	
CB-1007	5	0.98	7.76	0.90	0.14	
CB-1008	20	1.06	4.60	0.62	0.37	
CB-1017	5	0.77	7.76	0.90	0.11	
CB-1018	5	1.89	7.76	0.90	0.27	
CB-1019	5	1.12	7.76	0.90	0.16	
CB-1020	5	1.12	7.76	0.90	0.16	
CB-1101	10	1.10	6.23	0.63	0.28	
CB-1102	5	0.70	7.76	0.90	0.10	
CB-1103	5	1.68	7.76	0.90	0.24	
CB-1104	5	1.33	7.76	0.90	0.19	
CB-1105	5	0.56	7.76	0.90	0.08	
CB-1106	5	0.98	7.76	0.90	0.14	
CB-1107	5	2.23	7.76	0.90	0.32	
CB-1108	5	1.40	7.76	0.90	0.20	
CB-1109	18	1.57	4.84	0.90	0.36	
CB-110a	5	0.72	7.76	0.90	0.10	
CB-1110	5	1.54	7.76	0.90	0.22	
CB-1111	5	1.26	7.76	0.90	0.18	
CB-1112	5	0.84	7.76	0.90	0.12	
CB-1113	5	1.05	7.76	0.90	0.15	
CB-1114	5	1.33	7.76	0.90	0.19	
CB-1115	5	1.54	7.76	0.90	0.22	
CB-1116	5	1.19	7.76	0.90	0.17	
CB-1117	5	1.19	7.76	0.90	0.17	
CB-113a	5	0.60	7.76	0.77	0.10	
CB-113b	5	1.21	7.76	0.74	0.21	
CB-1203	5	0.56	7.76	0.90	0.08	
CB-1204	5	1.82	7.76	0.90	0.26	
CB-1205	5	2.79	7.76	0.90	0.40	
CB-1206	5	1.26	7.76	0.90	0.18	
CB-1207	5	1.82	7.76	0.90	0.26	
CB-1208	5	0.91	7.76	0.90	0.13	
CB-1209	5	1.33	7.76	0.90	0.19	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: US 21 / SC 51 Improvements SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 6

GEOPAK Output Tables

GEOPAK Output Type: **Area**

Area ID	Tc Used	Discharge	Intensity	Composite c value	Composite Area	Notes
CB-1216	5	0.98	7.76	0.90	0.14	
CB-1403	5	1.23	7.76	0.66	0.24	
CB-1405	5	0.26	7.76	0.66	0.05	
CB-200a	5	2.51	7.76	0.90	0.36	
CB-203a	10	0.92	6.25	0.42	0.35	
CB-203b	5	0.88	7.76	0.42	0.27	
CB-204a	5	1.19	7.76	0.90	0.17	
CB-205a	17	0.76	4.98	0.40	0.38	
CB-205b	13	0.83	5.61	0.40	0.37	
CB-205c	13	0.83	5.61	0.40	0.37	
CB-207a	5	2.16	7.76	0.90	0.31	
CB-207b	22	0.63	4.39	0.41	0.35	
CB-207c	20	0.72	4.60	0.41	0.38	
CB-207d	18	0.73	4.84	0.41	0.37	
CB-211a	6	0.60	7.38	0.48	0.17	
CB-211b	7	0.77	6.98	0.48	0.23	
CB-214a	5	0.59	7.76	0.85	0.09	
CB-214b	5	1.52	7.76	0.85	0.23	
CB-227a	5	1.98	7.76	0.85	0.30	
CB-229a	5	0.47	7.76	0.67	0.09	
CB-241a	6	1.54	7.42	0.56	0.37	
CB-241b	5	1.35	7.76	0.56	0.31	
CB-242a	6	0.50	7.38	0.48	0.14	
CB-501a	11	0.98	6.00	0.68	0.24	
CB-502a	5	0.56	7.76	0.90	0.08	
CB-502b	5	1.05	7.76	0.90	0.15	
CB-504a	5	1.02	7.76	0.88	0.15	
CB-506a	26	0.98	4.03	0.74	0.33	
CB-506b	25	1.00	4.11	0.74	0.33	
CB-506c	7	1.75	7.18	0.74	0.33	
CB-512a	5	0.70	7.76	0.90	0.10	
CB-600a	11	0.70	6.00	0.45	0.26	
CB-600b	13	0.66	5.61	0.45	0.26	
CB-600c	11	0.70	6.00	0.45	0.26	
CB-601a	5	1.75	7.76	0.90	0.25	
CB-602a	9	1.03	6.37	0.60	0.27	
CB-602b	5	1.02	7.76	0.60	0.22	
CB-604a	5	0.70	7.76	0.90	0.10	
CB-604b	6	1.29	7.38	0.53	0.33	
CB-609a	5	1.33	7.76	0.90	0.19	
CB-611a	5	0.84	7.76	0.90	0.12	
CB-701a	5	0.70	7.76	0.90	0.10	
CB-701b	5	1.05	7.76	0.90	0.15	
CB-702a	5	0.28	7.76	0.90	0.04	
CB-704a	5	0.21	7.76	0.90	0.03	
CB-707a	5	0.56	7.76	0.90	0.08	
CB-707b	5	1.05	7.76	0.90	0.15	
CB-710a	5	1.05	7.76	0.90	0.15	
CB-801a	5	0.09	7.76	0.90	0.01	
CB-801b	5	0.13	7.76	0.90	0.02	
CB-806A	5	0.63	7.76	0.90	0.09	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: US 21 / SC 51 Improvements SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 6

GEOPAK Output Tables

GEOPAK Output Type: **Area**

Area ID	Tc Used	Discharge	Intensity	Composite c value	Composite Area	Notes
CB-905a	5	1.68	7.76	0.90	0.24	
CB-906a	5	1.96	7.76	0.90	0.28	
CB-911a	5	2.11	7.76	0.85	0.32	
DI-1021	9	0.47	6.53	0.30	0.24	
DI-1022	20	6.29	4.60	0.52	2.63	
DI-1023	5	8.61	7.76	0.59	1.88	
DI-1024	14	1.90	5.43	0.46	0.76	
DI-1025	11	1.12	6.00	0.30	0.62	
DI-1026	9	2.72	6.58	0.30	1.38	
DI-1027	29	0.87	3.80	0.30	0.76	
DI-1404	5	1.30	7.76	0.73	0.23	
DI-1406	5	5.54	7.76	0.85	0.84	
DI-1601	5	1.21	7.76	0.40	0.39	
DI-228a	5	0.19	7.76	0.22	0.11	
DI-245a	16	0.47	5.12	0.22	0.42	
DI-506d	29	4.89	3.80	0.70	1.84	
DI-507A	5	0.45	7.76	0.45	0.13	
DI-603a	11	0.87	6.00	0.52	0.28	
DI-604C	7	1.55	6.95	0.62	0.36	
DI-700a	19	0.55	4.72	0.30	0.39	
DI-904A	5	0.28	7.76	0.45	0.08	
DI-907A	7	3.80	6.95	0.68	0.80	
ECB-623	5	2.09	7.76	0.84	0.32	
OEP-242	7	6.14	7.21	0.51	1.67	
OEP-524	8	1.76	6.72	0.32	0.82	
CB-1001a	5	2.86	7.76	0.80	0.46	
CB-1001b	5	1.55	7.76	0.80	0.25	
CB-1003a	19	1.36	4.72	0.45	0.64	
CB-1004a	24	0.53	4.20	0.35	0.36	
CB-1004b	27	0.54	3.95	0.35	0.39	
CB-1004c	28	0.47	3.87	0.35	0.35	
CB-1004d	25	0.47	4.11	0.35	0.33	
CB-1007a	20	0.66	4.60	0.62	0.23	
CB-1106a	5	1.47	7.76	0.90	0.21	
CB-1109a	8	1.75	6.72	0.90	0.29	
CB-1112a	5	1.05	7.76	0.90	0.15	
CB-1200a	5	0.56	7.76	0.90	0.08	
CB-1200b	5	0.42	7.76	0.90	0.06	
CB-1205a	5	0.84	7.76	0.90	0.12	
CB-1206a	5	1.19	7.76	0.90	0.17	
CB-1206b	5	0.84	7.76	0.90	0.12	
CB-1207a	5	1.40	7.76	0.90	0.20	
DI-1112b	5	0.38	7.76	0.35	0.14	
ECB-1401	8	1.76	6.72	0.32	0.82	
ECB-1402	5	2.46	7.76	0.72	0.44	
EXIP-531	5	3.66	7.76	0.86	0.55	
OEP-1407	14	8.23	5.43	0.75	2.02	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 8

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
OP-39	OP	US21FP	22+00.00	575.07	0.00	0.00	0.00	
OP-41	OP	US21FP	33+64.94	570.23	0.00	0.00	0.00	
CB-001	C.B. TYPE 17	US21FP	15+74.17	616.19	5.99	6.41	1.15	
CB-002	C.B. TYPE 17	US21FP	18+27.13	613.23	4.50	7.64	2.53	
CB-003	C.B. TYPE 17	US21FP	20+24.53	610.86	4.50	8.24	3.73	
CB-004	C.B. TYPE 17	US21FP	23+09.00	607.67	17.38	7.79	33.69	
CB-005	C.B. TYPE 17	US21FP	24+65.36	605.76	12.13	6.97	8.27	
CB-006	C.B. TYPE 17	US21FP	27+28.70	602.72	8.38	6.12	7.48	
CB-008	EX CATCH BASIN	US21FP	27+75.18	602.38	4.46	5.00	0.52	
CB-009	EX CATCH BASIN	US21FP	28+07.41	602.39	4.54	5.31	0.94	
CB-010	C.B. TYPE 17	US21FP	28+55.79	601.21	5.60	5.65	3.71	
CB-012	C.B. TYPE 17	US21FP	29+66.01	599.85	3.67	5.00	0.70	
CB-013	C.B. TYPE 17	US21FP	31+55.14	597.53	5.00	5.03	6.01	
CB-015	C.B. TYPE 17	US21FP	33+62.35	594.98	9.12	5.38	7.29	
CB-016	C.B. TYPE 17	US21FP	35+90.89	592.17	4.50	5.00	1.53	
CB-017	C.B. TYPE 17	US21FP	37+88.88	589.74	4.50	5.68	2.72	
CB-018	C.B. TYPE 17	US21FP	39+50.28	587.96	11.07	24.59	18.83	
CB-019	C.B. TYPE 18	US21FP	40+14.96	587.76	8.23	24.48	16.81	
CB-020	C.B. TYPE 17	US21FP	15+57.34	616.33	5.98	5.02	2.69	
CB-021	C.B. TYPE 1	US21FP	16+35.64	615.20	5.26	5.32	3.50	
CB-024	C.B. TYPE 17	US21FP	17+55.50	614.18	5.31	5.82	7.59	
CB-025	C.B. TYPE 17	US21FP	18+33.00	613.12	5.69	5.99	14.22	
CB-026	C.B. TYPE 17	US21FP	21+98.00	610.84	21.16	8.74	37.11	
CB-027	C.B. TYPE 17	US21FP	21+98.00	610.84	6.82	6.76	19.30	
CB-028	C.B. TYPE 17	US21FP	20+26.34	610.84	5.00	6.43	18.48	
CB-030	C.B. TYPE 17	US21FP	23+09.00	607.66	16.71	7.61	25.17	
CB-032	C.B. TYPE 17	US21FP	24+32.75	606.14	12.57	7.16	5.89	
CB-033	C.B. TYPE 17	US21FP	26+41.38	603.73	9.33	6.36	4.94	
CB-034	C.B. TYPE 17	US21FP	27+39.01	602.60	7.81	5.97	3.53	
CB-035	C.B. TYPE 17	MERCANTILE_FP	10+74.44	602.99	4.33	5.00	0.36	
CB-036	C.B. TYPE 1	US21FP	16+57.52	615.50	4.50	5.00	0.14	
CB-037	C.B. TYPE 1	US21FP	27+34.46	602.79	4.50	5.00	0.20	
CB-041	C.B. TYPE 1	US21FP	15+59.81	616.45	5.94	5.00	0.14	
CB-103	C.B. TYPE 17	US21FP	36+63.16	591.28	4.50	5.00	0.42	
CB-105	C.B. TYPE 1	US21FP	29+73.25	599.95	4.50	5.00	0.11	
CB-106	C.B. TYPE 1	US21FP	31+68.11	597.51	4.50	6.46	0.22	
CB-108	C.B. TYPE 17	US21FP	30+25.05	599.13	4.50	5.00	0.56	
CB-109	C.B. TYPE 17	US21FP	31+65.69	597.40	4.61	6.83	1.81	
CB-110	C.B. TYPE 17	US21FP	33+12.03	595.60	6.01	7.22	2.72	
CB-111	C.B. TYPE 17	US21FP	35+31.25	592.91	4.50	5.00	0.91	
CB-113	C.B. TYPE 17	US21FP	29+44.43	600.12	4.07	5.00	0.61	
CB-200	C.B. TYPE 18	US21FP	40+14.96	587.76	8.35	7.46	17.91	
CB-201	C.B. TYPE 17	US21FP	41+10.00	588.28	12.70	7.73	18.63	
CB-202	C.B. TYPE 17	US21FP	45+00.00	597.26	9.12	7.43	9.39	
CB-203	C.B. TYPE 17	US21FP	45+00.00	597.26	5.00	23.62	13.96	
CB-204	C.B. TYPE 17	US21FP	49+90.97	611.18	4.65	6.68	6.50	
CB-205	C.B. TYPE 17	US21FP	49+00.00	608.60	5.00	23.03	10.28	
CB-206	C.B. TYPE 17	US21FP	53+00.00	619.95	4.67	6.10	4.69	

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
CB-207	C.B. TYPE 17	US21FP	53+00.00	619.94	7.77	22.22	6.53	
CB-208	C.B. TYPE 17	US21FP	56+40.00	629.59	4.69	5.36	2.61	
CB-209	C.B. TYPE 17	US21FP	57+68.00	632.22	6.12	17.07	1.93	
CB-210	C.B. TYPE 17	US21FP	59+99.98	638.92	4.00	5.00	1.16	
CB-211	C.B. TYPE 17	US21FP	60+00.07	639.25	4.00	7.20	0.80	
CB-212	C.B. TYPE 17	US21FP	42+58.15	590.55	12.07	7.77	10.73	
CB-213	C.B. TYPE 17	US21FP	43+73.72	593.46	6.49	23.77	14.44	
CB-215	C.B. TYPE 17	US21FP	57+82.29	633.62	4.70	5.00	1.68	
CB-216	C.B. TYPE 17	US21FP	46+42.36	601.30	4.50	7.26	8.59	
CB-226	C.B. TYPE 17	US21B_FP	19+51.28	633.20	4.08	5.51	3.99	
CB-227	C.B. TYPE 17	US21B_FP	17+00.87	633.58	4.23	8.17	10.33	
CB-228	C.B. TYPE 17	US21B_FP	14+50.31	635.72	4.46	7.56	7.68	
CB-229	C.B. TYPE 17	US21B_FP	12+81.99	636.58	4.08	7.00	5.94	
CB-230	C.B. TYPE 17	US21B_FP	11+33.55	638.89	5.54	6.44	3.55	
CB-232	C.B. TYPE 17	US21B_FP	13+94.67	635.98	3.94	7.38	7.01	
CB-233	C.B. TYPE 17	US21B_FP	21+74.00	631.54	8.54	16.31	9.35	
CB-234	C.B. TYPE 17	US21B_FP	12+82.12	636.89	4.08	5.70	1.67	
CB-235	C.B. TYPE 17	US21B_FP	11+05.26	639.70	4.08	5.00	0.69	
CB-236	C.B. TYPE 17	US21FP	61+30.53	640.79	6.53	5.67	2.57	
CB-241	C.B. TYPE 17	US21FP	46+98.66	602.89	5.00	23.34	12.51	
CB-244	C.B. TYPE 17	US21B_FP	18+29.94	633.64	4.08	5.00	3.03	
CB-246	C.B. TYPE 17	US21B_FP	20+27.32	633.21	4.82	16.10	8.81	
CB-501	C.B. TYPE 17	US21FP	64+34.17	640.34	7.27	14.00	8.96	
CB-502	C.B. TYPE 17	US21FP	66+30.00	637.88	10.58	14.37	10.22	
CB-503	C.B. TYPE 18	US21FP	68+57.16	636.73	8.53	8.02	11.89	
CB-504	C.B. TYPE 17	US21FP	70+95.56	638.31	4.50	5.00	1.95	
CB-505	C.B. TYPE 17	US21FP	73+50.05	642.69	10.89	30.20	31.73	
CB-506	C.B. TYPE 17	US21FP	78+44.69	650.92	15.53	29.02	16.18	
CB-507	C.B. TYPE 17	US21FP	65+33.59	639.40	5.01	5.00	2.56	
CB-508	C.B. TYPE 17	US21FP	67+72.45	636.93	7.55	7.57	5.09	
CB-509	C.B. TYPE 18	US21FP	68+57.11	636.73	8.15	7.80	7.73	
CB-510	C.B. TYPE 17	US21FP	70+35.00	637.11	4.61	5.57	2.10	
CB-511	C.B. TYPE 17	US21FP	71+80.59	639.63	5.63	5.00	1.26	
CB-512	C.B. TYPE 17	US21FP	74+52.95	644.55	10.80	12.04	16.22	
CB-513	C.B. TYPE 17	US21FP	75+87.00	646.92	12.25	11.59	13.54	
CB-514	C.B. TYPE 17	US21FP	77+22.99	649.31	14.21	11.14	13.01	
CB-515	C.B. TYPE 17	US21FP	78+35.29	650.83	15.38	10.76	12.64	
CB-516	C.B. TYPE 17	US21FP	76+18.94	647.48	12.81	29.70	19.64	
CB-517	C.B. TYPE 1	US21FP	66+66.09	637.98	4.02	5.00	0.63	
CB-518	C.B. TYPE 1	US21FP	68+57.21	636.95	4.65	6.89	0.66	
CB-519	C.B. TYPE 1	US21FP	73+46.91	642.90	3.90	5.00	0.14	
CB-520	C.B. TYPE 1	US21FP	71+15.09	638.59	4.00	5.00	0.13	
CB-521	C.B. TYPE 1	US21FP	69+70.49	636.60	3.75	6.06	0.35	
CB-522	C.B. TYPE 17	US21FP	68+89.00	636.76	5.76	6.13	2.15	
CB-523	C.B. TYPE 1	US21FP	74+50.28	644.73	6.23	5.00	0.14	
CB-524	C.B. TYPE 1	US21FP	67+75.12	637.15	5.24	7.40	1.39	
CB-600	C.B. TYPE 17	US21FP	81+86.06	650.73	13.75	13.01	13.79	
CB-601	C.B. TYPE 17	US21FP	84+00.00	647.80	10.15	12.28	12.17	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 8

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
CB-602	C.B. TYPE 17	US21FP	85+35.30	646.09	8.04	11.83	11.78	
CB-603	C.B. TYPE 18	US21FP	87+45.15	644.51	5.79	11.09	9.39	
CB-604	C.B. TYPE 17	US21FP	90+57.75	649.42	4.50	6.79	5.96	
CB-605	C.B. TYPE 17	US21FP	92+23.33	652.92	4.50	6.45	4.75	
CB-606	C.B. TYPE 17	US21FP	94+26.36	657.36	4.50	5.98	3.06	
CB-607	C.B. TYPE 17	US21FP	81+86.94	650.72	14.17	9.55	12.14	
CB-608	C.B. TYPE 17	US21FP	84+03.98	648.09	10.95	8.80	11.16	
CB-609	C.B. TYPE 17	US21FP	85+43.35	646.38	8.80	8.31	9.95	
CB-610	C.B. TYPE 18	US21FP	87+45.29	644.17	5.94	7.61	8.27	
CB-611	C.B. TYPE 17	US21FP	88+86.76	645.33	5.50	7.21	7.03	
CB-612	C.B. TYPE 17	US21FP	91+77.48	651.92	10.10	6.32	5.10	
CB-613	C.B. TYPE 17	US21FP	92+92.33	654.43	11.10	5.87	3.68	
CB-614	C.B. TYPE 17	US21FP	94+25.20	657.34	4.50	5.67	2.90	
CB-617	C.B. TYPE 1	US21FP	90+90.46	650.04	3.25	5.00	0.42	
CB-618	C.B. TYPE 1	US21FP	92+88.49	654.57	4.00	5.00	0.49	
CB-619	C.B. TYPE 1	US21FP	91+74.81	652.08	5.69	5.60	0.88	
CB-620	C.B. TYPE 17	REGENTPKWY_FP	13+80.45	641.57	4.50	5.00	2.36	
CB-622	C.B. TYPE 17	REGENTPKWY_FP	13+80.45	641.44	4.50	5.06	2.54	
CB-700	C.B. TYPE 17	US21FP	97+01.50	662.40	4.69	5.00	0.91	
CB-701	C.B. TYPE 18	US21FP	99+39.32	664.19	4.80	5.30	1.88	
CB-702	C.B. TYPE 17	US21FP	101+74.45	664.99	6.63	6.32	4.89	
CB-703	C.B. TYPE 17	US21FP	103+64.98	667.03	4.50	5.00	0.99	
CB-704	C.B. TYPE 17	US21FP	105+15.00	669.03	5.14	7.82	1.41	
CB-705	C.B. TYPE 17	US21FP	107+00.00	670.63	7.31	10.06	3.92	
CB-706	C.B. TYPE 17	US21FP	96+60.71	662.49	4.50	5.00	1.47	
CB-707	C.B. TYPE 18	US21FP	99+66.85	664.18	4.80	5.21	1.28	
CB-708	C.B. TYPE 17	US21FP	101+74.44	664.97	7.52	6.61	10.19	
CB-709	C.B. TYPE 17	US21FP	103+64.98	667.03	4.50	5.67	2.11	
CB-710	C.B. TYPE 17	US21FP	107+01.38	670.64	5.16	5.00	1.50	
CB-800	C.B. TYPE 17	US21FP	110+06.87	670.80	8.42	11.45	4.41	
CB-801	C.B. TYPE 17	US21FP	112+02.34	670.01	8.23	12.29	5.39	
CB-802	C.B. TYPE 17	US21FP	114+60.32	667.01	6.01	13.36	6.43	
CB-803	C.B. TYPE 17	US21FP	116+62.72	664.26	6.07	13.84	10.80	
CB-804	C.B. TYPE 17	US21FP	118+90.51	661.16	5.00	14.39	11.70	
CB-805	C.B. TYPE 17	US21FP	121+90.86	657.08	11.93	14.80	17.30	
CB-806	C.B. TYPE 17	US21FP	124+15.74	654.02	10.10	15.35	18.03	
CB-807	C.B. TYPE 17	US21FP	110+64.12	670.92	6.46	7.92	1.02	
CB-808	C.B. TYPE 17	US21FP	113+73.10	668.42	4.92	9.85	2.32	
CB-809	C.B. TYPE 17	US21FP	115+55.41	665.72	4.50	10.43	3.40	
CB-810	C.B. TYPE 17	US21FP	117+90.10	662.53	4.50	5.00	0.89	
CB-811	C.B. TYPE 17	US21FP	119+06.67	660.00	4.50	5.39	2.07	
CB-812	C.B. TYPE 17	US21FP	121+91.10	657.07	11.19	7.34	5.74	
CB-813	C.B. TYPE 17	US21FP	123+85.58	654.17	7.67	6.39	2.68	
CB-816	C.B. TYPE 17	US21FP	116+57.13	664.33	4.92	10.69	3.90	
CB-900	C.B. TYPE 17	US21FP	126+68.43	650.52	18.32	11.59	16.80	
CB-901	C.B. TYPE 17	US21FP	129+10.41	647.28	14.34	10.83	15.86	
CB-902	C.B. TYPE 17	US21FP	130+98.13	644.85	11.27	10.25	14.79	
CB-903	C.B. TYPE 17	US21FP	134+07.56	640.52	5.50	9.24	13.28	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 8

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
CB-904	C.B. TYPE 17	US21FP	125+41.49	651.98	4.50	5.49	1.46	
CB-905	C.B. TYPE 17	US21FP	128+02.93	648.19	4.25	5.00	1.89	
CB-906	C.B. TYPE 17	US21FP	130+79.23	645.13	6.07	7.99	8.93	
CB-907	C.B. TYPE 17	US21FP	134+04.64	643.82	5.90	5.00	0.41	
CB-908	C.B. TYPE 1	US21FP	130+80.44	645.47	6.54	8.15	9.16	
CB-909	C.B. TYPE 1	US21FP	132+82.58	643.53	5.83	8.88	9.98	
CB-910	C.B. TYPE 1	US21FP	134+08.82	641.97	5.69	9.15	10.89	
CB-911	C.B. TYPE 17	SC51FP	297+74.63	645.33	4.50	5.31	4.25	
DI-007	D.I. 24"X36"	US21FP	27+28.87	601.50	6.47	5.00	2.54	
DI-011	D.I. 24"X36"	US21FP	28+55.89	600.00	3.65	5.55	1.93	
DI-014	D.I. 24"X36"	US21FP	31+55.07	597.10	3.20	5.00	4.84	
DI-022	D.I. 24"X36"	US21FP	15+57.47	616.00	4.94	5.00	2.35	
DI-023	D.I. 24"X36"	US21FP	16+39.28	615.00	4.27	5.00	0.42	
DI-026	D.I. 24"X36"	US21FP	17+52.48	613.00	3.20	5.00	2.68	
DI-027	D.I. 24"X36"	US21FP	18+36.68	611.20	3.20	5.00	5.54	
DI-029	D.I. 24"X36"	US21FP	20+26.31	610.00	3.20	5.00	3.56	
DI-100	D.I. 24"X36"	US21FP	38+80.33	585.07	5.67	7.00	13.91	
DI-219	D.I. 24"X36"	US21FP	55+72.42	619.56	3.20	11.00	2.28	
DI-220	D.I. 24"X36"	US21FP	54+55.47	616.44	3.20	11.27	3.31	
DI-221	D.I. 24"X36"	US21FP	43+25.00	588.50	4.50	11.00	1.44	
DI-222	D.I. 24"X24"	US21FP	57+61.61	630.77	4.50	17.00	1.00	
DI-239	D.I. 24"X36"	US21B_FP	19+58.07	634.83	3.20	5.00	7.97	
DI-522	D.I. 24"X24"	GARRISONFARM_FP	10+99.77	643.38	3.48	0.00	2.10	
DI-523	D.I. 24"X24"	GARRISONFARM_FP	11+15.21	643.42	3.38	0.00	1.30	
DI-525	D.I. 24"X36"	OLDNAT_FP-2	19+00.80	634.50	3.80	5.00	0.77	
DI-714	D.I. 24"X24"	US21FP	105+10.03	667.17	3.20	7.70	0.28	
DI-715	D.I. 24"X24"	US21FP	106+94.47	668.26	4.01	10.00	0.17	
DI-913	D.I. 24"X24"	US21FP	126+68.09	648.03	13.34	5.00	0.71	
DI-914	D.I. 24"X24"	US21FP	131+10.10	641.70	5.51	5.00	1.03	
MH-038	M.H.	US21FP	22+00.00	591.30	15.69	8.78	37.05	
MH-040	M.H.	US21FP	33+64.60	582.17	10.56	5.43	7.27	
MH-042	M.H.	US21FP	28+45.03	601.51	4.45	5.50	0.93	
MH-045	M.H.	US21FP	127+06.80	650.06	4.85	5.00	1.64	
MH-050	M.H.	US21FP	128+05.23	648.60	4.91	5.34	3.47	
MH-055	M.H.	US21FP	130+05.18	646.20	4.81	5.90	5.20	
MH-060	M.H.	US21FP	130+81.90	645.55	6.45	7.95	8.35	
MH-214	M.H.	US21FP	39+50.00	582.92	16.40	24.61	18.83	
MH-243	M.H.	US21FP	62+07.70	646.44	11.72	6.82	6.05	
MH-244	M.H.	US21FP	62+00.00	641.48	7.60	5.97	2.54	
MH-245	M.H.	US21FP	11+00.00	639.89	6.36	6.29	2.50	
MH-526	M.H.	US21FP	63+80.35	645.50	8.62	8.40	1.74	
MH-530	M.H.	US21FP	66+67.50	635.00	17.69	14.41	10.21	
CB-1001	C.B. TYPE 17	SC51FP	299+91.75	643.68	4.50	7.60	10.26	
CB-1002	C.B. TYPE 17	SC51FP	301+71.67	642.27	4.50	8.80	12.01	
CB-1003	C.B. TYPE 17	SC51FP	303+72.96	637.98	4.50	8.80	14.82	
CB-1004	C.B. TYPE 17	SC51FP	305+50.79	632.35	4.60	8.80	18.88	
CB-1005	C.B. TYPE 17	SC51FP	307+76.52	624.91	6.26	11.00	19.40	
CB-1006	C.B. TYPE 17	SC51FP	309+58.17	618.87	5.00	11.00	22.83	

