CONTRACT DOCUMENTS & TECHNICAL SPECIFICATIONS
ADDENDUM NO. 2

Auburn Heights Preserve
Paper Mill Bridge
Contract No. 2015-NVF-100

ADDENDUM NO. 2

Project Name: Auburn Heights Preserve
Paper Mill Bridge

Contract No.: 2015-NVF-100

Date of Issue: August 10, 2017

Notice No. 2: Attach this addendum to the Project Manual for this project. It modifies and becomes part of the Bidding Documents. Work or material not specifically mentioned herein is to be as described in the main body of the specifications and as shown on the drawings.

Bids Due: August 17, 2017, 1:00 PM

"DNREC CONTRACT NO. 2015-NVF-100 SEALED BID – DO NOT OPEN".
Dept. of Natural Resources & Environmental Control
Division of Parks and Recreation
Office of Design and Development
89 Kings Highway, Dover DE 19901
Attn: Cindy A. Todd, RLA. Phone Number: 302-739-9210

QUESTIONS:

1. Is an Affidavit of Employee Drug Testing Program" required to be submitted with the bid for the prime contractor and all listed subcontractors? If so, will the Department provide the correct form?

   Response: An Affidavit of Employee Drug Testing Program" is required to be submitted with the bid for the prime contractor and all listed subcontractors? The Affidavit has been added to the Bid Form and is included in this Addendum.

2. Demo Plan Sheet C-11 calls out notes 3 & 5, there is no note 5.

   Response: Sheet C-11, the call out referencing notes 3 and 5 has been revised and the revised sheet is included in this Addendum.

3. What fence items are included in the fence allowance? Does it include the split rail fence in Alternate No. 1?

   Response: The fence items included in the allowance will be determined by the owner during construction. The split rail fence shown in Add/Alternate No. 1 is not part of this allowance and shall be included in the lump sum bid for Add/Alternate No. 1.

4. Sheet C-1, Note 13, specifies no Portland cement fragments in the base material. Will DelDOT approved crushed concrete be approved as a base material for the project?

   Response: DelDOT approved crushed concrete shall be acceptable as a base material for the project.

5. Will the Department consider adding an allowance for the repair work that may be need to the existing HI Parcel Trail after it is utilized as an access road.

   Response: The Department has added Allowance No. 5: Trail Repairs, totaling $20,000 to the base bid. This allowance will be used as directed by the Owner for repairs to the HI Parcel Trail after it has been utilized as an access road. The Allowance specification and the bid forms have been updated and are included in this Addendum.

6. Who will be responsible for the Bog coordination and inspection? Who will be responsible for the compensation?

   Response: The contractor will be responsible to coordinate with the Bog Turtle surveyor as detailed on Sheet E-1, "Working in Waterways". The Bog Turtle inspection will be performed by the Bog Turtle surveyor. The Bog Turtle surveyor will be under contract to the Department.

7. Sheet 15, Detail 10C-15, not sure what is going on here?

   Response: The intent of the detail is to show the scoring pattern for the area. Clarifications were made to Sheet 15, Detail 10C-15 and issued in Addendum No. 1.

8. What is the overall scope that will be expected for the parking facility on Benge Road? Does the scope of work include repairs to the historic wall?

   Response: Repair to the historic wall is not included in the scope of work for the parking lot on Benge Road.

9. We need a typical section for Sta. 300+43 to 301+12 pertaining to Alternate No. 1.

   Response: The geometric layout for this area is shown on Sheet C-9. Notes was added to clarify the pavement and sidewalk section for this area. The revised sheet is included in this Addendum.

10. Will the Department require a field office (Section 015000)?

    Response: The contractor shall include a field office on the HI Parcel. The exact location of the field office shall be coordinated with the Owner in the field. The field office shall include a minimum of one desk and chair each for the Owner and the inspection engineer. All costs associated with the field office shall be included in the Base Bid.

11. The pre-bid meeting minutes indicate that the subcontractor list will be "reduced by eliminating the subs for the allowances." Will the bid forms be reissued with the correct sub listing?

    Response: The subcontractor list has been revised and is included in Addendum No. 2.

12. The pre-bid meeting minutes indicate that railing (from sheet P4) will be depicted on a new plan sheet. Will the plan sheet be issued soon?

    Response: New plan sheets P-5 and P-6 have been created to depict the railing locations and are included in this Addendum.

13. Section 600500 requires "At the time of the bid, the Contractor shall identify and submit qualifications for the Contractor's Engineer" Will the Department be providing a format or form for this submission?

    Response: The Contractor's Engineer was removed from the sub-contractors list and is part of the allowance for the Deck Over Structure. Once the contract is awarded the contractor will be required to submit documentation that the Contractor's Engineer is a registered professional engineer in the state of Delaware and evidence of successfully completing three projects of similar size and scope within the last five years. Documentation shall include name of project, Owner, owner contact information and date of the project.

14. I do not have the geotechnical report dated June27, 2012. Where are the (2) borings located that were taken by Hynes and Assoc.?

    Response: Geotechnical information was provided in Addendum No. 1 from pages 9-11 and as a separate document. The Geotechnical report prepared by Geo-Technology Associates, Inc. date June 2016 has been included to Addendum 2.

15. I see a note in addendum No.1, referencing unused soil from the project being disposed of to be included in the base bid. Does that include the soil being removed from Alternate No.1?

    Response: See Sheet C-1 Note 16 for the disposition of unused soil on the project. Unit Cost No. 8 includes the disposal of unused soil from the project site at the direction of the Owner. The quantity shown in the Unit Cost includes excavation from the project in its entirety. The Owner may request as little as none or as much as all unused material be disposed from the project site.

16. It is unclear whether or not we are to take our price for all of the work east of Benge Rd and then add Allowances 1, 2 & 3 to that number and enter it on the first page of the bid form or whether DNREC will take our Base Bid price (from page 1 of bid form) and then add in the Allowances. This needs to be more clear so that all bidders on the project do the same thing with the allowance items. It would be easier for us if you had us price all work that wasn't included in allowances and submit that as a base bid and then let you add $590,000 to everyone's bid. There would be a similar issue with Alternate 1 and Allowance #4, we need to know more clearly whether you want the $150,000 added to our price for Alternate #1. There is potential for a $740,000 mistake or variance between bids if someone misinterprets how these allowances are handled.

    Response: The Bid Form has been revised to address this question. See the enclosed Bid Form for your use

17. Section 132950 page 5 3.3 B mentions "Top Down" method of construction, this method is typically required in a wet or environmentally sensitive area. The area where the timber bridge is to be constructed is in the same area designated as Staging Area for Workin' Bridges and will be completely disturbed and will likely have some type of stone or gravel base installed for stability of cranes, equipment, etc. To make the Timber Bridge contractor adhere to "Top Down" construction after all this disturbance takes place would be expensive and time consuming as compared to being able to start at the bridge abutment and drive all of the timber piles working your way back out towards the paved trail. Please consider eliminating this requirement from the specifications.

    Response: Since the clearing and grubbing for the Staging Area for Workin' Bridges and the area below the boardwalk is going to occur, then the "Top Down" construction is not required for this project.

18. Plan Sheet C-11 Note 2 talks about intake and discharge pipes in the settlement tank being plugged, do you know how many of each there are and the size of intakes and discharges?

    Response: It is assumed that 1-6" intake and 1-6" discharge pipe exist in the tank, and shall be included in the base bid. If additional pipes are encountered they shall be removed and plugged, as directed by the Owner. Cost for this additional work shall documented and be paid under a Change Order.

19. Is it safe to calculate the overall depth of the Settlement Tank from the Fam Lane Profile Plan Sheet C-6 or is the depth unknown?

    Response: The contractor is advised not to scale the depth of the tank from the profile. As a follow up to the pre-bid meeting the Owner measured the depth of the tank to the top of the existing sediment to be approximately eleven (11) feet.

20. The 8' Shared Use Path next to the Bicycle Pad (west of Benge Rd) is shaded the same as the Scored PCC Pavement near the Settlement Tank please confirm these are the same type of pavement and please provide the Pavement Section (i.e. 8" Concrete over 6" GABC)

    Response: The Shared Use Path next the Bicycle Pad shall be constructed of 6" of DelDOT Class B concrete over 4" of Graded Aggregate Base Course. A note has been added to Sheet C-9, and is included in this Addendum.

21. Plan Sheet ES-1 "Access to Paper Mill Bridge East Abutment" mentions restoration/redressing/addition of graded aggregate along the existing trail. This trail is not graded aggregate but hot mix asphalt, are we to include milling and overlaying this trail at the end of the project to restore to current conditions?

    Response: The Department has added Allowance No. 5: Trail Repairs, totaling $20,000 to the base bid. This allowance will be used as directed by the Owner for repairs to the HI Parcel Trail after it has been utilized as an access road. The Allowance specification and the bid forms have been updated and are included in this Addendum.

22. Just to clarify, we are to include the allowances monetary figures as shown on Page Four of the Bid Form ($740,000) within our Lump Sum Price on Page One of the Bid Form. Also, is the Subcontractor Listing remaining the same? Your answer to one question asked during the Pre-Bid Meeting indicated that the number of listings might be reduced.

    Response: See the response to Question #16 for your use.

23. Is the Temporary Road Way to be removed after construction is complete?

    The contractor shall remove the Access Road at the completion of construction. The area shall be backfilled with excavated material, seeded and mulched. Sheet ES-1 has been revised to add this note, and is included in this Addendum.

24. Are there clearing of trees when installing the temporary roadway? If so, please specify.

    The limits of clearing and grubbing are to the Limit of Disturbance.

25. Are excess soils generated from the road and parking lot construction to be exported off site or can they be stockpiled onsite? If soils can remain, where are they to be stockpiled?

    This is considered the contractor's means and methods and should be considered when preparing his/her bid. Also, see the response to Question #15 for your use.

DRAWINGS:

1. **Drawing C-4:** Changed Shared Use Path to 6" PCC concrete.
2. **Drawing C-9:** Changed Shared Use Path to 6" PCC concrete and added notes clarifying the paving section for Farm Lane and the adjacent parking area.
3. **Drawing C-11:** Revised Note Reference. Revised Note 2, to clarify anticipated size of pipes removal and plugging to be included in the bid.
4. **Drawing C-16:** Changed Shared Use Path to 6" PCC concrete.
5. **Drawing ES-1:** Added Clear and Grubbing Note. Added Temporary Access Road Note, to clarify the disposition of the access road upon completion of construction. Revised Access To Paper Mill East Abutment, to include Allowance No. 5, for repairs.
6. **Drawing ES-2:** Revised Limit of Disturbance to include Bridge Staging Area and HI Trail.
7. **Drawings P-5 and P-6:** These are new sheets and identify the locations of the rail types indicated on Sheet P-4.

SPECIFICATIONS:

1. **Specification Section 012100, Allowances:** Allowance No. 5 Repairs to HI Trail, was added to the specification.
2. **Specification Section 012200, Unit Prices:** The quantity for Unit Price No. 4 Delaware No. 3 Stone was increased to 1,250 CY.
3. **Specification No. 004113, Bid Form:** The Bid Form was revised to include Allowance No. 5. And the Sub-Contractor List was revised.
4. **Specification T-600500, Design Build For Selected Project Elements:** The specification was revised to eliminate to the Contractor listing the Contractor's Engineer at the time of the bid, since the work covered under this specification is to be performed under and allowance.
5. **Specification 055213, Pipe and Tube Railings:** Paragraph 1.6D has been added to include information on the railing mock-up prior to final approval of the design and workmanship.

ADDITIONAL INFORMATION:

1. The Geotechnical Report Prepared by Geo-Technology Associates, Inc., dated June 10, 2016.

AUBURN HEIGHTS PRESERVE
PAPER MILL BRIDGE
FARM LANE / YORKLYN
DIVISION OF PARKS AND RECREATION CONTRACT No. 2015-NVF-100

BID FORM

For Bids Due: August 17, 2017 @ 1:00 PM To: Dept. of Natural Resources and Environmental Control
Division of Parks and Recreation
Office of Design and Development
89 Kings Highway, Dover DE 19901

Name of Bidder: _____

Delaware Business License No.: _____ **Taxpayer ID No.:** _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

(Other License Nos.): _____

Phone Number: ( ) _____ _____ **Fax Number: ( ) _____ _____**

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below. The Base Bid shall include Allowances 1, 2, 3, and 5:

$ _____
($)

AUBURN HEIGHTS PRESERVE
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BID FORM

ALTERNATES

Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

ALTERNATE No. 1: Proposed construction to the west of Benge Road, including the Farm Lane parking lot, Museum Drive, and Museum Drive parking lot. (Alternate 1 shall include Allowance 4.)

Add/Deduct: $_____

($)

No. of Days to Complete Alternate 1: _____

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BID FORM

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

UNIT PRICE No. 1:	Undercut Excavation	**Add or Deduct**	**$** _____	**/cy**
UNIT PRICE No. 2	DelDOT Borrow Type B	**Add or Deduct**	**$** _____	**/cy**
UNIT PRICE No. 3	DelDOT Borrow Type A	**Add or Deduct**	**$** _____	**/cy**
UNIT PRICE No. 4	Delaware No. 3 Stone	**Add or Deduct**	**$** _____	**/cy**
UNIT PRICE No. 5	Geotextile Separation Fabric	**Add or Deduct**	**$** _____	**/sy**
UNIT PRICE No. 6	Rock Excavation (non-Structural)	**Add or Deduct**	**$** _____	**/cy**
UNIT PRICE No. 7	Silt Fence	**Add or Deduct**	**$** _____	**/lf**
UNIT PRICE No. 8	Offsite Soil Disposal	**Add or Deduct**	**$** _____	**/cy**
UNIT PRICE No. 9	Flowable Fill	**Add or Deduct**	**$** _____	**/cy**

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BID FORM

ALLOWANCES

The following allowances are included in the Base Bid. Allowances conform to applicable project specification sections. Refer to the specifications for a complete description of the following Allowances:

Allowance No. 1: Path connection to the existing office. (Base Bid)

Two Hundred Thousand Dollars and Zero Cents
($ 200,000)

Allowance No. 2: Construction of the Mill Race deck-over structure as described in Sections 600500 and 600600. (Base Bid)

Three Hundred Fifty Thousand Dollars and Zero Cents
($ 350,000)

Allowance No. 3: Mill Race inspection and repair. (Base Bid)

Forty Thousand Dollars and Zero Cents
($ 40,000)

Allowance No. 4: Removal and replacement of existing fence. (This allowance is warranted if the owner selects Alternate 1.)

$One-Hundred and Fifty Thousand Dollars and Zero Cents
($ 150,000)

Allowance No. 5: HI Parcel Trail repair. (Base Bid)

Twenty Thousand Dollars and Zero Cents
($ 20,000)

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BID FORM

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____calendar days of the Notice to Proceed.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's/General Partner's /Corporate Name)

_____
(State of Corporation)

Business Address: _____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(Seal)

_____
(Title)

ATACHMENTS Date: _____
Sub-Contractor List
Non-Collusion Statement
Bid Security
(Others as Required by Project Manual)

AUBURN HEIGHTS PRESERVE
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BID FORM

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor **must be listed for each category** where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the *Owner*, **it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.**

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax payer ID # or Delaware Business license #
1.	Traffic Control			
2.	Paving			
3.	Structural Concrete			
4.	Non-Structural Concrete			
5.	Railing			
6.	Site Inspection			
7.	Timber Boardwalk Contractor			
8.	Mill Race Inspection			

AUBURN HEIGHTS PRESERVE
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BID FORM

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date to the Office of Design and Development, Division of Parks and Recreation.

All the terms and conditions of the Auburn Heights Preserve –Paper Mill Bridge project have been thoroughly examined and are understood.

NAME OF BIDDER _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ of 20_____.

My commission expires _____. NOTARY PULIC _____

THIS PAGE MUST BE SIGNED AND NOTORIZED FOR YOUR BID TO BE CONSIDERED.

AUBURN HEIGHTS PRESERVE
PAPER MILL BRIDGE
FARM LANE / YORKLYN
DIVISION OF PARKS AND RECREATION CONTRACT No. 2015-NVF-100

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Selected materials and equipment are specified in the Contract Documents by Allowances. In some cases, these Allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Proposal Request.

C. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost Allowances.
3. Contingency Allowances.

D. Related Requirements:

1. Section 012200 "Unit Prices" for procedures for using unit prices.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Owner of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Owner's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected in writing by Owner from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight**,** and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.9 Contingency Allowances:

A. Use the Contingency Allowance only as directed for the Owner's purposes and only by Change Orders that indicate amounts to be charged to the Allowance.

B. Change Orders authorizing use of funds from the Contingency Allowance, for purchase of products and equipment, will include Contractor's related costs and reasonable overhead and profit margins. These related costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. At Project Closeout, credit unused amounts remaining in the Contingency Allowance to the Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1 - Lump-Sum Allowance: Include, the sum of $200,000 for the path connection to the existing office.

1. This allowance includes material cost, receiving, handling, installation and Contractor overhead and profit and engineering.

B. Allowance No. 2 - Lump Sum Allowance: Include, the sum of $350,000 for the construction of the Mill Race deck-over structure as described in Sections 600500 and 600600.

1. This allowance includes material cost, receiving, handling, installation and Contractor overhead and profit and engineering.

C. Allowance No. 3 – Lump Sum Allowance: Include, the sum of $40,000.00 for inspection of and repairs to the mill race below the deck-over structure according to the Owner's direction.

1. This allowance includes material cost, receiving, handling, installation and Contractor overhead and profit.

D. Allowance No. 4 – Lump Sum Allowance to Add/Alternate No. 1: Include, the sum of $150,000.00 for the removal and replacement of existing fence and gates.

1. This allowance includes material cost, receiving, handling, installation and Contractor overhead and profit.

E. Allowance No. 5 – Lump Sum Allowance: Include, the sum of $20,000 for repairs to the HI Parcel Trail according to the Owner's direction.

1. This allowance includes material cost, receiving, handling, installation and Contractor overhead and profit.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

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

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

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

D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1 – Undercut Excavation
   1. Description: Excavation of poor subgrade materials as determined by the owner.
   2. Unit of Measurement: Cubic Yard (CY)
   3. Include 200 CY x Unit Price $____/CY = $____

B. Unit Price No. 2 – DelDOT Borrow Type B
   1. Description: Backfill material for undercut in wet areas.
   2. Unit of Measurement: Cubic Yard (CY)
   3. Include 200 CY x Unit Price $_____/CY = $_____

C. Unit Price No. 3 – DelDOT Borrow Type A
   1. Description: Backfill material for undercut in all areas other than wet areas.
   2. Unit of Measurement: Cubic Yard (CY)
   3. Include 200 CY x Unit Price $_____/CY = $_____

D. Unit Price No. 4 – Delaware No. 3 Stone
   1. Description: Backfill material for bridging undercut areas.
   2. Unit of Measurement: Cubic Yard (CY)
   3. Include 1,250 CY x Unit Price $_____/CY = $_____

E. Unit Price No. 5 – Geotextile Separation Fabric
   1. Description: Separation Fabric to be placed under borrow in undercut areas
   2. Unit of Measurement: Square Yard (SY)
   3. Include 500 SY x Unit Price $_____/SY = $_____

F. Unit Price No. 6 – Rock Excavation (Non-Structural)
   1. Description: Excavation of rock material in areas other than the proposed structures.
   2. Unit of Measurement: Cubic Yard (CY)
   3. Include 200 CY x Unit Price $_____/CY = $_____

G. Unit Price No. 7 – Silt Fence
   1. Description: Furnishing, installing and maintenance of silt fence at locations other than those shown on the plans at the direction of the Owner.
   2. Unit of Measurement: Linear Feet (LF)
   3. Include 500 LF x Unit Price $_____/LF = $_____

H. Unit Price No. 8 – Offsite Soil Disposal
   1. Description: Disposal of unused soil from the project site at the direction of the Owner.
   2. Unit of Measurement: Cubic Yard (CY)
      Include 2400 CY x Unit Price $_____/CY = $_____

END OF SECTION 012200

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel pipe railings.