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
CB-1007	C.B. TYPE 17	SC51FP	310+98.52	614.21	5.00	29.00	15.76	
CB-1008	C.B. TYPE 17	SC51FP	313+10.11	607.17	5.00	29.31	17.04	
CB-1017	C.B. TYPE 17	SC51FP	306+02.33	630.87	8.81	20.37	24.81	
CB-1018	C.B. TYPE 17	SC51FP	308+61.04	622.10	7.44	20.69	27.34	
CB-1019	C.B. TYPE 17	SC51FP	310+23.24	616.71	6.50	20.89	27.91	
CB-1020	C.B. TYPE 17	SC51FP	311+76.22	611.62	6.50	21.07	28.47	
CB-1101	C.B. TYPE 17	SC51FP	314+87.71	602.09	5.00	29.54	17.62	
CB-1102	C.B. TYPE 17	SC51FP	315+93.54	600.72	5.78	29.73	17.89	
CB-1103	C.B. TYPE 17	SC51FP	314+09.29	603.97	6.50	21.33	29.32	
CB-1104	C.B. TYPE 17	SC51FP	315+93.54	600.72	7.23	29.88	45.14	
CB-1105	C.B. TYPE 18	SC51FP	316+49.87	600.53	4.50	5.00	0.55	
CB-1106	C.B. TYPE 17	SC51FP	316+85.81	600.60	5.76	19.26	18.13	
CB-1107	C.B. TYPE 17	SC51FP	318+94.00	604.14	5.93	18.88	16.42	
CB-1108	C.B. TYPE 17	SC51FP	321+10.79	609.41	6.31	18.56	15.14	
CB-1109	C.B. TYPE 17	SC51FP	322+82.00	613.50	6.00	18.00	5.07	
CB-110a	C.B. TYPE 17	US21FP	34+07.30	594.43	11.80	7.38	4.15	
CB-1110	C.B. TYPE 17	SC51FP	324+97.51	617.75	4.50	7.59	3.26	
CB-1111	C.B. TYPE 17	SC51FP	326+65.26	619.68	4.64	7.02	1.98	
CB-1112	C.B. TYPE 17	SC51FP	316+85.81	600.60	7.98	19.38	32.39	
CB-1113	C.B. TYPE 17	SC51FP	320+20.00	605.39	5.00	12.33	15.89	
CB-1114	C.B. TYPE 17	SC51FP	320+97.47	609.13	4.51	12.24	15.17	
CB-1115	C.B. TYPE 17	SC51FP	322+67.71	613.32	5.10	11.98	14.34	
CB-1116	C.B. TYPE 17	SC51FP	324+97.51	618.00	7.66	11.48	13.44	
CB-1117	C.B. TYPE 17	SC51FP	326+64.70	619.85	8.99	10.92	12.81	
CB-113a	C.B. TYPE 17	MERCANTILE_FP	10+76.57	602.91	4.50	5.00	0.60	
CB-113b	C.B. TYPE 17	US21FP	28+68.31	601.05	5.76	5.37	2.36	
CB-1203	C.B. TYPE 17	SC51FP	337+47.23	623.60	4.60	5.00	0.55	
CB-1204	C.B. TYPE 17	SC51FP	340+00.33	620.21	3.75	5.00	1.77	
CB-1205	C.B. TYPE 18	SC51FP	330+32.92	619.93	7.94	9.66	11.82	
CB-1206	C.B. TYPE 17	SC51FP	331+46.13	620.27	7.94	9.27	9.75	
CB-1207	C.B. TYPE 17	SC51FP	333+65.70	622.72	9.70	8.48	7.33	
CB-1208	C.B. TYPE 17	SC51FP	337+47.30	623.45	8.74	6.86	4.12	
CB-1209	C.B. TYPE 17	SC51FP	339+33.50	621.08	5.62	6.09	3.43	
CB-1210	C.B. TYPE 17	SC51FP	339+33.50	620.57	4.57	5.81	2.23	
CB-1216	C.B. TYPE 17	SC51FP	336+46.40	624.20	9.82	7.32	4.89	
CB-1403	C.B. TYPE 18	FLINTHILL_FP	12+49.83	667.43	5.39	14.78	15.90	
CB-1405	C.B. TYPE 17	FLINTHILL_FP	13+20.52	667.93	5.09	14.58	12.07	
CB-200a	C.B. TYPE 17	US21FP	38+80.00	588.62	9.30	7.06	16.53	
CB-203a	C.B. TYPE 17	US21FP	46+20.99	600.69	5.00	23.45	13.10	
CB-203b	C.B. TYPE 17	US21FP	45+59.72	598.95	5.00	23.54	13.55	
CB-204a	C.B. TYPE 17	US21FP	48+23.84	606.44	4.50	6.97	7.49	
CB-205a	C.B. TYPE 17	US21FP	51+00.00	614.27	5.00	22.72	8.44	
CB-205b	C.B. TYPE 17	US21FP	50+36.05	612.46	5.00	22.82	9.06	
CB-205c	C.B. TYPE 17	US21FP	49+68.70	610.55	5.00	22.93	9.67	
CB-207a	C.B. TYPE 17	US21FP	54+60.75	624.50	11.83	17.71	5.97	
CB-207b	C.B. TYPE 17	US21FP	53+56.08	621.54	9.19	22.00	6.00	
CB-207c	C.B. TYPE 17	US21FP	52+43.61	618.35	6.48	22.40	7.18	
CB-207d	C.B. TYPE 17	US21FP	51+74.81	616.40	5.00	22.59	7.80	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 8

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
CB-211a	C.B. TYPE 17	US21FP	61+52.44	641.30	6.79	8.01	2.07	
CB-211b	C.B. TYPE 17	US21FP	60+79.19	640.52	5.66	7.66	1.54	
CB-214a	C.B. TYPE 17	US21FP	40+94.84	588.06	7.37	24.35	16.39	
CB-214b	C.B. TYPE 17	US21FP	41+80.48	589.05	6.95	24.21	16.13	
CB-221a	C.B. TYPE 16	US21FP	43+16.75	590.51	7.71	23.83	15.44	
CB-227a	C.B. TYPE 17	US21B_FP	15+87.77	634.60	4.30	7.91	9.25	
CB-229a	C.B. TYPE 17	US21B_FP	13+49.63	636.18	3.91	7.23	6.29	
CB-241a	C.B. TYPE 17	US21FP	48+23.94	606.45	5.00	23.15	11.14	
CB-241b	C.B. TYPE 17	US21FP	47+55.73	604.51	5.00	23.25	11.86	
CB-242a	C.B. TYPE 17	US21FP	62+11.09	641.63	7.42	8.26	8.18	
CB-501a	C.B. TYPE 17	US21FP	65+43.56	638.93	7.43	14.26	9.77	
CB-502a	C.B. TYPE 17	US21FP	68+07.79	636.80	11.07	8.07	12.35	
CB-502b	C.B. TYPE 17	US21FP	67+38.95	637.00	14.63	8.15	13.21	
CB-504a	C.B. TYPE 17	US21FP	69+81.72	637.16	4.50	5.39	2.91	
CB-506a	C.B. TYPE 17	US21FP	77+67.03	650.00	14.85	29.26	17.03	
CB-506b	C.B. TYPE 17	US21FP	77+41.16	649.61	14.55	29.34	17.93	
CB-506c	C.B. TYPE 17	US21FP	77+02.00	648.41	13.48	29.45	18.81	
CB-512a	C.B. TYPE 17	US21FP	73+48.38	642.67	9.73	12.27	16.62	
CB-600a	C.B. TYPE 17	US21FP	80+39.01	651.67	15.17	13.50	15.51	
CB-600b	C.B. TYPE 17	US21FP	80+85.61	651.51	14.85	13.34	14.94	
CB-600c	C.B. TYPE 17	US21FP	81+54.29	651.04	14.18	13.13	14.39	
CB-601a	C.B. TYPE 17	US21FP	83+53.82	648.37	10.87	12.43	13.39	
CB-602a	C.B. TYPE 17	US21FP	86+94.96	644.51	5.93	11.26	10.30	
CB-602b	C.B. TYPE 1	US21FP	86+26.18	645.26	6.91	11.51	10.99	
CB-604a	C.B. TYPE 17	US21FP	88+26.64	644.87	4.78	7.32	9.21	
CB-604b	C.B. TYPE 17	US21FP	89+04.61	645.97	4.50	7.08	7.11	
CB-609a	C.B. TYPE 17	US21FP	86+94.96	644.29	6.20	7.79	9.37	
CB-611a	C.B. TYPE 17	US21FP	87+96.05	644.30	5.91	7.43	7.71	
CB-701a	C.B. TYPE 17	US21FP	98+95.10	664.27	4.50	5.00	0.68	
CB-701b	C.B. TYPE 17	US21FP	100+19.63	664.23	5.25	5.64	2.84	
CB-702a	C.B. TYPE 1	US21FP	99+43.78	664.51	4.69	5.00	0.27	
CB-704a	C.B. TYPE 1	US21FP	105+14.82	669.20	5.00	5.00	0.20	
CB-707a	C.B. TYPE 17	US21FP	99+29.42	664.21	4.50	5.00	0.55	
CB-707b	C.B. TYPE 17	US21FP	100+19.74	664.23	5.12	5.46	2.27	
CB-710a	C.B. TYPE 17	US21FP	105+41.74	669.32	4.50	5.00	1.02	
CB-801a	C.B. TYPE 1	US21FP	112+61.39	669.66	4.52	5.00	0.09	
CB-801b	C.B. TYPE 1	US21FP	110+68.52	671.09	6.53	7.55	0.19	
CB-806A	C.B. TYPE 17	US21FP	125+11.07	652.72	21.50	15.53	33.17	
CB-905a	C.B. TYPE 17	US21FP	127+04.57	649.71	4.13	5.00	1.64	
CB-906a	C.B. TYPE 17	US21FP	130+02.51	645.89	4.14	5.00	1.91	
CB-911a	C.B. TYPE 17	SC51FP	297+08.12	645.62	4.50	5.00	2.06	
DI-1021	D.I. 24"X24"	SC51FP	302+40.19	639.00	6.01	8.80	13.46	
DI-1022	D.I. 24"X36"	SC51FP	303+78.00	634.00	6.00	20.00	19.48	
DI-1023	D.I. 24"X36"	SC51FP	306+05.30	628.61	6.50	20.32	24.38	
DI-1024	D.I. 24"X36"	SC51FP	308+63.79	621.20	4.50	14.00	1.86	
DI-1025	D.I. 24"X24"	SC51FP	307+73.76	623.70	4.50	11.00	1.09	
DI-1026	D.I. 24"X24"	SC51FP	309+60.46	619.00	4.50	8.60	2.66	
DI-1027	D.I. 24"X24"	SC51FP	311+00.81	614.72	4.50	29.00	0.85	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 8

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
DI-1028	D.I. 24"X36"	SC51FP	300+19.89	642.53	3.75	0.00	11.70	
DI-1029	D.I. 24"X36"	SC51FP	301+17.29	638.63	5.25	0.00	13.00	
DI-1120	D.I. 24"X36"	SPRINGHILL_FP	30+02.16	609.57	6.13	18.36	14.32	
DI-1121	D.I. 24"X36"	SPRINGHILL_FP	30+02.38	608.67	4.78	18.09	11.46	
DI-1404	D.I. 24"X36"	FLINTHILL_FP	12+49.83	666.65	4.84	14.92	16.73	
DI-1406	D.I. 24"X36"	FLINTHILL_FP	14+10.14	668.43	5.00	14.33	11.98	
DI-1601	D.I. 24"X24"	GH-REAL_FP	19+22.16	641.94	2.92	5.00	1.21	
DI-228a	D.I. 24"X24"	21TOCLTPRO	14+52.04	634.42	2.50	5.00	0.18	
DI-245a	D.I. 24"X36"	US21B_FP	20+32.54	633.40	3.20	5.00	8.69	
DI-506d	D.I. 24"X36"	US21FP	78+43.32	643.93	6.58	29.00	4.89	
DI-507A	D.I. 24"X24"	US21FP	64+42.38	637.87	3.00	0.00	1.30	
DI-603a	D.I. 24"X36"	US21FP	87+59.95	643.93	4.50	11.00	0.87	
DI-604C	D.I. 24"X24"	US21FP	88+21.09	644.34	3.15	7.30	1.55	
DI-904A	D.I. 24"X24"	US21FP	125+97.40	650.90	3.20	5.00	0.27	
DI-907A	D.I. 24"X36"	US21FP	132+22.53	643.00	3.00	7.30	3.71	
ECB-623	EX CATCH BASIN	REGENTPKWY_FP	13+81.67	640.10	5.10	5.14	4.60	
MH-040a	M.H.	US21FP	33+64.74	589.64	11.57	5.41	7.28	
MH-109a	M.H.	US21FP	34+09.98	586.44	9.35	7.41	4.14	
MH-212a	M.H.	US21FP	42+75.00	585.72	17.01	7.81	10.71	
MH-503a	M.H.	US21FP	67+09.01	634.75	16.80	8.15	13.21	
MH-505a	M.H.	US21FP	73+44.77	635.51	6.60	30.20	31.73	
MH-805a	M.H.	US21FP	124+66.18	622.00	11.86	16.00	32.73	
MH-805b	M.H.	US21FP	124+29.87	612.00	7.47	16.05	32.68	
MH-913A	M.H.	US21FP	125+01.95	644.00	17.56	15.76	32.95	
OEP-242	DUMMY JOINT	US21FP	62+53.40	635.18	0.00	6.50	6.14	
OEP-524	DUMMY JOINT	US21FP	63+66.77	637.22	0.00	8.10	1.76	
CB-1001a	C.B. TYPE 17	SC51FP	299+27.96	644.32	4.50	5.79	8.29	
CB-1001b	C.B. TYPE 17	SC51FP	298+42.91	645.03	4.50	5.57	5.67	
CB-1003a	C.B. TYPE 17	SC51FP	302+96.06	640.01	4.50	8.80	13.84	
CB-1004a	C.B. TYPE 17	SC51FP	304+20.09	636.44	4.50	8.80	15.62	
CB-1004b	C.B. TYPE 17	SC51FP	304+55.31	635.44	4.50	8.80	16.49	
CB-1004c	C.B. TYPE 17	SC51FP	304+97.43	634.03	4.50	8.80	17.27	
CB-1004d	C.B. TYPE 17	SC51FP	305+23.79	633.21	4.50	8.80	18.01	
CB-1007a	C.B. TYPE 17	SC51FP	311+92.95	611.07	5.00	29.16	16.24	
CB-1106a	C.B. TYPE 17	SC51FP	317+35.81	600.99	4.49	19.19	17.24	
CB-1109a	C.B. TYPE 17	SC51FP	323+75.00	616.07	4.50	8.10	4.90	
CB-1112a	C.B. TYPE 17	SC51FP	318+50.00	602.90	5.26	12.61	16.49	
CB-1200a	C.B. TYPE 17	SC51FP	329+54.84	620.45	4.50	5.00	0.55	
CB-1200b	C.B. TYPE 17	SC51FP	328+73.25	620.36	4.67	5.62	0.93	
CB-1205a	C.B. TYPE 17	SC51FP	329+27.63	620.17	8.50	10.01	12.32	
CB-1206a	C.B. TYPE 17	SC51FP	332+23.39	620.79	8.21	8.99	8.83	
CB-1206b	C.B. TYPE 17	SC51FP	333+09.21	621.87	9.03	8.68	7.96	
CB-1207a	C.B. TYPE 17	SC51FP	334+91.69	623.95	10.04	7.97	5.94	
DI-1112b	D.I. 24"X24"	US21FP	133+85.18	597.87	3.20	5.00	0.37	
ECB-1401	EX CATCH BASIN	US21FP	110+29.13	668.11	2.70	8.10	1.76	
ECB-1402	EX CATCH BASIN	FLINTHILL_FP	12+10.95	667.58	3.50	8.81	3.78	
EDI-1501	EXISTING D.I.	FLINT2_FP	20+76.94	600.10	5.27	0.00	7.40	
EDI-531A	EXISTING D.I.	OLDNAT_FP-2	17+22.80	632.45	3.92	5.01	3.67	

	STV Inc.	JOB: S-160 Widening		SHEET
	Consulting Engineers	SUBJECT: GEOPAK Output Tables		
	454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SCN	DATE: 30-Mar-22	OF
	Rock Hill, South Carolina 29730-3392	CHEK'D BY: GPP	DATE: 31-Mar-22	8

GEOPAK Output Tables

GEOPAK Output Type: **Node**

Node ID	Node Library Item	Node Ref. PGL	Node Station	Node Elevation	Node Depth	Node Tc Used	Node Cuml. Dis.	Notes
EXIP-531	DUMMY JOINT	OLDNAT_FP-2	17+18.02	632.00	1.81	5.00	3.66	
EXOP-532	OP	OLDNAT_FP-2	17+20.56	627.59	0.00	0.00	0.00	
OEP-1407	DUMMY JOINT	FLINTHILL_FP	16+31.39	671.47	0.00	14.00	8.23	
Outlet-1	OP	US21FP	41+50.00	575.00	0.00	0.00	0.00	
Outlet-2	OP	US21FP	42+75.00	568.50	0.00	0.00	0.00	
Outlet-3	OP	US21FP	39+50.00	566.37	0.00	0.00	0.00	
Outlet-4	OP	US21FP	66+74.23	617.00	0.00	0.00	0.00	
Outlet-5	OP	US21FP	101+28.50	653.00	0.00	0.00	0.00	
Outlet-7	OP	US21FP	123+89.32	604.00	0.00	0.00	0.00	
Outfall-9	OP	SC51FP	316+18.59	590.10	0.00	0.00	0.00	
Outlet-10	OP	SC51FP	316+29.60	590.10	0.00	0.00	0.00	
Outlet-12	OP	US21FP	34+09.92	575.58	0.00	0.00	0.00	
Outlet-14	OP	FLINTHILL_FP	12+44.07	661.38	0.00	0.00	0.00	
Outlet-15	OP	FLINT2_FP	21+47.87	596.00	2.32	0.00	0.00	
Outlet-16	OP	GH-REAL_FP	18+60.68	640.00	2.00	0.00	0.00	
Outlet-4a	OP	US21FP	67+14.45	617.43	0.00	0.00	0.00	
Outlet-4b	OP	US21FP	73+44.85	627.40	0.00	0.00	0.00	
Outlet-4c	OP	US21FP	16+91.00	629.03	0.00	0.00	0.00	
outlet-20	OP	OLDNAT_FP-2	18+67.18	629.90	0.00	0.00	0.00	
Outfall-11	OP	REGENTPKWY_FP	15+10.93	637.78	4.84	0.00	0.00	
Outfall-13	OP	21TOCLTPRO	22+00.00	622.46	0.00	0.00	0.00	
; W/MH- 62	M.H.	REGENTPKWY_FI	15+10.02	637.77	4.52	0.00	0.00	
; W/MH- 62	M.H.	REGENTPKWY	15+10.02	637.77	4.52	0.00	0.00	

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 10

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
EP-043	CB-009	MH-042	Circular	Concrete	1	15	46.18	1.12	0.94	597.85	599.10	598.29	2.41	597.31	598.56	597.61	4.13
EP-044	CB-008	CB-009	Circular	Concrete	1	15	32.23	0.16	0.52	597.92	599.17	598.32	1.52	597.87	599.12	598.29	1.41
EP-531	EXIP-531	EDI-531A	Circular	Plastic	1	12	5.71	2.8	3.66	630.19	631.19	631.71	4.66	630.03	631.03	630.69	6.63
NP-001	CB-001	CB-002	Circular	Concrete	1	18	248.96	0.58	1.15	610.20	611.70	610.72	2.14	608.73	610.23	609.10	3.42
NP-002	CB-002	CB-003	Circular	Concrete	1	18	193.4	1.2	2.53	608.73	610.23	609.35	3.67	606.36	607.86	606.82	5.52
NP-003	CB-003	CB-026	Circular	Concrete	1	18	169.47	0.99	3.73	606.36	607.86	607.11	4.20	604.64	606.14	605.23	5.75
NP-004	CB-026	MH-038	Circular	Concrete	1	36	47.45	8.64	37.11	589.68	592.68	592.33	5.61	585.25	588.25	586.26	17.75
NP-005	CB-006	CB-005	Circular	Concrete	1	18	259.34	0.51	7.48	594.96	596.46	596.46	4.23	593.63	595.13	594.76	5.22
NP-006	CB-010	CB-006	Circular	Concrete	1	18	123.09	0.51	3.71	595.61	597.11	596.68	2.74	594.96	596.46	596.46	2.1
NP-007	DI-007	CB-006	Circular	Concrete	1	18	7.52	6.00	2.54	595.03	596.53	596.47	1.46	594.34	595.84	596.46	1.44
NP-008	CB-005	CB-004	Circular	Concrete	1	18	152.36	1.19	8.27	593.64	595.14	594.76	5.82	591.78	593.28	592.68	7.5
NP-010	CB-012	CB-010	Circular	Concrete	1	18	106.22	0.52	0.70	596.18	597.68	596.68	1.36	595.61	597.11	596.68	0.52
NP-011	DI-011	CB-010	Circular	Concrete	1	18	8.27	6	1.93	596.35	597.85	597.02	2.52	595.61	597.11	595.92	7.47
NP-013	CB-013	CB-015	Circular	Concrete	1	24	203.21	3.22	6.01	592.53	594.53	593.63	3.41	585.86	587.86	586.36	9.79
NP-014	DI-014	CB-013	Circular	Concrete	1	18	14.84	4.62	4.84	593.9	595.4	595.17	3.02	593.03	594.53	593.55	8.79
NP-015	CB-015	MH-040a	Circular	Concrete	1	24	16.56	6.00	7.29	585.86	587.86	587.10	3.59	584.64	586.64	585.20	10.15
NP-016	CB-016	CB-017	Circular	Concrete	1	18	193.99	1.23	1.53	587.67	589.17	588.29	2.23	585.24	586.74	585.59	4.82
NP-017	CB-017	CB-018	Circular	Concrete	1	18	157.40	1.10	2.72	585.24	586.74	585.88	3.77	583.46	584.96	583.95	5.47
NP-018	CB-019	CB-018	Circular	Concrete	1	30	58.01	1.5	16.81	579.53	582.03	580.92	6	578.6	581.1	579.61	9.05
NP-019	CB-214a	CB-019	Circular	Concrete	1	30	73.22	1.50	16.39	580.69	583.19	582.06	5.95	579.53	582.03	580.51	9.19
NP-020	CB-020	CB-021	Circular	Concrete	1	18	71.64	0.54	2.69	610.35	611.85	611.14	2.84	609.94	611.44	610.52	4.24
NP-021	CB-021	CB-024	Circular	Concrete	1	18	122.53	0.45	3.50	609.94	611.44	610.81	3.31	609.37	610.87	610.17	3.70
NP-022	DI-022	CB-020	Circular	Concrete	1	18	7.91	6	2.35	611.06	612.56	611.88	2.39	610.35	611.85	610.69	7.67
NP-023	DI-023	CB-021	Circular	Concrete	1	18	11.50	5.13	0.42	610.73	612.23	611.02	1.80	609.94	611.44	610.08	5.26
NP-024	CB-024	CB-025	Circular	Concrete	1	24	81.5	1.69	7.59	608.87	610.87	610.17	3.53	607.43	609.43	608.1	8.15
NP-025	CB-025	CB-028	Circular	Concrete	1	24	193.34	0.80	14.22	607.43	609.43	609.28	4.68	605.84	607.84	607.01	7.42
NP-026	DI-026	CB-024	Circular	Concrete	1	18	9.71	3.12	2.68	609.8	611.3	610.69	2.47	609.37	610.87	609.79	6.59
NP-027	DI-027	CB-025	Circular	Concrete	1	18	11.30	0.48	5.54	608.00	609.50	609.39	3.24	607.93	609.43	609.28	3.30
NP-028	CB-028	CB-027	Circular	Concrete	1	24	167.66	1.06	18.48	605.84	607.84	607.81	5.9	604.02	606.02	605.3	8.74
NP-029	DI-029	CB-028	Circular	Concrete	1	18	9.14	3.50	3.56	606.80	608.30	607.86	2.68	606.34	607.84	607.81	2.03
NP-030	CB-032	CB-030	Circular	Concrete	1	18	119.75	0.4	5.89	593.57	595.07	594.61	4.52	593.07	594.57	594.01	5.07
NP-032	CB-033	CB-032	Circular	Concrete	1	18	204.63	0.40	4.94	594.40	595.90	595.33	4.30	593.57	595.07	594.61	3.79
NP-033	CB-034	CB-033	Circular	Concrete	1	18	93.64	0.4	3.53	594.79	596.29	595.71	3.1	594.4	595.9	595.33	3.07
NP-034	CB-113b	CB-034	Circular	Concrete	1	18	125.30	0.40	2.36	595.31	596.81	596.10	2.49	594.79	596.29	595.71	2.08
NP-035	CB-035	CB-034	Circular	Concrete	1	18	44.31	1.16	0.36	598.66	600.16	598.93	1.73	598.1	599.6	598.28	3.08

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 10

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-036	CB-036	CB-041	Circular	Concrete	1	18	93.72	0.50	0.14	611.00	612.50	611.18	1.13	610.51	612.01	610.73	0.90
NP-037	CB-037	CB-034	Circular	Concrete	1	18	39.7	0.43	0.2	598.29	599.79	598.49	1.35	598.1	599.6	598.27	1.81
NP-038	MH-038	OP-39	Circular	Concrete	1	36	54.73	0.95	37.05	575.61	578.61	577.60	7.45	575.07	578.07	576.71	9.38
NP-040	MH-040	OP-41	Circular	Concrete	1	24	21.22	6	7.27	571.61	573.61	572.57	4.89	570.23	572.23	570.78	10.41
NP-041	CB-041	CB-001	Circular	Concrete	1	18	42.56	0.45	0.14	610.51	612.01	610.73	0.90	610.30	611.80	610.72	0.35
NP-042	MH-042	DI-011	Circular	Concrete	1	18	9.54	1.94	0.93	597.06	598.56	597.48	2.33	596.8	598.3	597.06	4.56
NP-043	CB-030	CB-004	Circular	Concrete	1	36	72.00	0.46	25.17	590.95	593.95	593.15	4.54	590.60	593.60	592.86	4.40
NP-103	CB-103	CB-200a	Circular	Concrete	1	18	212.84	2.98	0.42	586.78	588.28	587.06	1.8	580.31	581.81	580.46	4.49
NP-105	CB-105	CB-106	Circular	Concrete	1	18	191.05	1.25	0.11	595.45	596.95	595.62	0.98	593.01	594.51	593.48	0.24
NP-106	CB-106	CB-109	Circular	Concrete	1	18	40	0.5	0.22	593.01	594.51	593.48	0.47	592.79	594.29	593.48	0.28
NP-108	CB-108	CB-109	Circular	Concrete	1	18	136.64	1.31	0.56	594.63	596.13	594.96	1.93	592.79	594.29	593.00	3.68
NP-109	CB-109	CB-110	Circular	Concrete	1	18	142.34	2.19	1.81	592.79	594.29	593.48	2.3	589.59	591.09	589.92	6.21
NP-110	CB-110a	MH-109a	Circular	Concrete	1	30	20.33	7.00	4.15	582.63	585.13	583.50	2.74	580.94	583.44	581.29	9.86
NP-111	CB-111	CB-110a	Circular	Concrete	1	18	119.95	3.86	0.91	588.41	589.91	588.85	2.08	583.63	585.13	583.84	6.19
NP-200	CB-200	CB-201	Circular	Concrete	1	24	88.37	0.44	17.91	579.41	581.41	581.17	6.11	579.00	581.00	580.52	6.97
NP-201	CB-201	Outlet-1	Circular	Concrete	1	24	58.25	0.96	18.63	575.58	577.58	577.51	5.99	575	577	576.35	8.28
NP-202	CB-202	CB-212	Circular	Concrete	1	18	237.85	3.94	9.39	588.14	589.64	589.33	6.22	578.60	580.10	579.27	12.19
NP-203	CB-203	CB-213	Circular	Concrete	1	24	122.28	4.19	13.96	592.26	594.26	593.61	6.19	586.97	588.97	587.7	13.36
NP-204	CB-204	CB-204a	Circular	Concrete	1	18	163.13	2.75	6.50	606.53	608.03	607.54	5.15	601.94	603.44	602.55	9.67
NP-205	CB-205	CB-241a	Circular	Concrete	1	24	72.06	2.83	10.28	603.6	605.6	604.75	5.48	601.45	603.45	602.16	10.37
NP-206	CB-206	CB-204	Circular	Concrete	1	18	305.03	2.83	4.69	615.28	616.78	616.14	4.51	606.53	608.03	607.04	8.95
NP-207	CB-207	CB-207c	Circular	Concrete	1	24	52.39	0.54	6.53	612.17	614.17	613.08	4.69	611.87	613.87	612.7	5.25
NP-208	CB-208	CB-206	Circular	Concrete	1	18	336.00	2.83	2.61	624.90	626.40	625.53	3.73	615.28	616.78	615.65	7.57
NP-209	CB-209	CB-207a	Circular	Concrete	1	18	303.25	4.21	1.93	626.1	627.6	626.77	2.52	613.17	614.67	613.47	7.99
NP-212	CB-212	MH-212a	Circular	Concrete	1	18	31.13	4.26	10.73	578.48	579.98	580.25	6.07	576.99	578.49	577.79	11.16
NP-213	CB-213	CB-221a	Circular	Concrete	1	24	51.66	6.58	14.44	586.97	588.97	588.49	5.64	583.3	585.3	584.01	14.42
NP-214	MH-214	Outlet-3	Circular	Concrete	1	30	31.27	0.45	18.83	566.52	569.02	568.07	5.89	566.37	568.87	567.81	6.44
NP-215	CB-215	CB-208	Circular	Concrete	1	18	138.29	2.83	1.68	628.92	630.42	629.58	2.25	624.9	626.4	625.2	6.66
NP-216	CB-216	CB-202	Circular	Concrete	1	18	138.36	6.08	8.59	596.80	598.30	597.95	5.92	588.14	589.64	588.71	13.88
NP-219	DI-219	DI-220	Circular	Concrete	1	18	112.96	2.67	2.28	616.36	617.86	617.16	2.38	613.24	614.74	613.6	7.12
NP-220	DI-220	CB-207a	Circular	Concrete	1	18	18.04	0.30	3.31	613.24	614.74	614.16	2.92	613.17	614.67	613.87	4.14
NP-221	DI-221	CB-221a	Circular	Concrete	1	18	10.65	1.35	1.44	584	585.5	584.59	2.21	583.8	585.3	584.15	4.58
NP-222	DI-222	CB-209	Circular	Concrete	1	18	12.92	1.00	1.00	626.27	627.77	626.75	2.05	626.10	627.60	626.77	1.30
NP-226	CB-226	CB-246	Circular	Concrete	1	18	69.13	0.32	3.99	629.12	630.62	630.01	3.66	628.89	630.39	629.65	4.41
NP-227	CB-227a	CB-227	Circular	Concrete	1	24	102.91	0.90	9.25	630.31	632.31	631.47	4.91	629.35	631.35	630.23	6.93

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 10

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-228	CB-228	CB-227a	Circular	Concrete	1	18	126.05	0.74	7.68	631.26	632.76	632.48	4.98	630.3	631.8	631.3	6.13
NP-229	CB-229	CB-229a	Circular	Concrete	1	18	63.52	0.50	5.94	632.61	634.11	633.87	3.75	632.27	633.77	633.27	4.74
NP-230	CB-230	CB-229	Circular	Concrete	1	18	144.59	0.5	3.55	633.35	634.85	634.12	3.91	632.61	634.11	633.31	4.4
NP-232	CB-232	CB-228	Circular	Concrete	1	18	51.65	0.50	7.01	632.04	633.54	633.13	5.12	631.76	633.26	632.79	5.45
NP-233	CB-233	Outfall-13	Circular	Concrete	1	30	38.81	1.51	9.35	623.07	625.57	624.31	3.87	622.46	624.96	623.2	7.6
NP-234	CB-234	CB-229	Circular	Concrete	1	18	68.73	0.43	1.67	632.81	634.31	633.90	1.22	632.50	634.00	633.87	0.99
NP-235	CB-235	CB-234	Circular	Concrete	1	18	172.87	1.59	0.69	635.62	637.12	635.99	2	632.81	634.31	633.03	4.19
NP-236	CB-210	CB-236	Circular	Concrete	1	18	126.58	0.51	1.16	634.92	636.42	635.44	2.15	634.26	635.76	634.65	3.23
NP-237	CB-236	MH-244	Circular	Concrete	1	18	68.57	0.52	2.57	634.26	635.76	634.89	3.63	633.88	635.38	634.46	4.1
NP-238	MH-244	MH-245	Circular	Concrete	1	18	71.76	0.46	2.54	633.88	635.38	634.57	3.19	633.53	635.03	634.12	3.94
NP-239	DI-239	DI-245a	Circular	Concrete	1	18	73.34	1.85	7.97	631.63	633.13	633.45	4.51	630.2	631.7	630.98	8.6
NP-240	CB-242a	CB-501	Circular	Concrete	1	18	224.81	0.50	8.18	634.21	635.71	635.83	4.63	633.07	634.57	634.38	4.99
NP-241	CB-241	CB-203a	Circular	Concrete	1	24	73.67	2.83	12.51	597.89	599.89	599.17	5.9	595.69	597.69	596.48	10.88
NP-242	OEP-242	MH-243	Circular	Concrete	1	18	92.83	0.49	6.14	635.18	636.68	636.67	3.48	634.72	636.22	635.96	3.94
NP-243	MH-243	CB-242a	Circular	Concrete	1	18	14.63	0.5	6.05	634.72	636.22	635.96	3.88	634.63	636.13	635.83	4
NP-244	CB-244	CB-226	Circular	Concrete	1	18	111.61	0.38	3.03	629.56	631.06	630.52	2.55	629.12	630.62	630.01	2.78
NP-245	CB-246	CB-233	Circular	Concrete	1	24	142.68	3.67	8.81	628.39	630.39	629.62	4.36	623	625	623.59	11.38
NP-501	CB-501	CB-501a	Circular	Concrete	1	18	105.39	0.98	8.96	633.07	634.57	634.38	5.47	632.00	633.50	633.01	7.06
NP-502	CB-502	MH-530	Circular	Concrete	1	24	34.82	6.21	10.22	627.45	629.45	628.93	4.11	625.05	627.05	625.67	12.39
NP-503	CB-503	CB-502a	Circular	Concrete	1	24	42.71	5.29	11.89	628.20	630.20	629.91	4.16	625.73	627.73	626.42	12.46
NP-504	CB-504	CB-504a	Circular	Concrete	1	18	109.84	1.01	1.95	633.81	635.31	634.53	2.31	632.66	634.16	633.08	4.83
NP-505	MH-505a	Outlet-4b	Circular	Concrete	1	30	17.02	8.00	31.73	628.91	631.41	630.93	7.45	627.40	629.90	628.60	13.62
NP-506	CB-506	CB-506a	Circular	Concrete	1	30	73.66	0.32	16.18	635.39	637.89	636.88	5.33	635.15	637.65	636.69	5.07
NP-507	CB-507	CB-508	Circular	Concrete	1	18	234.86	0.82	2.56	634.39	635.89	635.17	2.75	632.43	633.93	632.94	4.84
NP-508	CB-508	CB-509	Circular	Concrete	1	24	77.99	0.98	5.09	629.38	631.38	630.41	3.11	628.58	630.58	629.21	6.06
NP-509	CB-524	CB-508	Circular	Concrete	1	18	29.00	0.45	1.39	631.91	633.41	632.50	2.15	631.76	633.26	632.19	3.27
NP-510	CB-510	CB-522	Circular	Concrete	1	18	142	0.68	2.1	632.5	634	633.06	3.5	631.5	633	631.98	4.3
NP-511	CB-511	CB-510	Circular	Concrete	1	18	141.59	1.03	1.26	634.00	635.50	634.54	2.17	632.50	634.00	632.83	4.28
NP-512	CB-512	CB-512a	Circular	Concrete	1	30	100.52	0.77	16.22	633.75	636.25	635.2	5.48	632.94	635.44	634.07	7.52
NP-513	CB-513	CB-512	Circular	Concrete	1	24	130.05	0.31	13.54	634.67	636.67	636.24	5.12	634.25	636.25	635.58	6.13
NP-514	CB-514	CB-513	Circular	Concrete	1	24	131.98	0.32	13.01	635.1	637.1	636.66	4.96	634.67	636.67	636.24	4.92
NP-515	CB-515	CB-514	Circular	Concrete	1	24	108.30	0.31	12.64	635.45	637.45	636.99	4.88	635.10	637.10	636.66	4.82
NP-516	CB-516	CB-505	Circular	Concrete	1	30	264.83	1.07	19.64	634.67	637.17	636.18	6.32	631.8	634.3	632.94	8.97
NP-517	CB-517	CB-524	Circular	Concrete	1	18	105.03	0.74	0.63	633.96	635.46	634.31	1.97	633.15	634.65	633.41	3.12
NP-518	CB-509	CB-503	Circular	Concrete	1	24	84	0.91	7.73	629	631	630.34	3.45	628.2	630.2	629	6.62

STV Inc.	JOB: S-160 Widening	SHEET
Consulting Engineers	SUBJECT: GEOPAK Output Tables	
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SCN DATE: 30-Mar-22	OF
Rock Hill, South Carolina 29730-3392	CHEK'D BY: GPP DATE: 31-Mar-22	10

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-519	CB-512a	CB-505	Circular	Concrete	1	30	76.36	1.42	16.62	632.94	635.44	634.71	4.47	631.80	634.30	632.80	9.09
NP-520	CB-520	CB-521	Circular	Concrete	1	18	140.6	1.2	0.13	634.59	636.09	634.77	1.06	632.85	634.35	633.07	0.77
NP-521	CB-521	CB-518	Circular	Concrete	1	18	109.30	0.49	0.35	632.85	634.35	633.07	2.16	632.30	633.80	632.61	1.33
NP-522	CB-522	CB-509	Circular	Concrete	1	24	25.22	1.71	2.15	631	633	631.52	3.29	630.5	632.5	630.86	5.56
NP-524	OEP-524	MH-526	Circular	Concrete	1	18	63.65	0.52	1.76	637.22	638.72	637.90	2.27	636.88	638.38	637.35	3.69
NP-525	DI-525	outlet-20	Circular	Concrete	1	18	75.8	1.03	0.77	630.7	632.2	631.1	2.04	629.9	631.4	630.16	3.69
NP-526	MH-526	CB-501	Circular	Concrete	1	18	58.25	5.58	1.74	636.88	638.38	637.47	2.66	633.41	634.91	633.67	8.52
NP-527	DI-523	DI-522	Circular	Concrete	1	18	34.33	0.37	1.3	640.04	641.54	640.6	2.18	639.9	641.4	640.53	1.86
NP-528	DI-522	CB-512	Circular	Concrete	1	18	83.38	4.85	2.10	639.90	641.40	640.53	3.01	635.66	637.16	635.95	8.59
NP-529	CB-518	CB-524	Circular	Concrete	1	18	78.09	0.48	0.66	632.3	633.8	632.61	2.48	631.91	633.41	632.2	2.68
NP-530	MH-530	Outlet-4	Circular	Concrete	1	24	31.50	0.92	10.21	617.31	619.31	618.71	4.35	617.00	619.00	617.96	6.85
NP-600	CB-600	CB-600c	Circular	Concrete	1	24	33.1	0.33	13.79	636.98	638.98	638.78	4.64	636.86	638.86	638.66	4.62
NP-601	CB-601	CB-601a	Circular	Concrete	1	24	42.18	0.33	12.17	637.65	639.65	639.33	4.33	637.50	639.50	639.23	4.20
NP-602	CB-602	CB-601	Circular	Concrete	1	24	125.97	0.31	11.78	638.05	640.05	639.61	4.48	637.65	639.65	639.33	4.19
NP-603	CB-603	CB-602a	Circular	Concrete	1	24	43.57	0.30	9.39	638.72	640.72	640.04	4.28	638.58	640.58	639.96	4.07
NP-604	CB-604	CB-604b	Circular	Concrete	1	18	149.21	2.25	5.96	644.92	646.42	645.88	5	641.47	642.97	642.08	8.78
NP-605	CB-605	CB-604	Circular	Concrete	1	18	161.58	2.11	4.75	648.42	649.92	649.28	4.55	644.92	646.42	645.47	8.08
NP-606	CB-606	CB-605	Circular	Concrete	1	18	199.03	2.19	3.06	652.86	654.36	653.55	3.86	648.42	649.92	648.85	7.24
NP-607	CB-607	CB-515	Circular	Concrete	1	24	352.99	0.31	12.14	636.55	638.55	638.03	4.87	635.45	637.45	636.99	4.69
NP-608	CB-608	CB-607	Circular	Concrete	1	24	213.03	0.31	11.16	637.23	639.23	638.62	4.8	636.55	638.55	638.03	4.47
NP-609	CB-609	CB-608	Circular	Concrete	1	24	135.14	0.32	9.95	637.58	639.58	638.90	4.51	637.14	639.14	638.62	4.00
NP-610	CB-610	CB-609a	Circular	Concrete	1	24	43.87	0.29	8.27	638.23	640.23	639.41	4.29	638.09	640.09	639.3	4.16
NP-611	CB-611	CB-611a	Circular	Concrete	1	18	86.73	1.04	7.03	639.83	641.33	640.90	5.22	638.89	640.39	639.74	6.84
NP-612	CB-612	CB-611	Circular	Concrete	1	18	287.01	0.68	5.1	641.82	643.32	642.91	3.68	639.83	641.33	640.62	5.44
NP-613	CB-613	CB-612	Circular	Concrete	1	18	110.86	0.45	3.68	643.33	644.83	644.08	4.18	642.82	644.32	643.55	4.29
NP-614	CB-614	CB-613	Circular	Concrete	1	18	128.86	7.15	2.9	652.84	654.34	653.51	3.83	643.33	644.83	643.65	10.84
NP-617	CB-617	CB-619	Circular	Concrete	1	18	80.35	0.47	0.42	646.79	648.29	647.07	1.80	646.39	647.89	646.85	0.91
NP-618	CB-619	CB-612	Circular	Concrete	1	18	28.5	1.2	0.88	646.39	647.89	646.85	1.9	646	647.5	646.27	4.05
NP-619	CB-618	CB-619	Circular	Concrete	1	18	109.68	2.19	0.49	650.57	652.07	650.88	1.87	648.08	649.58	648.26	4.20
NP-620	CB-620	CB-622	Circular	Concrete	1	18	13.3	0.75	2.36	637.07	638.57	637.89	2.4	636.94	638.44	637.45	4.45
NP-622	CB-622	ECB-623	Circular	Concrete	1	18	39.77	4.64	2.54	636.94	638.44	637.55	3.74	635.00	636.50	635.33	8.66
NP-623	ECB-623	Outfall-11	Circular	Concrete	1	18	129.4	1.59	4.6	635	636.5	636.08	3.38	632.94	634.44	633.52	7.21
NP-700	CB-700	CB-606	Circular	Concrete	1	18	271.81	1.76	0.91	657.71	659.21	658.15	2.08	652.86	654.36	653.11	4.69
NP-701	CB-701	CB-701b	Circular	Concrete	1	18	73.91	0.53	1.88	659.39	660.89	660.08	2.34	658.98	660.48	659.47	3.78
NP-702	CB-702	CB-708	Circular	Concrete	1	18	77.72	0.50	4.89	658.36	659.86	659.54	3.29	657.95	659.45	658.80	4.75

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GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-703	CB-703	CB-702	Circular	Concrete	1	18	186.54	2.19	0.99	662.53	664.03	663	2.11	658.36	659.86	658.61	5.2
NP-704	CB-704	CB-705	Circular	Concrete	1	18	181.00	0.31	1.41	663.89	665.39	664.53	1.97	663.32	664.82	664.39	1.06
NP-706	CB-706	CB-614	Circular	Concrete	1	18	230.96	2.19	1.47	657.99	659.49	658.59	2.21	652.84	654.34	653.14	5.85
NP-707	CB-707	CB-707b	Circular	Concrete	1	18	46.05	0.54	1.28	659.38	660.88	659.82	2.99	659.11	660.61	659.50	3.44
NP-708	CB-708	Outlet-5	Circular	Concrete	1	24	143.36	3.06	10.19	657.45	659.45	658.99	3.93	653	655	653.67	11.09
NP-709	CB-709	CB-708	Circular	Concrete	1	18	186.43	2.41	2.11	662.53	664.03	663.10	3.45	657.95	659.45	658.30	6.74
NP-710	CB-710	CB-705	Circular	Concrete	1	18	72.01	2.84	1.5	665.48	666.98	666.09	2.22	663.32	664.82	663.61	6.43
NP-714	DI-714	CB-704	Circular	Concrete	1	18	11.18	0.50	0.28	663.97	665.47	664.53	0.46	663.89	665.39	664.53	0.39
NP-715	DI-715	CB-705	Circular	Concrete	1	18	11.42	6	0.17	664.25	665.75	664.44	1.26	663.32	664.82	664.39	0.13
NP-800	CB-800	CB-801	Circular	Concrete	1	18	192.03	0.31	4.41	662.38	663.88	663.33	3.73	661.78	663.28	662.86	3.22
NP-801	CB-801	CB-802	Circular	Concrete	1	18	249.09	0.3	5.39	661.78	663.28	662.86	3.94	661	662.5	662	4.33
NP-802	CB-802	CB-803	Circular	Concrete	1	18	198.92	1.14	6.43	661.00	662.50	662.00	5.16	658.69	660.19	659.47	6.97
NP-803	CB-803	CB-804	Circular	Concrete	1	24	229.72	0.87	10.8	658.19	660.19	659.68	4.32	656.16	658.16	657.13	7.17
NP-804	CB-804	CB-805	Circular	Concrete	1	24	296.41	3.50	11.70	656.16	658.16	657.40	5.72	645.64	647.64	646.33	12.19
NP-806	CB-805	CB-806	Circular	Concrete	1	30	220.89	0.55	17.3	645.15	647.65	646.86	4.82	643.92	646.42	645.21	6.78
NP-807	CB-807	CB-808	Circular	Concrete	1	18	299.18	0.32	1.02	664.46	665.96	664.95	2.02	663.50	665.00	664.10	1.56
NP-808	CB-808	CB-809	Circular	Concrete	1	18	183.17	1.22	2.32	663.5	665	664.1	3.55	661.22	662.72	661.66	5.41
NP-809	CB-809	CB-816	Circular	Concrete	1	18	97.46	1.37	3.40	661.22	662.72	661.94	4.06	659.83	661.33	660.35	6.28
NP-810	CB-810	CB-811	Circular	Concrete	1	18	112.27	2.18	0.89	658.03	659.53	658.47	2.08	655.5	657	655.73	5.03
NP-811	CB-811	CB-812	Circular	Concrete	1	18	285.73	2.97	2.07	655.50	657.00	656.06	3.44	646.90	648.40	647.23	7.21
NP-812	CB-812	CB-805	Circular	Concrete	1	24	72	0.3	5.74	645.88	647.88	647.1	2.87	645.65	647.65	646.86	2.88
NP-813	CB-813	CB-812	Circular	Concrete	1	24	190.34	0.32	2.68	646.50	648.50	647.16	2.99	645.88	647.88	647.10	1.34
NP-816	CB-816	CB-803	Circular	Concrete	1	18	72	0.95	3.9	659.41	660.91	660.38	3.22	658.69	660.19	659.31	5.7
NP-900	CB-900	CB-806A	Circular	Concrete	1	30	153.33	0.31	16.80	632.20	634.70	634.04	4.33	631.72	634.22	633.83	3.80
NP-901	CB-902	CB-901	Circular	Concrete	1	30	183.72	0.34	14.79	633.58	636.08	634.94	5.42	632.95	635.45	634.44	4.84
NP-902	CB-903	CB-902	Circular	Concrete	1	24	300.37	0.31	13.28	635.02	637.02	636.88	4.36	634.08	636.08	635.39	6.08
NP-903	CB-901	CB-900	Circular	Concrete	1	30	238.07	0.3	15.86	632.94	635.44	634.44	5.15	632.2	634.7	634.04	4.08
NP-904	CB-904	CB-813	Circular	Concrete	1	18	152.27	0.31	1.46	647.48	648.98	648.00	2.67	647.00	648.50	647.45	3.24
NP-905	MH-050	MH-055	Circular	Concrete	1	18	196.28	1.15	3.47	643.69	645.19	644.63	2.96	641.39	642.89	641.94	5.95
NP-906	CB-906	CB-908	Circular	Concrete	1	24	39.03	0.30	8.93	639.06	641.06	640.44	3.88	638.93	640.93	640.37	3.69
NP-907	CB-907	CB-910	Circular	Concrete	1	18	39.09	2.39	0.41	637.92	639.42	638.2	1.79	636.89	638.39	637.05	4.13
NP-908	CB-908	CB-909	Circular	Concrete	1	24	198.12	0.30	9.16	638.93	640.93	640.37	3.79	638.33	640.33	639.41	5.29
NP-909	CB-909	CB-910	Circular	Concrete	1	24	123.04	1.12	9.98	637.7	639.7	638.86	5.26	636.28	638.28	637.15	7.66
NP-910	CB-910	CB-903	Circular	Concrete	1	24	47.89	2.43	10.89	636.28	638.28	637.84	4.14	635.02	637.02	635.80	9.58
NP-911	CB-911	CB-1001b	Circular	Concrete	1	18	64.28	0.44	4.25	640.83	642.33	641.66	4.24	640.53	642.03	641.47	3.65

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-913	DI-913	CB-900	Circular	Concrete	1	18	11.14	6.00	0.71	634.69	636.19	635.07	2.01	633.78	635.28	633.95	6.34
NP-914	DI-914	CB-902	Circular	Concrete	1	18	18.01	4.8	1.03	636.19	637.69	636.67	2.12	635.13	636.63	635.35	6.65
NP-915	MH-060	CB-906	Circular	Concrete	1	24	8.17	0.33	8.35	639.10	641.10	640.62	3.25	639.06	641.06	640.44	3.62
NP-916	CB-906a	MH-055	Circular	Concrete	1	18	7.94	3.06	1.91	641.75	643.25	642.47	2.26	641.39	642.89	642.52	1.34
NP-917	CB-905	MH-050	Circular	Concrete	1	18	5.56	2.66	1.89	643.94	645.44	644.65	2.30	643.69	645.19	644.63	1.62
NP-918	CB-905a	MH-045	Circular	Concrete	1	18	8.11	3.1	1.64	645.58	647.08	646.23	2.25	645.21	646.71	645.53	5.85
EP-1401	ECB-1401	ECB-1402	Circular	Plastic	1	15	175.57	0.67	1.76	665.41	666.66	666.15	2.31	664.23	665.48	664.71	4.10
EP-1501	EDI-1501	Outlet-15	Circular	Concrete	1	18	77.73	1.48	7.4	594.83	596.33	596.54	4.19	593.68	595.18	594.47	7.82
EP-531a	EDI-531A	EXOP-532	Circular	Concrete	1	18	41.19	2.28	3.67	628.53	630.03	629.48	3.12	627.59	629.09	628.08	7.36
NP-003a	CB-004	CB-026	Circular	Concrete	1	36	107	0.49	33.69	590.29	593.29	592.86	5.22	589.75	592.75	592.33	5.2
NP-028a	CB-027	CB-030	Circular	Concrete	1	24	107.00	1.25	19.30	604.02	606.02	605.61	7.22	602.63	604.63	603.88	9.30
NP-040a	MH-040a	MH-040	Circular	Concrete	1	24	11.35	6	7.28	578.07	580.07	579.04	4.84	577.17	579.17	577.76	9.48
NP-1001	CB-1001	CB-1002	Circular	Concrete	1	18	171.58	0.80	10.26	639.18	640.68	640.50	6.23	637.77	639.27	639.00	6.60
NP-1002	CB-1002	CB-1003a	Circular	Concrete	1	18	113.8	1.92	12.01	637.77	639.27	639.2	6.9	635.51	637.01	636.5	9.71
NP-1003	CB-1003	CB-1004a	Circular	Concrete	1	18	43.33	3.25	14.82	633.48	634.98	634.91	8.52	631.94	633.44	632.97	11.51
NP-1004	CB-1004	CB-1005	Circular	Concrete	1	18	216.24	3.91	18.88	627.75	629.25	629.29	10.68	619.15	620.65	620.2	14.2
NP-1005	CB-1005	CB-1006	Circular	Concrete	1	24	182.98	2.56	19.40	618.65	620.65	620.23	7.27	613.87	615.87	614.87	12.31
NP-1006	CB-1006	CB-1007	Circular	Concrete	1	24	136.35	3.32	22.83	613.87	615.87	615.96	7.27	609.21	611.21	610.25	13.86
NP-1007	CB-1007	CB-1007a	Circular	Concrete	1	24	90.43	3.33	15.76	609.21	611.21	610.64	6.55	606.07	608.07	606.92	12.34
NP-1008	CB-1008	CB-1101	Circular	Concrete	1	24	173.59	2.86	17.04	602.17	604.17	603.66	6.77	597.09	599.09	597.99	12.41
NP-1017	CB-1017	CB-1018	Circular	Concrete	1	42	254.71	2.86	24.81	622.06	625.56	624.00	4.53	614.66	618.16	615.53	13.27
NP-1018	CB-1018	CB-1019	Circular	Concrete	1	42	158.2	2.74	27.34	614.66	618.16	616.43	5.61	610.21	613.71	611.15	13.14
NP-1019	CB-1019	CB-1020	Circular	Concrete	1	42	148.98	3.33	27.91	610.21	613.71	611.84	6.35	605.12	608.62	606.03	14.10
NP-1020	CB-1020	CB-1103	Circular	Concrete	1	42	229.06	3.28	28.47	605.12	608.62	606.77	6.39	597.47	600.97	598.37	14.45
NP-1021	DI-1021	DI-1022	Circular	Concrete	1	36	139.91	3.46	13.46	632.99	635.99	634.17	5.18	628.00	631.00	628.65	12.00
NP-1022	DI-1022	DI-1023	Circular	Concrete	1	36	223.51	2.37	19.48	628	631	629.46	5.69	622.61	625.61	623.46	11.76
NP-1023	DI-1023	CB-1017	Circular	Concrete	1	42	12.49	0.30	24.38	622.11	625.61	624.24	3.97	622.06	625.56	624.00	4.45
NP-1024	DI-1024	CB-1018	Circular	Concrete	1	18	9.75	0.3	1.86	616.7	618.2	617.4	2.29	616.66	618.16	617.17	3.48
NP-1025	DI-1025	CB-1005	Circular	Concrete	1	18	13.45	0.30	1.09	619.20	620.70	620.23	0.84	619.15	620.65	620.23	0.80
NP-1026	DI-1026	CB-1006	Circular	Concrete	1	18	9.45	0.97	2.66	614.5	616	615.96	1.52	614.37	615.87	615.96	1.51
NP-1027	DI-1027	CB-1007	Circular	Concrete	1	18	9.43	3.80	0.85	610.22	611.72	610.64	2.06	609.71	611.21	609.92	5.54
NP-1028	DI-1028	DI-1029	Circular	Concrete	1	18	100.86	3.72	11.7	638.78	640.28	641.51	6.62	634.88	636.38	635.68	12.29
NP-1029	DI-1029	DI-1021	Circular	Concrete	1	36	127.58	0.30	13.00	633.38	636.38	634.73	4.21	632.99	635.99	634.17	5.00
NP-109a	MH-109a	Outlet-12	Circular	Concrete	1	30	23.39	6	4.14	577.09	579.59	577.76	3.92	575.58	578.08	575.94	9.4
NP-1101	CB-1101	CB-1102	Circular	Concrete	1	24	101.84	1.29	17.62	597.09	599.09	598.61	6.89	595.72	597.72	596.89	9.20

STV	STV Inc. Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 10

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-1102	CB-1102	CB-1104	Circular	Concrete	1	24	72	0.95	17.89	594.94	596.94	596.99	5.69	594.22	596.22	595.53	8.21
NP-1103	CB-1103	CB-1104	Circular	Concrete	1	42	180.25	2.16	29.32	597.47	600.97	599.15	6.44	593.49	596.99	594.52	12.39
NP-1104	CB-1104	Outfall-9	Circular	Concrete	1	42	37	8.7	45.14	593.49	596.99	596.23	5.59	590.1	593.6	591.23	16.87
NP-1105	CB-1105	CB-1106	Circular	Concrete	1	18	29.27	0.34	0.55	596.03	597.53	596.94	0.49	595.92	597.42	596.94	0.43
NP-1106	CB-1106	CB-1112	Circular	Concrete	1	24	72	1.7	18.13	594.84	596.84	596.94	5.77	593.55	595.55	594.68	9.94
NP-1107	CB-1107	CB-1106a	Circular	Concrete	1	24	154.19	1.08	16.42	598.21	600.21	599.68	6.63	596.50	598.50	597.67	8.58
NP-1108	CB-1108	CB-1107	Circular	Concrete	1	24	212.79	2.26	15.14	603.1	605.1	604.84	5.21	598.21	600.21	599.11	11.09
NP-1109	CB-1109	DI-1121	Circular	Concrete	1	18	56.17	5.17	5.07	607.50	609.00	608.55	3.83	604.39	605.89	604.85	10.94
NP-1110	CB-1110	CB-1109a	Circular	Concrete	1	18	118.51	1.37	3.26	613.25	614.75	613.96	3.97	611.57	613.07	612.08	6.22
NP-1111	CB-1111	CB-1110	Circular	Concrete	1	18	164.00	1.07	1.98	615.04	616.54	615.59	3.39	613.25	614.75	613.67	4.95
NP-1112	CB-1112	Outlet-10	Circular	Concrete	1	42	60.39	4.04	32.39	592.62	596.12	594.77	5.24	590.1	593.6	591.13	13.73
NP-1113	CB-1113	CB-1112a	Circular	Concrete	1	24	166.00	1.62	15.89	600.39	602.39	601.83	6.55	597.64	599.64	598.66	9.89
NP-1114	CB-1114	CB-1113	Circular	Concrete	1	24	73.47	5.46	15.17	604.62	606.62	606.03	6.4	600.39	602.39	601.13	14.3
NP-1115	CB-1115	CB-1114	Circular	Concrete	1	24	166.25	2.11	14.34	608.22	610.22	609.59	6.24	604.62	606.62	605.51	10.64
NP-1116	CB-1116	CB-1115	Circular	Concrete	1	24	225.8	0.92	13.44	610.34	612.34	611.67	6.08	608.22	610.22	609.31	7.72
NP-1117	CB-1117	CB-1116	Circular	Concrete	1	24	163.19	0.31	12.81	610.86	612.86	612.38	4.99	610.34	612.34	611.67	5.80
NP-111a	CB-110	CB-110a	Circular	Concrete	1	18	91.27	6.25	2.72	589.59	591.09	590.23	3.79	583.63	585.13	583.94	10.13
NP-1120	DI-1120	CB-1108	Circular	Concrete	1	24	68.83	0.47	14.32	603.44	605.44	605.26	4.77	603.10	605.10	604.84	4.93
NP-1121	DI-1121	DI-1120	Circular	Concrete	1	24	89.22	0.48	11.46	603.89	605.89	605.55	4.1	603.44	605.44	605.26	3.81
NP-113a	CB-113a	CB-113b	Circular	Concrete	1	18	56.21	2.26	0.60	598.41	599.91	598.75	1.95	597.05	598.55	597.24	4.53
NP-113b	CB-113	CB-113b	Circular	Concrete	1	18	72.11	1	0.61	596.05	597.55	596.4	1.96	595.29	596.79	595.53	3.42
NP-1202	CB-1203	CB-1210	Circular	Concrete	1	18	182.27	1.53	0.55	619.00	620.50	619.33	1.92	616.15	617.65	616.35	3.86
NP-1203	CB-1210	CB-1209	Circular	Concrete	1	18	72	0.71	2.23	616	617.5	616.74	2.56	615.46	616.96	615.95	4.41
NP-1204	CB-1204	CB-1210	Circular	Concrete	1	18	62.83	0.46	1.77	616.46	617.96	617.14	2.27	616.15	617.65	616.64	3.54
NP-1205	CB-1205	CB-1205a	Circular	Concrete	1	24	98.62	0.31	11.82	611.99	613.99	613.46	4.77	611.67	613.67	613.18	4.66
NP-1206	CB-1206	CB-1205	Circular	Concrete	1	24	106.07	0.31	9.75	612.33	614.33	613.67	4.39	611.99	613.99	613.46	3.93
NP-1207	CB-1207	CB-1206b	Circular	Concrete	1	24	51.74	0.32	7.33	613.02	615.02	614.09	4.3	612.84	614.84	613.97	4
NP-1208	CB-1208	CB-1216	Circular	Concrete	1	18	102.23	0.31	4.12	614.71	616.21	615.62	3.68	614.38	615.88	615.40	3.22
NP-1209	CB-1209	CB-1208	Circular	Concrete	1	18	182.2	0.4	3.43	615.46	616.96	616.38	3.02	614.71	616.21	615.62	3.06
NP-1216	CB-1216	CB-1207a	Circular	Concrete	1	18	149.77	0.31	4.89	614.38	615.88	615.40	3.82	613.91	615.41	615.05	3.37
NP-1402	ECB-1402	CB-1403	Circular	Concrete	1	18	48.96	2.26	3.78	664.08	665.58	664.9	3.8	662.93	664.43	663.42	7.51
NP-1403	CB-1403	DI-1404	Circular	Concrete	1	30	40.00	0.30	15.90	662.04	664.54	663.85	4.18	661.91	664.41	663.26	5.90
NP-1404	DI-1404	Outlet-14	Circular	Concrete	1	30	83.01	0.51	16.73	661.81	664.31	663.23	5.83	661.38	663.88	662.67	6.52
NP-1405	CB-1405	CB-1403	Circular	Concrete	1	24	64.03	0.44	12.07	662.84	664.84	664.17	5.46	662.54	664.54	663.85	5.54
NP-1406	DI-1406	CB-1405	Circular	Concrete	1	24	88.79	0.54	11.98	663.43	665.43	664.74	5.5	662.93	664.93	664.12	6.13