B. Related Sections:

1. Section 099113 "Exterior Painting" for painting of steel tube railings.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.
2. Stainless Steel: 60 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Railing brackets.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer**.**

B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical railing section 4-feet high by 24-feet long as shown on Drawings.
2. Protect accepted mockups with polyethylene sheet membrane.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.4 FASTENERS

A. General: Provide the following:

1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting".

E. Intermediate Coats and Topcoats: Provide products that comply with Section 099113 "Exterior Painting".

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form changes in direction as follows:

1. By radius bends of radius indicated

J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of rail-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.

1. Shop prime uncoated railings with universal shop primer unless indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine bridges and concrete decking, which are to receive anchors, to verify that installations are plumb, meet ramping requirements and are ready for railing installation.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal, wood or concrete supporting surfaces.
2. Provide non-shrink grout where anchoring surfaces are not plumb. Place grout to comply with anchoring material manufacturer's written instructions.

3.5 ATTACHING RAILINGS

A. Attach railings to posts with post brackets. Provide brackets with 2-1/4-inch (38-mm) clearance from inside face of handrail and finished rail surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use ½-inch diameter round galvanized bar bracket.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
3. Shop weld anchors as indicated on drawings. Grind welds smooth. Touch-up welds with primer.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

T600500 - DESIGN-BUILD FOR SELECTED PROJECT ELEMENTS

In the interest of reducing the cost of the project, the Contractor shall use a design build process for the following project elements (heretofore referred to as the Design Build Elements)

1. Design and Construction of the Deck Over Structure spanning over the existing mill race and connecting Benge Road to the proposed parking lot constructed on the existing settling tank. The design of the Deck Over structure shall include but is not limited to the design of the precast concrete planks, concrete substructure and the micro piles.

All project elements other than those specifically cited above as Design Build Element(s) shall be constructed in accordance with the provided plans and specifications.

The Contractor shall design and construct the Design Build Element(s) in accordance with the performance specifications, plans, details and design criteria outlined in the contract documents, and shall comply with the latest AASHTO specifications.

The Contractor shall be responsible for reviewing existing site conditions. The provided Geotechnical Reports are for the Contractor's information. The contractor shall be responsible for conducting additional subsurface investigation as the contractor deems necessary with respect to the Design Build Elements. No additional payment shall be made by to the Owner to the Contractor for additional subsurface investigations.

The design effort shall be led by an engineering firm which has successfully completed three projects of similar size and scope in the last five years. This firm is identified in this special provision as the Contractor's Engineer. The Contractor's Engineer shall be a registered Professional Engineer in the State of Delaware and shall be responsible for assembling, signing and sealing the design build package as a whole.

The Contractor shall identify and submit qualifications for the Contractor's Engineer in accordance with the requirements outlined in the special provisions. Upon award of Contract the contractor shall be required to submit documentation that the Contractor's Engineer is a registered professional engineer in the state of Delaware and evidence of successfully completing the three projects as stated above. Documentation shall include; name of project, Owner, Owner contact information and date of project.

All design performed by parties other than the Contractor's Engineer (including but not limited to micro piles or precast planks) shall be reviewed and approved by the Contractor's Engineer prior to being submitted for review and approval by the Owner and/or the Owner's representative. Such submittals shall include complete plans and calculations signed and sealed by a Professional Engineer registered in the State of Delaware. The Contractor's Engineer shall stamp each submission as approved prior to forwarding the submission to the Owner and/or the Owner's representative. The contractor's engineer shall assemble, sign and seal the submitted package.

Each element of the Design Build Elements submissions shall be sealed by a Professional Engineer licensed in the State of Delaware.

After Notice to Proceed, the selected Contractor shall submit plans, shop drawings, calculations, reports, working drawings, erection drawings, agency, and utility coordination drawings/procedures; product/material data; and other documentation for the Design Build Elements to the Owner and/or the Owner's representative for review and approval. The Owner and/or their representative will review the submission for compliance with the performance specifications and design requirements. The Owner and/or their representative shall have 10 calendar days to provide comments or approve the submission. If the Owner and/or their representative provides comments, the contractor shall address the comments in writing, modify the submission, and resubmit to the Owner and/or their representative. Multiple submissions and responses to comments may be necessary. After all comments are resolved, the Owner and/or their representative will approve the submission. The Contractor shall not begin construction of the Design Build Element(s) prior to the shop drawings being approved by the Owner or the Owner's representative. The contractor shall take into consideration the review time when scheduling the construction.

Approval of the submission indicates only that the design, to the extent reviewed by the Owner and/or their representative, meets the performance specifications and design requirements and does not relieve the contractor of responsibility and risk for the Design Build Element(s).

The Contractor shall be responsible for obtaining all permits and permit modifications necessary to complete the proposed work related to the Design Build Element(s).

The following design elements shall not be altered by the Contractor's Design:
Horizontal Alignment
Vertical Profile
Typical Section

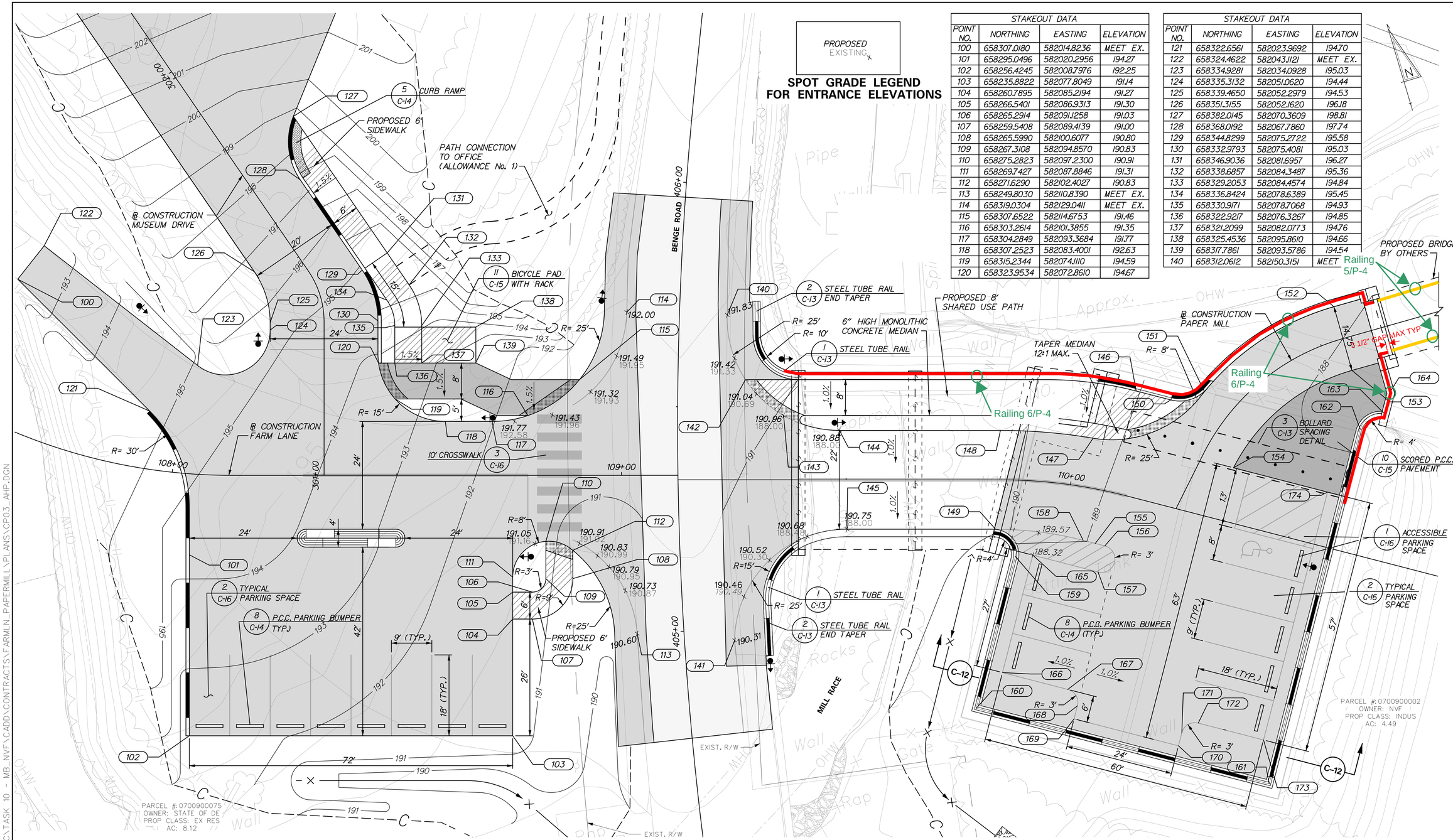
END OF SECTION

PROPOSED
EXISTING

SPOT GRADE LEGEND FOR ENTRANCE ELEVATIONS

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
100	658307.0180	582014.8236	MEET EX.
101	658295.0496	582020.2956	194.27
102	658256.4245	582008.7976	192.25
103	658235.8822	582077.8049	191.14
104	658260.7895	582085.2194	191.27
105	658266.5401	582086.9313	191.30
106	658265.2914	582091.1258	191.03
107	658259.5408	582089.4139	191.00
108	658265.5990	582100.6077	190.80
109	658267.3108	582094.8570	190.83
110	658275.2823	582097.2300	190.91
111	658269.7427	582087.8846	191.31
112	658271.6290	582102.4027	190.83
113	658249.8030	582110.8390	MEET EX.
114	658319.0304	582129.0411	MEET EX.
115	658307.6522	582114.6753	191.46
116	658303.2614	582101.3855	191.35
117	658304.2849	582093.3684	191.77
118	658307.2523	582083.4001	192.63
119	658315.2344	582074.1110	194.59
120	658323.9534	582072.8610	194.67

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
121	658322.6561	582023.9692	194.70
122	658324.4622	582043.1121	MEET EX.
123	658334.9281	582034.0928	195.03
124	658335.3132	582051.0620	194.44
125	658339.4650	582052.2979	194.53
126	658351.3155	582052.1620	196.18
127	658382.0145	582070.3609	198.81
128	658368.0192	582067.7860	197.74
129	658344.8299	582075.2722	195.58
130	658332.9793	582075.4081	195.03
131	658346.9036	582081.6957	196.27
132	658338.6857	582084.3487	195.36
133	658329.2053	582084.4574	194.84
134	658336.8424	582078.6389	195.45
135	658330.9171	582078.7068	194.93
136	658322.9217	582076.3267	194.85
137	658321.2099	582082.0773	194.76
138	658325.4536	582095.8610	194.66
139	658317.7861	582093.5786	194.54
140	658312.0612	582150.3151	MEET



NOTE: THIS SHEET ISSUED FOR RAILING INFORMATION ONLY

DATE: DESCRIPTION: BY:

DATE: DESCRIPTION: BY:

AUBURN HEIGHTS PRESERVE
PAPER MILL PARKING LOTS
FARM LANE AND PAPER MILL BRIDGE
RAILING LOCATIONS IDENTIFIED

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY:

DRAWN BY:

BUILDING NO.: N/A

DATE: 08/10/17

SCALE: 1" = 10'

SHEET NO.: P-5

PARKS PROJECT #: NVF-4

CONTRACT #: 2015-NVF-100

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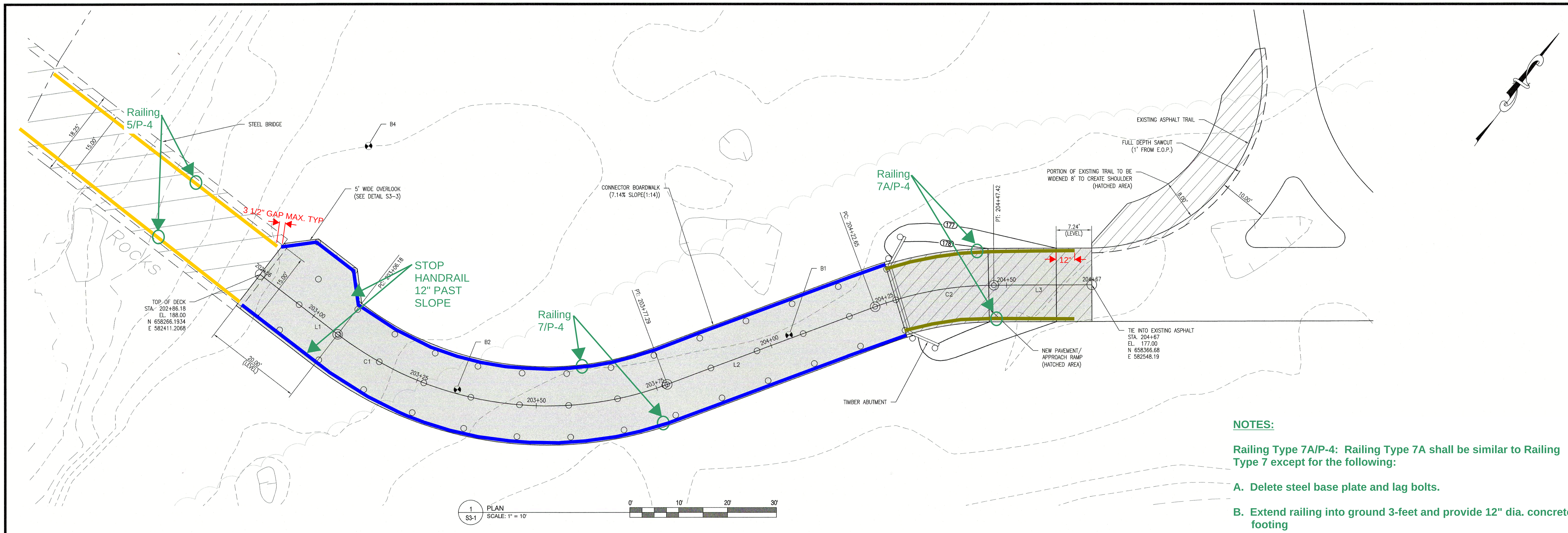


1 / S3-1 PLAN
SCALE: 1" = 10'

NOTES:

Railing Type 7A/P-4: Railing Type 7A shall be similar to Railing Type 7 except for the following:

A. Delete steel base plate and lag bolts.

B. Extend railing into ground 3-feet and provide 12" dia. concrete footing

CONNECTOR BOARDWALK GENERAL NOTES:

DESIGN AND CONSTRUCTION SPECIFICATIONS:

AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (WITH INTERIMS)

DESIGN:
SERVICE LOAD DESIGN (DECK, SUPERSTRUCTURE, & SUBSTRUCTURE)
ALLOWABLE STRESS DESIGN OR LOAD RESISTANCE FACTOR DESIGN (SUPERSTRUCTURE)

MINIMUM PILE CAPACITY SHALL BE 8 TONS (16,000 LB) EACH. MINIMUM BUTT DIAMETER IS 10 INCHES.

LOADS:
LIVE LOAD – IN ACCORDANCE WITH AASHTO GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES, 2ND EDITION, EXCEPT AS NOTED.

VEHICLE LOAD – H-10 (20,000 POUNDS)

MATERIALS:
PILING SHALL BE SOUTHERN YELLOW PINE COMPLYING WITH ASTM STANDARD D25, STANDARD SPECIFICATIONS FOR ROUND TIMBER PILES.

ALLOWABLE BENDING STRESS (Fb):	2400 PSI
MODULUS OF ELASTICITY (E):	1,500,000 PSI
ALLOWABLE COMPRESSIVE STRESS (Fc):	1200 PSI
ALLOWABLE SHEAR STRESS (Fv):	110 PSI

WOOD DECKING:
DECKING SHALL BE SOUTHERN YELLOW PINE, NO. 1 WITH THE FOLLOWING PROPERTIES:

ALLOWABLE BENDING STRESS (Fb):	1500 PSI
MODULUS OF ELASTICITY (E):	1,700,000 PSI
ALLOWABLE SHEAR STRESS (Fv):	90 PSI

SOLID WOOD FRAMING:
ALL SOLID WOOD FRAMING SHALL BE SOUTHERN PINE GRADED IN ACCORDANCE WITH SPIB RULES. ALL PIECES SHALL BEAR THE APPROPRIATE GRADE MARK.

MEMBERS SHALL HAVE THE FOLLOWING MINIMUM STRUCTURAL PROPERTIES:

	GRADE	Fb	Fv	Fc⊥	E
CAP	#1	1,350 PSI	165 PSI	357 PSI	1,500,000 PSI
STRINGERS	#2	975 PSI	175 PSI	565 PSI	1,500,000 PSI
OTHER	#2	(DESIGN VALUES VARY BY SIZE)			

TIMBER TREATMENT:
ALL MEMBERS SHALL BE PRESSURE TREATED WITH CHROMATED COPPER ARSENATE (CCA) TYPE C TO THE FOLLOWING RETENTION LEVELS AS PER AWPA, UNLESS NOTED:

PILING: 0.80 CCA
STRUCTURE: 0.60 CCA
DECKING: 0.40 ACQ

ALL TREATMENT TREATMENT SHALL BE IN ACCORDANCE WITH THE LATEST AWPA STANDARDS APPLICABLETO THE TYPE OF MEMBER BEING TREATED. PROVIDE CERTIFICATE OF TREATMENT FOR ALL WOOD MATERIALS INCORPORATED INTO THE STRUCTURE. MATERIALS SHALL BE AIR DRIED TO A MAXIMUM MOIST CONTENT OF 19% AFTER TREATMENT AND PRIOR TO INSTALLATION, IF PRACTICAL.

STRUCTURAL STEEL & MISCELLANEOUS METALS:
ALL STEEL USED SHALL HAVE A MINIMUM YIELD STRESS (Fy) OF 36 KSI AND SHALL BE HOT DIPPED GALVANIZED.
ALL BOLTS SHALL BE A307, GALVANIZED.

DESIGN AND MANUFACTURE OF THE CONNECTOR BOARDWALK SHALL BE IN ACCORDANCE WITH SECTION 132950 – PREFABRICATED WOOD BRIDGE. THE CONTRACTOR SHALL SUBMIT AN ERECTION PLAN TO THE ENGINEER FOR REVIEW A MINIMUM OF 30 CALENDAR DAYS PRIOR TO ANY SCHEDULED BRIDGE ERECTION. NECESSARY REVISIONS AND ADDITIONS TO THE ERECTION PLAN AS DEEMED NECESSARY BY THE ENGINEER SHALL BE PREPARED BY THE CONTRACTOR AND SUBMITTED FOR REVIEW. THE ENGINEER MUST APPROVE AN ERECTION PLAN BEFORE ANY TRUSS PLACEMENT WORK SHALL BE PERMITTED. THE SUBMITTAL MUST CONTAIN, BUT IS NOT LIMITED TO, THE FOLLOWING:

1. CALCULATIONS SHOWING THE WEIGHT OF MATERIALS AND LIFTING EQUIPMENT.
2. TYPE AND POSITIONING OF EQUIPMENT, INCLUDING MOVEMENTS.
3. LOCATION OF STAGING AREA(S).

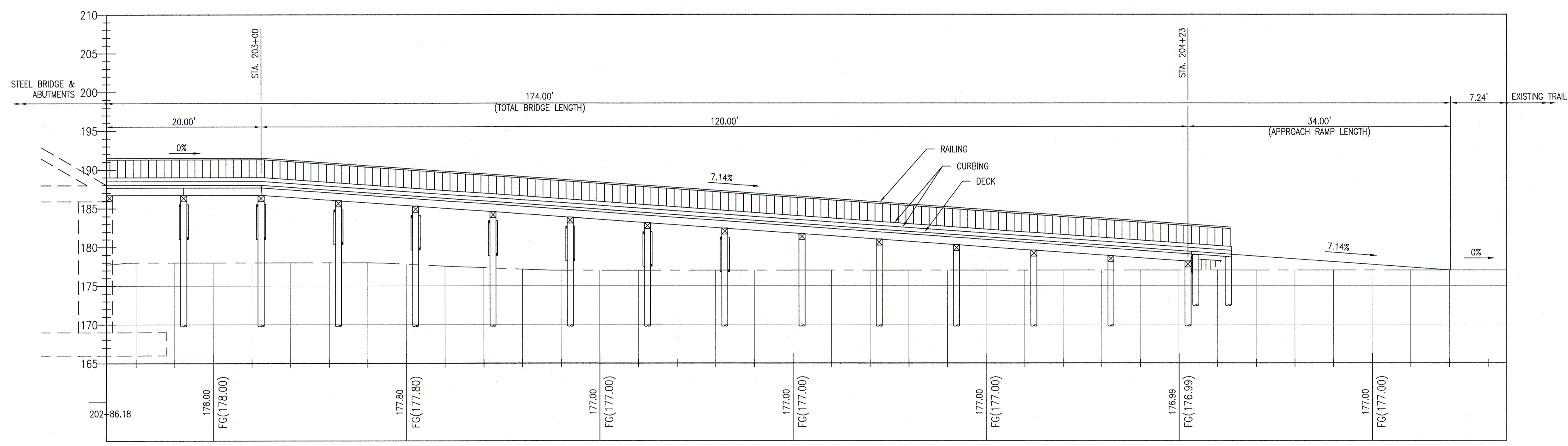
CONTRACTOR/FABRICATOR SHALL CONSIDER SITE ACCESSIBILITY AND ERECTION PATH IN DETERMINING MAXIMUM BRIDGE SPLICE LENGTHS FOR PREFABRICATION. SHOP DRAWINGS AND CALCULATIONS SHALL SHOW THE SPLICE LOCATIONS. ALL PLANS AND CALCULATIONS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF DELAWARE.

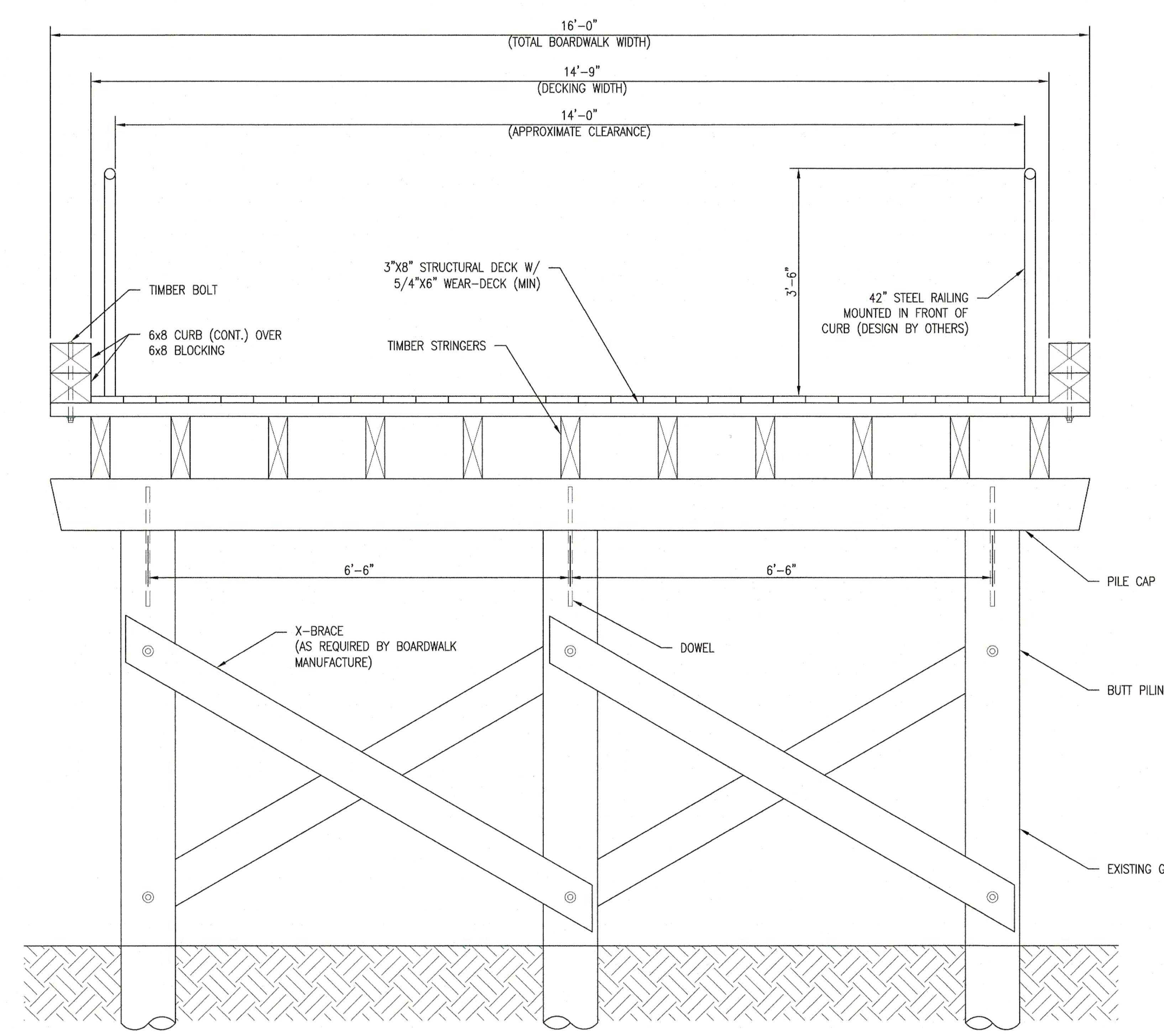
PROVIDE AND INSTALL 1/2 INCH THICK WEATHERING STEEL COVER PLATES WITH 1/4 INCH 2:1 BEVEL ON TOP FACES, AS SPECIFIED IN THE PROJECT MANUAL TO COVER GAP BETWEEN TIMBER DECKING AND CONCRETE ABUTMENT BACKWALL. COVER PLATES TO BE ATTACHED TO BRIDGE DECK WITH 1/2 INCH DIAMETER STAINLESS STEEL BEVEL HEAD BOLTS WITH HEADS COUNTERSUNK FLUSH WITH PLATE. COVER PLATES TO BE ONE PIECE FABRICATED TO FIT THE FULL WIDTH OF THE DECK.

BOLTED CONNECTIONS THAT ARE EXPOSED TO PEDESTRIANS ON THE BRIDGE SHALL BE POSITIONED SUCH THAT THE BOLT HEADS FACE THE DECK AND NUTS FACE AWAY FROM THE CENTERLINE OF THE BRIDGE.

CONSTRUCTION VEHICLES SHALL BE PROHIBITED FROM PASSING OVER THE FINISHED PROPOSED BRIDGE UNLESS APPROVED BY THE ENGINEER.

RESULTS OF SOIL BORINGS SHOWN ON DRAWING ARE INCLUDED FOR BIDDING PURPOSES ONLY. ADDITIONAL BORINGS AS REQUIRE BY THE BOARDWALK MANUFACTURER SHALL BE INCIDENTAL TO THE BOARDWALK COST AND SHALL NOT BE PAID FOR SEPARATELY.





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REVISIONS: DATE: DESCRIPTION: BY:

AUBURN HEIGHTS PRESERVE
PAPER MILL BRIDGE
CONNECTOR BOARDWALK
RAILING LOCATIONS IDENTIFIED

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: 08/10/17
SCALE: AS SHOWN
SHEET NO.: P-6
CONTRACT NO.: 2015-NVF-100

ALLOWANCE No. 1 (PATH CONNECTION TO OFFICE)

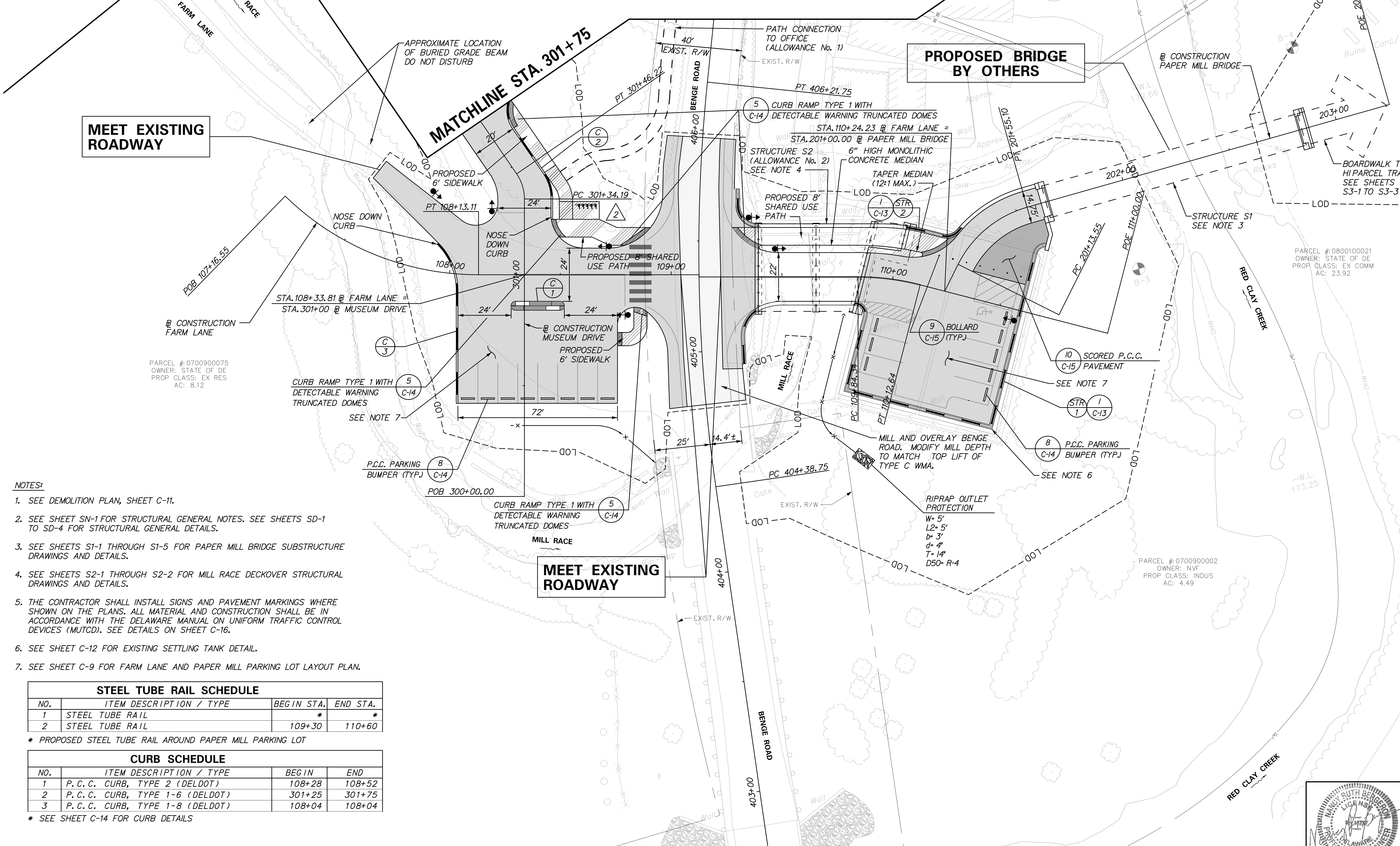
ALLOWANCE No. 1 SHALL BE INCLUDED IN THE CONTRACTOR'S BID FOR THE CONSTRUCTION OF A PATH CONNECTING THE PROPOSED SHARED USE PATH TO THE PARK OFFICE LOCATED ALONG BENGE ROAD. THE ALLOWANCE SHALL INCLUDE, BUT IS NOT LIMITED TO, CLEARING AND GRUBBING, EXCAVATION, SIDEWALK, FENCING, PEDESTRIAN LIGHTING, REPAIRS TO THE EXISTING WALL AND MAINTENANCE OF TRAFFIC TO COMPLETE THIS WORK.

ALLOWANCE No. 2 (STRUCTURE S2)

ALLOWANCE No. 2 SHALL BE INCLUDED IN THE CONTRACTOR'S BID FOR THE CONSTRUCTION OF STRUCTURE S2. THE ALLOWANCE SHALL INCLUDE ALL DESIGN AND CONSTRUCTION ASSOCIATED WITH THE PROPOSED STRUCTURE.

ALLOWANCE No. 3 (REPAIRS TO THE MILL RACE)

ALLOWANCE No. 3 SHALL BE INCLUDED IN THE CONTRACTOR'S BID FOR REPAIRS TO THE MILL RACE AT THE DIRECTION OF THE OWNER. THE ALLOWANCE SHALL INCLUDE, BUT IS NOT LIMITED TO, ALL MATERIAL, LABOR, EQUIPMENT, AND MAINTENANCE OF TRAFFIC TO COMPLETE THE WORK.



NOTES:

1. SEE DEMOLITION PLAN, SHEET C-11.
2. SEE SHEET SN-1 FOR STRUCTURAL GENERAL NOTES. SEE SHEETS SD-1 TO SD-4 FOR STRUCTURAL GENERAL DETAILS.
3. SEE SHEETS S1-1 THROUGH S1-5 FOR PAPER MILL BRIDGE SUBSTRUCTURE DRAWINGS AND DETAILS.
4. SEE SHEETS S2-1 THROUGH S2-2 FOR MILL RACE DECKOVER STRUCTURAL DRAWINGS AND DETAILS.
5. THE CONTRACTOR SHALL INSTALL SIGNS AND PAVEMENT MARKINGS WHERE SHOWN ON THE PLANS. ALL MATERIAL AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD). SEE DETAILS ON SHEET C-16.
6. SEE SHEET C-12 FOR EXISTING SETTLING TANK DETAIL.
7. SEE SHEET C-9 FOR FARM LANE AND PAPER MILL PARKING LOT LAYOUT PLAN.

STEEL TUBE RAIL SCHEDULE

NO.	ITEM DESCRIPTION / TYPE	BEGIN STA.	END STA.
1	STEEL TUBE RAIL	*	*
2	STEEL TUBE RAIL	109+30	110+60

* PROPOSED STEEL TUBE RAIL AROUND PAPER MILL PARKING LOT

CURB SCHEDULE

NO.	ITEM DESCRIPTION / TYPE	BEGIN	END
1	P.C.C. CURB, TYPE 2 (DELDOT)	108+28	108+52
2	P.C.C. CURB, TYPE 1-6 (DELDOT)	301+25	301+75
3	P.C.C. CURB, TYPE 1-8 (DELDOT)	108+04	108+04

* SEE SHEET C-14 FOR CURB DETAILS

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DATE:	DESCRIPTION:	BY:
8/10/17	2 REVISED SHARED USE PATH SHADING	RLS

AUBURN HEIGHTS PRESERVE
PAPER MILL BRIDGE

CONSTRUCTION PLANS

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY: RKK

DRAWN BY: RKK

BUILDING NO.: N/A

DATE: 6/30/2017

SCALE: 1" = 20'

SHEET NO.: C-4

PARKS PROJECT #: NVF-4

CONTRACT #: 2015-NVF-100

NANCY RUTH BERGERON LICENSED PROFESSIONAL ENGINEER DELAWARE

PROPOSED
EXISTING

SPOT GRADE LEGEND FOR ENTRANCE ELEVATIONS

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
100	658307.0180	582014.8236	MEET EX.
101	658295.0496	582020.2956	194.27
102	658256.4245	582008.7976	192.25
103	658235.8822	582077.8049	191.14
104	658260.7895	582085.2194	191.27
105	658266.5401	582086.9313	191.30
106	658265.2914	582091.1258	191.03
107	658259.5408	582089.4139	191.00
108	658265.5990	582100.6077	190.80
109	658267.3108	582094.8570	190.83
110	658275.2823	582097.2300	190.91
111	658269.7427	582087.8846	191.31
112	658271.6290	582102.4027	190.83
113	658249.8030	582110.8390	MEET EX.
114	658319.0304	582129.0411	MEET EX.
115	658307.6522	582114.6753	191.46
116	658303.2614	582101.3855	191.35
117	658304.2849	582093.3684	191.77
118	658307.2523	582083.4001	192.63
119	658315.2344	582074.1110	194.59
120	658323.9534	582072.8610	194.67

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
121	658322.6561	582023.9692	194.70
122	658324.4622	582043.1121	MEET EX.
123	658334.9281	582034.0928	195.03
124	658335.3132	582051.0620	194.44
125	658339.4650	582052.2979	194.53
126	658351.3155	582052.1620	196.18
127	658382.0145	582070.3609	198.81
128	658368.0192	582067.7860	197.74
129	658344.8299	582075.2722	195.58
130	658332.9793	582075.4081	195.03
131	658346.9036	582081.6957	196.27
132	658338.6857	582084.3487	195.36
133	658329.2053	582084.4574	194.84
134	658336.8424	582078.6389	195.45
135	658330.9171	582078.7068	194.93
136	658322.9217	582076.3267	194.85
137	658321.2099	582082.0773	194.76
138	658325.4536	582095.8610	194.66
139	658317.7861	582093.5786	194.54
140	658312.0612	582150.3151	MEET EX.

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
141	658242.1473	582131.2062	MEET EX.
142	658297.1132	582150.0789	191.12
143	658287.0232	582155.9343	190.97
144	658280.3091	582166.8998	190.88
145	658258.7451	582162.2301	190.75
146	658269.8630	582232.7168	189.27
147	658262.5263	582220.5223	189.27
148	658270.0881	582201.2350	190.30
149	658249.3104	582193.9241	190.05
150	658270.0881	582239.5226	188.62
151	658265.1880	582246.9341	188.50
152	658275.3063	582280.2401	188.11

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
153	658260.5576	582280.0445	187.89
154	658247.3029	582248.5842	188.59
155	658239.9321	582214.2998	188.83
156	658238.8053	582216.1710	188.71
157	658233.6652	582213.0759	188.47
158	658241.3735	582211.9060	189.00
159	658242.2259	582196.4287	188.28
160	658212.3167	582178.4188	188.28
161	658177.5741	582236.1165	188.04
162	658247.4583	582278.0474	188.04
163	658249.3834	582284.1659	188.10
164	658253.2954	582286.5455	188.15

STAKEOUT DATA			
POINT NO.	NORTHING	EASTING	ELEVATION
165	658241.4030	582200.2257	188.32
166	658218.2726	582186.2978	188.32
167	658210.5349	582199.1480	188.47
168	658206.4173	582200.1705	188.50
169	658203.8473	582198.6229	188.50
170	658191.4669	582219.1832	188.26
171	658194.0369	582220.7308	188.26
172	658195.0594	582224.8484	188.23
173	658187.3217	582237.6986	188.08
174	658236.1525	582267.1019	188.38

PARCEL #: 0700900075
OWNER: STATE OF DE
PROP CLASS: EX RES
AC: 8.12

PARCEL #: 0700900002
OWNER: NVF
PROP CLASS: INDUS
AC: 4.49

NOTES: 2

1. ALL ROADWAYS BEYOND THE RIGHT-OF-WAY ARE PRIVATELY MAINTAINED
2. FARM LANE AND PARKING LOT PAVING SECTION SHALL BE:
   2" WMA, SUPERPAVE, TYPE C, PG 64-22
   3" WMA, SUPERPAVE, TYPE B, PG 64-22, 160 GYRATIONS
   8" GRADED AGGREGATE BASE COURSE, TYPE B
3. SHARED USE PATH PAVING FROM BENGE ROAD TO MUSEUM DRIVE SHALL BE:
   6" DELDOT CLASS B CONCRETE
   4" GRADED AGGREGATE BASE COURSE, TYPE B

NANCY RUTH BERGERON
LICENSE
NO. 18780
DELAWARE
PROFESSIONAL ENGINEER

DATE: 8/10/17
DESCRIPTION: 2 REVISED NOTES
REVISED SHARED USE PATH MATERIAL
BY: RLS

AUBURN HEIGHTS PRESERVE
PAPER MILL BRIDGE

FARM LANE AND PAPER MILL PARKING LOTS
LAYOUT PLAN

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY: RKK
DRAWN BY: RKK
BUILDING NO.: N/A
DATE: 6/30/2017
SCALE: 1" = 10'
SHEET NO.: C-9
PARKS PROJECT #: NVF-4
CONTRACT #: 2015-NVF-100