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-1407	OEP-1407	DI-1406	Circular	Concrete	1	18	219.40	3.41	8.23	671.47	672.97	673.34	4.66	663.93	665.43	664.58	11.13
NP-1601	DI-1601	Outlet-16	Circular	Concrete	1	18	89.04	1.12	1.21	639.02	640.52	639.55	2.16	638	639.5	638.32	4.35
NP-200a	CB-200a	CB-200	Circular	Concrete	1	24	128.29	0.31	16.53	579.82	581.82	582.11	5.26	579.41	581.41	581.17	5.63
NP-200b	DI-100	CB-200a	Circular	Concrete	1	24	17.05	0.44	13.91	579.4	581.4	582.17	4.43	579.32	581.32	582.11	4.43
NP-203a	CB-203a	CB-203b	Circular	Concrete	1	24	57.27	2.84	13.10	595.69	597.69	597.00	6.02	593.95	595.95	594.78	10.71
NP-203b	CB-203b	CB-203	Circular	Concrete	1	24	55.72	2.83	13.55	593.95	595.95	595.28	6.11	592.26	594.26	593.11	10.73
NP-204a	CB-204a	CB-216	Circular	Concrete	1	18	177.48	2.83	7.49	601.94	603.44	603.01	5.54	596.80	598.30	597.45	10.16
NP-205a	CB-205a	CB-205b	Circular	Concrete	1	24	59.95	2.83	8.44	609.27	611.27	610.31	5.1	607.46	609.46	608.1	9.75
NP-205b	CB-205b	CB-205c	Circular	Concrete	1	24	63.35	2.84	9.06	607.46	609.46	608.54	5.23	605.55	607.55	606.21	9.97
NP-205c	CB-205c	CB-205	Circular	Concrete	1	24	64.7	2.84	9.67	605.55	607.55	606.67	5.36	603.6	605.6	604.29	10.14
NP-207a	CB-207a	CB-207b	Circular	Concrete	1	24	100.66	0.31	5.97	612.67	614.67	613.84	3.15	612.35	614.35	613.27	4.24
NP-207b	CB-207b	CB-207	Circular	Concrete	1	24	52.08	0.32	6	612.35	614.35	613.27	4.26	612.17	614.17	613.08	4.31
NP-207c	CB-207c	CB-207d	Circular	Concrete	1	24	64.80	0.68	7.18	611.87	613.87	612.82	4.83	611.40	613.40	612.23	5.84
NP-207d	CB-207d	CB-205a	Circular	Concrete	1	24	70.81	2.85	7.8	611.4	613.4	612.4	4.97	609.27	611.27	609.87	9.74
NP-211a	CB-211b	CB-211a	Circular	Concrete	1	18	69.27	0.48	1.54	634.86	636.36	635.85	1.25	634.51	636.01	635.84	0.93
NP-211b	CB-211	CB-211b	Circular	Concrete	1	18	75.14	0.49	0.8	635.25	636.75	635.85	1.22	634.86	636.36	635.85	0.65
NP-212a	MH-212a	Outlet-2	Circular	Concrete	1	18	41.93	0.48	10.71	568.71	570.21	570.49	6.06	568.50	570.00	569.76	6.78
NP-214a	CB-018	MH-214	Circular	Concrete	1	30	16.21	4.84	18.83	576.89	579.39	578.82	4.62	575.92	578.42	576.88	10.88
NP-214b	CB-214b	CB-214a	Circular	Concrete	1	30	81.64	1.65	16.13	582.10	584.60	583.51	5.65	580.69	583.19	581.63	9.51
NP-221a	CB-221a	CB-214b	Circular	Concrete	1	30	138.73	0.49	15.44	582.8	585.3	584.23	5.33	582.1	584.6	583.35	6.31
NP-227a	CB-227	Outlet-4c	Circular	Concrete	1	24	105.73	0.30	10.33	629.35	631.35	630.91	3.93	629.03	631.03	630.18	5.52
NP-228a	DI-228a	CB-228	Circular	Concrete	1	18	10.1	1.14	0.18	631.92	633.42	632.48	0.3	631.76	633.26	632.48	0.22
NP-229a	CB-229a	CB-232	Circular	Concrete	1	18	41.03	0.51	6.29	632.27	633.77	633.27	5.03	632.04	633.54	633.13	4.59
NP-238a	MH-245	CB-230	Circular	Concrete	1	18	33.26	0.49	2.5	633.53	635.03	634.23	3.1	633.35	634.85	633.93	3.99
NP-241a	CB-241a	CB-241b	Circular	Concrete	1	24	64.21	2.84	11.14	601.45	603.45	602.65	5.63	599.51	601.51	600.25	10.48
NP-241b	CB-241b	CB-241	Circular	Concrete	1	24	53.07	2.84	11.86	599.51	601.51	600.75	5.78	597.89	599.89	598.67	10.38
NP-242a	CB-211a	CB-242a	Circular	Concrete	1	18	54.66	0.51	2.07	634.51	636.01	635.84	1.25	634.21	635.71	635.83	1.17
NP-245a	DI-245a	CB-246	Circular	Concrete	1	18	54.15	2.26	8.69	630.2	631.7	631.74	4.92	628.89	630.39	629.68	9.22
NP-501a	CB-501a	CB-502	Circular	Concrete	1	24	82.45	4.86	9.77	631.50	633.50	632.65	5.20	627.30	629.30	627.89	12.59
NP-502a	CB-502b	MH-503a	Circular	Concrete	1	24	34.71	1.76	13.21	622.37	624.37	623.85	5.3	621.69	623.69	622.66	8.78
NP-502b	CB-502a	CB-502b	Circular	Concrete	1	24	64.83	4.88	12.35	625.73	627.73	627.03	5.73	622.37	624.37	623.06	12.95
NP-503a	MH-503a	Outlet-4a	Circular	Concrete	1	24	31.19	1.57	13.21	617.95	619.95	619.62	4.72	617.43	619.43	618.43	8.38
NP-504a	CB-504a	CB-503	Circular	Concrete	1	18	117.89	1.61	2.91	632.66	634.16	633.32	3.87	630.70	632.20	631.16	6.38
NP-505a	CB-505	MH-505a	Circular	Concrete	1	30	18.54	8	31.73	631.8	634.3	634.48	6.46	630.01	632.51	631.17	14.15
NP-506a	CB-506a	CB-506b	Circular	Concrete	1	30	21.87	0.35	17.03	635.15	637.65	636.69	5.34	635.06	637.56	636.64	5.19

STV	**STV Inc.** Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, South Carolina 29730-3392	JOB: S-160 Widening SUBJECT: GEOPAK Output Tables CALC'D BY: SCN DATE: 30-Mar-22 CHEK'D BY: GPP DATE: 31-Mar-22	SHEET OF 10

GEOPAK Output Tables

GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-506b	CB-506b	CB-506c	Circular	Concrete	1	30	35.16	0.33	17.93	635.06	637.56	636.64	5.47	634.93	637.43	636.54	5.36
NP-506c	CB-506c	CB-516	Circular	Concrete	1	30	79.06	0.32	18.81	634.93	637.43	636.54	5.62	634.67	637.17	636.18	6.05
NP-506d	DI-506d	CB-506	Circular	Concrete	1	18	11.95	6	4.89	637.35	638.85	638.63	3.04	636.39	637.89	636.9	9.25
NP-507a	DI-507A	CB-507	Circular	Concrete	1	18	88.73	0.52	1.30	634.87	636.37	635.43	2.18	634.39	635.89	634.80	3.39
NP-512a	CB-519	CB-523	Circular	Concrete	1	18	99.38	0.48	0.14	639	640.5	639.18	1.13	638.5	640	638.67	1.29
NP-512b	CB-523	CB-512	Circular	Concrete	1	18	40.00	0.68	0.14	638.50	640.00	638.67	1.29	638.20	639.70	638.29	3.07
NP-600a	CB-600a	CB-506	Circular	Concrete	1	24	195.65	0.31	15.51	636.5	638.5	638.32	5.18	635.89	637.89	637.31	6.5
NP-600b	CB-600b	CB-600a	Circular	Concrete	1	24	42.59	0.33	14.94	636.66	638.66	638.47	4.99	636.50	638.50	638.32	4.99
NP-600c	CB-600c	CB-600b	Circular	Concrete	1	24	59.35	0.32	14.39	636.86	638.86	638.66	4.83	636.66	638.66	638.47	4.8
NP-601a	CB-601a	CB-600	Circular	Concrete	1	24	164.20	0.31	13.39	637.50	639.50	639.23	4.63	636.98	638.98	638.78	4.50
NP-602a	CB-602a	CB-602b	Circular	Concrete	1	24	67.73	0.32	10.3	638.58	640.58	639.96	4.46	638.35	640.35	639.81	4.2
NP-602b	CB-602b	CB-602	Circular	Concrete	1	24	89.59	0.32	10.99	638.35	640.35	639.81	4.48	638.05	640.05	639.61	4.18
NP-603a	DI-603a	CB-603	Circular	Concrete	1	18	16.52	1	0.87	639.43	640.93	640.03	1.31	639.22	640.72	640.04	0.89
NP-604a	CB-604a	CB-603	Circular	Concrete	1	18	74.61	1.10	9.21	640.09	641.59	641.59	5.21	639.22	640.72	640.22	7.40
NP-604b	CB-604b	CB-604a	Circular	Concrete	1	18	73.99	1.77	7.11	641.47	642.97	642.52	5.36	640.09	641.59	640.83	8.25
NP-604c	DI-604C	CB-604a	Circular	Concrete	1	18	7.86	9.28	1.55	641.19	642.69	641.81	2.23	640.09	641.59	640.33	8.33
NP-609a	CB-609a	CB-609	Circular	Concrete	1	24	148.07	0.34	9.37	638.09	640.09	639.3	4.72	637.58	639.58	638.9	4.25
NP-611a	CB-611a	CB-610	Circular	Concrete	1	24	44.11	0.33	7.71	638.39	640.39	639.51	4.26	638.23	640.23	639.41	4.00
NP-623a	JB W/MH- 623a	Outfall-11	Circular	Concrete	1	18	3.26	6	0	633.25	634.75	634.54	0	632.94	634.44	634.54	0
NP-701a	CB-701a	CB-701	Circular	Concrete	1	18	37.69	0.92	0.68	659.77	661.27	660.14	2.00	659.39	660.89	659.64	3.43
NP-701b	CB-701b	CB-702	Circular	Concrete	1	18	151.41	0.4	2.84	658.98	660.48	659.66	3.66	658.36	659.86	659.54	1.91
NP-702a	CB-702a	CB-701	Circular	Concrete	1	18	42.78	0.92	0.27	659.82	661.32	660.07	1.44	659.39	660.89	660.08	0.34
NP-704a	CB-704a	CB-704	Circular	Concrete	1	18	30.82	0.89	0.2	664.2	665.7	664.53	0.72	663.89	665.39	664.53	0.28
NP-705a	CB-705	CB-800	Circular	Concrete	1	18	308.43	0.30	3.92	663.32	664.82	664.39	2.93	662.38	663.88	663.33	3.32
NP-707a	CB-707a	CB-707	Circular	Concrete	1	18	35.97	0.83	0.55	659.71	661.21	660.04	1.92	659.38	660.88	659.61	3.09
NP-707b	CB-707b	CB-708	Circular	Concrete	1	18	150.31	0.75	2.27	659.11	660.61	659.69	3.55	657.95	659.45	658.44	4.52
NP-710a	CB-710a	CB-709	Circular	Concrete	1	18	172.76	1.3	1.02	664.82	666.32	665.3	2.12	662.53	664.03	662.81	4.38
NP-801a	CB-801a	CB-801b	Circular	Concrete	1	18	188.86	0.30	0.09	665.14	666.64	665.30	0.84	664.56	666.06	664.95	0.24
NP-801b	CB-801b	CB-807	Circular	Concrete	1	18	31.14	0.3	0.19	664.56	666.06	664.95	0.51	664.46	665.96	664.95	0.37
NP-806a	CB-806	CB-806A	Circular	Concrete	1	30	91.32	1.00	18.03	643.92	646.42	645.36	6.14	642.97	645.47	644.10	8.36
NP-900a	CB-806A	MH-913A	Circular	Concrete	1	36	84.42	0.32	33.17	631.22	634.22	633.83	5.09	630.94	633.94	632.81	7.16
NP-903a	MH-805a	MH-805b	Circular	Concrete	1	36	50.33	5.56	32.73	610.14	613.14	612.34	5.89	607.14	610.14	608.18	15.08
NP-903b	MH-805b	Outlet-7	Circular	Concrete	1	36	52.93	0.97	32.68	604.53	607.53	606.39	7.12	604	607	605.52	9.1
NP-904a	DI-904A	CB-904	Circular	Concrete	1	18	52.93	0.39	0.27	647.70	649.20	648.01	1.06	647.48	648.98	648.00	0.50
NP-905a	MH-045	MH-050	Circular	Concrete	1	18	94.76	1.54	1.64	645.21	646.71	645.81	2.47	643.69	645.19	644.04	5.33

	STV Inc.	JOB: S-160 Widening	SHEET
	Consulting Engineers	SUBJECT: GEOPAK Output Tables	
	454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: SCN DATE: 30-Mar-22	OF
	Rock Hill, South Carolina 29730-3392	CHEK'D BY: GPP DATE: 31-Mar-22	10

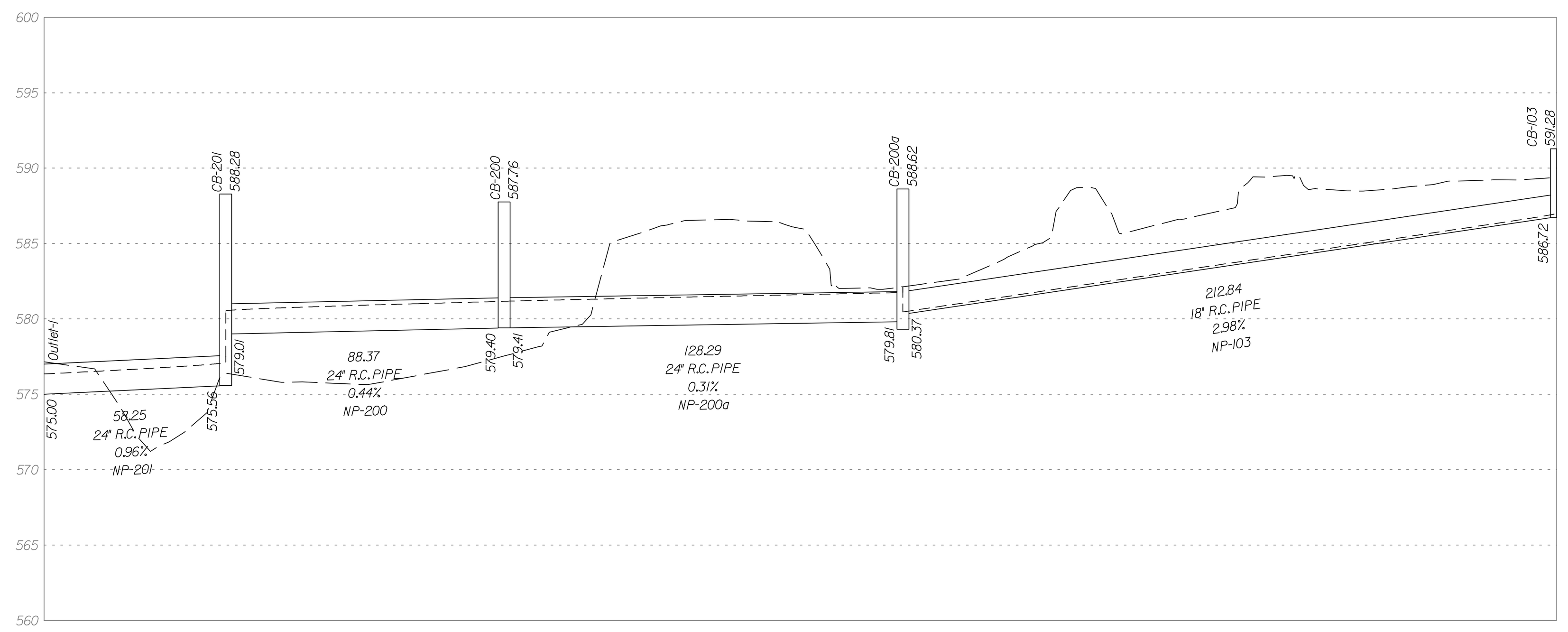
GEOPAK Output Tables

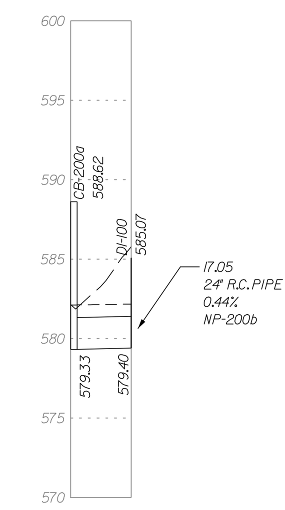
GEOPAK Output Type: **Link**

Link	Upstream	Downstream			Number	Rise	Actual			Upstream				Downstream			
ID	Node	Node	Shape	Material	of Barrels	(in)	Length	Slope	Discharge	Invert	Soffit	HGL	Velocity	Invert	Soffit	HGL	Velocity
NP-906a	MH-055	MH-060	Circular	Concrete	1	18	73.05	2.38	5.20	641.39	642.89	642.52	3.65	639.56	641.06	640.13	8.50
NP-907a	DI-907A	MH-060	Circular	Concrete	1	18	139.33	0.31	3.71	640	641.5	641.08	2.72	639.56	641.06	640.62	2.77
NP-911a	CB-911a	CB-911	Circular	Concrete	1	18	62.51	0.44	2.06	641.12	642.62	641.87	2.33	640.83	642.33	641.37	3.61
NP-913a	MH-913A	MH-805a	Circular	Concrete	1	36	267.99	6	32.95	626.44	629.44	628.31	7.13	610.14	613.14	611.02	19.02
NP-1001a	CB-1001a	CB-1001	Circular	Concrete	1	18	51.11	1.16	8.29	639.82	641.32	640.99	5.61	639.18	640.68	640.10	7.30
NP-1001b	CB-1001b	CB-1001a	Circular	Concrete	1	18	78.88	0.86	5.67	640.53	642.03	641.47	4.87	639.82	641.32	640.61	6.05
NP-1003a	CB-1003a	CB-1003	Circular	Concrete	1	18	70.38	2.73	13.84	635.51	637.01	636.99	7.86	633.48	634.98	634.48	11.12
NP-1004a	CB-1004a	CB-1004b	Circular	Concrete	1	18	31.29	2.83	15.62	631.94	633.44	633.4	8.92	630.94	632.44	632.07	10.93
NP-1004b	CB-1004b	CB-1004c	Circular	Concrete	1	18	38.20	3.34	16.49	630.94	632.44	632.39	9.44	629.53	631.03	630.63	11.82
NP-1004c	CB-1004c	CB-1004d	Circular	Concrete	1	18	22.41	3.1	17.27	629.53	631.03	630.99	9.86	628.71	630.21	629.92	11.34
NP-1004d	CB-1004d	CB-1004	Circular	Concrete	1	18	23.05	3.55	18.01	628.71	630.21	630.17	10.25	627.75	629.25	628.95	11.93
NP-1007a	CB-1007a	CB-1008	Circular	Concrete	1	24	113.17	3.33	16.24	606.07	608.07	607.53	6.62	602.17	604.17	603.03	12.67
NP-1106a	CB-1106a	CB-1106	Circular	Concrete	1	24	46.00	2.16	17.24	596.50	598.50	598.00	6.80	595.42	597.42	596.48	10.18
NP-1109a	CB-1109a	CB-1109	Circular	Concrete	1	18	89	4.38	4.9	611.57	613.07	612.44	4.61	607.5	609	607.97	10.48
NP-1112a	CB-1112a	CB-1112	Circular	Concrete	1	24	160.19	2.14	16.49	597.64	599.64	599.11	6.67	594.12	596.12	595.08	11.04
NP-1112b	DI-1112b	CB-1112	Circular	Concrete	1	18	11.57	0.3	0.37	594.67	596.17	594.94	1.74	594.62	596.12	594.86	2.13
NP-1200a	CB-1200a	CB-1200b	Circular	Concrete	1	18	77.59	0.31	0.55	615.95	617.45	616.28	1.92	615.69	617.19	616.09	1.44
NP-1200b	CB-1200b	CB-1111	Circular	Concrete	1	18	209.29	0.31	0.93	615.69	617.19	616.09	2.45	615.04	616.54	615.59	1.58
NP-1205a	CB-1205a	CB-1117	Circular	Concrete	1	24	264.27	0.30	12.32	611.67	613.67	613.18	4.86	610.86	612.86	612.38	4.80
NP-1206a	CB-1206a	CB-1206	Circular	Concrete	1	24	72.23	0.32	8.83	612.58	614.58	613.81	4.34	612.33	614.33	613.67	3.97
NP-1206b	CB-1206b	CB-1206a	Circular	Concrete	1	24	80.67	0.31	7.96	612.84	614.84	613.97	4.34	612.58	614.58	613.81	3.91
NP-1207a	CB-1207a	CB-1207	Circular	Concrete	1	18	120.31	0.31	5.94	613.91	615.41	615.05	4.1	613.52	615.02	614.46	5.09
NP-1207a	CB-1207a	CB-1207	Circular	Concrete	1	18	120.31	0.31	6.09	613.91	615.41	615.08	4.12	613.52	615.02	614.47	5.14

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	1149-004	US 21	

SYSTEM–1





SCALE: H: 1"=50' V: 1"=10'

LEGEND
- EXISTING GRADE
- STORM DRAINAGE PIPE
- HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE | RTE. | DWG. NO.

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7/13/2022

SYSTEM-2

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	1149-004	US 21	

SCALE: H: 1"=50' V: 1"=10'

LEGEND
- - - - - EXISTING GRADE
——— STORM DRAINAGE PIPE
- - - - - HYDRAULIC GRADE LINE

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
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ROCK HILL, SOUTH CAROLINA 29730

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STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE RTE. DWG. NO.

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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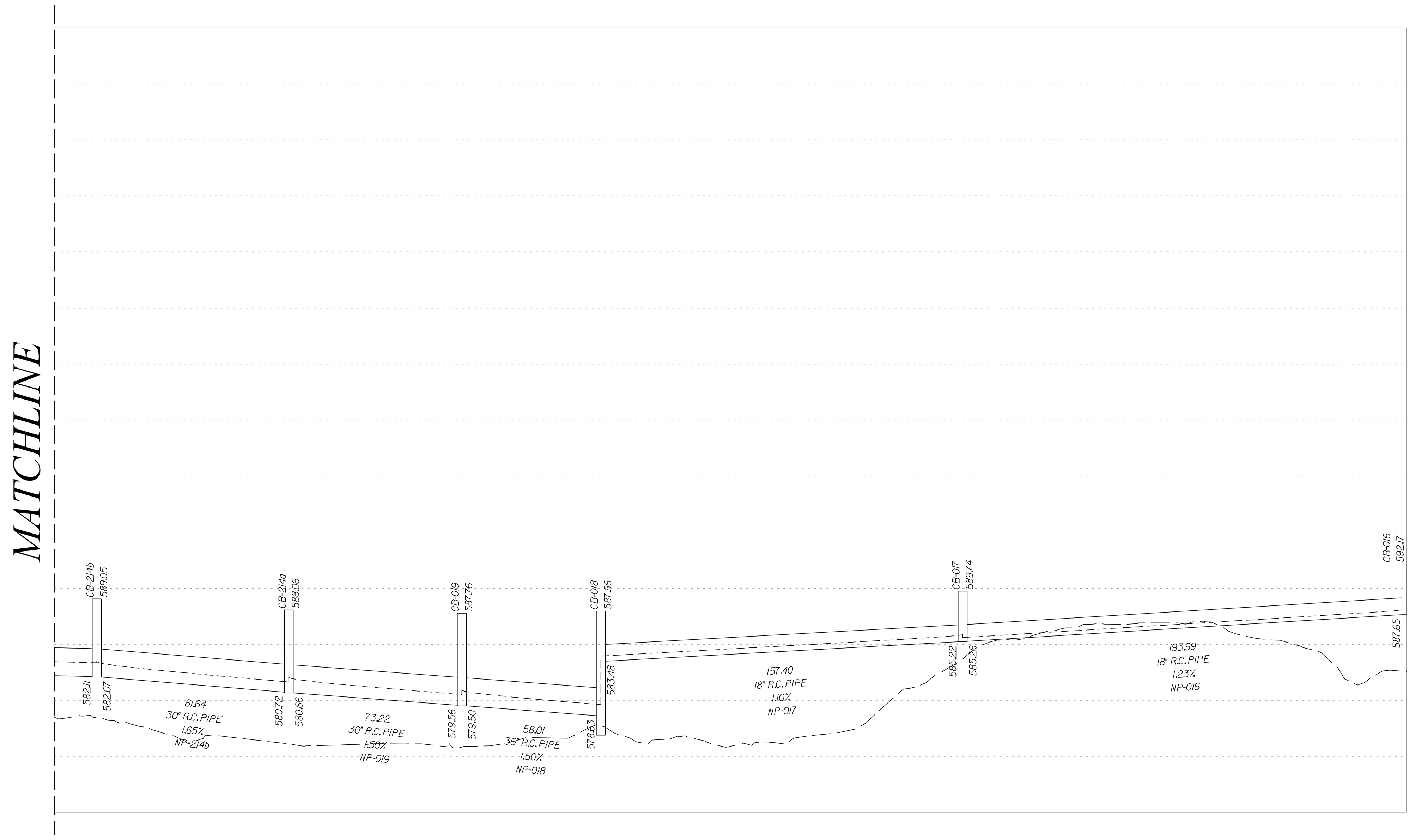
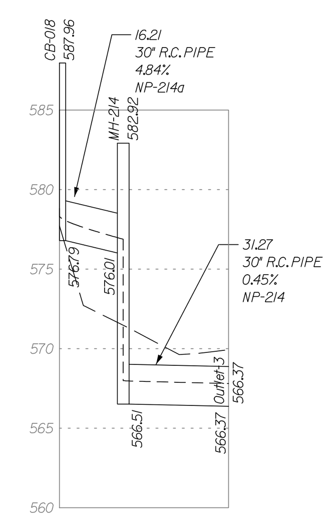
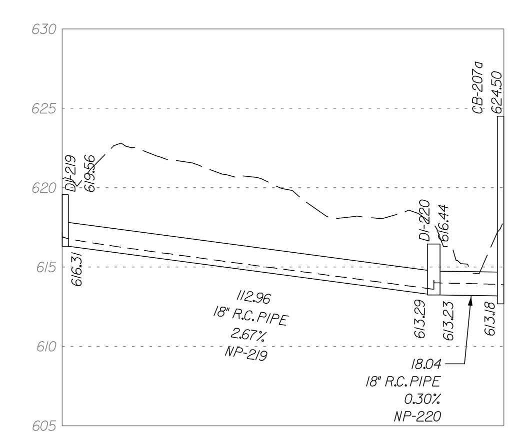
FINAL R/W PLANS FOR REVIEW ONLY

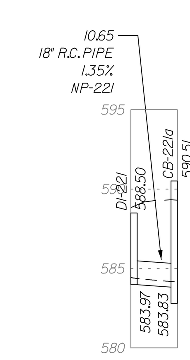
FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	

SYSTEM-3









SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
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REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

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7/13/2022

SYSTEM–4

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
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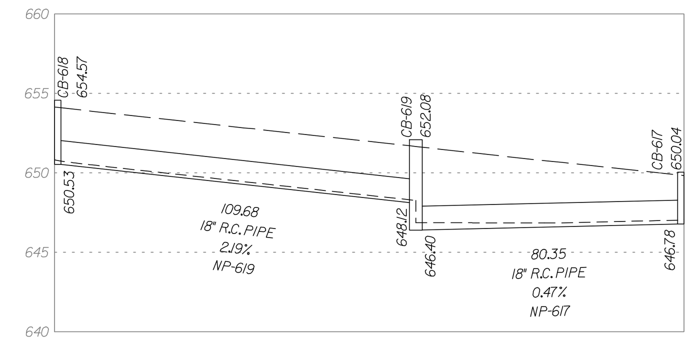