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EROSION AND SEDIMENT CONTROL NOTES

1. NOTIFY THE DNREC SEDIMENT AND STORMWATER MANAGEMENT PROGRAM IN WRITING AT LEAST FIVE (5) DAYS PRIOR TO THE START OF CONSTRUCTION. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.
2. REVIEW AND APPROVAL OF THE SEDIMENT AND STORMWATER MANAGEMENT PLAN SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OR HER RESPONSIBILITIES FOR COMPLIANCE WITH THE REQUIREMENTS OF THE SEDIMENT AND STORMWATER MANAGEMENT REGULATIONS, NOR SHALL IT RELIEVE THE CONTRACTOR FROM ERRORS OR OMISSIONS IN THE APPROVED PLAN.
3. IF THE APPROVED PLAN NEEDS TO BE MODIFIED, ADDITIONAL SEDIMENT AND STORMWATER MEASURES MAY BE REQUIRED AS DEEMED NECESSARY BY DNREC.
4. FOLLOWING SOIL DISTURBANCE OR REDISTURBANCE OF THE STAGING AREA, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN FOURTEEN (14) CALENDAR DAY AS TO THE SURFACE OF ALL PERIMETER SEDIMENT CONTROLS AND SOIL STOCKPILES.
5. UPON COMPLETION OF CONSTRUCTION AND APPROVAL BY DNREC'S SEDIMENT & STORMWATER PROGRAM, THE OWNER SHALL BE RESPONSIBLE FOR FUTURE MAINTENANCE OF THE PERMANENT STORMWATER MANAGEMENT FACILITIES.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE AND REPAIR OF ALL EROSION AND SEDIMENT CONTROL DEVICES AND STORMWATER MANAGEMENT PRACTICES DURING ALL CONSTRUCTION ACTIVITIES.
7. DUST IS TO BE CONTROLLED EXCLUSIVELY THROUGH THE USE OF WATER. COSTS ASSOCIATED WITH THE FURNISHING AND APPLICATION OF WATER FOR DUST CONTROL SHALL BE INCLUDED IN THE BID.
8. IT IS INTENDED THAT MUD TRACKING BE ELIMINATED ON ALL ROADWAYS AND PARKING LOTS ADJOINING THE PROJECT. EACH POINT OF INGRESS AND EGRESS FROM THE PROJECT SHALL HAVE INSTALLED A STABILIZED CONSTRUCTION ENTRANCE (SCE). ALL PAVED SURFACES ADJOINING THE PROJECT LIMITS SHALL BE LEFT IN A BROOM CLEAN CONDITION AT THE END OF EACH WORKDAY.
9. STABILIZED CONSTRUCTION ENTRANCES SHALL BE TOP DRESSED WITH TWO (2) INCHES OF CLEAN DE NO. STONES WHEN THE VOIDS BECOME CLOGGED OR AS DIRECTED BY THE OWNER. IN THE EVENT THAT IT IS DETERMINED THAT VEHICLES ARE TRANSPORTING SEDIMENT FROM THE SITE, A WHEEL WASH SHALL BE INSTALLED TO CLEAN VEHICLES PRIOR TO THEIR EGRESS FROM THE SITE AT NO ADDITIONAL COST. THIS DETERMINATION SHALL BE MADE BY THE ON SITE CERTIFIED CONSTRUCTION REVIEWER (CCR) AND/OR BY THE OWNER.
10. PRIOR TO ANY CLEARING, INSTALLATION OF SEDIMENT CONTROL MEASURES, OR GRADING, THE CONTRACTOR SHALL SCHEDULE AND CONDUCT A PRE-CONSTRUCTION MEETING WITH THE AGENCY CONSTRUCTION SITE REVIEWER. THE LANDOWNER/DEVELOPER REPRESENTATIVE, SITE CONTRACTOR, AND A CERTIFIED CONSTRUCTION REVIEWER ARE REQUIRED TO BE IN ATTENDANCE AT THE PRE-CONSTRUCTION MEETING; THE SITE DESIGNER IS RECOMMENDED TO ATTEND.
11. THE CONTRACTOR SHALL AT ALL TIMES PROTECT AGAINST SEDIMENT OR DEBRIS LADEN RUNOFF OR WIND FROM LEAVING THE SITE. PERIMETER CONTROLS SHOULD BE CHECKED DAILY AND ADJUSTED AND/OR REPAIRED TO FULLY CONTAIN AND CONTROL SEDIMENTATION ON THE SITE. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS REACHED HALF OF THE EFFECTIVE CAPACITY OF THE CONTROL. IN ADDITION, THE CONTRACTOR MAY NEED TO ADJUST OR REPAIR MEASURES IN TIMES OF ADVERSE WEATHER CONDITIONS, AS NEEDED OR AS DIRECTED BY THE AGENCY CONSTRUCTION SITE REVIEWER.
12. THE CONTRACTOR SHALL NOTIFY THE PERSON RESPONSIBLE FOR STORMWATER SYSTEM CONSTRUCTION REVIEW AT LEAST THREE (3) DAYS PRIOR TO THE START OF THE STORMWATER SYSTEM CONSTRUCTION; STORMWATER FACILITIES MUST BE REVIEWED THROUGHOUT THEIR CONSTRUCTION.
13. STOCKPILE TOPSOIL AND EXCAVATED SUBSOILS. STOCKPILES SHALL BE SURROUNDED WITH A PERIMETER CONTROL, LOCATED ON LAND WITH SLIGHT TO NO SLOPE, AND STABILIZED ONCE INACTIVE.
14. SOILS WITHIN THE PROJECT AREA CONSIST OF: HATBORO-CODORUS COMPLEX (Hw), HYDROLOGIC SOIL GROUP B/D AND DELANCO-CODORUS-HATBORO COMPLEX (DcB), HYDROLOGIC SOIL GROUP C.
15. TOTAL DISTURBED AREA: 2.28 ACRES. TOTAL VOLUME OF SPOILS: APPROX. 3,000 C.Y. FOR THE COMPLETE LIMIT OF DISTURBANCE AREA, REFER TO THE CONSTRUCTION PLANS, SHEETS C-4 THROUGH C-5.
16. FOR EROSION AND SEDIMENT CONTROLS, SEE SHEETS ES-2 THROUGH ES-3.
17. ALL PERIMETER CONTROLS ARE TO BE REVIEWED BY THE AGENCY CONSTRUCTION SITE REVIEWER AND APPROVED PRIOR TO PROCEEDING WITH FURTHER SITE DISTURBANCE OR CONSTRUCTION.
18. EROSION AND SEDIMENT CONTROL DEVICES SHOULD BE REMOVED ONLY AFTER WORK IN AN AREA HAS BEEN COMPLETED AND STABILIZED, WITH WRITTEN APPROVAL FROM THE AGENCY CONSTRUCTION SITE REVIEWER.
19. PRIOR TO COMMENCING A NEW PHASE OF CONSTRUCTION, THE CONTRACTOR SHALL RECEIVE APPROVAL FROM THE AGENCY CONSTRUCTION SITE REVIEWER THAT THE PREVIOUS PHASE HAS BEEN SUFFICIENTLY STABILIZED.
20. THE TERMINATION OF THE CONSTRUCTION GENERAL PERMIT WILL REQUIRE SUBMISSION AND ACCEPTANCE OF THE POST CONSTRUCTION VERIFICATION DOCUMENTS, INCLUDING FINAL STABILIZATION THROUGHOUT THE SITE, ALL ELEMENTS OF THE SEDIMENT AND STORMWATER MANAGEMENT PLAN IMPLEMENTED, AND ACCEPTANCE OF THE FINAL OPERATION AND MAINTENANCE PLAN.

CONSTRUCTION PHASING & M.O.T	
	BARRICADE, TYPE 3
	CONCRETE SAFETY BARRIER - PORTABLE
	CONSTRUCTION WARNING SIGN LOCATION
END ROAD WORK	CONSTRUCTION WARNING SIGN
	DRUM - TRAFFIC CONTROL

EROSION & SEDIMENT CONTROL	
SCE	STABILIZED CONSTRUCTION ENTRANCE
SF	SILT FENCE
RSF	SILT FENCE - REINFORCED
SAP	SENSITIVE AREA PROTECTION
CFL	COMPOST FILTER LOG
RIP-7	RIPRAP OUTLET PROTECTION, TYPE 1

CONSTRUCTION PHASING PROJECT NOTES

ACCESS THROUGH THE CONSTRUCTION SITE

THE CONTRACTOR SHALL MAINTAIN ACCESS TO THE EXISTING RESIDENCES ON FARM LANE AT ALL TIMES THROUGHOUT THE LIFE OF THE PROJECT. THE CONTRACTOR SHALL MAINTAIN EMERGENCY ACCESS THROUGH THE WORK ZONE DURING EACH PHASE OF CONSTRUCTION. THE PROJECT SITE SHALL BE CLOSED TO PEDESTRIANS THROUGHOUT THE LIFE OF THE PROJECT.

WORK AREA ADJACENT TO BENGE ROAD

WHEN WORKING ADJACENT TO BENGE ROAD THE CONTRACTOR SHALL UTILIZE FLAGGERS IN ACCORDANCE WITH THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) TA 10. THE CONTRACTOR SHALL EXCAVATE ONLY AS MUCH AS CAN BE CONSTRUCTED TO THE GABC COURSE AT THE END OF EACH WORK DAY. LONGITUDINAL DROP OFFS SHALL BE CORRECTED AT THE END OF EACH WORK DAY IN ACCORDANCE WITH TABLE 6G-1 OF THE DELAWARE MUTCD.

BRIDGE INSTALLATION - WORKIN BRIDGES

THE CONTRACTOR SHALL NOTE THAT FURNISHING AND INSTALLING PAPER MILL BRIDGE OVER RED CLAY CREEK SHALL BE BY WORKIN BRIDGES UNDER SEPARATE CONTRACT AND IS NOT INCLUDED IN THIS CONTRACT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION OF THE ABUTMENTS AND SCOUR PROTECTION FOR THE NEW STRUCTURE AS SHOWN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL ANTICIPATE AND INCLUDE AN UNINTERRUPTED 45 CALENDAR DAY PERIOD FOR THE INSTALLATION OF THE BRIDGE. THE CONTRACTOR SHALL PROVIDE A MINIMUM 30 DAY NOTICE TO WORKIN BRIDGES AND THE OWNER AS TO THE EXACT DATE WHEN THE ABUTMENTS AND WORK SITE SHALL BE AVAILABLE FOR THE INSTALLATION OF THE BRIDGE. THE CONTRACTOR SHALL COORDINATE ONGOING CONSTRUCTION ACTIVITIES WITH WORKIN BRIDGES SUCH AS TO NOT INTERRUPT OR DELAY THE INSTALLATION OF THE BRIDGE. ACCESS TO THE BRIDGE CONSTRUCTION STAGING AREA SHALL BE MAINTAINED AT ALL TIMES.

CONTACT INFORMATION:
WORKIN BRIDGES - JULIE BOWERS 641.260.1262 JBOWERS@GMAIL.COM
BACH STEEL - NELS RAYNOR 517.581.6243 NELS@BACHSTEEL.COM

STAGING / STOCKPILE AREAS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION, MAINTENANCE AND REPAIR/REPLACEMENT OF ALL EROSION AND SEDIMENT CONTROL DEVICES REQUIRED FOR THE INSTALLATION OF THE BRIDGES INCLUDING THE STAGING AREA SHOWN ON THE PLANS AS WORKIN BRIDGES' CONSTRUCTION STAGING AREA. ALL COST ASSOCIATED WITH THE INSTALLATION, MAINTENANCE AND REPAIR/REPLACEMENT OF THESE DEVICES SHALL BE INCLUDED IN THE CONTRACTOR'S LUMP SUM BID. NO ADDITIONAL PAYMENT SHALL BE MADE BY THE OWNER. THE CONTRACTOR SHALL BE REQUIRED TO RESTORE ALL AREAS UTILIZED TO THE ORIGINAL CONDITION. ALL COSTS ASSOCIATED WITH THE RESTORING THESE AREA ARE TO BE INCLUDED IN THE CONTRACTOR'S LUMP SUM BID. NO ADDITIONAL PAYMENT SHALL BE MADE BY THE OWNER.

ACCESS TO PAPER MILL BRIDGE EAST ABUTMENT

2 THE CONTRACTOR SHALL USE THE HI PARCEL TRAIL TO ACCESS THE STAGING AREA NEAR THE EAST ABUTMENT FOR PAPER MILL BRIDGE. THE ENTRANCE IS LOCATED OFF OF YORKLYN ROAD. UPON COMPLETION OF THE PROJECT, INCLUDING THE INSTALLATION OF THE PAPER MILL BRIDGE BY WORKIN BRIDGES, THE CONTRACTOR SHALL REPAIR THE EXISTING TRAIL AT THE DIRECTION OF THE OWNER. THE COST FOR REPAIRS SHALL BE PAID FOR FROM ALLOWANCE NO. 5 - TRAIL REPAIRS.

BENGE ROAD PARKING LOT

THE CONTRACTOR SHALL NOTE THE EXISTING PARK OFFICE MAY BE UNDER RENOVATION BY OTHERS UNDER SEPARATE CONTRACT DURING THE TIME OF THIS PROJECT. THE EXISTING STONE LOT NORTH OF THE OFFICE SHALL BE USED BY OTHERS DURING THE RENOVATION AND SHALL NOT BE AVAILABLE UNTIL THE RENOVATIONS ARE COMPLETE. THE CONTRACTOR SHALL COORDINATE THE CONSTRUCTION OF THE PROPOSED PARKING LOT IMPROVEMENTS INCLUDING THE PROPOSED SIDEWALK WITH THE CONTRACTOR OF THE RENOVATIONS AND SCHEDULE THE CONSTRUCTION OF THE IMPROVEMENTS ACCORDINGLY.

WORKING IN WATERWAYS

THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE BOG TURTLE SURVEYOR 10 DAYS IN ADVANCE OF DEWATERING THE MILL RACE.

THE CONTRACTOR SHALL MONITOR THE WATER LEVELS AND COORDINATE WITH THE BOG TURTLE SURVEYOR. THE BOG TURTLE SURVEYOR SHALL MONITOR THE MILL RACE BELOW WHERE THE SAND BAGS DIVERSION IS PLACED TO THE MILL RACE OUTFALL ONCE THE WATER LEVEL IS APPROXIMATELY THREE INCHES IN DEPTH AND EACH DAY THEREAFTER UNTIL THE MILL RACE IS COMPLETELY DRY, TO ENSURE ANY TURTLES THAT MIGHT BE IN THE DRYING MILL RACE ARE NOT EXPOSED AND CAN BE MOVED TO SAFETY.

NO EQUIPMENT SHALL BE MOVED INTO THE MILL RACE UNTIL THE BED OF THE MILL RACE IS COMPLETELY DRY, ALL SURVEYS ARE COMPLETE AND THE BOG TURTLE SURVEYOR HAS RELEASED THE AREA FOR CONSTRUCTION.

2 CLEARING AND GRUBBING

THE LIMITS OF CLEARING AND GRUBBING SHALL BE TO THE LIMITS OF DISTURBANCE (LOD), INCLUDING THE STAGING AREA. THE COSTS ASSOCIATED WITH CLEARING AND GRUBBING ARE TO BE INCLUDED IN THE BASE BID.

TEMPORARY ACCESS ROAD 2

THE CONTRACTOR SHALL CONSTRUCT THE TEMPORARY ACCESS ROAD AS SHOWN ON THE PLANS. UPON COMPLETION OF BRIDGE CONSTRUCTION, THE ACCESS ROAD SHALL BE REMOVED AND THE AREA BACKFILLED, SEEDED AND MULCHED.

SUGGESTED CONSTRUCTION SEQUENCING NOTES- PHASE 1

1. NOTIFY THE DNREC SEDIMENT AND STORMWATER MANAGEMENT PROGRAM IN WRITING AT LEAST FIVE (5) DAYS PRIOR TO THE START OF CONSTRUCTION. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.
2. INSTALL ADVANCED WARNING SIGNS AS SHOWN ON THE PLANS. SIGNS SHOWN ON PLAN ARE FOR WORK IN THE LOCATION OF FARM LANE AND THE PAPER MILL BRIDGE PARKING LOT. THE CONTRACTOR SHALL ADJUST SIGN LOCATIONS AS REQUIRED TO CONSTRUCT PARKING LOT IMPROVEMENTS ON BENGE ROAD NORTH OF THE OFFICE.
3. INSTALL EROSION AND SEDIMENT CONTROL DEVICES AS SHOWN ON THE PLANS. MARK THE LIMITS OF SENSITIVE AREAS, SUCH AS PRESERVED TREES, INFILTRATION AREAS, WETLANDS, AND OTHER SECTIONS THAT ARE NOT TO BE DISTURBED WITH A PHYSICAL BARRIER.
4. ONCE THE EROSION AND SEDIMENT PERIMETER CONTROLS ARE SET, THE CONTRACTOR SHALL SCHEDULE A PERIMETER CONTROL REVIEW WITH THE AGENCY CONSTRUCTION SITE REVIEWER. ALL PERIMETER CONTROLS ARE TO BE REVIEWED BY THE AGENCY CONSTRUCTION SITE REVIEWER AND APPROVED PRIOR TO PROCEEDING WITH FURTHER SITE DISTURBANCE OR CONSTRUCTION.
5. CLEAR AND GRUB AND REMOVE DEBRIS WITHIN THE PROJECT AREA AS SHOWN ON THE PLANS.
6. UTILIZE DELAWARE MUTCD TA-10 WHILE WORKING ADJACENT TO BENGE ROAD.
7. INSTALL TEMPORARY ROAD TO ACCESS PAPER MILL WEST ABUTMENT.
8. INSTALL SUPPORT OF EXCAVATION AS REQUIRED TO CONSTRUCT THE PROPOSED BRIDGE ABUTMENTS. THE SUPPORT OF EXCAVATION SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF DELAWARE. WORKING DRAWINGS AND CALCULATIONS SHALL BE PROVIDED TO THE OWNER FOR REVIEW AND APPROVAL.
9. CONSTRUCT ABUTMENTS TO THE BEAM SEAT & CONSTRUCT WINGWALLS AS SHOWN ON PLANS.
10. REMOVE SUPPORT OF EXCAVATION.
11. INSTALL RIPRAP SCOUR PROTECTION.
12. RELEASE BRIDGE ABUTMENTS TO WORKIN' BRIDGES FOR INSTALLATION OF THE BRIDGES. SEE CONSTRUCTION PHASING PROJECT NOTES THIS SHEET.
13. INSTALL SAND BAG DIVERSION AT THE HEAD OF THE MILL RACE AND DEWATER THE EXISTING MILL RACE. SEE CONSTRUCTION PHASING PROJECT- WORKING IN WATERWAYS, THIS SHEET.
14. INSTALL THE PAPER MILL DECKOVER STRUCTURE.
15. CONSTRUCT PARKING AREA OVER EXISTING SETTLING TANK TO TOP OF GABC.
16. CONSTRUCT BENGE ROAD PARKING LOT IN ACCORDANCE WITH OWNER PREPARED DRAWINGS. SEE CONSTRUCTION PHASING PROJECT NOTES- BENGE ROAD PARKING LOT, THIS SHEET.
17. CONSTRUCT PATH CONNECTION FROM OFFICE TO PROVIDE PEDESTRIAN ACCESS TO THE EXISTING RESIDENCES ALONG BENGE ROAD DURING PHASE 2 CONSTRUCTION ACTIVITIES.
18. STABILIZE WORK AREA IN ACCORDANCE WITH THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK.
19. REMOVE EROSION AND SEDIMENT CONTROL DEVICES NOT REQUIRED FOR FUTURE PHASES.

SUGGESTED CONSTRUCTION SEQUENCING NOTES- PHASE 2

1. MAINTAIN EROSION AND SEDIMENT CONTROL DEVICES FROM PREVIOUS PHASE AND INSTALL ADDITIONAL EROSION AND SEDIMENT DEVICES REQUIRED FOR THIS PHASE.
2. INSTALL TEMPORARY TRAFFIC CONTROL DEVICES AS SHOWN ON THE PLANS.
3. CLOSE FARM LANE TO PUBLIC ACCESS. CLOSE MUSEUM DRIVE TO ALL TRAFFIC.
4. CONSTRUCT REMAINING PORTION OF OFFICE PATH CONNECTION. UTILIZE THE NEWLY CONSTRUCTED OFFICE PARKING LOT AND PATH FOR PEDESTRIAN ACCESS TO EXISTING RESIDENCES ALONG BENGE ROAD.
5. MAINTAIN LOCAL ACCESS TO FARM LANE AT ALL TIMES.
6. DEMO BUILDINGS AS SHOWN ON THE DEMOLITION PLAN
7. ROUGH GRADE WORK AREA.
8. INSTALL UTILITY SLEEVES TO THE FUTURE BUILDING.
9. CONSTRUCT IMPROVEMENTS AS SHOWN ON PLANS.
10. UPON COMPLETION OF BRIDGE ERECTION CONSTRUCT REMAINING BRIDGE ELEMENTS.
11. UPON COMPLETION OF REMAINING BRIDGE ELEMENTS, CONSTRUCT BOARDWALK CONNECTION TO HI PARCEL TRAIL.
12. REMOVE TEMPORARY ACCESS ROAD TO PAPER MILL WEST ABUTMENT UPON THE COMPLETION OF THE PAPER MILL BRIDGE AND RESTORE THE AREA TO IT'S ORIGINAL GRADES AND CONDITION.
13. CONSTRUCT REMAINING IMPROVEMENTS EAST OF BENGE ROAD.
14. STABILIZE WORK AREA IN ACCORDANCE WITH THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK.
15. REMOVE EROSION AND SEDIMENT CONTROL DEVICES AFTER APPROVAL BY DNREC'S SEDIMENT AND STORMWATER PROGRAM.

NANCY RUTH BERGERON LICENSE NO. 14738 STATE OF DELAWARE PROFESSIONAL ENGINEER

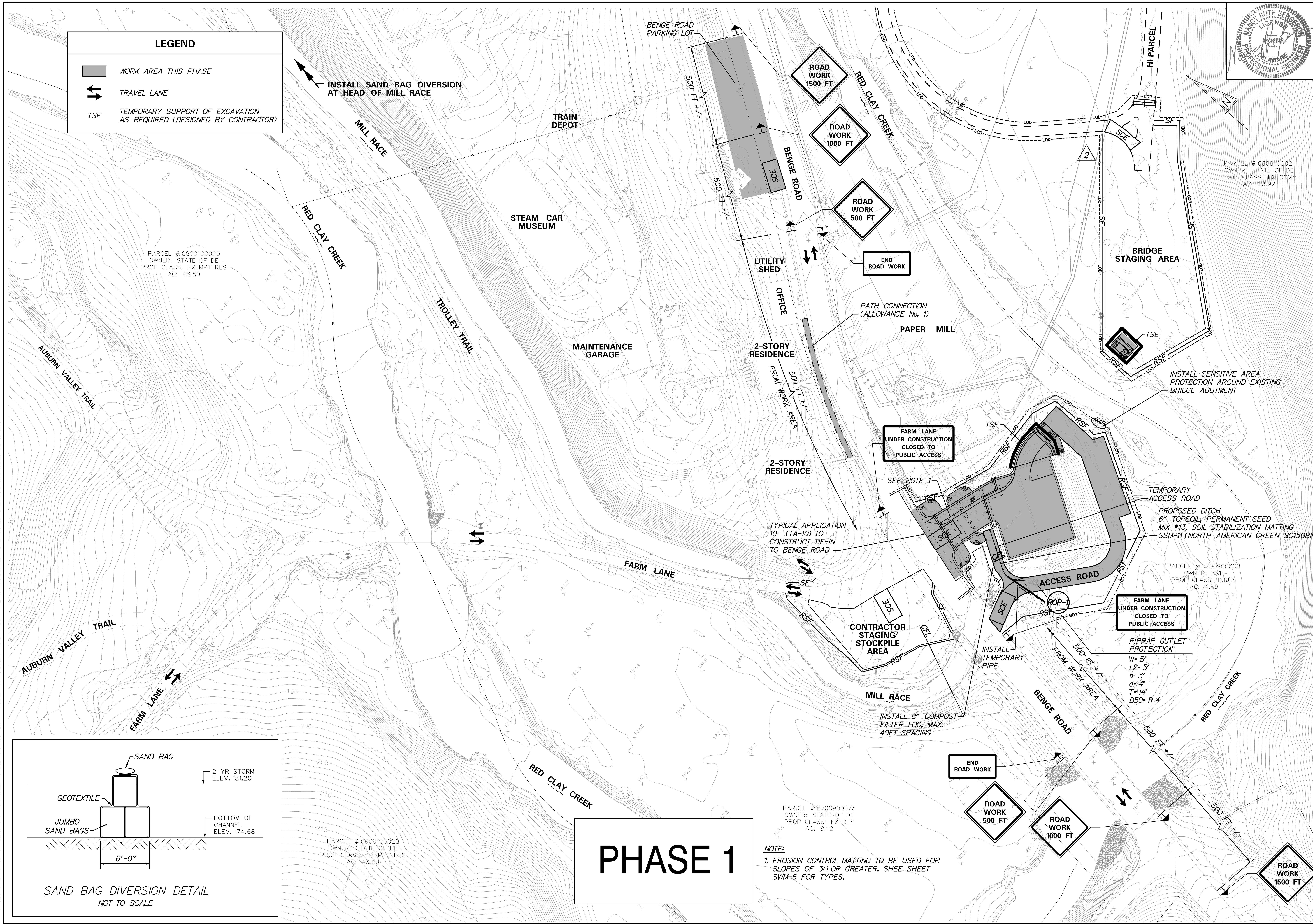
DATE: DESCRIPTION: BY:
DATE: 8/10/17 DESCRIPTION: 2 REVISED AND ADDED NOTES BY: RLS

AUBURN HEIGHTS PRESERVE
PAPER MILL BRIDGE
CONSTRUCTION PHASING & EROSION AND SEDIMENT CONTROL NOTES

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY: RKK
DRAWN BY: RKK
BUILDING NO.: N/A
DATE: 6/30/2017
SCALE: NOT TO SCALE
SHEET NO.: ES-1
PARKS PROJECT #: NVF-4
CONTRACT #: 2015-NVF-100

8/10/2017 11:24:34 AM
\\BALSRV01\V2014\2014\14078_DNREC\TASK 10 - MB_NVF\CADD\CONTRACTS\FARMLN_PAPERMILL\PLANS\CS01_AHP.DGN


LEGEND
WORK AREA THIS PHASE
TRAVEL LANE
TSE TEMPORARY SUPPORT OF EXCAVATION AS REQUIRED (DESIGNED BY CONTRACTOR)
INSTALL SAND BAG DIVERSION AT HEAD OF MILL RACE
MILL RACE
TRAIN DEPOT
BENGE ROAD PARKING LOT
ROAD WORK 1500 FT
ROAD WORK 1000 FT
ROAD WORK 500 FT
END ROAD WORK
RED CLAY CREEK
BENGE ROAD
HI PARCEL
SCE
SF
RSF
LOD
PARCEL #:0800100021 OWNER: STATE OF DE PROP CLASS: EX COMM AC: 23.92
BRIDGE STAGING AREA
TSE
STEAM CAR MUSEUM
PARCEL #:0800100020 OWNER: STATE OF DE PROP CLASS: EXEMPT RES AC: 48.50
UTILITY SHED
OFFICE
PATH CONNECTION (ALLOWANCE No. 1)
PAPER MILL
TROLLEY TRAIL
MAINTENANCE GARAGE
2-STORY RESIDENCE
500 FT +/- FROM WORK AREA
AUBURN VALLEY TRAIL
INSTALL SENSITIVE AREA PROTECTION AROUND EXISTING BRIDGE ABUTMENT
FARM LANE UNDER CONSTRUCTION CLOSED TO PUBLIC ACCESS
SEE NOTE 1
TEMPORARY ACCESS ROAD
PROPOSED DITCH 6" TOPSOIL, PERMANENT SEED MIX #13, SOIL STABILIZATION MATTING SSM-11 (NORTH AMERICAN GREEN SC150BN)
TYPICAL APPLICATION 10 (TA-10) TO CONSTRUCT TIE-IN TO BENGE ROAD
FARM LANE
ACCESS ROAD
ROP-1
CFL
PARCEL #:0700900002 OWNER: NVF PROP CLASS: INDUS AC: 4.49
CONTRACTOR STAGING/ STOCKPILE AREA
INSTALL TEMPORARY PIPE
RIPRAP OUTLET PROTECTION
W= 5'
L2= 5'
b= 3'
d= 4"
T= 14"
D50= R-4
MILL RACE
INSTALL 8" COMPOST FILTER LOG, MAX. 40FT SPACING
SAND BAG
2 YR STORM ELEV. 181.20
GEOTEXTILE
JUMBO SAND BAGS
BOTTOM OF CHANNEL ELEV. 174.68
6'-0"
SAND BAG DIVERSION DETAIL
NOT TO SCALE
PARCEL #:0700900075 OWNER: STATE OF DE PROP CLASS: EX RES AC: 8.12
PARCEL #:0800100020 OWNER: STATE OF DE PROP CLASS: EXEMPT RES AC: 48.50

PHASE 1

NOTE:

1. EROSION CONTROL MATTING TO BE USED FOR SLOPES OF 3:1 OR GREATER. SHEE SHEET SWM-6 FOR TYPES.

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NANCY RUTH BERGERON LICENSED PROFESSIONAL ENGINEER DELAWARE

DATE:	DESCRIPTION:	BY:
8/10/17	2 REVISED LOD	RLS

AUBURN HEIGHTS PRESERVE PAPER MILL BRIDGE

CONSTRUCTION SEQUENCING & EROSION AND SEDIMENT CONTROL PLANS

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY: RKK

DRAWN BY: RKK

BUILDING NO.: N/A

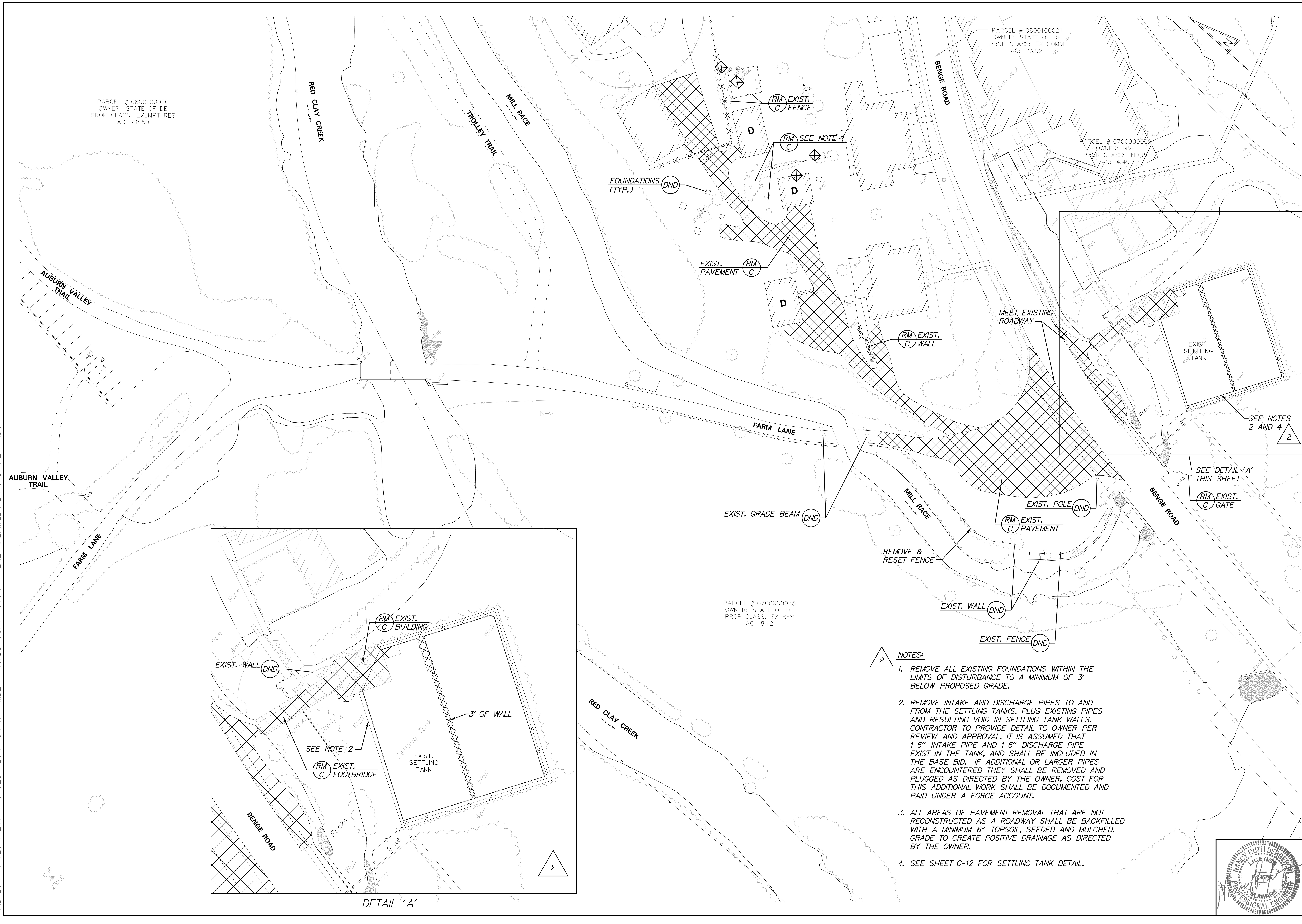
DATE: 6/30/2017

SCALE: 1" = 40'

SHEET NO.: ES-2

PARKS PROJECT #: NVF-4

CONTRACT #: 2015-NVF-100



2 NOTES:

1. REMOVE ALL EXISTING FOUNDATIONS WITHIN THE LIMITS OF DISTURBANCE TO A MINIMUM OF 3' BELOW PROPOSED GRADE.
2. REMOVE INTAKE AND DISCHARGE PIPES TO AND FROM THE SETTLING TANKS. PLUG EXISTING PIPES AND RESULTING VOID IN SETTLING TANK WALLS. CONTRACTOR TO PROVIDE DETAIL TO OWNER PER REVIEW AND APPROVAL. IT IS ASSUMED THAT 1-6" INTAKE PIPE AND 1-6" DISCHARGE PIPE EXIST IN THE TANK, AND SHALL BE INCLUDED IN THE BASE BID. IF ADDITIONAL OR LARGER PIPES ARE ENCOUNTERED THEY SHALL BE REMOVED AND PLUGGED AS DIRECTED BY THE OWNER. COST FOR THIS ADDITIONAL WORK SHALL BE DOCUMENTED AND PAID UNDER A FORCE ACCOUNT.
3. ALL AREAS OF PAVEMENT REMOVAL THAT ARE NOT RECONSTRUCTED AS A ROADWAY SHALL BE BACKFILLED WITH A MINIMUM 6" TOPSOIL, SEEDED AND MULCHED. GRADE TO CREATE POSITIVE DRAINAGE AS DIRECTED BY THE OWNER.
4. SEE SHEET C-12 FOR SETTLING TANK DETAIL.

DATE:	DESCRIPTION:	BY:
8/10/17	2 REVISED NOTES AND CORRECTED CALLOUT	RLS

AUBURN HEIGHTS PRESERVE PAPER MILL BRIDGE

DEMOLITION PLAN

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY: RKK
DRAWN BY: RKK
BUILDING NO.: N/A
DATE: 6/30/2017
SCALE: 1" = 30'
SHEET NO.: C-11
PARKS PROJECT #: NVF-4
CONTRACT #: 2015-NVF-100

NANCY RUTH BERGERON LICENSED PROFESSIONAL ENGINEER DELAWARE

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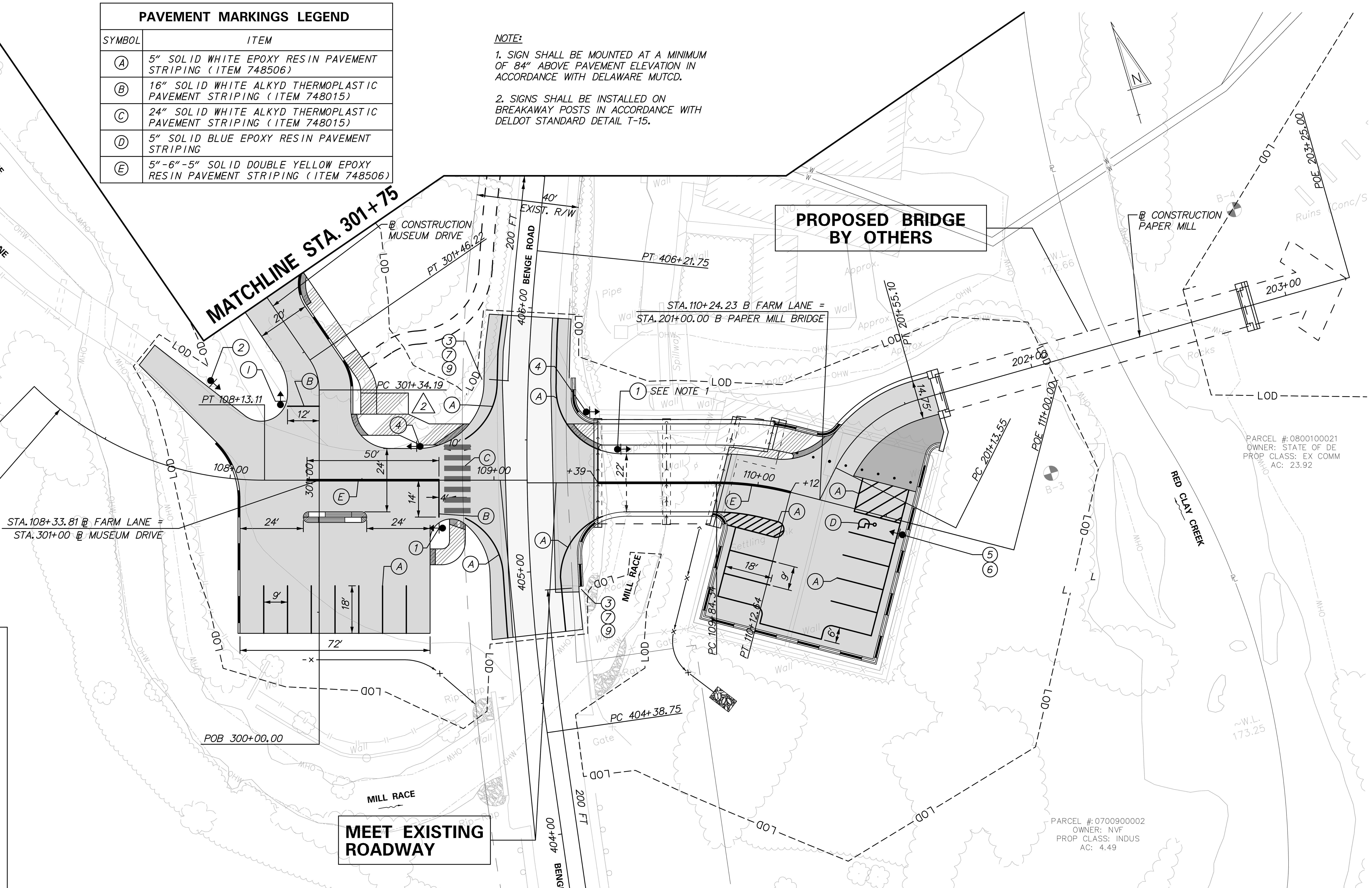
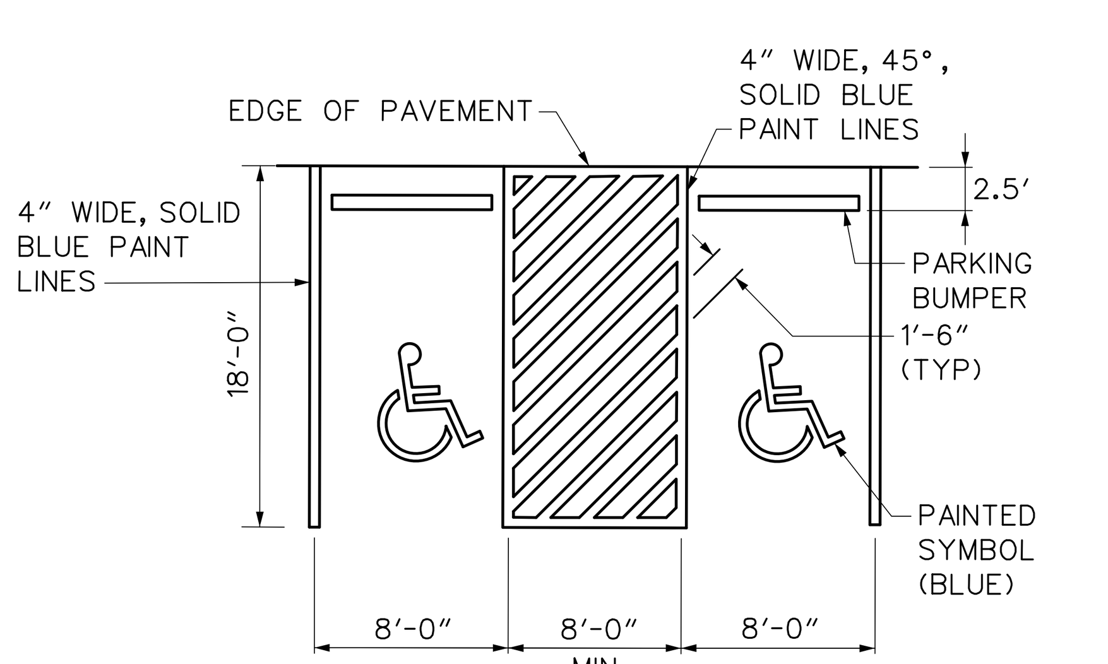
PAVEMENT MARKINGS LEGEND