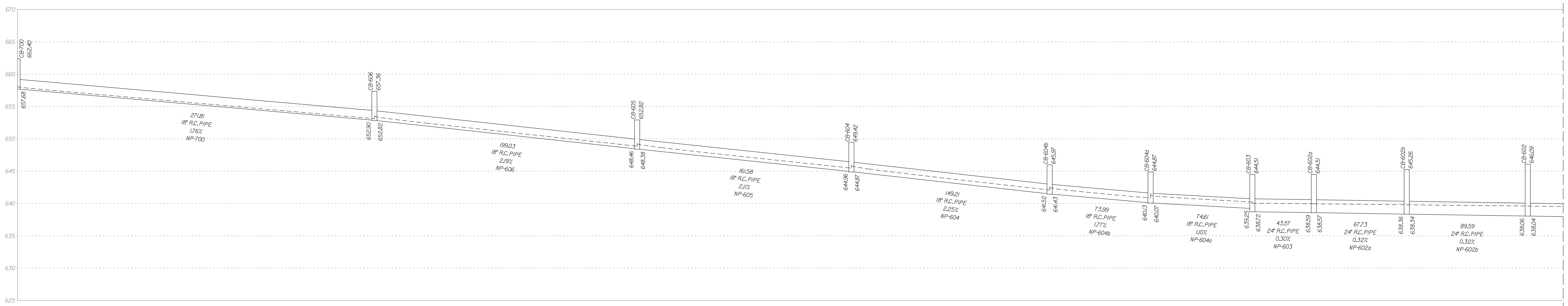

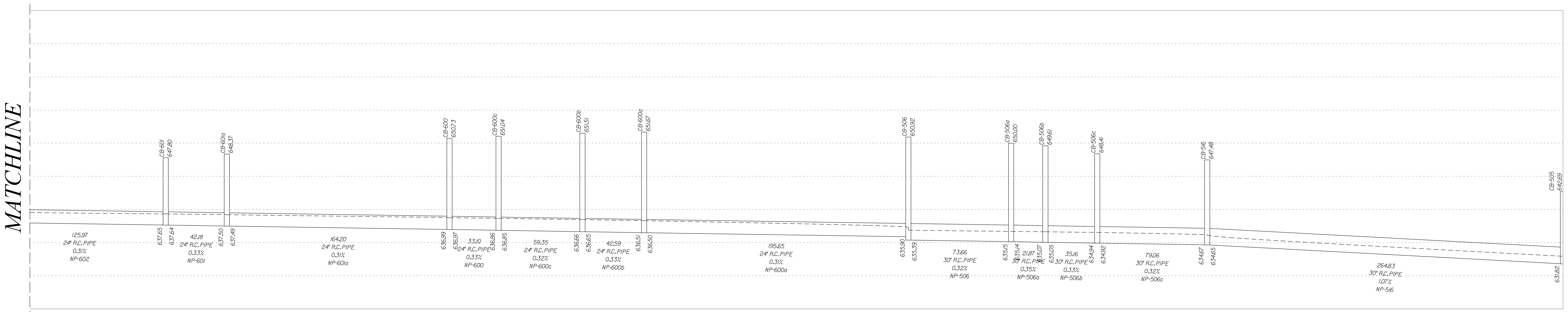

SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

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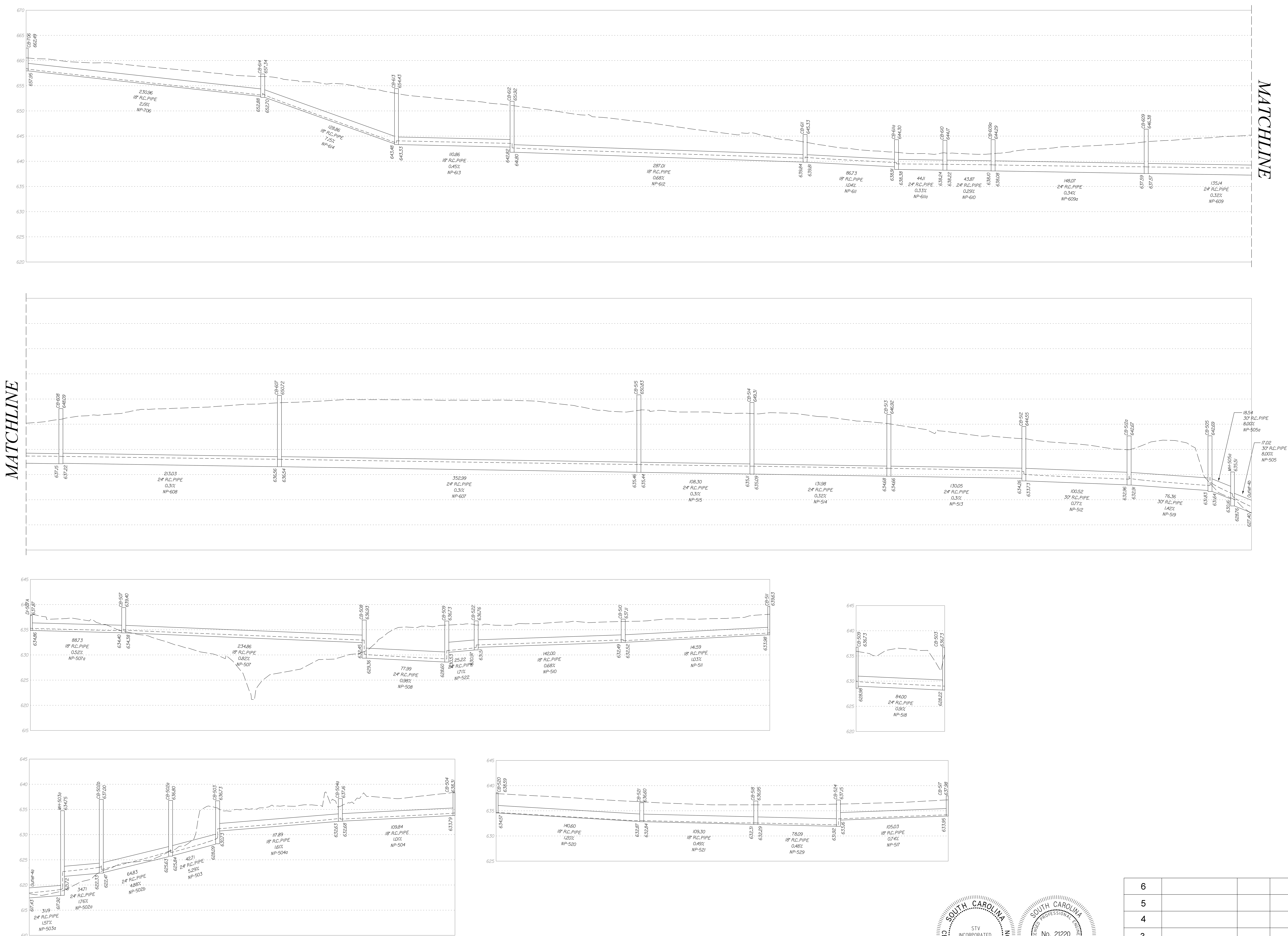
SYSTEM–4A

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	

FINAL R/W PLANS
FOR REVIEW ONLY



SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
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SOUTH CAROLINA
STV INCORPORATED NO. C03318
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE	RTE.	DWG. NO.

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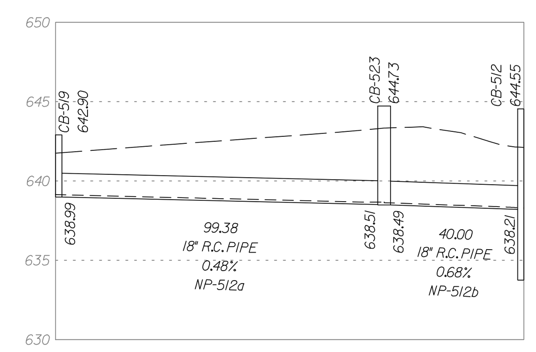
7/13/2022

SYSTEM-4B

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	1149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE RTE. DWG. NO.

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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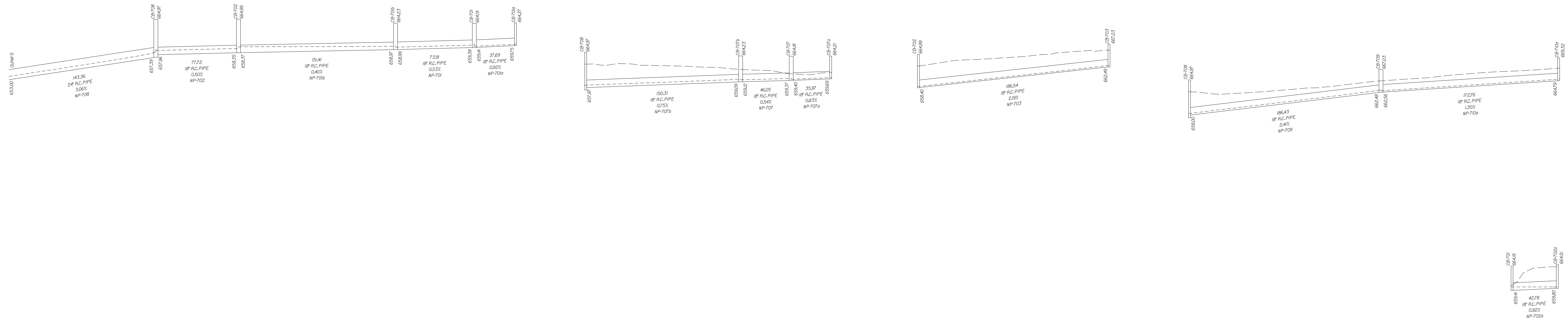
7/13/2022

SYSTEM-5

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	1149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND
- - - - - EXISTING GRADE
———— STORM DRAINAGE PIPE
- - - - - - - HYDRAULIC GRADE LINE

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STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION
STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE | RTE. | DWG. NO.

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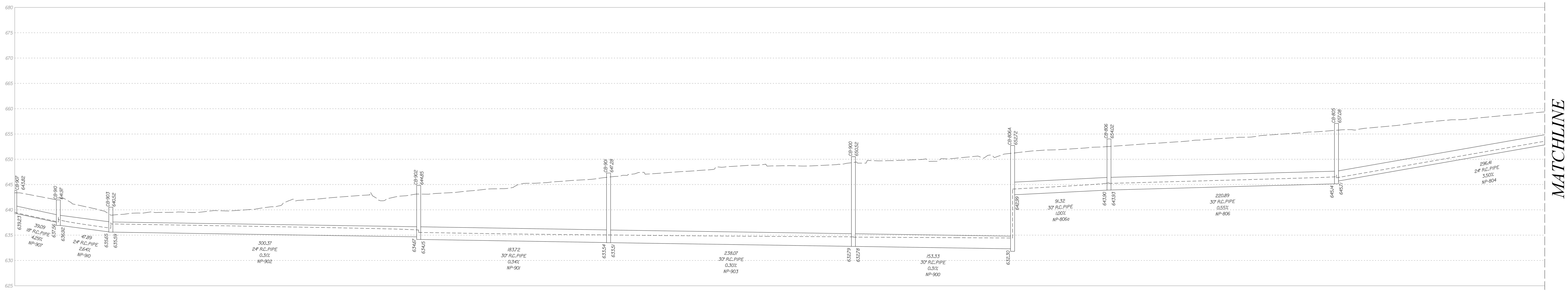
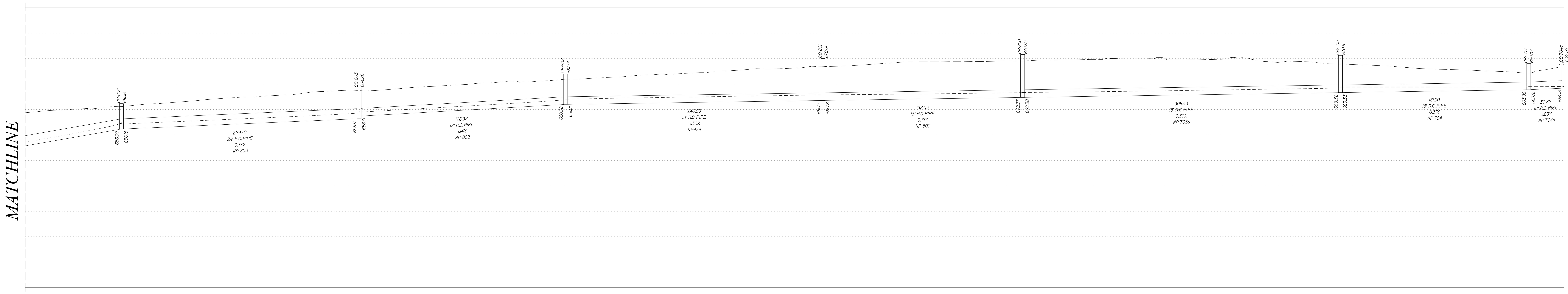
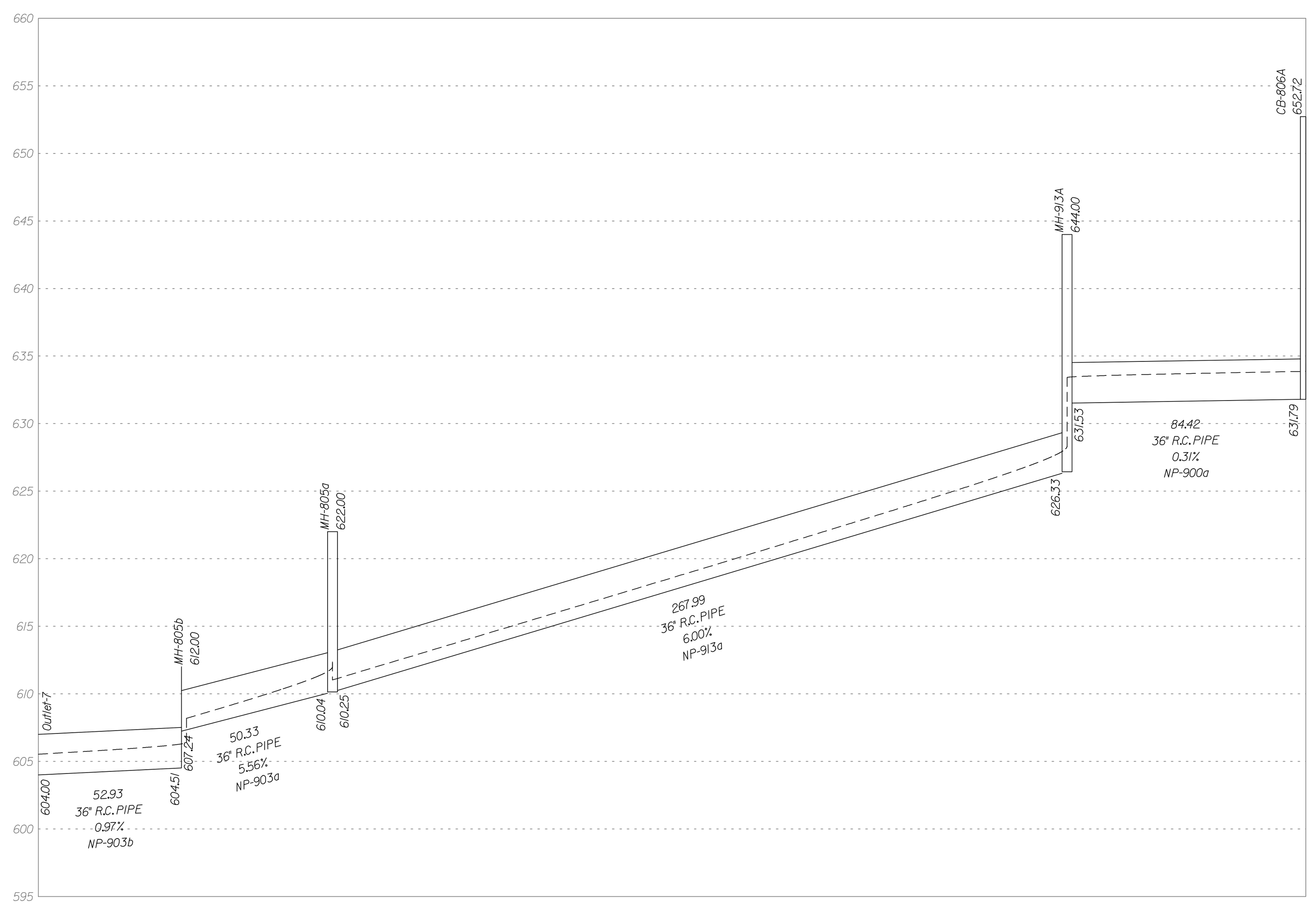
7/13/2022

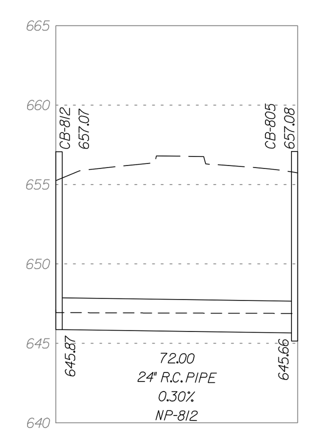
SYSTEM-6

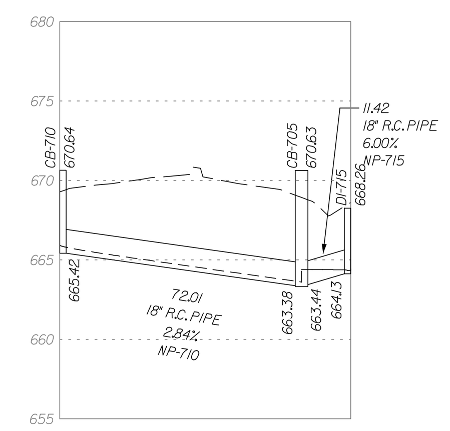
FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	1149-004	US 21	











SCALE: H: 1"=50' V: 1"=10'

LEGEND

EXISTING GRADE

STORM DRAINAGE PIPE

HYDRAULIC GRADE LINE

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ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
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SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE RTE. DWG. NO.

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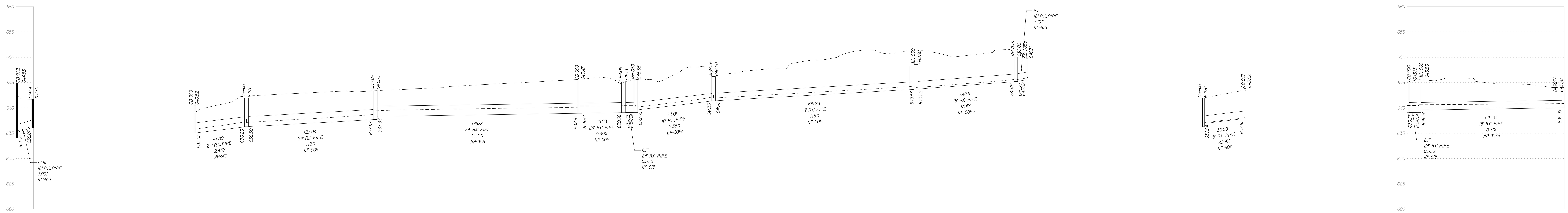
7/13/2022

SYSTEM–8

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	



SCALE: H: 1" = 50' V: 1" = 10'

LEGEND

- – – – – EXISTING GRADE
- ———— STORM DRAINAGE PIPE
- - - - - - - HYDRAULIC GRADE LINE

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SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

**US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE**

SCALE RTE. DWG. NO.

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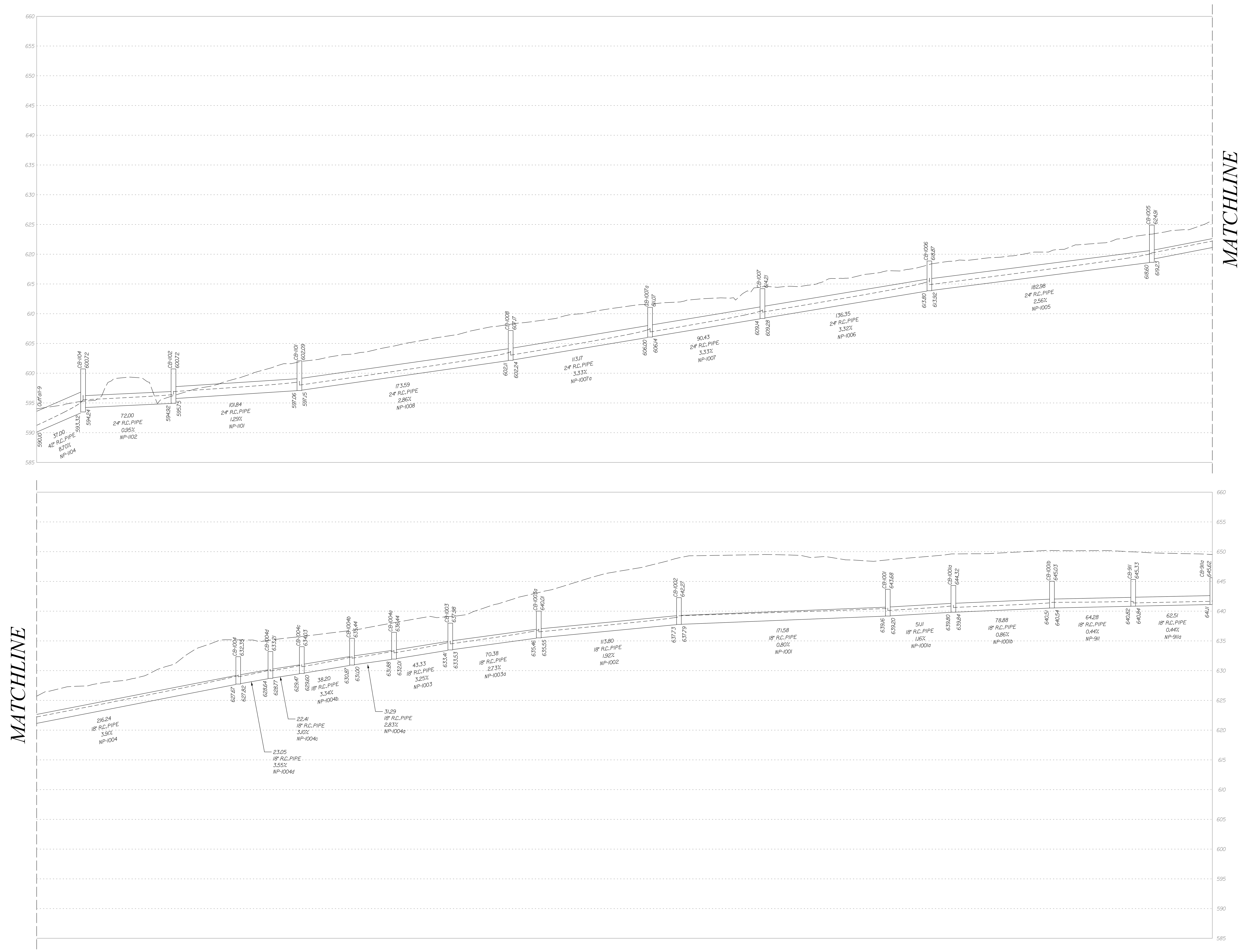
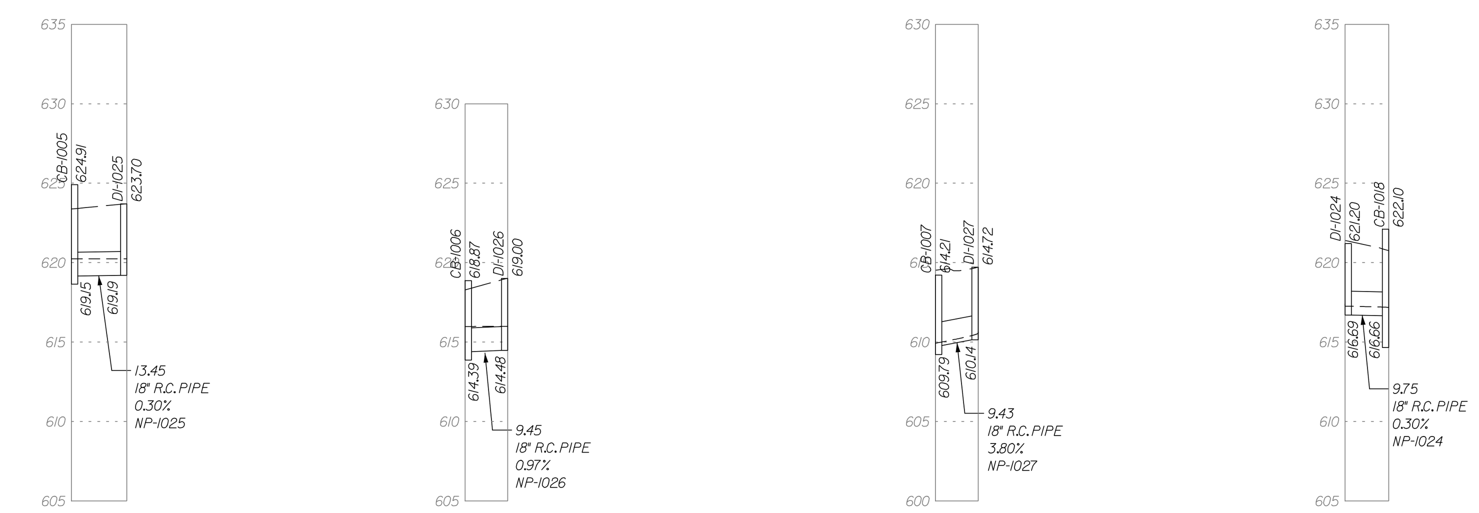
SYSTEM-9

FINAL R/W PLANS (FOR REVIEW ONLY)	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	





SCALE: H: 1"=50' V: 1"=10'

LEGEND
- - - - - EXISTING GRADE
——— STORM DRAINAGE PIPE
- - - - - - - HYDRAULIC GRADE LINE

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454 S. ANDERSON ROAD, SUITE 3
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SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51 CLOSED SYSTEM DRAINAGE PROFILE

SCALE | RTE. | DWG. NO.

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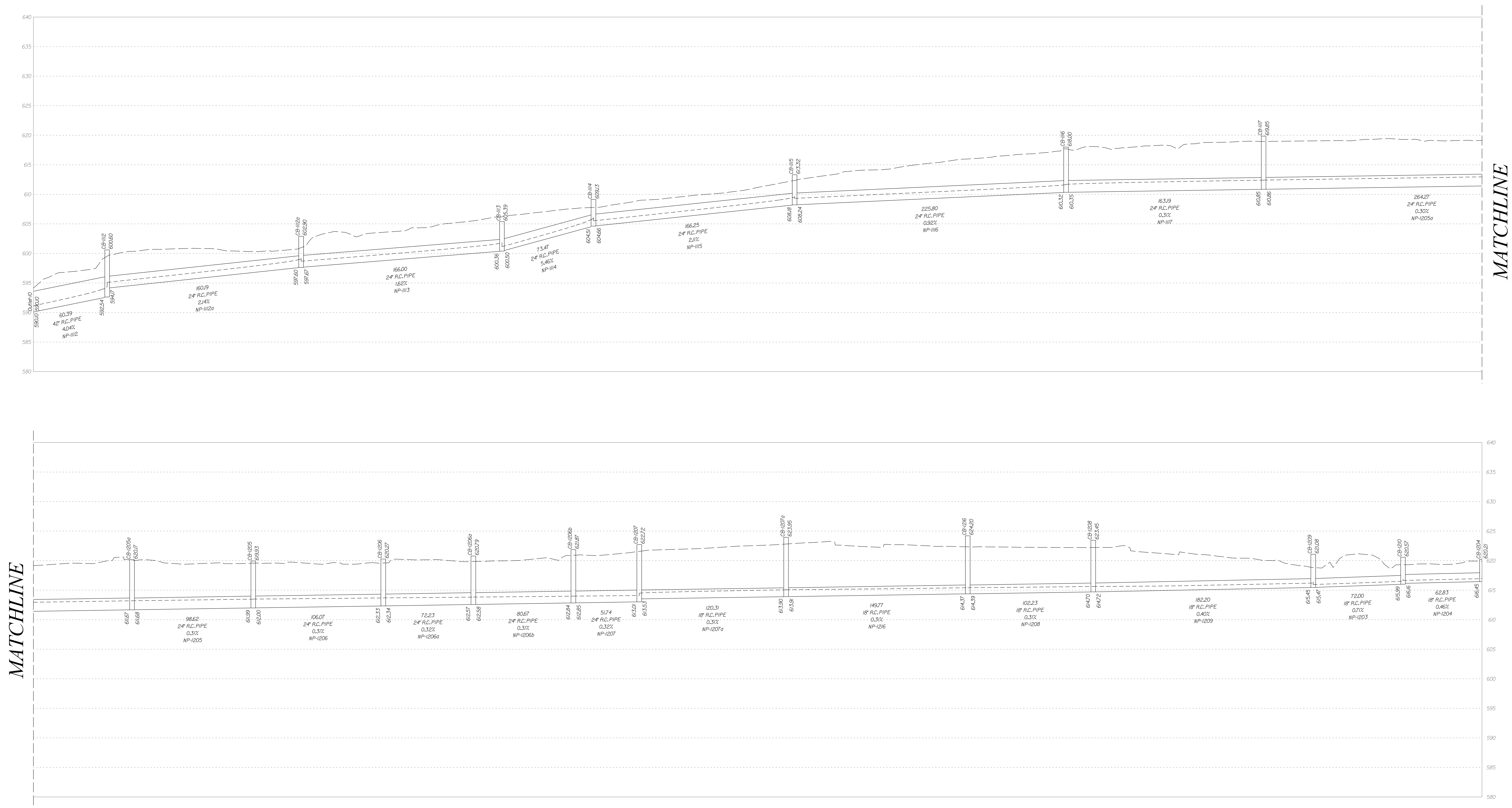
7/13/2022

SYSTEM–10

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND

EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE RTE. DWG. NO.

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SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

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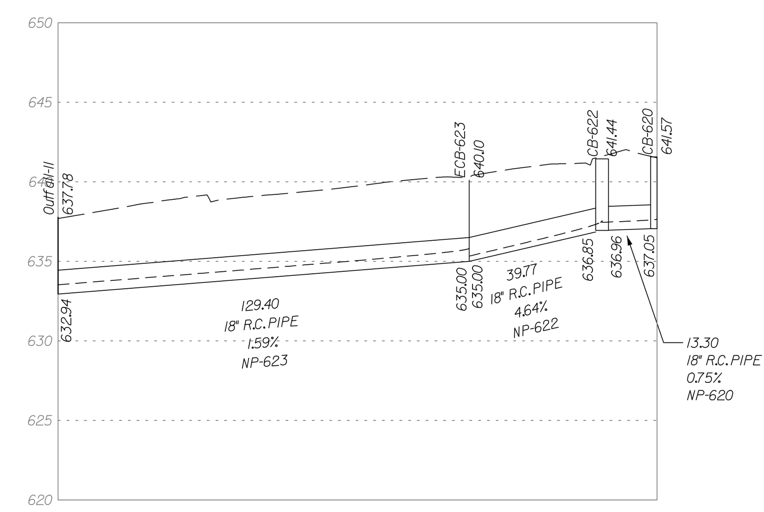
SYSTEM-11



SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51 CLOSED SYSTEM DRAINAGE PROFILE

SCALE	RTE.	DWG. NO.