SYMBOL	ITEM
(A)	5" SOLID WHITE EPOXY RESIN PAVEMENT STRIPING (ITEM 748506)
(B)	16" SOLID WHITE ALKYD THERMOPLASTIC PAVEMENT STRIPING (ITEM 748015)
(C)	24" SOLID WHITE ALKYD THERMOPLASTIC PAVEMENT STRIPING (ITEM 748015)
(D)	5" SOLID BLUE EPOXY RESIN PAVEMENT STRIPING
(E)	5"-6"-5" SOLID DOUBLE YELLOW EPOXY RESIN PAVEMENT STRIPING (ITEM 748506)

NOTE:

1. SIGN SHALL BE MOUNTED AT A MINIMUM OF 84" ABOVE PAVEMENT ELEVATION IN ACCORDANCE WITH DELAWARE MUTCD.
2. SIGNS SHALL BE INSTALLED ON BREAKAWAY POSTS IN ACCORDANCE WITH DELDOT STANDARD DETAIL T-15.



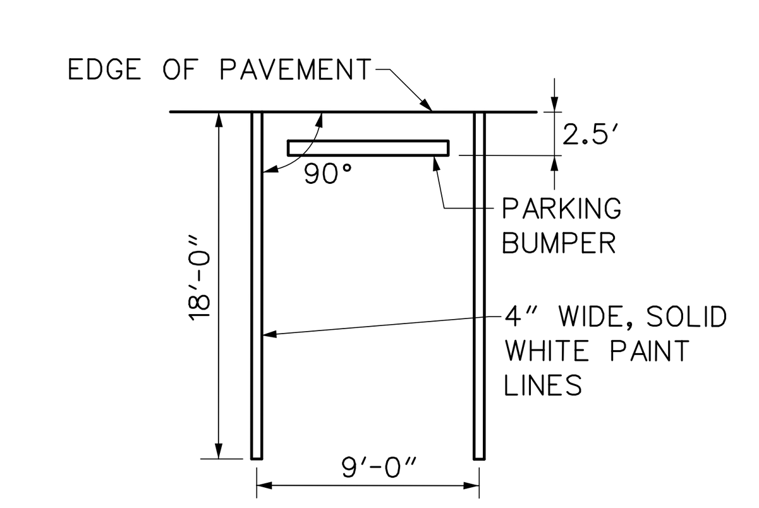


1 / C-16 *ACCESSIBLE LAYOUT PARKING SPACE DETAIL*

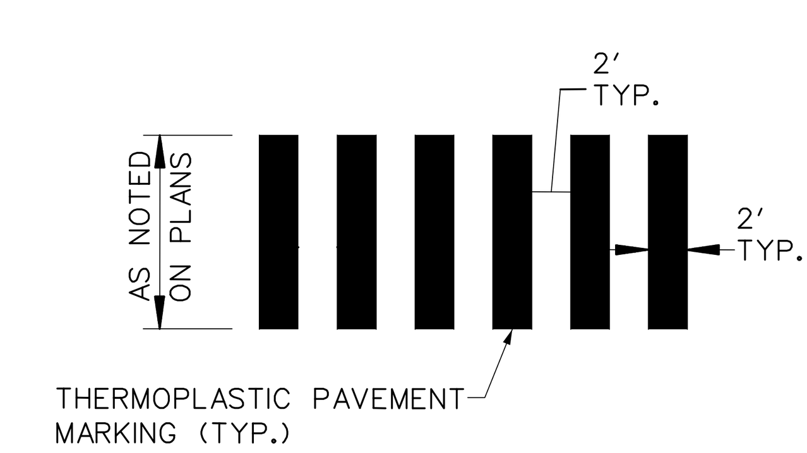
SIGN LEGEND

No.	Sign	Designation
1	STOP	R1-1 (36" X 36")
2	ONE LANE BRIDGE	W5-3 (30"x30")
3	(trail crossing symbol)	
4	(bicycle symbol) STOP	SR1-16-DE (24" X 42")
5*	RESERVED PARKING (accessible symbol)	R7-8 (12"x18")
6*	VAN ACCESSIBLE	R7-8P (12"x6")
7	TRAIL X-ING	W11-15P (24"X18")
8	AHEAD	W16-9P (24"X12")
9	(arrow)	W16-7P (24"X12")

* ALL ACCESSIBLE SIGNS SHALL BE 60" MINIMUM ABOVE THE GROUND SURFACE MEASURED TO THE BOTTOM OF THE SIGN



2 / C-16 *TYPICAL PARKING SPACE DETAIL*



3 / C-16 *CROSSWALK DETAIL*

N.T.S.

DATE:	DESCRIPTION:	BY:
8/10/17	1 REVISED SHARED USE PATH MATERIAL	RLS

AUBURN HEIGHTS PRESERVE PAPER MILL BRIDGE

SIGNING AND STRIPING PLAN

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DESIGNED BY: RKK

DRAWN BY: RKK

BUILDING NO.: N/A

DATE: 6/30/2017

SCALE: 1" = 20'

SHEET NO.: C-16

PARKS PROJECT #: NVF-4

CONTRACT #: 2015-NVF-100

NANCY RUTH BERGERON LICENSED PROFESSIONAL ENGINEER DELAWARE

7/12/2017 10:17:27 AM \\BALSRV01\V2014\14078_DNREC\TASK 10 - MB_NVF\CADD\CONTRACTS\FARMLN_PAPERMILL\PLANS\SS01_AHP.DGN

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

June 10, 2016

Rummel Klepper & Kahl, LLP
81 Mosher Street
Baltimore, Maryland 21217

Attn: Mr. Robert Schaffer

Re: Report of Geotechnical Exploration
NVF Flood Plain Mitigation and Culverts
New Castle County, Delaware

Dear Mr. Schaffer:

In accordance with our agreement, Geo-Technology Associates, Inc. (GTA) has performed a geotechnical exploration for the proposed flood plain mitigation site, culverts, and bridge proposed along the Red Clay Creek at the former NVF plant and Auburn Heights in New Castle County, Delaware. The subsurface exploration consisted of performing Standard Penetration Test (SPT) borings at the proposed locations of the mitigation area, culverts, and bridge. The results of the subsurface exploration and laboratory testing are presented in this report.

We appreciate the opportunity to be of assistance on this project. Should you have questions or require additional information, please do not hesitate to contact our office.

Sincerely,
GEO-TECHNOLOGY ASSOCIATES, INC.

FOR Edwin Williams
Associate

Christopher M. Reith, P.E.
Principal

SJ/CMR/amd
160621

REPORT OF GEOTECHNICAL EXPLORATION

NVF FLOOD PLAIN MITIGATION AND CULVERTS

New Castle County, Delaware

June 2016

Prepared For:

RUMMEL KLEPPER & KAHL, LLP
81 Mosher Street
Baltimore, Maryland 21217

Attn: Mr. Robert Schaffer

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
18 Boulden Circle, Suite 36
New Castle, Delaware 19720
(302) 326-2100

GTA Job No: 160621

TABLE OF CONTENTS

REPORT OF GEOTECHNICAL EXPLORATION

NVF FLOOD PLAIN MITIGATION AND CULVERTS
NEW CASTLE COUNTY, DELAWARE
JUNE 2016

INTRODUCTION

Geo-Technology Associates, Inc. (GTA) has completed a subsurface exploration for the proposed improvements at as part of the NVF Floodplain Mitigation and Culvert Replacement, located in New Castle County, Delaware. GTA understands that the proposed construction includes a floodplain/wetland mitigation area, the replacement and relocation of one culvert, the addition of a second culvert, and a new bridge. The flood plain mitigation site is located north of the Auburn Heights Mansion between the Red Clay Creek and millrace, the culvert replacement/realignment will be at Farm Lane where the road crosses over the mill race, the Paper Mill culvert/bridge will cross the mill race, and the new bridge will cross Red Clay Creek at the former NVF plant. Included in the field explorations were 11 Standard Penetration Test borings drilled to depths of 10 to 37 feet below the existing ground surface. Limited laboratory testing was performed on split spoon samples recovered from the borings to characterize general subsurface conditions. The results of the field and laboratory testing are detailed herein.

SITE GEOLOGY

Geologic Maps

According to the *Bedrock Geologic Map of the Piedmont of Delaware & Adjacent Pennsylvania* (2000), prepared by the Delaware Geological Survey (DGS), the area is situated in the Piedmont Geographic Province. The map indicates that most of the borings were drilled in the Precambrian Age Baltimore Gneiss. The borings for the bridge at the former NVF Plant are near the geologic contact between the Baltimore Gneiss and the Cambrian-Ordovician Age Cockeysville Marble.

The Geologic Map of New Castle County (2005) indicates that some areas adjacent to the Red Clay Creek are underlain by Holocene Age alluvial deposits. These materials are described as being in the stream beds and adjacent flood plains.

Soil Survey

According to the U.S. Department of Agriculture (USDA), National Resources Conservation Service (NRCS) Web Soil Survey (2015), the soils underlying the wetland mitigation site and culverts are generally mapped as the Hatboro-Codorus complex. The Hatboro frequently flooded soil series is characterized as a flood plain soil with poor drainage. Lithic bedrock is indicated to be at a depth of 60 to 118 inches with a water table depth of 0 to 6 inches. The Codorus occasionally flooded soil series is characterized as a flood plain soil that is moderately well drained. Lithic bedrock is indicated to be at a depth of more than 80 inches with a water table depth of 18 to 36 inches. The soils underlying the uplands portion of the culvert areas are mapped as the Delanco-Hatboro-Codorus complex, characterized as an alluvial soil which is moderately well drained. The depth to water table is mapped at about 20 to 40 inches with lithic bedrock mapped at 60 to 118 inches deep. The soils underlying the NVF bridge are mapped as Urban Land bedrock substratum. No soils description is given for this series, but the depth to lithic bedrock is listed as 40 to 72 inches. Refer to the publications for more detailed information.

FIELD EXPLORATION

The subsurface exploration consisted of drilling 11 Standard Penetration Test (SPT) borings from April 25 through April 29, 2016. The borings were field located by GTA using hand held GPS equipment and coordinates supplied by RK&K. Elevations were not provided and the contours on the provided plans were not labelled. A few of the borings were off-set from the specified locations by a few feet due to accessibility issues. The approximate locations are indicated on the Test Boring Location Plan included in Appendix A.

The borings were performed by GTA using a CME 550X or CME 55 drill rig. Soil borings were advanced using hollow stem augers and an automatic hammer to depths ranging from 10 to 37 feet below existing ground surface. Standard Penetration Testing was performed in the boreholes,

with soil samples generally obtained continuously in the upper 10 feet and then approximately 5-foot intervals thereafter. Standard Penetration Testing involves driving a 2-inch O.D., 1⅜-inch I.D. split-spoon sampler with a 140-pound hammer free falling 30 inches. The number of blows required to drive the sampler was recorded in intervals of 6 inches. The total number of hammer blows required to drive the sampler from the 6 to 18-inch interval is the SPT N-value. Uncorrected SPT blow counts have been recorded on the borings logs.

Split spoon samples retrieved from the test borings were returned to GTA's laboratory for visual classification by engineering personnel and limited laboratory testing. Descriptions provided on the logs are based on visual classifications by a GTA engineer in accordance with ASTM D2488 (Unified Soil Classification System), supplemented by available laboratory test results. The field sampling information is included on the test boring logs contained in Appendix B. Descriptions of the soil classification system are also included in Appendix B.

Topsoil thicknesses at the boring locations generally ranged from 1 to 8 inches, except at Boring B-1 which was in the dirt/gravel drive lane.

The depth to groundwater was noted during the drilling operations and groundwater levels were measured at the completion of drilling and in general, approximately 24 to 48 hours after completion. The test borings were backfilled after the 24 to 48 hour water readings were obtained except in areas with safety concerns or on the last day of drilling, where the borings were backfilled upon completion. The depth to the bottom of each borehole was also measured after the removal of the augers to measure the depth of collapse or cave-in.

Groundwater was encountered in the test borings during drilling at depths ranging from approximately 6 to 16 ft bgs. The observed water levels are unstabilized readings and actual levels are likely slightly higher. Groundwater was observed at depths ranging from approximately 3½ to 7 ft bgs after a period of 24 to 48 hours. The water table will fluctuate several feet due to variations in precipitation and surface runoff and is likely commensurate with the adjacent creek.

LABORATORY TESTING

The soil samples retrieved from the test borings were brought to GTA's AASHTO Materials Reference Laboratory (AMRL) accredited (R18) laboratory for review by laboratory personnel and limited laboratory testing. Index testing was performed on the samples obtained from the borings to aid in classification of the soils. The laboratory testing consisted of determining the natural moisture content, the particle-size distribution, and the Atterberg Limits of the soil samples recovered from the split spoon sampler. Results of the testing for the samples are summarized in Table C-1, in Appendix C. The particle size distribution test results are also included in Appendix C.

PRESENTATION OF BORING DATA

The test boring information is contained on the final boring logs included in Appendix B. The test boring information on the final logs represents an interpretation of the field logs and includes modifications based on laboratory soil testing and comparison by visual examination during review of the recovered samples.

LIMITATIONS

This report has been prepared for the exclusive use of RK&K in accordance with generally accepted engineering practice. No warranty, express or implied, is made. Use and reproduction of this report by any other person without the expressed written permission of GTA is unauthorized, and such use is at the sole risk of the user.

The borings indicate soil conditions only at specific locations and times and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between the test locations. Geo-Technology Associates, Inc. is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of Geo-Technology Associates, Inc.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A

Notes: (1) Base drawing obtained from Google Earth
(2) Test Boring Location Plan should be read together with GTA Report Job No. 160621
(3) ⌖ Indicates Test Boring location

TEST BORING LOCATION PLAN
NVF Flood Plain Mitigation and Culverts
NEW CASTLE COUNTY, DELAWARE

JOB NUMBER.:
160621

FIGURE:
A-1

REVIEW BY:
EW

SCALE:
NTS

DATE:
June 2016

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
18 Boulden Circle, Suite 36
New Castle, Delaware 19720
(302) 326-2100
Fax (302) 326-2399

APPENDIX B

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)			SYMBOLS GRAPHIC	SYMBOLS LETTER
COARSE - GRAINED SOILS	GRAVEL AND GRAVELY SOILS	CLEAN GRAVELS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		GW
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			GP
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		GM
				GC
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		SW
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE			SP
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		SM
				SC
FINE - GRAINED SOILS	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	SILT OR CLAY (<15% RETAINED THE NO. 200 SIEVE)		ML
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		CL
		SANDY OR GRAVELY SILT OR CLAY (>30% RETAINED THE NO. 200 SIEVE)		OL
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50	SILT OR CLAY (<15% RETAINED THE NO. 200 SIEVE)		MH
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		CH
		SANDY OR GRAVELY SILT OR CLAY (>30% RETAINED THE NO. 200 SIEVE)		OH
HIGHLY ORGANIC SOILS				PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS CONTAINING AN ESTIMATED 10% FINES BY VISUAL CLASSIFICATION OR WHEN THE SOIL HAS BETWEEN 5 AND 12 PERCENT FINES FROM LABORATORY TESTS; AND FOR FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSSHATCHED AREA. RESULTS OF LABORATORY TESTING ARE USED TO SUPPLEMENT THE CLASSIFICATION OF THE SOILS BASED ON THE VISUAL-MANUAL PROCEDURES OF ASTM D2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIPTION		GRAPHIC SYMBOLS
ADDITIONAL DESIGNATION	TOPSOIL		
	MAN-MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATION	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" PENETRATION, AUGER PENETRABLE	

COARSE-GRAINED SOILS
(GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D1586

FINE-GRAINED SOILS
(SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:
WOH = WEIGHT OF HAMMER
WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SPLIT-SPOON	S-
SHELBY TUBE	U-
ROCK CORE	R-

WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	▽
UPON COMPLETION OF DRILLING	▼
24 HOURS AFTER COMPLETION	⧩

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

LOG OF BORING NO. B-1

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	13.0	Dry	BOC
DATE:	4/26/16	4/26/16	4/26/16
CAVED (ft):	In Auger	12.2	

DATE STARTED: **4/26/2016**
DATE COMPLETED: **4/26/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **13.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0.0				0.0	0	SC		Brown, moist, Clayey SAND	Augered to 2.0 feet.
					-2.0					
S-1	2.0	12	2-5-6-8	11			SM		Brown and tan, moist, medium dense, Silty SAND, contains rock fragments	
S-2	4.0	5	2-5-7-8	12		5			Same	
S-3	6.0	15	5-10-10-10	20					Dark brown, moist, medium dense, micaceous, Silty SAND	
S-4	8.0	17	4-14-12-17	26					Tan, moist, medium dense, Silty SAND, contains rock fragments	
						10				
					-13.0		HW		Dark brown, wet, very dense, Highly Weathered ROCK	
S-5	13.0	1	50/2		-15.0	15			Auger refusal at 15.0 feet.	
						20				
						25				

NOTES:

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New Castle, DE 19720

LOG OF BORING NO. B-2

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	8.0	6.7	6.2
DATE:	4/25/16	4/25/16	4/26/16
CAVED (ft):	In Auger	7.5	7.8

DATE STARTED: **4/25/2016**
DATE COMPLETED: **4/25/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **8.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0	12	1-1-1-2	2	0.0 -0.3	0	ML		Topsoil +/- 4 inches Brown, moist, soft, Sandy SILT	
S-2	2.0	11	2-3-4-3	7	-2.0		SM		Brown, moist, loose, Silty SAND, contains rock fragments	
S-3	4.0	15	1-1-2-3	3		5			Brown, moist, very loose, Silty SAND	
S-4	6.0	21	3-3-6-6	9					Same, wet	▼
S-5	8.0	14	2-4-6-7	10		10			Same, medium dense	▽
S-6	13.0	11	2-10-18-14	28		15			Brown and white, wet, medium dense, Silty SAND	
S-7	18.0	10	24-50/4	50/4	-18.0 -18.8	20	HW		Brown and white, wet, very dense, High Weathered ROCK Boring terminated at 18.8 feet.	
						25				