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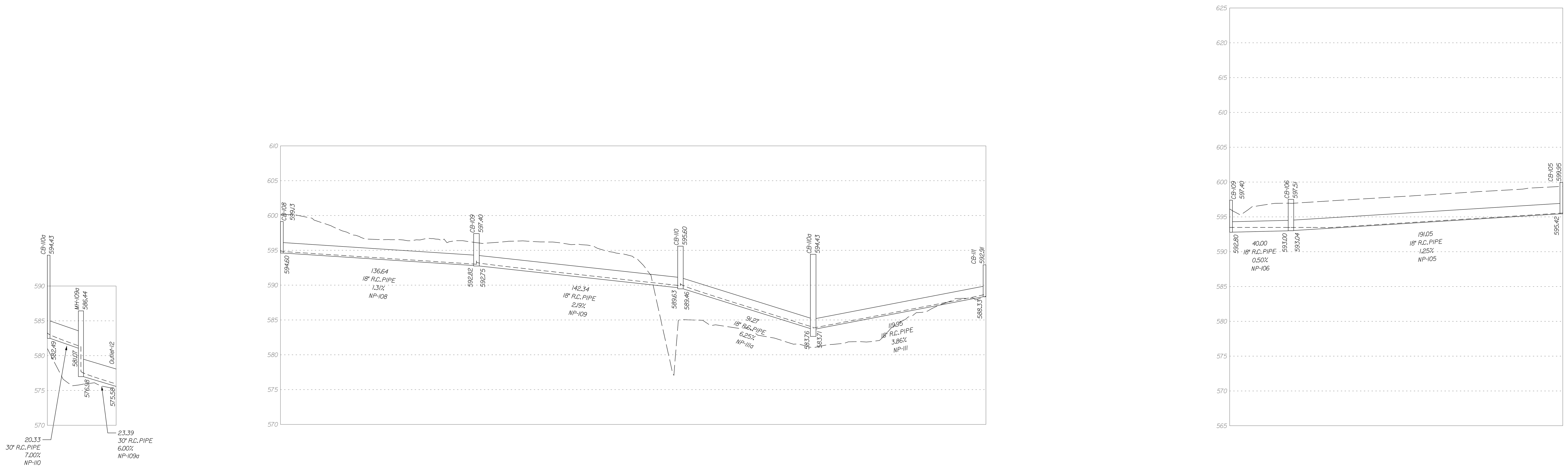
SYSTEM–12

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND
- - - - - EXISTING GRADE
——— STORM DRAINAGE PIPE
--------- HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE | RTE. | DWG. NO.

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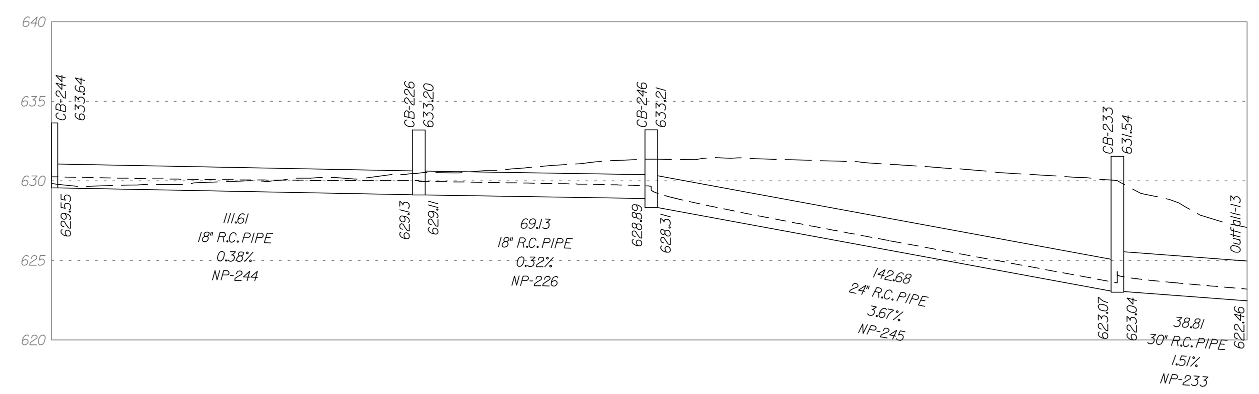
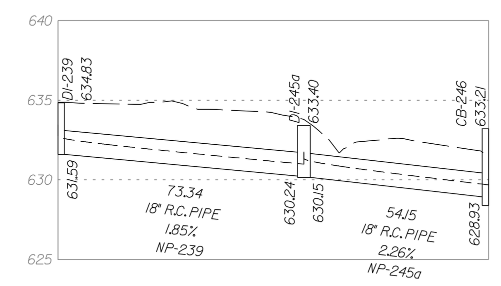
SYSTEM–13

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	





SCALE: H: 1"=50' V: 1"=10'

LEGEND

- – – – – EXISTING GRADE
- ——— STORM DRAINAGE PIPE
- - - - - - HYDRAULIC GRADE LINE

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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51 CLOSED SYSTEM DRAINAGE PROFILE

SCALE	RTE.	DWG. NO.

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ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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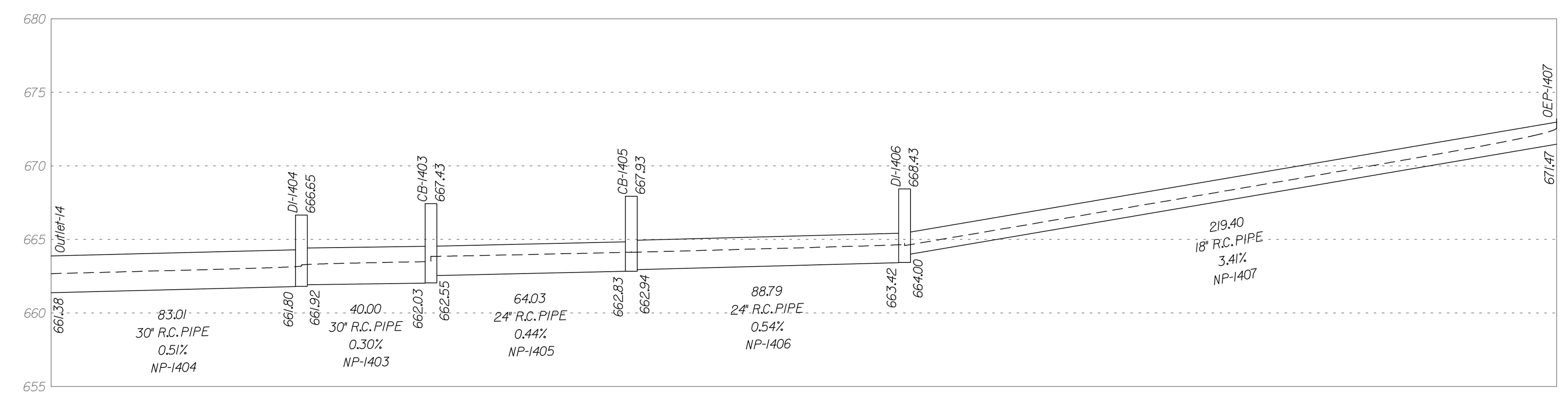
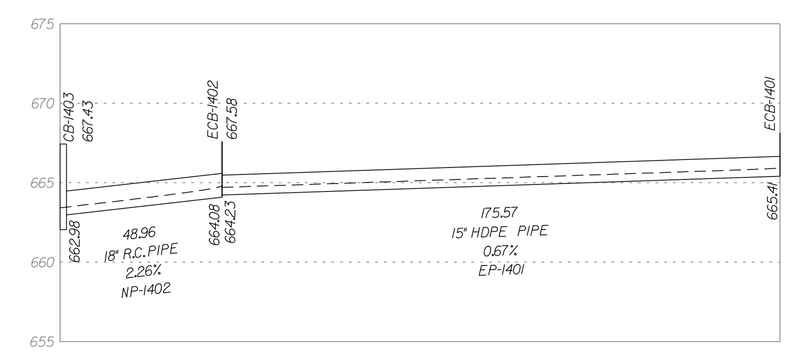
SYSTEM–14

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	





SCALE: H: 1"=50' V: 1"=10'

LEGEND
- – – – – – EXISTING GRADE
- ——— STORM DRAINAGE PIPE
- - - - - - - - HYDRAULIC GRADE LINE

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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE | RTE. | DWG. NO.

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ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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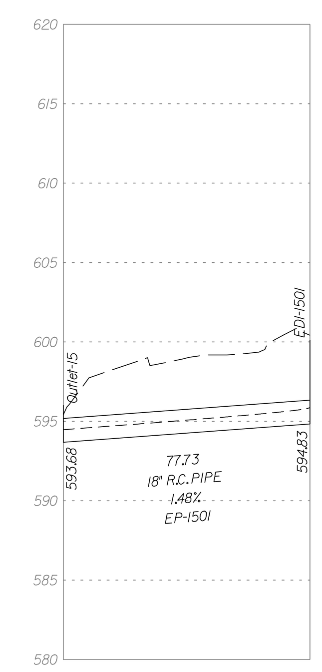
SYSTEM–15

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	1149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND

- – – – – EXISTING GRADE
- ——— STORM DRAINAGE PIPE
- - - - - - HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

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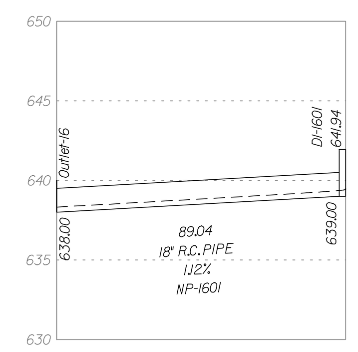
SYSTEM–16

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND

– – – – – EXISTING GRADE

———— STORM DRAINAGE PIPE

- - - - - - - - - HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

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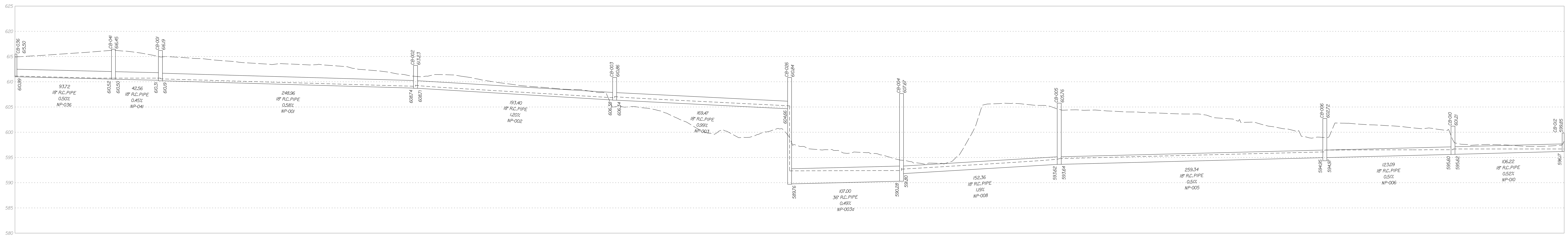
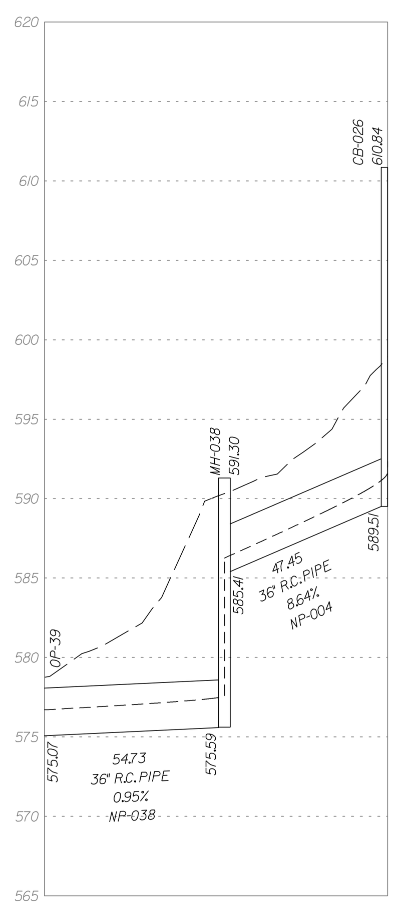
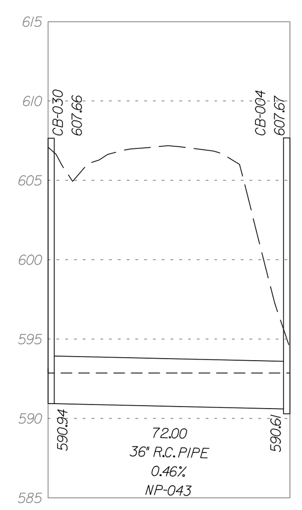
SYSTEM-17

FINAL R/W PLANS
FOR REVIEW ONLY

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	







SCALE: H: 1" = 50' V: 1" = 10'

LEGEND

- - - - - EXISTING GRADE
———— STORM DRAINAGE PIPE
- - - - - - HYDRAULIC GRADE LINE

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YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE	RTE.	DWG. NO.

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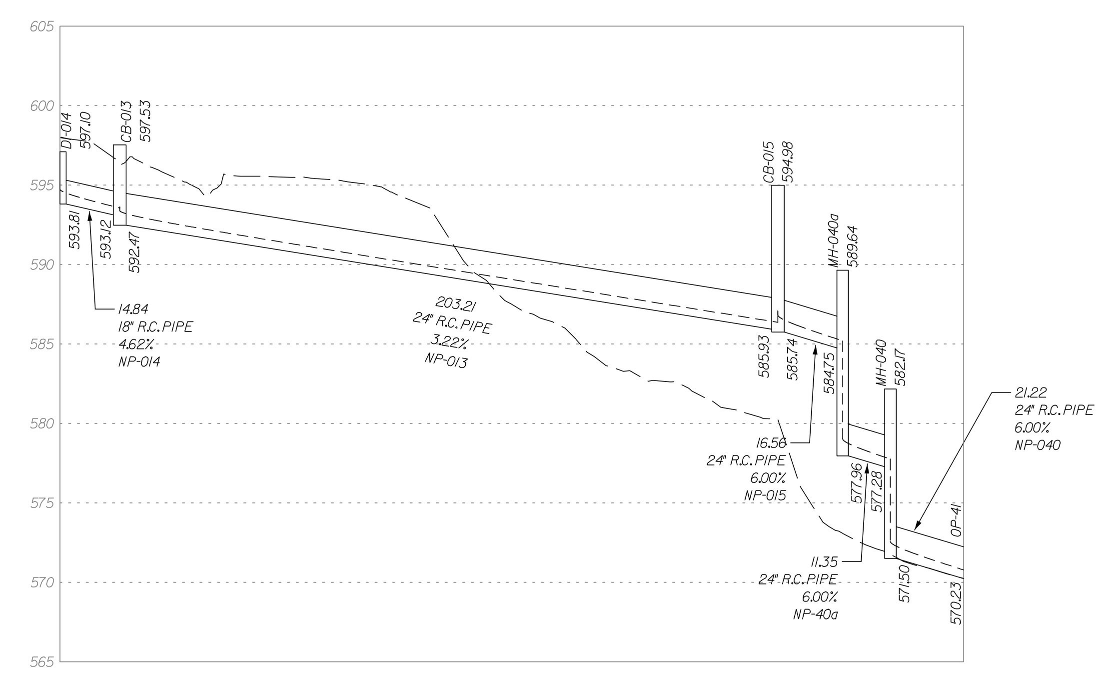
SYSTEM–18

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	1149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
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DRAINAGE PROFILE

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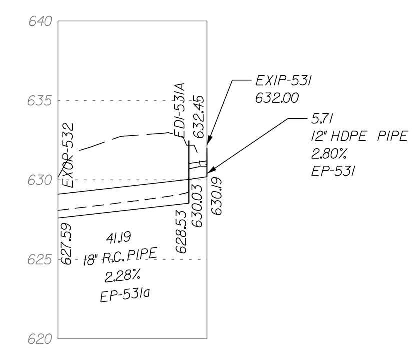
SYSTEM-19

FINAL R/W PLANS (FOR REVIEW ONLY)	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	



SCALE: H: 1" = 50' V: 1" = 10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
6			
5			
4			
3			
2			
1			

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE RTE. DWG. NO.

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
6			
5			
4			

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
3			
2			
1			

norlegsc
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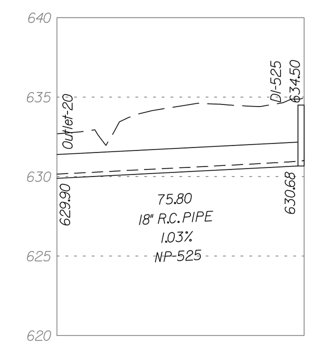
7/13/2022

SYSTEM–20

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	1149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND
EXISTING GRADE
STORM DRAINAGE PIPE
HYDRAULIC GRADE LINE

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
6			
5			
4			
3			
2			
1			

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
CLOSED SYSTEM
DRAINAGE PROFILE

SCALE RTE. DWG. NO.

norlegsc
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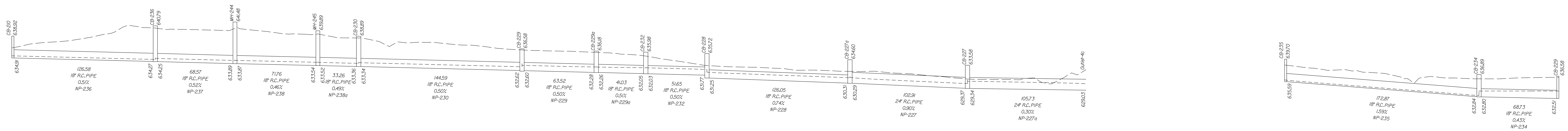
7/13/2022

SYSTEM–21

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	1149-004	US 21	



SCALE: H: 1"=50' V: 1"=10'

LEGEND

- EXISTING GRADE
- STORM DRAINAGE PIPE
- HYDRAULIC GRADE LINE

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION STV INCORPORATED NO. C03318

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
6			
5			
4			
3			
2			
1			

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51 CLOSED SYSTEM DRAINAGE PROFILE

SCALE | RTE. | DWG. NO.

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
6			
5			
4			

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
3			
2			
1			

norlegsc
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7/13/2022

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		1
Consulting Engineers	SUBJECT:	DI-100		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\le$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1100		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0779	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	190		
9. Watercourse slope, s	ft./ft.	0.1000		
10. Average velocity, V (figure 3-1)	ft./sec.	5.10		
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0103	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	5.00		
13. Wetted perimeter, p_w	ft.	10.20		
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.	0.4902		
15. Channel slope, s	ft./ft.	0.0370		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.09		
17b. Input Velocity, FPS	ft./sec.	5.09		
18. Flow length, L	ft.	417		
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0228	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1109	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

6.7 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: DI-221 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16	2 SHEET OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.400	0.150	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	124	152	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.1300	0.0860	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1896	0.1201	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1896	0.1201	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.19 Hour

11 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening	3 SHEET
	SUBJECT: CB-203	
	CALC'D BY: PRJ DATE: 7-Jul-16	OF
	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Path #1	Path #2	Path #3
Segment ID	AB		
1. Surface Description (table 3-1)	Wood		
2. Manning's roughness coefficient, n (table 3-1)	0.300		
3. Flow length, L (total L ≤ 300 ft) ft.	86		
4. Two-year 24-hour rainfall, P_2 in.	3.60		
5. Land slope, s ft./ft.	0.2100		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr.	0.0928	0.0000	0.0000

Shallow concentrated flow

	Path #1	Path #2	Path #3
Segment ID	BC		
7. Surface description (Paved or Unpaved)	Paved		
8. Flow length, L ft.	34		
9. Watercourse slope, s ft./ft.	0.0430		
10. Average velocity, V (figure 3-1) ft./sec.	4.22		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t hr.	0.0022	0.0000	0.0000

Channel flow

	Path #1	Path #2	Path #3
Segment ID			
12. Cross sectional flow area, a ft.^{2}			
13. Wetted perimeter, p_w ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r ft.			
15. Channel slope, s ft./ft.			
16. Manning's roughness coefficient, n			
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft./sec.			
17b. Input Velocity, FPS ft./sec.			
18. Flow length, L ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19) hr.	0.0950	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.09 Hour

5.7 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-203b CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L ≤ 300 ft)	ft.	57		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1600		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0744	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	56		
9. Watercourse slope, s	ft./ft.	0.2100		
10. Average velocity, V (figure 3-1)	ft./sec.	7.39		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0021	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0765	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.08 Hour

4.6 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		5
Consulting Engineers	SUBJECT: CB-203a		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L ≤ 300 ft)	ft.	144		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1400		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1648	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1648	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.16 Hour

9.9 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening — 6 SHEET SUBJECT: CB-241 CALC'D BY: PRJ DATE: 7-Jul-16 — OF CHECK'D BY: GPP DATE: 8-Jul-16 — 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L ≤ 300 ft)	ft.	106		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.2100		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1096	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1096	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

6.6 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970				
JOB:	US 21/ SC 51 Phase I Widening			7 SHEET
SUBJECT:	CB-241b			
CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
CHECK'D BY:	GPP	DATE:	8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	80		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.2900		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0769	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0769	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.08 Hour

4.6 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening	8
Consulting Engineers	SUBJECT:	CB-241a	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.200		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	72		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0600		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0960	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	65		
9. Watercourse slope, s	ft./ft.	0.3200		
10. Average velocity, V (figure 3-1)	ft./sec.	9.13		
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0020	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0980	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.10 Hour

5.9 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-205 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	197		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1350		
6. $T_t = \dfrac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2148	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \dfrac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2148	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.21 Hour

13 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-205c CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16	10 SHEET OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L ≤ 300 ft)	ft.	210		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1400		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2228	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2228	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.22 Hour

13 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	11
Consulting Engineers	SUBJECT: CB-205b	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	203		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1400		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2169	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2169	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.22 Hour

13 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		12
Consulting Engineers	SUBJECT: CB-205a		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L ≤ 300 ft)	ft.	201		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1200		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2881	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2881	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.29 Hour

17 min

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	207		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1200		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2949	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2949	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.29 Hour

18 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		14
Consulting Engineers	SUBJECT:	CB-207c		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	175		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0650		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3295	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC	CD	
7. Surface description (Paved or Unpaved)		Upaved	Paved	
8. Flow length, L	ft.	61	17	
9. Watercourse slope, s	ft./ft.	0.2900	0.0550	
10. Average velocity, V (figure 3-1)	ft./sec.	10.95	4.77	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0015	0.0010	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3311	0.0010	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour

20 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		15
Consulting Engineers	SUBJECT: CB-207		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	153		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0470		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.3369	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Upaved		
8. Flow length, L	ft.	81		
9. Watercourse slope, s	ft./ft.	0.2140		
10. Average velocity, V (figure 3-1)	ft./sec.	9.40		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0024	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, r = a / p_w Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3393	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.34 Hour

20 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB:	US 21/ SC 51 Phase I Widening		16 SHEET
	SUBJECT:	CB-207b		
	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF 73
	CHECK'D BY:	GPP	DATE: 8-Jul-16	

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.400		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	248		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.1020		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3637	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3637	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.36 Hour

22 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening			17
Consulting Engineers	SUBJECT:	DI-220			SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE:	8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1327	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Upaved		
8. Flow length, L	ft.	63		
9. Watercourse slope, s	ft./ft.	0.0530		
10. Average velocity, V (figure 3-1)	ft./sec.	4.68		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0037	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	18.00		
13. Wetted perimeter, p_w	ft.	13.42		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.3413		
15. Channel slope, s	ft./ft.	0.1900		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	22.57		
17b. Input Velocity, FPS	ft./sec.	22.57		
18. Flow length, L	ft.	124		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0015	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1380	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.14 Hour

8.3 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		18 SHEET
Consulting Engineers	SUBJECT: DI-219		
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	155		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0310		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1835	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Upaved		
8. Flow length, L	ft.	97		
9. Watercourse slope, s	ft./ft.	0.0810		
10. Average velocity, V (figure 3-1)	ft./sec.	5.79		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0047	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	36.75		
13. Wetted perimeter, p_w	ft.	22.14		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	1.6599		
15. Channel slope, s	ft./ft.	0.1900		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	26.01		
17b. Input Velocity, FPS	ft./sec.	26.01		
18. Flow length, L	ft.	70		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0007	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1889	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.19 Hour

11 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening			19
Consulting Engineers	SUBJECT:	DI-222			SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE:	8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Grass	Wood	
2. Manning's roughness coefficient, n (table 3-1)		0.150	0.400	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	58	135	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0660	0.0540	
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.0618	0.2883	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0618	0.2883	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.29 Hour

17 min

STV
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

JOB:	US 21/ SC 51 Phase I Widening		20 SHEET
SUBJECT:	CB-211		
CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	112		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0610		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1079	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1079	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

6.5 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	21
Consulting Engineers	SUBJECT: CB-211b	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	101		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0400		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1176	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	22		
9. Watercourse slope, s	ft./ft.	0.0090		
10. Average velocity, V (figure 3-1)	ft./sec.	1.93		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0032	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1208	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.12 Hour

7.2 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-211a CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16	22 SHEET OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	94		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0570		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0964	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	18		
9. Watercourse slope, s	ft./ft.	0.0050		
10. Average velocity, V (figure 3-1)	ft./sec.	1.44		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0035	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0999	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.10 Hour
6 min

STV	JOB:	US 21/ SC 51 Phase I Widening	23
Consulting Engineers	SUBJECT:	CB-501	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	53		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0110		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.2049	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	47		
9. Watercourse slope, s	ft./ft.	0.0010		
10. Average velocity, V (figure 3-1)	ft./sec.	0.64		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0203	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2252	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.23 Hour

14 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-501a CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	114		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0660		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1847	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, r = a / p_w Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1847	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.18 Hour

11 min

STV
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\le$ 300 ft)	ft.	30		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0290		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0882	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC	CD	
7. Surface description (Paved or Unpaved)		Unpaved	Paved	
8. Flow length, L	ft.	22	56	
9. Watercourse slope, s	ft./ft.	0.0430	0.0016	
10. Average velocity, V (figure 3-1)	ft./sec.	3.35	0.81	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0018	0.0191	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0900	0.0191	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.09 Hour

5.4 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		26
Consulting Engineers	SUBJECT: CB-516		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Woods	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.250	0.011	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	67	284	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0570	0.0340	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1106	0.0355	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1106	0.0355	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

6.6 min

STV	JOB:	US 21/ SC 51 Phase I Widening		27
Consulting Engineers	SUBJECT:	CB-506c		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Woods	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.250	0.011	
3. Flow length, L (total L ≤ 300 ft)	ft.	44	260	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0280	0.0260	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1050	0.0368	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1050	0.0368	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.11 Hour

6.3 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		28
Consulting Engineers	SUBJECT: CB-506b		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.280		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	200		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0280		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3860	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	317		
9. Watercourse slope, s	ft./ft.	0.0270		
10. Average velocity, V (figure 3-1)	ft./sec.	3.34		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0264	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4124	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.41 Hour

25 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		29
Consulting Engineers	SUBJECT: CB-506a		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Woods		
2. Manning's roughness coefficient, n (table 3-1)		0.280		
3. Flow length, L (total L ≤ 300 ft)	ft.	237		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0370		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.3955	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	280		
9. Watercourse slope, s	ft./ft.	0.0190		
10. Average velocity, V (figure 3-1)	ft./sec.	2.22		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0350	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4305	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.43 Hour

26 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		30
Consulting Engineers	SUBJECT:	CB-600a		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	180		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0430		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1814	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1814	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.18 Hour

11 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	31
Consulting Engineers	SUBJECT: CB-600b	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.300	0.150	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	90	126	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0270	0.0430	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2185	0.1364	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2185	0.1364	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.22 Hour

13 min

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.300	0.150	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	74	118	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0320	0.0460	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1746	0.1260	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		CD		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	43		
9. Watercourse slope, s	ft./ft.	0.1000		
10. Average velocity, V (figure 3-1)	ft./sec.	6.43		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0019	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1764	0.1260	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.18 Hour

11 min

STV
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Woods	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.300	0.150	
3. Flow length, L (total L $\le$ 300 ft)	ft.	78	102	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0280	0.0360	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1921	0.1236	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1921	0.1236	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.19 Hour

12 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		34
Consulting Engineers	SUBJECT:	CB-602b		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	46		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0630		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0523	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	80		
9. Watercourse slope, s	ft./ft.	0.0260		
10. Average velocity, V (figure 3-1)	ft./sec.	3.28		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0068	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0591	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.06 Hour

3.5 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening			35 SHEET
	SUBJECT: CB-602a			
	CALC'D BY: PRJ	DATE: 7-Jul-16		OF
	CHECK'D BY: GPP	DATE: 8-Jul-16		73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	79		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0610		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1421	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	128		
9. Watercourse slope, s	ft./ft.	0.0150		
10. Average velocity, V (figure 3-1)	ft./sec.	2.49		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0143	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1564	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.16 Hour

9.4 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	36
Consulting Engineers	SUBJECT: CB-603	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.250	0.011	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	90	44	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0630	0.0170	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1346	0.0105	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, r = a / p_w Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1346	0.0105	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.13 Hour

8.1 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: DI-603a CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.250	0.011	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	113	35	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0440	0.0480	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1864	0.0058	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1864	0.0058	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.19 Hour

11 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening — 38 SHEET
Consulting Engineers	SUBJECT: DI-604c
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16 — OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16 — 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Grass	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.150	0.011	
3. Flow length, L (total L $\le$ 300 ft)	ft.	138	52	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0680	0.0120	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1221	0.0138	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1221	0.0138	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.12 Hour

7.3 min

STV

STV
Consulting Engineers
454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

JOB:	US 21/ SC 51 Phase I Widening		
SUBJECT:	CB-604b		
CALC'D BY:	PRJ	DATE:	7-Jul-16
CHECK'D BY:	GPP	DATE:	8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	94		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0660		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0909	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	111		
9. Watercourse slope, s	ft./ft.	0.0320		
10. Average velocity, V (figure 3-1)	ft./sec.	3.64		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0085	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0994	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.10 Hour
6 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	40
Consulting Engineers	SUBJECT: CB-604	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	98		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0540		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1018	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1018	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.10 Hour

6.1 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: DI-700a CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	145		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0070		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.3154	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3154	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.32 Hour

19 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.200		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	58		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0230		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1185	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	117		
9. Watercourse slope, s	ft./ft.	0.0370		
10. Average velocity, V (figure 3-1)	ft./sec.	3.10		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0105	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1290	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) ...... 0.13 Hour

7.7 min

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Rock Hill, SC 29730 (803) 980-4970

JOB:	US 21/ SC 51 Phase I Widening			43 SHEET
SUBJECT:	DI-715			
CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
CHECK'D BY:	GPP	DATE:	8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	98		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0600		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1700	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1700	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.17 Hour
10 min

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454 South Anderson Road, Suite 3, BTC 517
Rock Hill, SC 29730 (803) 980-4970

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	73		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0590		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0096	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	19		
9. Watercourse slope, s	ft./ft.	0.0140		
10. Average velocity, V (figure 3-1)	ft./sec.	2.41		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0022	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0118	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.01 Hour

0.7 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		45 SHEET
Consulting Engineers	SUBJECT: CB-911		
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	100		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0305		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0161	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0161	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.02 Hour
1 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening	46
Consulting Engineers	SUBJECT:	CB-1001	SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Grass	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.150	0.011	
3. Flow length, L (total L ≤ 300 ft)	ft.	79	102	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0200	0.0370	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1275	0.0151	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1275	0.0151	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.13 Hour

7.6 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-1002 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16	47 SHEET OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Grass	Wood	
2. Manning's roughness coefficient, n (table 3-1)		0.150	0.300	
3. Flow length, L (total L ≤ 300 ft)	ft.	32	101	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0310	0.0930	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0519	0.1461	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0519	0.1461	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.15 Hour

8.8 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening — SHEET 48
Consulting Engineers	SUBJECT: CB-1003a
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ — DATE: 7-Jul-16 — OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP — DATE: 8-Jul-16 — 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	203		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0570		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3107	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3107	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.31 Hour

19 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening			49
Consulting Engineers	SUBJECT:	CB-1003			SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE:	8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	120		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0380		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2399	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	126		
9. Watercourse slope, s	ft./ft.	0.0780		
10. Average velocity, V (figure 3-1)	ft./sec.	4.51		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0078	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2477	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.25 Hour

15 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening		50
Consulting Engineers	SUBJECT:	CB-1004a		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	271		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0532		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.4024	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4024	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.40 Hour
24 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening	51 SHEET
Consulting Engineers	SUBJECT: CB-1004b	
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	299		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0500		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4463	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4463	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.45 Hour

27 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		52
Consulting Engineers	SUBJECT: CB-1004c		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	299		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0440		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4697	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	30		
9. Watercourse slope, s	ft./ft.	0.0720		
10. Average velocity, V (figure 3-1)	ft./sec.	4.33		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0019	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, r = a / p_w Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4716	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.47 Hour

28 min

STV

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-1004d		53 SHEET
	CALC'D BY: PRJ CHECK'D BY: GPP	DATE: 7-Jul-16 DATE: 8-Jul-16	OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0580		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4217	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4217	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.42 Hour

25 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0490		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.4511	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	45		
9. Watercourse slope, s	ft./ft.	0.0400		
10. Average velocity, V (figure 3-1)	ft./sec.	3.23		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0039	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4550	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.45 Hour
27 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L ≤ 300 ft)	ft.	289		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0540		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4211	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Paved		
8. Flow length, L	ft.	146		
9. Watercourse slope, s	ft./ft.	0.0530		
10. Average velocity, V (figure 3-1)	ft./sec.	4.68		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0087	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4298	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.43 Hour
26 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	98		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0710		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1589	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	370		
9. Watercourse slope, s	ft./ft.	0.0630		
10. Average velocity, V (figure 3-1)	ft./sec.	4.05		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0254	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1843	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.18 Hour

11 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: DI-1026		57 SHEET
	CALC'D BY: PRJ CHECK'D BY: GPP	DATE: 7-Jul-16 DATE: 8-Jul-16	OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\le$ 300 ft)	ft.	46		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0430		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1060	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	514		
9. Watercourse slope, s	ft./ft.	0.0560		
10. Average velocity, V (figure 3-1)	ft./sec.	3.82		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0374	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, r = a / p_w Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1434	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.14 Hour
8.6 min

STV

STV	JOB:	US 21/ SC 51 Phase I Widening			58
Consulting Engineers	SUBJECT:	DI-1027			SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY:	PRJ	DATE:	7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY:	GPP	DATE:	8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.300		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	300		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0430		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.4753	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	175		
9. Watercourse slope, s	ft./ft.	0.0416		
10. Average velocity, V (figure 3-1)	ft./sec.	3.29		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0148	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.4901	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.49 Hour

29 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.300	0.011	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	202	72	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0480	0.0330	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3315	0.0120	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3315	0.0120	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour
20 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		60
Consulting Engineers	SUBJECT: CB-1008		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Wood	Pavement	
2. Manning's roughness coefficient, n (table 3-1)		0.300	0.011	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	203	172	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0470	0.0270	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3356	0.0261	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID				
12. Cross sectional flow area, a	ft.^{2}			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3356	0.0261	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.34 Hour

20 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		61
Consulting Engineers	SUBJECT: CB-1101		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	170		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0430		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.1733	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1733	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.17 Hour

10 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		62
Consulting Engineers	SUBJECT: DI-1021		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	112		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0280		
6. $T_t = \dfrac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.1473	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \dfrac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \dfrac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \dfrac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.1473	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) ..... 0.15 Hour

8.8 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L ≤ 300 ft)	ft.	215		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0160		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.3105	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	84		
9. Watercourse slope, s	ft./ft.	0.0280		
10. Average velocity, V (figure 3-1)	ft./sec.	2.70		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0086	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		CD		
12. Cross sectional flow area, a	$ft.^2$	4.00		
13. Wetted perimeter, p_w	ft.	8.25		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4848		
15. Channel slope, s	ft./ft.	0.0210		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	3.81		
17b. Input Velocity, FPS	ft./sec.	3.81		
18. Flow length, L	ft.	188		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0137	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.3329	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.33 Hour
20 min

STV Consulting Engineers	JOB: US 21/ SC 51 Phase I Widening	SHEET 64
454 South Anderson Road, Suite 3, BTC 517	SUBJECT: DI-1023	OF 73
Rock Hill, SC 29730 (803) 980-4970	CALC'D BY: PRJ DATE: 7-Jul-16	
	CHECK'D BY: GPP DATE: 8-Jul-16	

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Pavement		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	227		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0420		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.0273	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	233		
9. Watercourse slope, s	ft./ft.	0.0310		
10. Average velocity, V (figure 3-1)	ft./sec.	2.84		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0228	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0500	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.05 Hour

3 min

STV

STV	JOB: US 21/ SC 51 Phase I Widening		65
Consulting Engineers	SUBJECT: DI-1024		SHEET
454 South Anderson Road, Suite 3, BTC 517	CALC'D BY: PRJ	DATE: 7-Jul-16	OF
Rock Hill, SC 29730 (803) 980-4970	CHECK'D BY: GPP	DATE: 8-Jul-16	73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Pavement	Wood	
2. Manning's roughness coefficient, n (table 3-1)		0.011	0.250	
3. Flow length, L (total L $\leq$ 300 ft)	ft.	82	164	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0730	0.0540	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0097	0.2313	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a\ /\ p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0097	0.2313	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.23 Hour

14 min

TIME OF CONCENTRATION (T_c) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

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Include a map, schematic, or description of flow segments.

Sheet flow

	Units	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Wood		
2. Manning's roughness coefficient, n (table 3-1)		0.200		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	240		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0120		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.4789	0.0000	0.0000

Shallow concentrated flow

	Units	Path #1	Path #2	Path #3
Segment ID		BC	CD	
7. Surface description (Paved or Unpaved)		Unpaved	Paved	
8. Flow length, L	ft.	566	85	
9. Watercourse slope, s	ft./ft.	0.0220	0.0350	
10. Average velocity, V (figure 3-1)	ft./sec.	2.39	3.80	
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0657	0.0062	0.0000

Channel flow

	Units	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.5446	0.0062	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.54 Hour

33 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: CB-1109 CALC'D BY: PRJ DATE: 7-Jul-16 CHECK'D BY: GPP DATE: 8-Jul-16	67 SHEET OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	219		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0190		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.2942	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2942	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.29 Hour

18 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Pavement	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.011	0.150	
3. Flow length, L (total L ≤ 300 ft)	ft.	168	95	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0090	0.0250	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0397	0.1352	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0397	0.1352	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.14 Hour
8.1 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Concrete		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	204		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0086		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0472	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID		BC		
12. Cross sectional flow area, a	ft.^{2}	1.77		
13. Wetted perimeter, p_w	ft.	4.71		
14. Hydraulic Radius, r = a / p_w Compute r	ft.	0.3758		
15. Channel slope, s	ft./ft.	0.0680		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	5.78		
17b. Input Velocity, FPS	ft./sec.	5.78		
18. Flow length, L	ft.	162		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0078	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0550	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.05 Hour

3.3 min

STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening SUBJECT: DI-245a		70 SHEET
	CALC'D BY: PRJ CHECK'D BY: GPP	DATE: 7-Jul-16 DATE: 8-Jul-16	OF 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	162		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0130		
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.2691	0.0000	0.0000

Shallow concentrated flow

		Path #1	Path #2	Path #3
Segment ID		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft.	75		
9. Watercourse slope, s	ft./ft.	0.1400		
10. Average velocity, V (figure 3-1)	ft./sec.	6.04		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0035	0.0000	0.0000

Channel flow

		Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2725	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.27 Hour

16 min

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STV Consulting Engineers 454 South Anderson Road, Suite 3, BTC 517 Rock Hill, SC 29730 (803) 980-4970	JOB: US 21/ SC 51 Phase I Widening — SHEET 71 SUBJECT: OEP-1407 CALC'D BY: PRJ DATE: 7-Jul-16 — OF CHECK'D BY: GPP DATE: 8-Jul-16 — 73

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

		Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Grass		
2. Manning's roughness coefficient, n (table 3-1)		0.150		
3. Flow length, L (total L $\leq$ 300 ft)	ft.	181		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0330		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t	hr.	0.2026	0.0000	0.0000

Shallow concentrated flow

Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

Segment ID		BC		
12. Cross sectional flow area, a	$ft.^2$	4.00		
13. Wetted perimeter, p_w	ft.	8.25		
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.	0.4848		
15. Channel slope, s	ft./ft.	0.0300		
16. Manning's roughness coefficient, n		0.0350		
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.	4.55		
17b. Input Velocity, FPS	ft./sec.	4.55		
18. Flow length, L	ft.	418		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0255	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.2281	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.23 Hour
14 min

TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

Check One: ☐ Present ☑ Developed

Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB		
1. Surface Description (table 3-1)		Concrete		
2. Manning's roughness coefficient, n (table 3-1)		0.011		
3. Flow length, L (total L ≤ 300 ft)	ft.	248		
4. Two-year 24-hour rainfall, P_2	in.	3.60		
5. Land slope, s	ft./ft.	0.0170		
6. $T_t = \frac{.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr.	0.0420	0.0000	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0420	0.0000	0.0000

21. Watershed Total, T_c (maximum, Path #1, #2, or #3) .... 0.04 Hour

2.5 min

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TIME OF CONCENTRATION (T_C) - POST DEVELOPMENT

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Note: Space for as many as three segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow

	Unit	Path #1	Path #2	Path #3
Segment ID		AB	BC	
1. Surface Description (table 3-1)		Pavement	Grass	
2. Manning's roughness coefficient, n (table 3-1)		0.011	0.150	
3. Flow length, L (total L ≤ 300 ft)	ft.	150	86	
4. Two-year 24-hour rainfall, P_2	in.	3.60	3.60	
5. Land slope, s	ft./ft.	0.0250	0.0200	
6. $T_t = \frac{.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr.	0.0241	0.1365	0.0000

Shallow concentrated flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
7. Surface description (Paved or Unpaved)				
8. Flow length, L	ft.			
9. Watercourse slope, s	ft./ft.			
10. Average velocity, V (figure 3-1)	ft./sec.			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000

Channel flow

	Unit	Path #1	Path #2	Path #3
Segment ID				
12. Cross sectional flow area, a	$ft.^2$			
13. Wetted perimeter, p_w	ft.			
14. Hydraulic Radius, $r = a / p_w$ Compute r	ft.			
15. Channel slope, s	ft./ft.			
16. Manning's roughness coefficient, n				
17a. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V	ft./sec.			
17b. Input Velocity, FPS	ft./sec.			
18. Flow length, L	ft.			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr.	0.0000	0.0000	0.0000
20. Total, T_c (add T_t in steps 6, 11, and 19)	hr.	0.0241	0.1365	0.0000

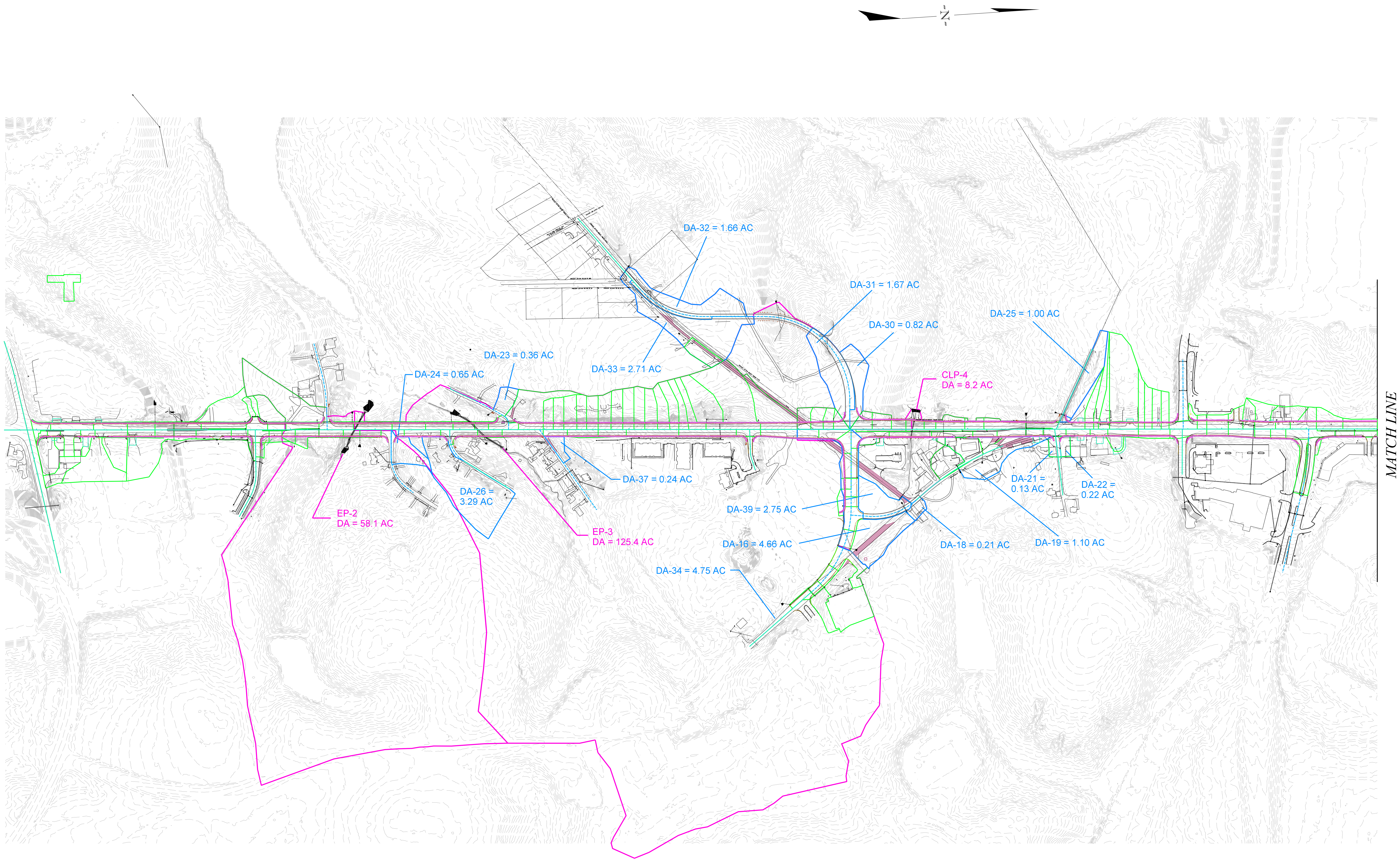
21. Watershed Total, T_c (maximum, Path #1, #2, or #3) 0.14 Hour

8.2 min

Appendix H

Drainage Area Maps

FINAL R/W PLANS FOR REVIEW ONLY	FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
	3	S.C.	YORK	0042332	11149-004	US 21	



LEGEND

DA DITCH

DA CULVERT

DA SYSTEM

300 0 300 600

FIGURE 7A

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51
DRAINAGE AREA MAP (1 OF 2)

SOUTH CAROLINA
STV INCORPORATED
NO. C03318
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 21220
GUY PARIS PETERS

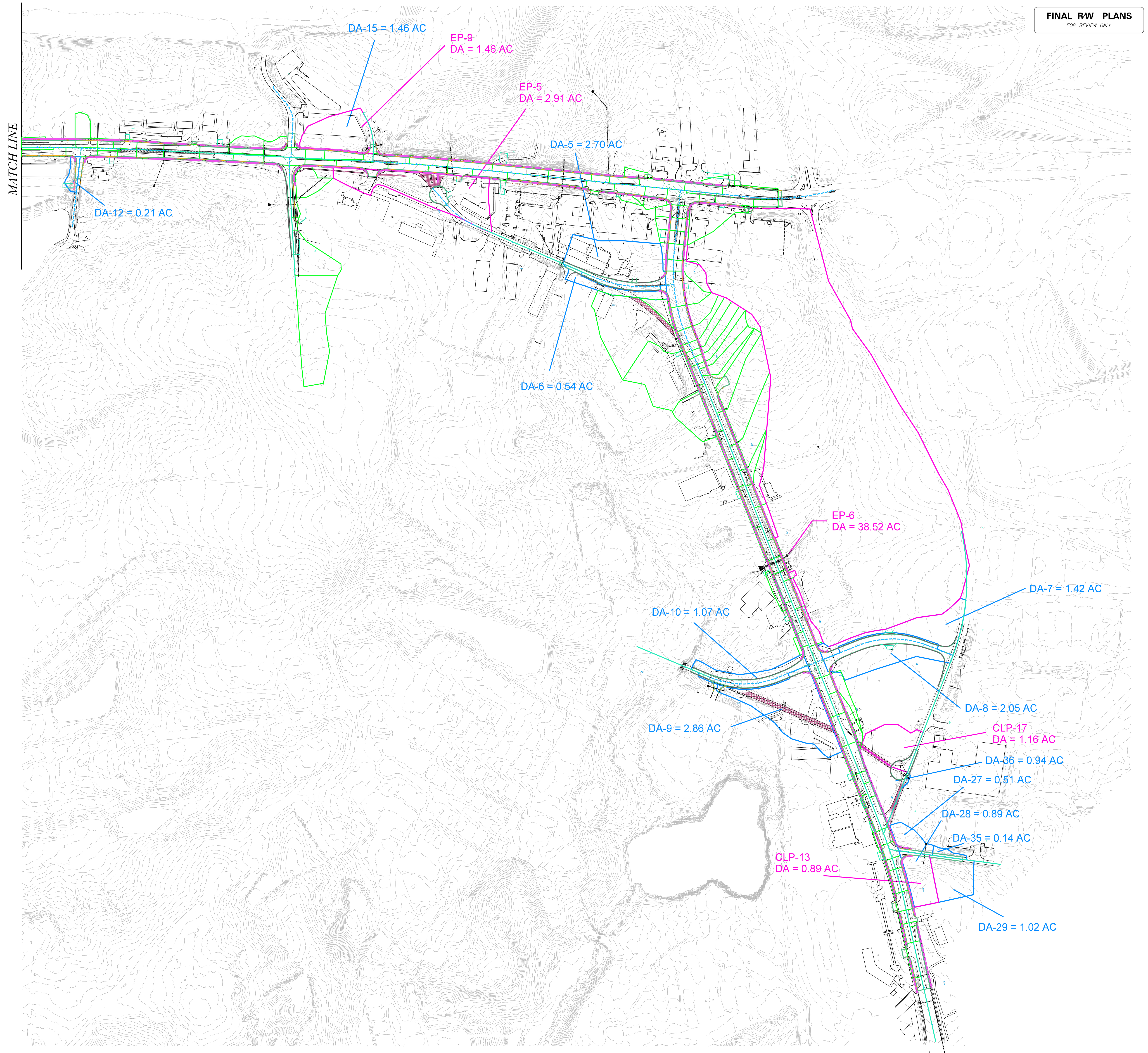
STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
4			
5			
6			
1			
2			
3			

norlegsc
3/31/2022

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	PROJECT NO.	ROUTE NO.	SHEET NO.
3	S.C.	YORK	0042332	11149-004	US 21	

FINAL R/W PLANS
FOR REVIEW ONLY



LEGEND

- DA DITCH
- DA CULVERT
- DA SYSTEM

300 0 300 600

FIGURE 7B

YORK COUNTY
SOUTH CAROLINA

US 21 NORTH PHASE 1 & SC 51 DRAINAGE AREA MAP (2 OF 2)

STV Incorporated
ROCK HILL BUSINESS TECHNOLOGY CENTER, BTC 517
454 S. ANDERSON ROAD, SUITE 3
ROCK HILL, SOUTH CAROLINA 29730

SOUTH CAROLINA STV INCORPORATED NO. C03318 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 21220 GUY PARIS PETERS

REV. NO.	BY	DATE	DESCRIPTION OF REVISION
4			
5			
6			
1			
2			
3			

Appendix F

Inspection Log and Reports

SWPPP Inspection Log

Name of Construction Site	Location of Construction Site

Date of Inspection	Inspector Name	Does Inspection Report require maintenance of installed BMPs?	
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No

SWPPP Inspection Log (Continued)			
Date of Inspection	Inspector Name	Does Inspection Report require maintenance of installed BMPs?	
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No

Appendix G

Rainfall Log and Reports

SWPPP Rainfall Records (January - June) Year:

January	Rainfall	February	Rainfall	March	Rainfall	April	Rainfall	May	Rainfall	June	Rainfall
1		1		1		1		1		1	
2		2		2		2		2		2	
3		3		3		3		3		3	
4		4		4		4		4		4	
5		5		5		5		5		5	
6		6		6		6		6		6	
7		7		7		7		7		7	
8		8		8		8		8		8	
9		9		9		9		9		9	
10		10		10		10		10		10	
11		11		11		11		11		11	
12		12		12		12		12		12	
13		13		13		13		13		13	
14		14		14		14		14		14	
15		15		15		15		15		15	
16		16		16		16		16		16	
17		17		17		17		17		17	
18		18		18		18		18		18	
19		19		19		19		19		19	
20		20		20		20		20		20	
21		21		21		21		21		21	
22		22		22		22		22		22	
23		23		23		23		23		23	
24		24		24		24		24		24	
25		25		25		25		25		25	
26		26		26		26		26		26	
27		27		27		27		27		27	
28		28		28		28		28		28	
29		29		29		29		29		29	
30				30		30		30		30	
31				31				31			

SWPPP Rainfall Records (July - December)										Year:	
July	Rainfall	August	Rainfall	September	Rainfall	October	Rainfall	November	Rainfall	December	Rainfall
1		1		1		1		1		1	
2		2		2		2		2		2	
3		3		3		3		3		3	
4		4		4		4		4		4	
5		5		5		5		5		5	
6		6		6		6		6		6	
7		7		7		7		7		7	
8		8		8		8		8		8	
9		9		9		9		9		9	
10		10		10		10		10		10	
11		11		11		11		11		11	
12		12		12		12		12		12	
13		13		13		13		13		13	
14		14		14		14		14		14	
15		15		15		15		15		15	
16		16		16		16		16		16	
17		17		17		17		17		17	
18		18		18		18		18		18	
19		19		19		19		19		19	
20		20		20		20		20		20	
21		21		21		21		21		21	
22		22		22		22		22		22	
23		23		23		23		23		23	
24		24		24		24		24		24	
25		25		25		25		25		25	
26		26		26		26		26		26	
27		27		27		27		27		27	
28		28		28		28		28		28	
29		29		29		29		29		29	
30		30		30		30		30		30	
31		31				31				31	

Appendix H

Additional Site Logs and Records

SWPPP Pre-Construction Conference Attendance Log

Date & Time	Description/Outline and Name of the Presenter of SWPPP and Site Requirements

Name	Company	Signature

SWPPP Pre-Construction Conference Attendance Log (Continued)

Name	Company	Signature

SWPPP Contractor & Sub-Contractor Log

Name of Construction Site	Location of Construction Site

Company/Individual Name		Work Responsibilities
1.)		
Start Date:		
Completion Date:		
2.)		
Start Date:		
Completion Date:		
3.)		
Start Date:		
Completion Date:		
4.)		
Start Date:		
Completion Date:		
5.)		
Start Date:		
Completion Date:		
6.)		
Start Date:		
Completion Date:		
7.)		
Start Date:		
Completion Date:		
8.)		
Start Date:		
Completion Date:		
9.)		
Start Date:		
Completion Date:		
10.)		
Start Date:		
Completion Date:		

SWPPP Contractor & Sub-Contractor Log (Continued)

11.)		
Start Date:		
Completion Date:		
12.)		
Start Date:		
Completion Date:		
13.)		
Start Date:		
Completion Date:		
14.)		
Start Date:		
Completion Date:		
15.)		
Start Date:		
Completion Date:		
16.)		
Start Date:		
Completion Date:		
17.)		
Start Date:		
Completion Date:		
18.)		
Start Date:		
Completion Date:		
19.)		
Start Date:		
Completion Date:		
20.)		
Start Date:		
Completion Date:		
21.)		
Start Date:		
Completion Date:		

SWPPP Modification Log

Name of Construction Site	Location of Construction Site

Type of Modification		Description of Modification		Location of Modification
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	

SWPPP Modification Log (Continued)

Name of Construction Site	Location of Construction Site

Type of Modification		Description of Modification	Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	

Type of Modification		Description of Modification	Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	

Type of Modification		Description of Modification	Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	

Type of Modification		Description of Modification	Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	

Type of Modification		Description of Modification	Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	

SWPPP Soil Stabilization Log

Name of Construction Site	Location of Construction Site

Type of Stabilization		Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	

SWPPP Modification Log (Continued)

Name of Construction Site	Location of Construction Site

Type of Stabilization		Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	

Appendix I

Construction General Permit SCR100000

A copy of the NPDES General Permit for Stormwater Discharges from Construction Activities (SCR100000) can be found at the following address:

http://www.scdhec.gov/environment/water/swater/docs/CGP-permit.pdf

Appendix J

Sediment and Erosion Control Plan Set

Plans are provided as a separate volume and are not bound with the remainder of the SWPPP.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

August 2, 2023

Division 10

York County Pennies for Progress
6 Congress Street, PO Box 148
York, SC 29745

SUBJECT: Non-Utility Encroachment Contract – Mecklenburg County – US-21 and SC-51 Improvements – US-21 (Carowinds Blvd) from SC-460 (Springfield Pkwy) to 700 ft. south of S-48 (Springhill Farm Rd) & SC-51 (Pineville-Rock Hill Rd) from US-21 (Carowinds Blvd) to the NC state line.

Encroachment Number: E102-060-23-00572

To Whom It May Concern:

A review of the subject encroachment has been completed by the appropriate staff agencies of the Division of Highways. Plans for construction at the above referenced location have been approved for construction at this time and are subject to the attached special provisions.

This encroachment involves roadway improvements and pavement markings along US-21 (Carowinds Blvd) and SC-51 (Pineville-Rock Hill Rd).
Please contact our District Office at (980) 523-0000 should additional information be needed.

Cordially,

Brett D. Canipe/KHB/JTL

Brett D. Canipe, PE
Division Engineer

BDC/KHB
Enclosure
cc: Mr. Felix Obregon, District Engineer
Mr. Dwight Hill, County Maintenance Engineer (Letter Only)
File

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
DIVISION 10 DISTRICT 2 OFFICE
7605 DISTRICT DRIVE
CHARLOTTE, NC 28213

Telephone: (980) 523-0000
Fax: (704) 598-1758
Customer Service: 1-877-368-4968

Website: www.ncdot.gov

Location:
7605 DISTRICT DRIVE
CHARLOTTE, NC 28213

ROUTE (Pineville-Rock Hill Rd) NC 51 / SC 51 PROJECT US 21 and SC 51 Improvements COUNTY OF Mecklenburg

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

-AND-

York County Pennies For Progress
6 Congress Street, Post Office Box 148
York, SC 29745

RIGHT OF WAY ENCROACHMENT AGREEMENT FOR CURB AND GUTTER, PAVEMENT WIDENING AND STORM DRAINAGE

THIS AGREEMENT, made and entered into this the 2nd day of Aug , 20 23 , by and between the Department of Transportation, party of the first part; and York County Pennies for Progress party of the second part,

W I T N E S S E T H

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) NC Highway 51 (Pineville-Rock Hill Rd) , located at the North Carolina / South Carolina border

with the construction and/or erection of: roadway improvements

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the said party of the second part binds and obligates himself to install the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway.

That the party of the second part agrees to provide during construction proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first part.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

It is clearly understood by the party of the second part that the party of the first part will assume no responsibility for any damage that may be caused to such facilities, within the highway rights of way limits, in carrying out its construction.

That the party of the second part agrees to restore all areas disturbed during construction to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any construction operation disturbs the ground surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the encroaching site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the second part from the party of the first part.

R/W (161B) : Party of the Second Part certifies that this agreement is true and accurate copy of the form

R/W (161B) incorporating all revisions to date.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

DocuSigned by:

BY: Brett D. Canipe, PE/KHB

DIVISION ENGINEER

F6B8E4EDA41A4E8...

ATTEST OR WITNESS: Troy L. McKinnon

Assistant County Engineer

Second Party

INSTRUCTIONS

When the applicant is a corporation or a municipality, this agreement must have the corporate seal and be attested by the corporation secretary or by the empowered city official, unless a waiver of corporate seal and attestation by the secretary or by the empowered City official is on file in the Raleigh office of the State Utilities Manager. In the space provided in this agreement for execution, the name of the corporation or municipality shall be typed above the name, and title of all persons signing the agreement should be typed directly below their signature.