NOTES:

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LOG OF BORING NO. B-2

LOG OF BORING NO. B-3

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	▼ 10.0	▼ 10.0	▼ Dry
DATE:	4/26/16	4/26/16	4/28/16
CAVED (ft):	In Auger	10.9	8.5

DATE STARTED: **4/26/2016**
DATE COMPLETED: **4/26/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **10.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0	14	1-2-3-3	5	0.0 -0.2	0	FILL		Topsoil +/- 2 inches Brown, moist, loose, silty sand FILL, contains rock fragments	
S-2	2.0	13	3-3-2-3	5					Same	
S-3	4.0	16	1-2-2-3	4		5			Same	
S-4	6.0	15	2-2-2-3	4					Dark brown and gray, moist, very loose, clayey sand FILL, contains rock fragments	
S-5	8.0	2	1-3-4-4	7					Same, loose	▼
						10				
S-6	13.0	5	6-10-12-17	22	-13.0		SM		Brown, wet, medium dense, Silty SAND	
						15				
S-7	18.0	12	11-29-50/4	79	-18.0		HW		Brown, wet, very dense, Highly Weathered ROCK	
					-19.3	20			Boring terminated at 19.3 feet.	
						25				

NOTES:

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LOG OF BORING NO. B-4

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	16.0	Dry	Dry
DATE:	4/26/16	4/26/16	4/28/16
CAVED (ft):	In Auger	14.3	9.7

DATE STARTED: **4/26/2016**
DATE COMPLETED: **4/26/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **16.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					0.0	0			Topsoil +/- 6 inches	Augered to 2.0 feet.
					-0.5		SC		Brown, moist, Clayey SAND	
S-1	2.0	12	3-3-3-3	6					Brown, moist, loose, Clayey SAND	
S-2	4.0	17	2-5-9-10	14	-4.0	5	SM		Brown, moist, medium dense, Silty SAND, contains rock fragments	
S-3	6.0	18	8-8-13-17	21					Same, brown and white	
S-4	8.0	10	14-27-31-20	58	-8.0		HW		Brown and gray, moist, very dense, Highly Weathered ROCK	
						10				
S-5	13.0	8	11-50/5	50/5					Same, brown	
						15				▽
S-6	18.0	17	6-18-27-34	45					Same	
					-20.0	20			Boring terminated at 20.0 feet.	
						25				

NOTES:

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LOG OF BORING NO. B-4

LOG OF BORING NO. B-5

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	16.0	Dry	Dry
DATE:	4/26/16	4/26/16	4/28/16
CAVED (ft):	In Auger	13.7	7.2

DATE STARTED: **4/26/2016**
DATE COMPLETED: **4/26/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **16.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					0.0	0				
S-1	0.0	16	3-4-4-4	8	-0.1		FILL		Topsoil +/- 1 inches Dark brown and black, moist, loose, silty sand FILL, contains rock fragments	
S-2	2.0	6	3-2-3-3	5					Same	
S-3	4.0	15	3-7-6-5	13		5			Gray, moist, stiff, sandy silt FILL	
S-4	6.0	20	5-7-8-10	15	-6.0		ML		Brown and gray, mottled, moist, stiff, Sandy SILT	
S-5	8.0	17	1-1-2-3	3					Gray, moist, micaceous, soft, Sandy SILT	
						10				
S-6	13.0	12	2-3-6-13	9	-13.0		SM		Brown and gray, moist, loose, Silty SAND with gravel	▽
						15				
S-7	18.0	16	3-3-5-7	8	-18.0		ML		Orange and brown, wet, medium stiff, Sandy SILT	
						20				
S-8	23.0	16	5-9-16-21	25	-23.0		SM		Brown, wet, medium dense, micaceous, Silty SAND, contains rock fragments	
					-25.0	25			Boring terminated at 25.0 feet.	

NOTES:

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LOG OF BORING NO. B-5

LOG OF BORING NO. B-6

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	8.0	Dry	BOC
DATE:	4/29/16	4/29/16	4/29/16
CAVED (ft):	In Auger	17.2	

DATE STARTED: **4/29/2016**
DATE COMPLETED: **4/29/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **8.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					0.0	0				
S-1	0.0	5	1-1-1-1	2	-0.1		SM		Topsoil +/- 1 inches Dark brown, moist, very loose, micaceous, Silty SAND	
S-2	2.0	10	1-1-1-1	2					Same	
S-3	4.0	12	1-1-2-3	3		5			Same	
S-4	6.0	11	4-5-8-4	13					Same, medium dense	
S-5	8.0	14	4-18-20-21	38					Orange, wet, dense, Silty SAND, contains gravel	▼
						10				
S-6	13.0	2	4-10-14-10	24					Brown, wet, medium dense, micaceous, Silty SAND	
						15				
S-7	18.0	16	3-4-4-5	8					Brown, orange and black, wet, loose, micaceous, Silty SAND	
						20				
S-8	23.0	16	2-2-3-4	5					Same	
						25				
S-9	28.0	18	2-3-4-6	7	-28.0		ML		Brown, orange and gray, wet, medium stiff, micaceous, Sandy SILT	

NOTES:

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LOG OF BORING NO. B-6

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	8.0	Dry	BOC
DATE:	4/29/16	4/29/16	4/29/16
CAVED (ft):	In Auger	17.2	

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						30				
					-33.0		SM		Orange, black and brown, wet, medium dense, micaceous, Silty SAND	
S-10	33.0	13	2-6-8-8	14		35			Same, medium dense	
S-11	35.0	10	10-10-16-31	26						
					-37.0				Boring terminated at 37.0 feet.	
						40				
						45				
						50				
						55				
						60				
						65				

LOG OF BORING NO. B-7

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	8.0	Dry	6.5
DATE:	4/25/16	4/25/16	4/26/16
CAVED (ft):	In Auger	6.7	7.0

DATE STARTED: **4/25/2016**
DATE COMPLETED: **4/25/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **8.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					0.0	0			Topsoil +/- 6 inches	
S-1	0.5	19	1-2-2-1	4	-0.5		SC		Brown, moist, very loose, Clayey SAND	
S-2	2.0	16	1-2-6-6	8	-2.0		CL		Brown, moist, medium stiff,Sandy Lean CLAY	
S-3	4.0	8	1-2-2-3	4		5			Same, soft	
S-4	6.0	7	19-50/5	50/5	-6.0		HW		Brown, white, moist, very dense, Highly Weathered ROCK	▼ Auger grinding 6.0 to 8.0 feet.
S-5	8.0	18	21-30-16-18	46					Same, brown, gray, wet	▼
					-10.0	10			Boring terminated at 10.0 feet.	
						15				
						20				
						25				

NOTES:

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New Castle, DE 19720

LOG OF BORING NO. B-7

LOG OF BORING NO. B-8

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	7.5	7.4	6.9
DATE:	4/25/16	4/25/16	4/26/16
CAVED (ft):	In Auger		7.6

DATE STARTED: **4/25/2016**
DATE COMPLETED: **4/25/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **7.5**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					0.0	0			Topsoil +/- 8 inches	
S-1	0.0	16	1-1-1-2	2	-0.7		ML		Brown, moist, very soft, Sandy SILT	
S-2	2.0	12	1-1-1-2	2	-2.0		SM		Brown, moist, very loose, Silty SAND	
S-3	4.0	13	1-1-2-2	3		5			Same	
S-4	6.0	14	6-11-30-25	41					Brown, moist, dense, Silty SAND with rock fragments	▼
S-5	8.0	10	4-7-18-27	25					Same, brown and gray, wet, medium dense	Auger grinding 7.0 to 8.0 feet.
					-10.0	10			Boring terminated at 10.0 feet.	
						15				
						20				
						25				

NOTES:

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LOG OF BORING NO. B-8

LOG OF BORING NO. B-9

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	8.0	Dry	Dry
DATE:	4/25/16	4/25/16	4/26/16
CAVED (ft):	In Auger	6.2	5.8

DATE STARTED: **4/25/2016**
DATE COMPLETED: **4/25/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **8.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					0.0	0			Topsoil +/- 5 inches	
S-1	0.0	18	1-3-2-3	5	-0.4		SC		Brown, moist, loose, Clayey SAND	
S-2	2.0	20	2-1-1-1	2	-2.0		SM		Brown, moist, very loose, Silty SAND	
S-3	4.0	14	2-7-16-17	23		5			Brown, white, moist, medium dense, Silty SAND, contains rock fragments	
S-4	6.0	8	24-36-50/2	86/8	-6.0		HW		Brown, moist, very dense, Highly Weathered ROCK	
S-5	8.0	16	15-25-31-23	56					Same, wet	▼
					-10.0	10			Boring terminated at 10.0 feet.	
						15				
						20				
						25				

NOTES:

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LOG OF BORING NO. B-10

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	8.0	7.5	5.8
DATE:	4/25/16	4/25/16	4/26/16
CAVED (ft):	In Auger	8.0	7.6

DATE STARTED: **4/25/2016**
DATE COMPLETED: **4/25/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **8.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0	10	1-3-2-2	5	0.0 -0.3	0	ML		Topsoil +/- 4 inches Brown, moist, medium stiff, Sandy SILT	
S-2	2.0	12	2-2-2-3	4	-2.0		SM		Brown, moist, very loose, Silty SAND	
S-3	4.0	10	2-2-3-4	5		5			Same, loose, contains rock fragments	
S-4	6.0	10	9-18-14-10	32					Brown, white, moist, dense, Silty SAND, contains rock fragments	
S-5	8.0	12	6-20-38-10	58	-8.0		HW		Brown, wet, very dense, Highly Weathered ROCK	
					-10.0	10			Boring terminated at 10.0 feet.	
						15				
						20				
						25				

NOTES:

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

LOG OF BORING NO. B-11

PROJECT: **NVF Flood Plain Mitigation & Culverts**
PROJECT NO.: **160621**
PROJECT LOCATION: **New Castle County, Delaware**

WATER LEVEL (ft):	6.0	4.5	3.4
DATE:	4/25/16	4/25/16	4/26/16
CAVED (ft):	In Auger	8.0	6.0

DATE STARTED: **4/25/2016**
DATE COMPLETED: **4/25/2016**
DRILLING CONTRACTOR: **GTA**
DRILLER: **D. Hans**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING (ft) **6.0**
GROUND SURFACE ELEVATION:
DATUM: **Topo**
EQUIPMENT: **CME550X**
LOGGED BY: **T. Hill**
CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0	13	1-1-1-1	2	0.0 -0.4	0	ML		Topsoil +/- 5 inches Brown, moist, soft, Sandy SILT	
S-2	2.0	21	1-1-2-2	3	-2.0		SC		Brown, moist, very loose, Clayey SAND	▼
S-3	4.0	14	1-2-3-4	5	-4.0	5	SM		Brown, moist, loose, Silty SAND	▼
S-4	6.0	10	7-10-15-15	25					Brown and white, wet, medium dense, Silty SAND, contains rock fragments	▼
S-5	8.0	16	7-11-16-17	27					Same	
					-10.0	10			Boring terminated at 10.0 feet.	
						15				
						20				
						25				

NOTES:

GEO-TECHNOLOGY ASSOCIATES, INC.
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New Castle, DE 19720

LOG OF BORING NO. B-11

APPENDIX C

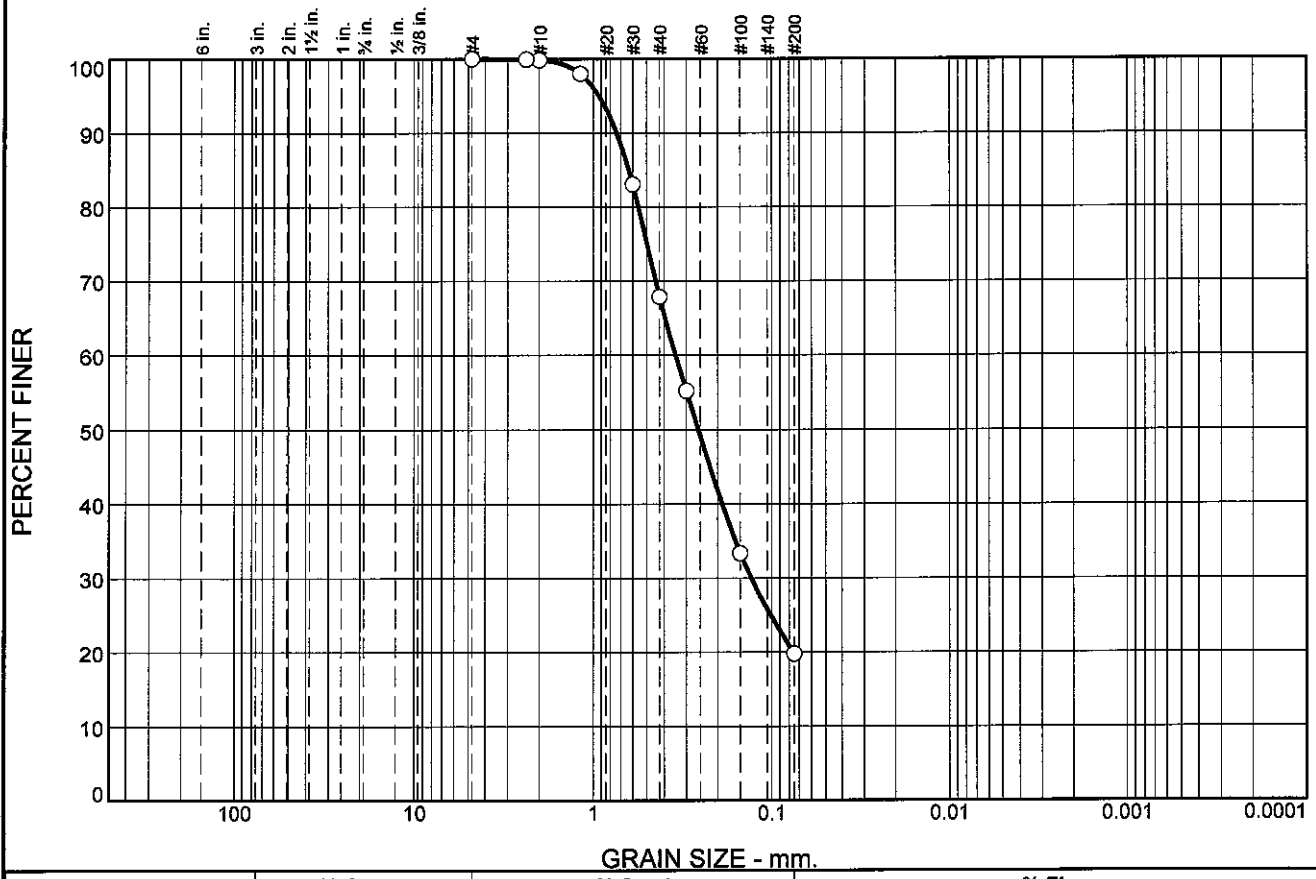
SUMMARY OF SOIL ANALYSIS TESTS

CONTRACT 160621
DATE 6/2/2016

NAME NVF Flood Plain Mitigation & Culverts

LOCATION	DEPTH	PERCENT PASSING								LL	PL	MO	OR	PI	CLASS
		2.5	2	1	3/8	No. 4	No. 10	No. 40	No. 200						
B-1	0.0-2.0	100.0	100.0	100.0	100.0	100.0	100.0	92.2	44.3	32	21	21.0		11	A-6(2)
	2.0-4.0											7.7			
	6.0-8.0	100.0	100.0	100.0	100.0	100.0	99.9	67.9	19.8	NP	NP	15.4		NP	A-2-4(0)
B-2	4.0-6.0											19.6			
	8.0-10.0											25.9			
	13.0-15.0	100.0	100.0	100.0	100.0	93.0	88.0	61.0	19.0	NP	NP	11.5		NP	A-2-4(0)
B-3	2.0-4.0											15.4			
	6.0-8.0											25.6			
	13.0-15.0											19.3			
B-4	0.0-2.0	100.0	100.0	100.0	100.0	100.0	100.0	92.2	44.3	32	21	21.0		11	A-6(2)
	2.0-4.0	100.0	100.0	100.0	100.0	89.2	83.6	64.6	31.8	27	19	11.6		8	A-2-4(0)
	6.0-8.0	100.0	100.0	100.0	100.0	97.4	93.2	69.0	21.9	NP	NP	15.7		NP	A-2-4(0)
	13.0-15.0											3.3			
B-5	2.0-4.0											17.7			
	8.0-10.0	100.0	100.0	100.0	100.0	99.3	96.3	84.5	63.9	32	27	25.5		5	A-4(2)
	13.0-15.0											11.1			
	18.0-20.0	100.0	100.0	100.0	100.0	96.9	93.3	83.4	58.0	42	28	26.7		14	A-7-6(7)
B-6	2.0-4.0											11.3			
	6.0-8.0	100.0	100.0	100.0	100.0	99.5	99.0	89.6	18.6	NP	NP	12.3		NP	A-2-4(0)
	13.0-15.0											37.9			
	23.0-25.0	100.0	100.0	100.0	100.0	98.5	92.9	73.6	42.9	49	33	28.0		16	A-7-5(4)
	33.0-35.0	100.0	100.0	100.0	100.0	100.0	96.7	70.6	39.8	37	28	28.4		9	A-4(1)
B-7	0.0-2.0	100.0	100.0	100.0	100.0	100.0	100.0	92.2	44.3	32	21	21.0		11	A-6(2)
	2.0-4.0	100.0	100.0	100.0	100.0	99.4	99.0	94.2	57.1	36	24	25.5		12	A-6(5)
B-8	2.0-4.0	100.0	100.0	100.0	100.0	99.3	98.9	91.7	36.9			20.4			
B-9	0.4-0.4	100.0	100.0	100.0	100.0	100.0	100.0	92.2	44.3	32	21	21.0		11	A-6(2)
B-10															
B-11															

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	32.0	48.1	19.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#10	99.9		
#16	98.0		
#30	83.1		
#40	67.9		
#50	55.3		
#100	33.4		
#200	19.8		

* (no specification provided)

Soil Description

Dark Brown, moist, micaceous, Silty SAND

Atterberg Limits

PL= NP LL= NP PI= NP NM= 15.4

Coefficients

D_{90}= 0.7374 D_{85}= 0.6305 D_{60}= 0.3448
D_{50}= 0.2568 D_{30}= 0.1303 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Source of Sample: B-1 **Depth:** 6.0 to 8.0
Sample Number: S-3