When the applicant is not a corporation, then his signature must be witnessed by one person. The address should be included in this agreement and the names of all persons signing the agreement should be typed directly below their signature.

This agreement must be accompanied, in the form of an attachment, by plans or drawings showing the following applicable information:

1. All roadways and ramps.
2. Right of way lines and where applicable, the control of access lines.
3. Location of the proposed encroachment.
4. Length and type of encroachment.
5. Location by highway survey station number. If station number cannot be obtained, location should be shown by distance from some identifiable point, such as a bridge, road, intersection, etc. (To assist in preparation of the encroachment plan, the Department's roadway plans may be seen at the various Highway Division Offices, or at the Raleigh office.)
6. Drainage structures or bridges if affected by encroachment.
7. Typical section indicating the pavement design and width, and the slopes, widths and details for either a curb and gutter or a shoulder and ditch section, whichever is applicable.
8. Horizontal alignment indicating general curve data, where applicable.
9. Vertical alignment indicated by percent grade, P.I. station and vertical curve length, where applicable.
10. Amount of material to be removed and/or placed on NCDOT right of way, if applicable.
11. Cross-sections of all grading operations, indicating slope ratio and reference by station where applicable.
12. All pertinent drainage structures proposed. Include all hydraulic data, pipe sizes, structure details and other related information.
13. Erosion and sediment control.
14. Any special provisions or specifications as to the performance of the work or the method of construction that may be required by the Department must be shown on a separate sheet attached to encroachment agreement provided that such information cannot be shown on plans or drawings.
15. The Department's Division Engineer should be given notice by the applicant prior to actual starting of installation included in this agreement.
16. Method of handling traffic during construction where applicable.
17. Scale of plans, north arrow, etc.

NCDOT PRECONSTRUCTION MEETING REQUEST FORM

Date: ________________________________

Prior to beginning any work inside NCDOT ROW, this form must be completed and submitted to the inspectors listed below. Please allow 2-3 business days for a response by the appropriate inspector. Please note that this form must be completed and submitted to NCDOT prior to the pre-construction meeting.

Please submit this form to the following NCDOT Inspectors:

Elijah Hager- (980)250-08680 (ebhager1@ncdot.gov)

Carl Valente- (980) 323-0614 (cvalente@ncdot.gov)

Permit number: D102-060-23-00572

Project Name: US-21 and SC-51 Improvements

Construction start date: ______________________________________

Approximate ending date: ______________________________________

Requested Date & time: __________________________________

Contractor's Information:

- **Name:** _______________
- **Email:** _______________
- **Phone Number:** _______________

City/Town Inspector's Information:

- **Name:** _______________
- **Email:** _______________
- **Phone Number:** _______________
- **City/Town:** _______________

SPECIAL PROVISIONS

R/W 16.1B

ENCROACHING PARTY

E102-060-23-00572

Pre-Construction

Contact Offices & Outside Agency issues/contacts/info

1. Approval may be rescinded upon failure to follow any of the provisions in this permit and may be considered a violation of the encroachment agreement.

2. The encroachment applicant shall have one (1) year from the approval date as shown on the cover letter to begin construction. If work is not started within this one (1) year time period, the Encroachment Contract will become VOID, thus requiring written authorization from the District Engineer's office to proceed with construction.

3. The Encroaching party or their contractor shall provide the following notices prior to construction activity within the NCDOT Right of Way:
    - Three (3) business days advance phone call at telephone (980) 523-0000 or email to ebhager1@ncdot.gov and cvalente@ncdot.gov to the District Engineer's office.
    - If the construction falls within the limits of an NCDOT managed construction project, five (5) business days advance phone call to the Resident Engineer, Mr. Jon Hinson at (980) 523-0160 or email to jchinson@ncdot.gov.

    Failure to provide these notifications prior to beginning construction is subject to the Division Engineer's discretion to cease construction activity for this encroachment. NCDOT reserves the right to cease any construction or maintenance work associated with this installation by the encroaching party until the construction or maintenance meets the satisfaction of the Division Engineer or their representative.

4. The approval is subject to the project being constructed as shown on the approved plan and any attached revisions to the approved plans must be approved through **Kimberly Boik or Felix Obregon** with the NCDOT District Office.

5. Prior to beginning work, it is the requirement of the Encroaching Party to contact the appropriate Utility Companies involved and make arrangements to adjust or relocate any utilities that conflict with the proposed work.

6. It shall be the responsibility of the encroaching party to determine the location of utilities within the encroachment area. NCGS § 87-115 through § 87-130 of the Underground Utility Safety and Damage Prevention Act requires underground utilities to be located by calling 811 prior to construction. The encroaching party shall be responsible for notifying other utility owners and providing protection and safeguards to prevent damage or interruption to existing facilities and maintain access to them.

7. The encroaching party shall notify the appropriate municipal office prior to beginning any work within the municipality's limits of jurisdiction.

8. Excavation within 1000 feet of a signalized intersection will require notification by the encroaching party to NC-811 at telephone number 811 no less than one week prior to beginning work. All traffic signal or detection cables must be located prior to excavation by calling 811. Cost to replace or repair NCDOT signs, signals, pavement markings or associated equipment and facilities shall be the responsibility of the encroaching party.

9. This agreement does not authorize installations within nor encroachment onto railroad rights of way. Permits for installations within railroad right of way must be obtained from the railroad and are the responsibility of the encroaching party.

10. At the option of the District Engineer, a preconstruction meeting including representatives of NCDOT, the encroaching party, contractors, and municipality, if applicable, shall be required. A pre-construction conference held between a municipality (or other facility owner) and a contractor without the presence of NCDOT personnel with subsequent construction commencing may be subject to NCDOT personnel ceasing any work on NCDOT right-of-way related to this encroachment until such meeting is held. Contact the District office to schedule.

11. At the discretion of the District Engineer, a NOTIFICATION FOR UTILITY / NON-UTILITY ENCROACHMENT WITHIN NCDOT R/W form (See corresponding attachment) with the scheduled pre-construction meeting and associated construction schedule details must be completed and submitted to the District Engineer's office a minimum of one week prior to construction.

12. At the discretion of the District Engineer, the encroaching party (not the utility contractor) shall make arrangements to have a qualified inspector, under the supervision of a Professional Engineer registered in North Carolina, on site at all times during construction. The registered Professional Engineer shall be required to submit a signed and PE sealed certification that the utility was installed in accordance with the encroachment agreement.

Legal & Right-of-Way Issues

13. This approval and associated plans and supporting documents shall not be interpreted to allow any design change or change in the intent of the design by the Owner, Design Engineer, or any of their representatives. Any revisions or changes to these approved plans or intent for construction must be obtained in writing from the Division Engineer's office or their representative prior to construction or during construction if an issue arises during construction to warrant changes.

14. NCDOT does not guarantee the right of way on this road, nor will it be responsible for any claim for damages brought about by any property owner by reason of this installation. It is the responsibility of the encroaching party to verify the right of way.

15. Encroaching party shall be responsible for obtaining all necessary permanent and/or temporary construction, drainage, utility and/or sight distance easements.

16. All Right of Way and easements necessary for construction and maintenance shall be dedicated to NCDOT with proof of dedication furnished to the District Engineer prior to beginning work.

17. No commercial advertising shall be allowed within NCDOT Right of Way.

18. The encroaching party shall obtain proper approval from all affected pole owners prior to attachment to any pole.

19. The installation within the Control of Access fence shall not adversely affect the design, construction, maintenance, stability, traffic safety or operation of the controlled access highway, and the utility must be serviced without access from the through-traffic roadways or ramps.

20. No permission is given through the NCDOT permitting process to install items on NON-NCDOT maintained streets, private property, or railroad property.

21. Prior to the approval of any privately maintained facility within NCDOT right of way which the State of North Carolina is not the fee simple owner, written permission that each and every property owner affected by the installation shall be provided to NCDOT by the encroaching party.

Work Zone Traffic

22. WORK ZONE TRAFFIC CONTROL QUALIFICATIONS AND TRAINING PROGRAM

    All personnel performing any activity inside the highway right of way are required to be familiar with the NCDOT Maintenance / Utility Traffic Control Guidelines (MUTCG). No specific training course or test is required for qualification in the Maintenance /Utility Traffic Control Guidelines (MUTCG).

    All flagging, spotting, or operating Automated Flagger Assist Devices (AFAD) inside the highway right of way requires qualified and trained Work Zone Flaggers. Training for this certification is provided by NCDOT approved training resources and by private entities that have been pre-approved to train themselves.

    All personnel involved with the installation of Work Zone Traffic Control devices inside the highway right of way are required to be qualified and trained Work Zone Installers. Training for this certification is provided by NCDOT approved training resources and by private entities that have been pre-approved to train themselves.

    All personnel in charge of overseeing work zone Temporary Traffic Control operations and installations inside the highway right of way are required to be qualified and trained Work Zone Supervisors. Training for this certification is provided by NCDOT approved training resources and by private entities that have been pre-approved to train themselves.

    For questions and/or additional information regarding this training program please refer to https://connect.ncdot.gov/projects/WZTC/Pages/Training.aspx or call the NCDOT Work Zone Traffic Control Section (919) 814-5000.

23. The party of the second part shall employ traffic control measures that are in accordance with the prevailing federal, state, local, and NCDOT policies, standards, and procedures. These policies, standards, and procedures include, but are not limited to the following:
    - Manual on Uniform Traffic Control Devices (MUTCD) – North Carolina has adopted the MUTCD to provide basic principles and guidelines for traffic control device design, application, installation, and maintenance. North Carolina uses the MUTCD as a minimum requirement where higher supplemental standards specific to North Carolina are not established. Use fundamental principles and best practices of MUTCD (Part 6, Temporary Traffic Control).
    - NCDOT Maintenance / Utility Traffic Control Guidelines – This document enhances the fundamental principles and best practices established in MUTCD Part 6, Temporary Traffic Control, incorporating NCDOT-specific standards and details. It also covers important safety knowledge for a wide range of work zone job responsibilities.
    - *NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures* and amendments or supplements thereto. When there is no guidance provided in the *NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures*, comply with the *Manual on Uniform Traffic Control Devices for Streets and Highways* and amendments or supplements thereto. Information as to the above rules and regulations may be obtained from the NCDOT Division Engineer.

24. If the Traffic Control Supervisor determines that portable concrete barrier (PCB) is required to shield a hazard within the clear zone, then PCB shall be designed and sealed by a licensed North Carolina Professional Engineer. PCB plans and design calculations shall be submitted to the District Engineer for review and approval prior to installation.

25. Ingress and egress shall be maintained to all businesses and dwellings affected by the project. Special attention shall be paid to police, EMS and fire stations, fire hydrants, secondary schools, and hospitals.

26. Traffic shall always be maintained. All lanes of traffic are to be open during the hours of 6:00 A.M. to 9:00 A.M. and from 4:00 P.M. to 6:00 P.M. Monday through Friday, during any time of inclement weather, **or as directed by the District Engineer per the approval letter**. Any violation of these hours will result in ceasing any further construction by the Encroaching Party or their contractor.

27. If the construction is within 1000 feet of a school location or on a designated bus route, the construction shall be coordinated with the school start and end times to avoid traffic delays.

28. Work hours may be modified by the District Engineer or designee if installation causes traffic problems. If nighttime or weekend work is allowed or required, all signs must be retro-reflective, and a work zone lighting plan must be submitted for approval prior to construction.

29. Two-way traffic shall be maintained at all times unless designated by the District Engineer. Traffic shall not be rerouted or detoured without the prior written approval from the District Engineer. No utility work will be allowed on state holidays from 7:00 PM the night before through 9:00 AM the day prior to, following or during local events without prior approval from the District Engineer. If the construction is within 1000 feet of a school location or on a designated bus route, the construction shall be coordinated with the school start and end times to avoid traffic delays.

30. **ADDITIONAL NCDOT HOLIDAY LANE CLOSING RESTRICTIONS** are as follows:
    - **New Year's:** From 4pm, Dec. 31, until 9am, Jan. 2. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until 9am the following Tuesday.
    - **Easter:** From 4pm, Thursday before the holiday until 6pm the Monday after holiday.
    - **Memorial Day:** From 4pm, Friday, until 9am Tuesday.
    - **Independence Day:** From 4pm on the day before holiday, until 9am on the day after. If the holiday lands on a Friday, Saturday, Sunday or Monday, then there will be no lane closures from 4pm on the Thursday before until 9am the Tuesday after.
    - **Labor Day:** From the hours of 4pm, Friday until 9am Tuesday.
    - **Thanksgiving:** From 4pm, Tuesday until 9am Monday.
    - **Christmas:** From 4pm the Friday before the week of Christmas Day, until 9am the following Tuesday after the week of Christmas Day.

31. No lane closures shall be allowed on days or times in which special events are occurring in the area which may include but not be limited to CIAA and ACC Tournaments, NASCAR races, soccer games, stadium events, college graduations, move-ins and sporting events, plus Panthers, Knights and Hornets games. The time restrictions, including the requirement to perform work within the roadway at night, will be adjusted by the Engineer or Inspector for that project. Further restrictions may also be required depending on the size and location of the event.

32. Work requiring lane or shoulder closures shall not be performed on both sides of the road simultaneously within the same area.

33. Any work requiring equipment or personnel within 5 feet of the edge of any travel lane of an undivided facility and within 10 feet of the edge of any travel lane of a divided facility shall require a lane closure with appropriate tapers per current *NCDOT Roadway Standard Drawings or MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES*.

34. At the discretion of the District Engineer, a traffic control plan shall be developed and submitted under the seal and signature of a Licensed North Carolina Professional Engineer prior to construction. The plan shall be specific to the site and adequately detailed. Issues such as the proximity to intersections shall be addressed.

35. Temporary and final pavement markings are the responsibility of the encroaching party. Final pavement markings and sign plans shall be submitted with the encroachment request to the Division Traffic Engineer prior to construction. Final pavement markings shall be thermoplastic unless otherwise directed by the Division Traffic Engineer or District Engineer.

36. Any pavement markings that are damaged or obliterated shall be restored by the encroaching party at no expense to NCDOT.

37. Sidewalk closures shall be installed as necessary. Pedestrian traffic shall be detoured around these closures and shall be signed appropriately and in accordance with The American with Disabilities Act Accessibility Guidelines. The encroaching party must adhere to the guidelines for accommodating pedestrians in encroachment work zones as described in the NCDOT Pedestrian Work Zone Accommodations Training found at https://www.youtube.com/watch?v=AOuYa5IW3dg&feature=youtu.be

Roadside Environmental

38. The encroaching party shall comply with all applicable Federal, State and local environmental regulations and shall obtain all necessary Federal, State and local environmental permits, including but not limited to, those related to sediment control, stormwater, wetland, streams, endangered species and historical sites. Additional information can be obtained by contacting the NCDOT Roadside Environmental Engineer regarding the North Carolina Natural Heritage Program or the United States Fish and Wildlife Services. Contact the Division Roadside Environmental Engineer's Office at (704) 244-8260.

39. It is the responsibility of the encroaching party to secure any needed environmental permits and/or authorizations prior to beginning construction. Permit authorizations from the US Army Corps of Engineers Asheville Regulatory Field Office, (828) 271-7980, and the NC Division of Water Quality Mooresville Regional Office, (704) 663-1699, are required for any stream or wetland impacts. If you, or your representative, determine that no permits or authorizations are needed, attach a letter of verification to the encroachment application stating such.

40. When surface area in excess of one acre will be disturbed, the Encroacher shall submit a Sediment and Erosion Control Plan which has been approved by the appropriate regulatory agency or authority prior to beginning any work on the Right of Way. Failure to provide this information shall be grounds for suspension of operations. Proper temporary and permanent measures shall be used to control erosion and sedimentation in accordance with the approved sediment and erosion control plan.

41. The Verification of Compliance with Environmental Regulations (VCER-1) form is required for all non-utility encroachment agreements or any utility encroachments when land disturbance within NCDOT right of way exceeds 1 acre. The VCER-1 form must be PE sealed by a NC registered professional engineer who has verified that all appropriate environmental permits (if applicable) have been obtained and all applicable environmental regulations have been followed.

42. All erosion control devices and measures shall be constructed, installed, maintained, and removed by the Encroacher in accordance with all applicable Federal, State, and Local laws, regulations, ordinances, and policies. Permanent vegetation shall be established on all disturbed areas in accordance with the recommendations of the Division Roadside Environmental Engineer. All areas disturbed (shoulders, ditches, removed accesses, etc.) shall be graded and seeded in accordance with the latest *NCDOT Standards Specifications for Roads and Structures* and within 15 calendar days with an approved NCDOT seed mixture (all lawn type areas shall be maintained and reseeded as such). Seeding rates per acre shall be applied according to the Division Roadside Environmental Engineer. Any plant or vegetation in the NCDOT planted sites that is destroyed or damaged as a result of this encroachment shall be replaced with plants of like kind or similar shape.

43. No trees within NCDOT shall be cut without authorization from the Division Roadside Environmental Engineer. An inventory of trees measuring greater than 4 caliper inches (measured 6" above the ground) is required when trees within C/A right of way will be impacted by the encroachment installation. Mitigation is required and will be determined by the Division Roadside Environmental Engineer's Office.

44. Prior to installation, the Encroaching Party shall contact the District Engineer to discuss any environmental issues associated with the installation to address concerns related to the root system of trees impacted by boring or non-utility construction of sidewalk, roadway widening, etc.

45. The applicant is responsible for identifying project impacts to waters of the United States (wetlands, intermittent streams, perennial streams and ponds) located within the NCDOT right-of-way. The discharge of dredged or fill material into waters of the United States requires authorization from the United States Army Corps of Engineers

(USACE) and certification from the North Carolina Division of Water Quality (NCDWQ). The applicant is required to obtain pertinent permits or certification from these regulatory agencies if construction of the project impacts waters of the United States within the NCDOT right-of-way. The applicant is responsible for complying with any river or stream Riparian Buffer Rule as regulated by the NCDWQ. The Rule regulates activity within a 50-foot buffer along perennial streams, intermittent streams and ponds. Additional information can be obtained by contacting the NCDWQ or the USACE.

46. The contractor shall not begin the construction until after the traffic control and erosion control devices have been installed to the satisfaction of the Division Engineer or their agent.

47. The contractor shall perform all monitoring and record keeping and any required maintenance of erosion and sediment control measures to maintain compliance with stormwater regulations.

48. It should be noted that there are federally protected plant species found within the Department of Transportation rights of way. While the department makes every effort to assure that these roadside populations are identified by posting "Do Not Mow" signs, it is the responsibility of the encroaching party to assure that these populations remain undisturbed. Assistance with threatened and endangered species issues can be obtained through the US Fish and Wildlife Service Asheville Field Office, (828) 258-3939.

Construction

General

49. An executed copy of the encroachment agreement, provisions and approved plans shall be present at the construction site at all times. If safety or traffic conditions warrant such an action, NCDOT reserves the right to further limit, restrict or suspend operations within the right of way.

50. The Encroaching Party and/or their Contractor shall comply with all OSHA requirements. If OSHA visits the work area associated with this encroachment, the District Office shall be notified by the encroaching party immediately if any violations are cited.

51. All materials and workmanship shall conform to the *NCDOT Standards and Specifications for Roads and Structures*.

52. Strict compliance with the *Policies and Procedures for Accommodating Utilities on Highway Rights of Way* manual shall be required.

53. Any REVISIONS marked in RED on the attached non-PE sealed plans shall be incorporated into and made part of the approved encroachment agreement.

54. The attached plans reflect the corrections and revisions as coordinated with the NCDOT Encroachment Review Unit of the District Office.

55. All disturbed areas are to be fully restored to current NCDOT minimum roadway standards or as directed by the Division Engineer or their representative. Disturbed areas within NCDOT Right-of-Way include, but not limited to, any excavation areas, pavement removal, drainage or other features.

56. Any pavement, curb and gutter, handicap ramps, or concrete sidewalk replacement/repair required due to this installation shall be the responsibility of the encroaching party and shall be completely restored within 7-days of final construction. All repairs or replacements shall be in accordance with the requirements of and to the satisfaction of the District Engineer.

57. The encroaching party shall notify the Division Engineer or their representative immediately in the event any drainage structure is blocked, disturbed or damaged. All drainage structures disturbed, damaged or blocked shall be restored to its original condition as directed by the Division Engineer or their representative.

58. Unless specified otherwise, during non-working hours, equipment shall be located away from the job site or parked as close to the right of way line as possible and be properly barricaded in order not to have any equipment obstruction within the Clear Recovery Area. Also, during non-working hours, no parking or material storage shall be allowed along the shoulders of any state-maintained roadway.

59. Guardrail removed or damaged during construction shall be replaced or repaired to its original condition, meeting current NCDOT standards or as directed by the Division Engineer or their representative.

60. The resetting of the Control of Access fence shall be in accordance with the applicable NCDOT standard and as directed by the Division Engineer or their representative.

61. Right of Way monuments disturbed during construction shall be referenced by a registered Land Surveyor and reset after construction.

62. All Traffic signs moved during construction shall be reinstalled as soon as possible to the satisfaction of the Division Engineer or their representative.

63. Any utility markers, cabinets, pedestals, meter bases and services for meter reading required shall be as close to the Right of Way line as possible. If it is not feasible to install at or near Right of Way line, then written approval shall be obtained from NCDOT prior to installation.

64. All driveways disturbed during construction shall be returned to a state comparable with the condition of the driveways prior to construction.

65. If the approved method of construction is unsuccessful and other means are required, prior approval must be obtained through the District Engineer before construction may continue.

Engineering

66. All traffic control, asphalt mixes, structures, construction, workmanship and construction methods, and materials shall be in compliance with the most-recent versions of the following resources: *ASTM Standards, Manual on Uniform Traffic Control Devices, NCDOT Utilities Accommodations Manual*, *NCDOT Standard Specifications for Roads and Structures, NCDOT Roadway Standard Drawings,* NCDOT *Asphalt Quality Management System* manual, **and the approved plans.**

67. Prior approval for any blasting must be obtained from the Division Engineer or their representative.

Location within R/W

68. All utility access points, such as manholes, vaults, handholes, splice boxes and junction boxes shall be located as close to the right of way line as possible and shall not be placed in the ditch line, side slopes of the ditches or in the pavement. All manholes, handholes, splice boxes, junction boxes and vaults and covers shall be flush with the ground when located within the vehicle clear zone. Slack loops for telecommunications in industry standard housing units shall be buried a minimum of 18 inches when buried or meet minimum NCDOT vertical and horizontal clearances when installed aerially.

69. Fire Hydrants shall be of the breakaway type. Hydrants shall be placed near the right of way line. In curb and gutter sections with written approval from the District, the hydrants may be placed at 6' behind the back of the curb or minimum 2' back of sidewalk.

70. Luminaire and/or utility poles and guy wires shall be set as close to the Right of Way line as practical and outside the Clear Zone in accordance with the latest version of the AASHTO Roadside Design Guide (See corresponding attachment) or made breakaway in accordance with the requirements of NCHRP Report 350. Any relocation of the utility poles from the original design due to Clear Zone requirements shall require a re-submittal for the utility design.

71. Luminaire and/or utility poles shall be set a minimum of 5'-6" behind face of any guardrail or otherwise sufficiently protected. However, standard placement may be reduced to 3'-6" behind face of guardrail when posts are spaced 3'-1 ½", or where speed limit is less than 55 MPH..

Excavation

72. Excavation material shall not be placed on pavement.

73. Trenching, bore pits and/or other excavations shall not be left open or unsafe overnight.

74. It is the responsibility of the encroaching party or their contractor to prevent any mud/dirt from tracking onto the roadway. Any dirt which may collect on the roadway pavement from equipment and/or truck traffic on site shall be immediately removed to avoid any unsafe traffic conditions.

Paving

75. The paving of this roadway shall be in accordance with the latest version of NCDOT Standard Specifications, Sections 610, 1012 and 1020. The Contractor shall follow all procedures of the Quality Management System (QMS) for asphalt pavement - Maintenance Version (see https://connect.ncdot.gov/resources/Materials/MaterialsResources/2018%20QMS%20Asphalt%20Manual.pdf). The Contractor must adhere to all testing requirements and quality control requirements specified. The Contractor shall contact the NCDOT Division QA Supervisor prior to producing plant mix and make the Supervisor aware that the mix is being produced for a future NCDOT road. Contact the District Engineer to determine the NCDOT Division QA Supervisor. Only NCDOT approved mix designs will be acceptable. A Quality Control Plan shall be submitted (as Directed by the District Engineer) to the District Engineer's Office prior to asphalt production utilizing form QMS-MV1. Failing mixes and/or densities are subject to penalties including monetary payments or removal and replacement. To minimize traffic queuing in construction areas, the possibility of traffic detours may be considered when working on high traffic routes even if traffic control is used. The District Engineer may require traffic detours.

76. "Potholing" pavement cores to expose existing utilities shall be made with an 18" diameter keyhole pavement core. Pavement core locations shall not be placed in the wheel path whenever possible. Vacuum excavation shall be utilized to expose underground utilities. Pavement cores shall be repaired within the same working day. The pavement core shall be retained and reused to fill the core hole.

    The excavation shall be backfilled and compacted with select material to the bottom of the existing pavement structure or as indicated by the District Engineer. The retained core shall be placed in the hole and secured with a waterproof, mechanical joint. If the pavement core is damaged and cannot be re-used, the core may be replaced with the surface mix, S9.5C. The asphalt patch shall match the thickness of the existing asphalt or four inches, whichever is greater. All materials must be listed on the NCDOT Approved Products List (APL) found at: https://apps.ncdot.gov/vendor/approvedproducts/.

77. The minimum pavement design for pavement repair shall be according to NCDOT Standard Drawing 654.01 (https://connect.ncdot.gov/resources/Specifications/2018StandardRdwyDrawings/Division%2006%20Asphalt%20Bases%20and%20Pavements.pdf) and shall include a mechanical overlay extent to be a minimum of 25 feet each side of the pavement repair area OR as directed by the District Engineer.

78. Pavement cuts shall be repaired the same day the cuts are made unless an asphalt patch cannot be accomplished the same day due to material availability or time restrictions. When the asphalt patch is not feasible, the following apply:

- The pavement cut shall be filled to the surface with ABC stone or Flowable Fill per NCDOT's Standards and Specifications.
- Once the cut is filled, a minimum ¾-inch steel plate shall be placed and pinned to prevent moving. Plates shall be designed large enough to span a minimum of 1-foot on all sides on the pavement cut.
- When flowable fill is used, it shall cure for 24 hours prior to any asphalt material placement. Flowable fill bleed water shall not be present during paving operations. Paving shall not cause damage (shoving, distortion, pumping, etc.) to the flowable fill.
- Install and leave "BUMP" signs according to MUTCD until the steel plate has been removed. Once the flowable fill has cured, remove the steel plate, and mill/fill according to the directions of the District Engineer.
- All pavement cuts must be sealed with NCDOT approved sealant to prevent future pavement separation or cracking.

79. Any pavement damaged because of settlement of the pavement or damaged by equipment used to perform encroachment work, shall be re-surfaced to the satisfaction of the District Engineer. This may include the removal of pavement and a 50' mechanical overlay. All pavement work and pavement markings (temporary and final) are the responsibility of the Encroaching Party.

Post Construction

Close out/ Inspection

80. The Encroaching party shall notify the District Engineer's office within 2 business days after construction is complete. The District Engineer may perform a construction inspection. Any deficiencies may be noted and reported to the encroaching party to make immediate repairs or resolve any issues to restore the right-of-way to a similar condition prior to construction, including pavement, signage, traffic signals, pavement markings, drainage, structures/pipes, or other highway design features.

81. At the discretion of the District Engineer, a final inspection report may be provided to the encroaching party upon satisfactory completion of the work.

82. A written acknowledgement of the completed work by the District Engineer's office begins the one-year warranty period associated with the performance bond.

83. If the actual construction differs from the approved plans associated with this encroachment, a copy of "as-built" plans shall be submitted to the District Engineer's office in a PDF format and in a current ESRI GIS format within 4 weeks of construction.

Complete restoration including fertilizing, seeding, and mulching of all areas disturbed during construction will follow within a maximum of fifteen (15) working days of the initial disturbing activity.

Grass cover to be established on all disturbed areas in accordance with recommendations of the Division Roadside Environmental engineer.

August 1 – June 1	May 1 – September 1
100# KY 31 TALL FESCUE	100# KY 31 TALL FESCUE
OR ALTA TALL FESCUE	OR ALTA TALL FESCUE
15# ALTA TALL FESCUE	15# KENIBLUE BLUGRASS
15# RELIANT HARD FESCUE	15# RELIANT HARD FESCUE
500# FERTILIZER	25# KOBE OR KOREAN LESPEDEZA
400# LIMESTONE	500# FERTILIZER
	400# LIMESTONE

On cut and fill slopes 2:1 or steeper add 25# Rye Grain November 1 through March 1.

On cut and fill slopes 2:1 or steeper add 30# Sericea Lespedeza January 1 through December 1.

Fertilizer shall be 10-20-20 analysis. Upon written approval of the Engineer, a difference analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

River Birches will not be planted near storm or sanitary sewers as roots will intrude at pipe joints.

VERIFICATION OF COMPLIANCE WITH ENVIRONMENTAL REGULATIONS

(Check Appropriate Box)

☐ Permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers are not required for this project. However, all applicable federal and state regulations have been followed.

☐ The required permits from the ~~N.C.~~ S.C. Department of ~~Environment and Natural Resources~~ Health and Environmental Control and the U.S. Army Corp of Engineers have been obtained for this project. Copies of permits and Completion Certificates are attached.

☐ All applicable NPDES Stormwater Permit requirements have been met for this project. (The applicant should contact the N.C. Division of Water Quality in Raleigh to determine if a stormwater permit is required.)

☐ The project is in compliance with all applicable sedimentation and erosion control laws and regulations.

Project Name: US21 and SC51 Improvements

Township: ______________ County: York SC at Mecklenburg NC

Project Engineer: STV Incorporated Phone No.: 704 314 5374

Project Contact: Guy P. Peters, PE, CFM

Applicant's Name: Guy P. Peters, PE, CFM

Date Submitted: 17 February 2023

Form VCER-1
June 1, 2006