Date: 4/26/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

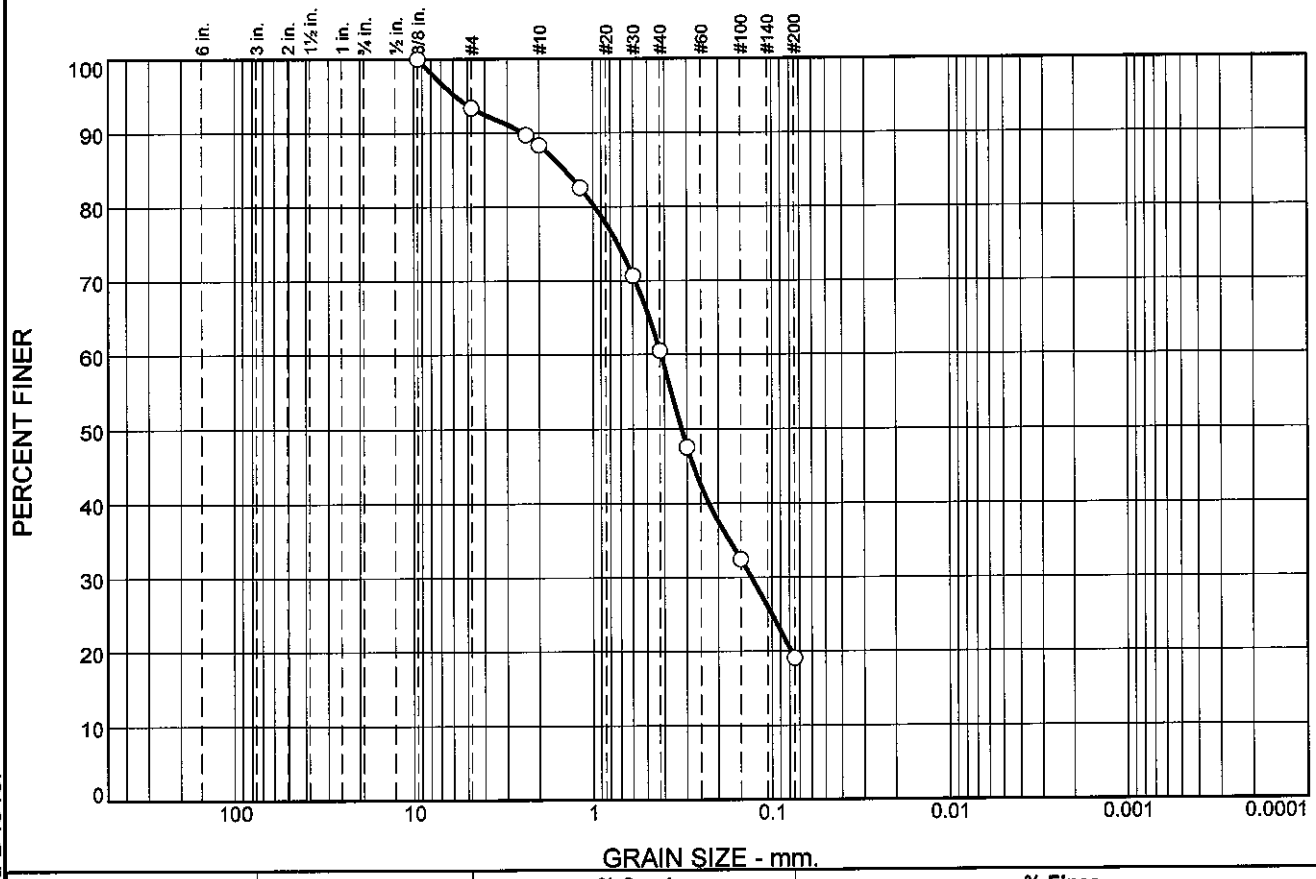
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Emery **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.6	5.1	27.7	41.5	19.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	93.4		
#8	89.7		
#10	88.3		
#16	82.6		
#30	70.7		
#40	60.6		
#50	47.6		
#100	32.5		
#200	19.1		

* (no specification provided)

Soil Description

Brown and white, wet, Silty SAND

Atterberg Limits

PL= NP LL= NP PI= NP NM= 11.5

Coefficients

D_{90}= 2.4453 D_{85}= 1.4391 D_{60}= 0.4185
D_{50}= 0.3214 D_{30}= 0.1308 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4(0)

Remarks

Source of Sample: B-2 **Depth:** 13.0 to 15.0
Sample Number: S-6

Date: 5/23/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

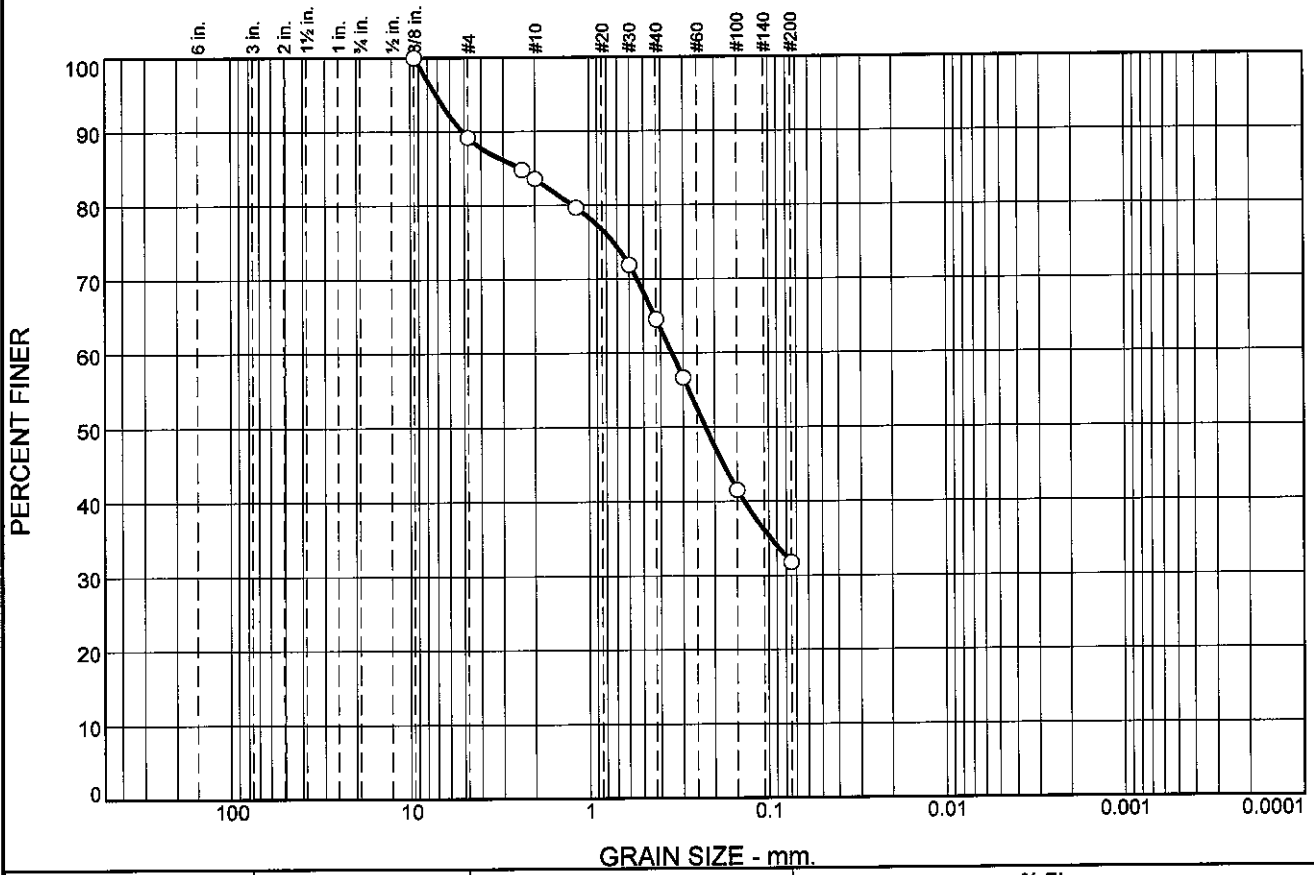
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.8	5.6	19.0	32.8	31.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	89.2		
#8	84.8		
#10	83.6		
#16	79.7		
#30	71.9		
#40	64.6		
#50	56.7		
#100	41.5		
#200	31.8		

* (no specification provided)

Soil Description

Brown, moist, Clayey SAND

Atterberg Limits

PL= 19 LL= 27 PI= 8 NM= 11.6

Coefficients

D_{90}= 5.1060 D_{85}= 2.4167 D_{60}= 0.3472
D_{50}= 0.2250 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4(0)

Remarks

Source of Sample: B-4 **Depth:** 2.0 to 4.0
Sample Number: S-1

Date: 5/23/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

GEO-TECHNOLOGY ASSOCIATES, INC.
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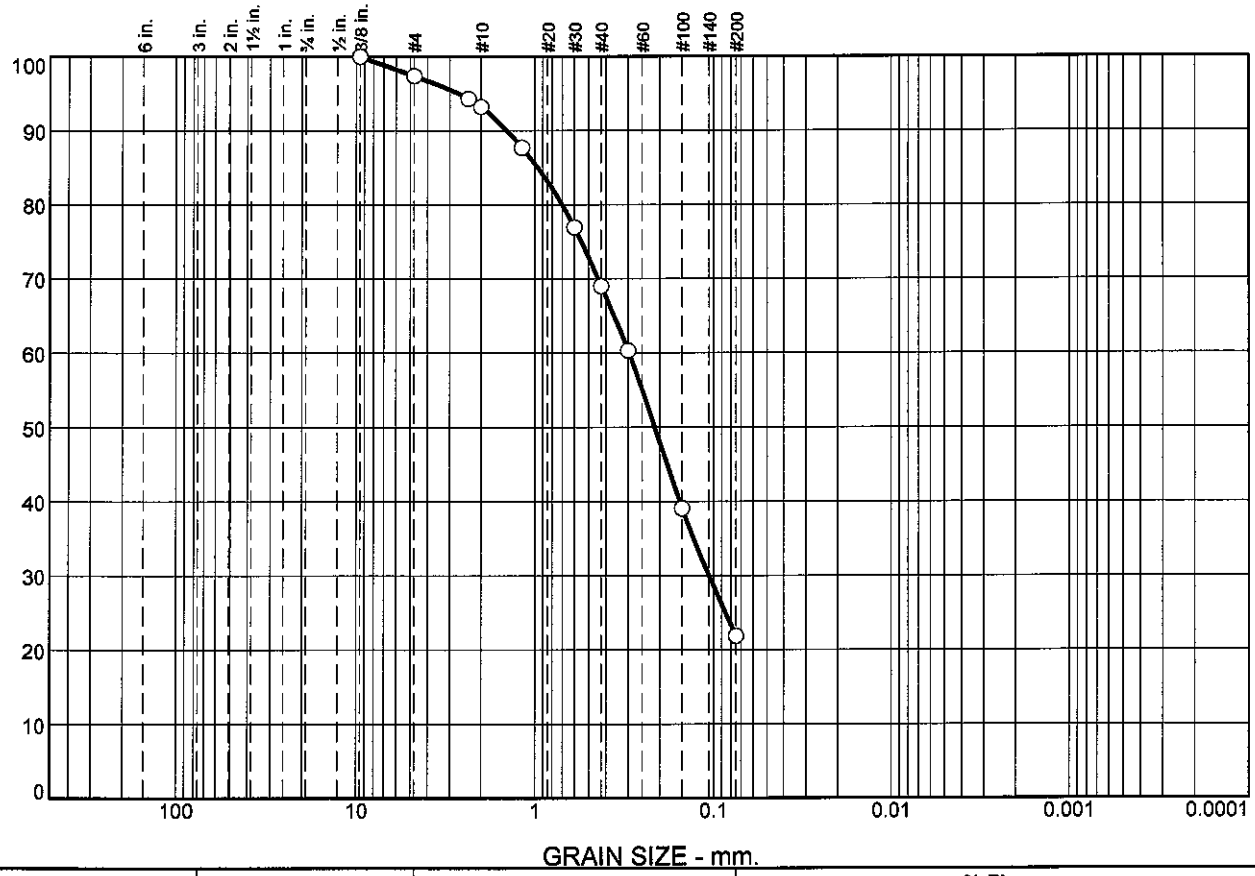
New Castle, DE 19720

Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.6	4.2	24.2	47.1	21.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.4		
#8	94.3		
#10	93.2		
#16	87.7		
#30	77.0		
#40	69.0		
#50	60.3		
#100	39.1		
#200	21.9		

* (no specification provided)

Soil Description

Brown and white, moist, Silty SAND

Atterberg Limits

PL= NP LL= NP PI= NP NM= 15.7

Coefficients

D_{90}= 1.4292 D_{85}= 0.9597 D_{60}= 0.2962
D_{50}= 0.2130 D_{30}= 0.1064 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4(0)

Remarks

Source of Sample: B-4 **Depth:** 6.0 to 8.0
Sample Number: S-3

Date: 4/26/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

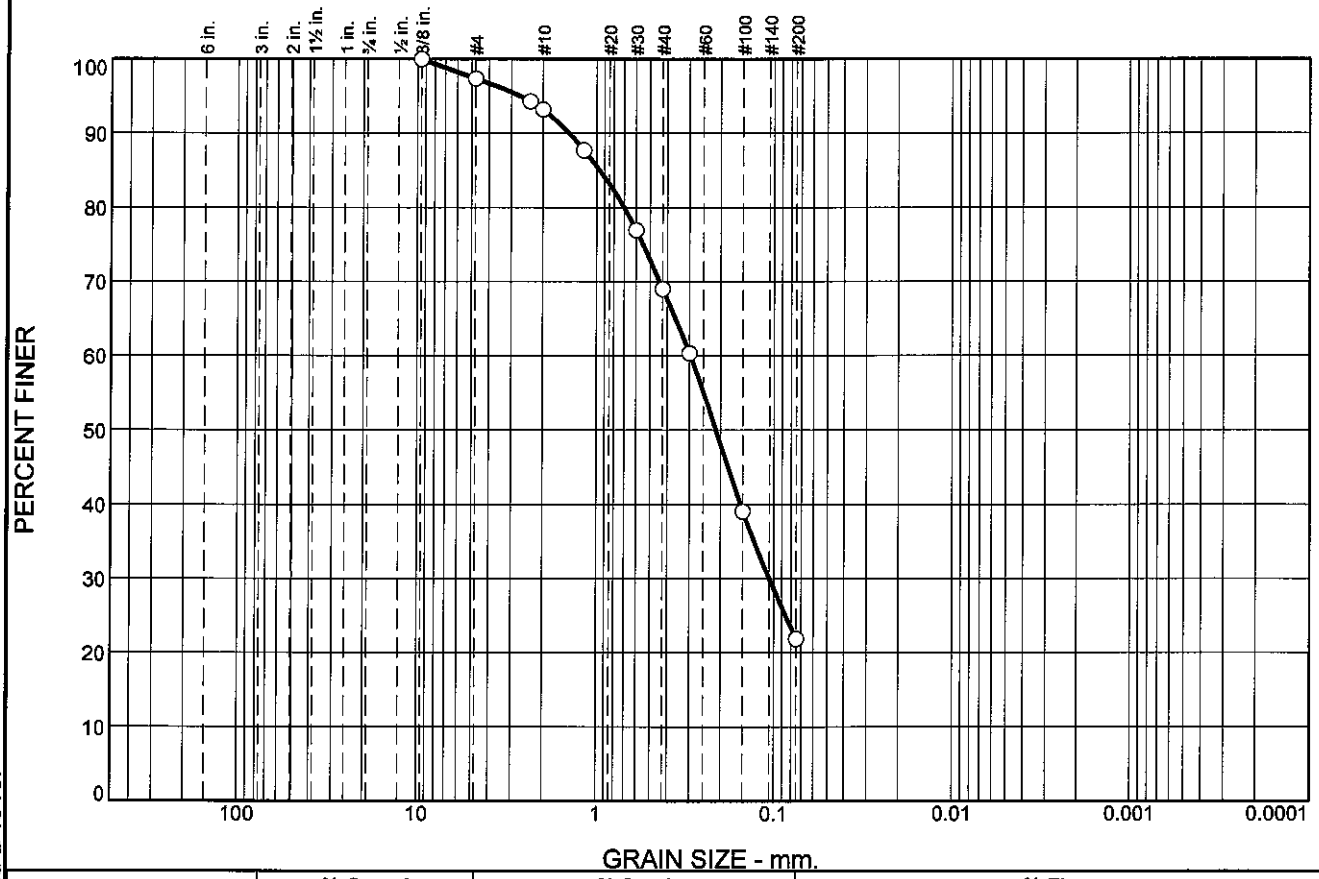
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Emery **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.6	4.2	24.2	47.1	21.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.4		
#8	94.3		
#10	93.2		
#16	87.7		
#30	77.0		
#40	69.0		
#50	60.3		
#100	39.1		
#200	21.9		

* (no specification provided)

Soil Description

Dark Brown, moist, micaceous, Silty SAND

Atterberg Limits

PL= NP LL= NV PI= NP NM= 15.7

Coefficients

D_{90}= 1.4292 D_{85}= 0.9597 D_{60}= 0.2962
D_{50}= 0.2130 D_{30}= 0.1064 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Source of Sample: B-4 **Depth:** 8.0 to 10.0
Sample Number: S-4 **Date:** 4/26/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

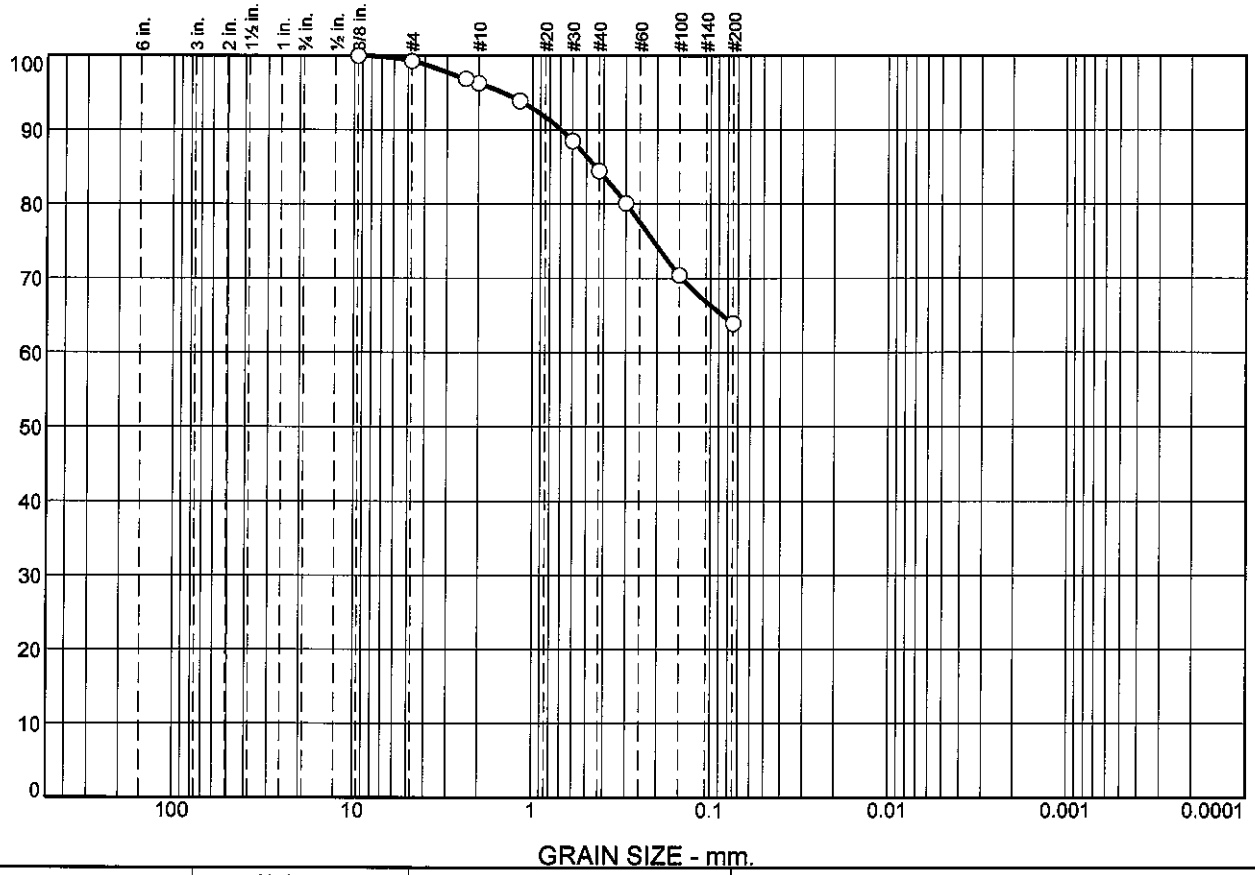
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Emery **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	3.0	11.8	20.6	63.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.3		
#8	96.9		
#10	96.3		
#16	93.9		
#30	88.5		
#40	84.5		
#50	80.1		
#100	70.4		
#200	63.9		

* (no specification provided)

Soil Description

Gray, moist, micaceous, Sandy SILT

Atterberg Limits

PL= 27 LL= 32 PI= 5 NM= 25.5

Coefficients

D_{90}= 0.6939 D_{85}= 0.4436 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(2)

Remarks

Source of Sample: B-5 **Depth:** 8.0 to 10.0
Sample Number: S-5

Date: 5/23/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

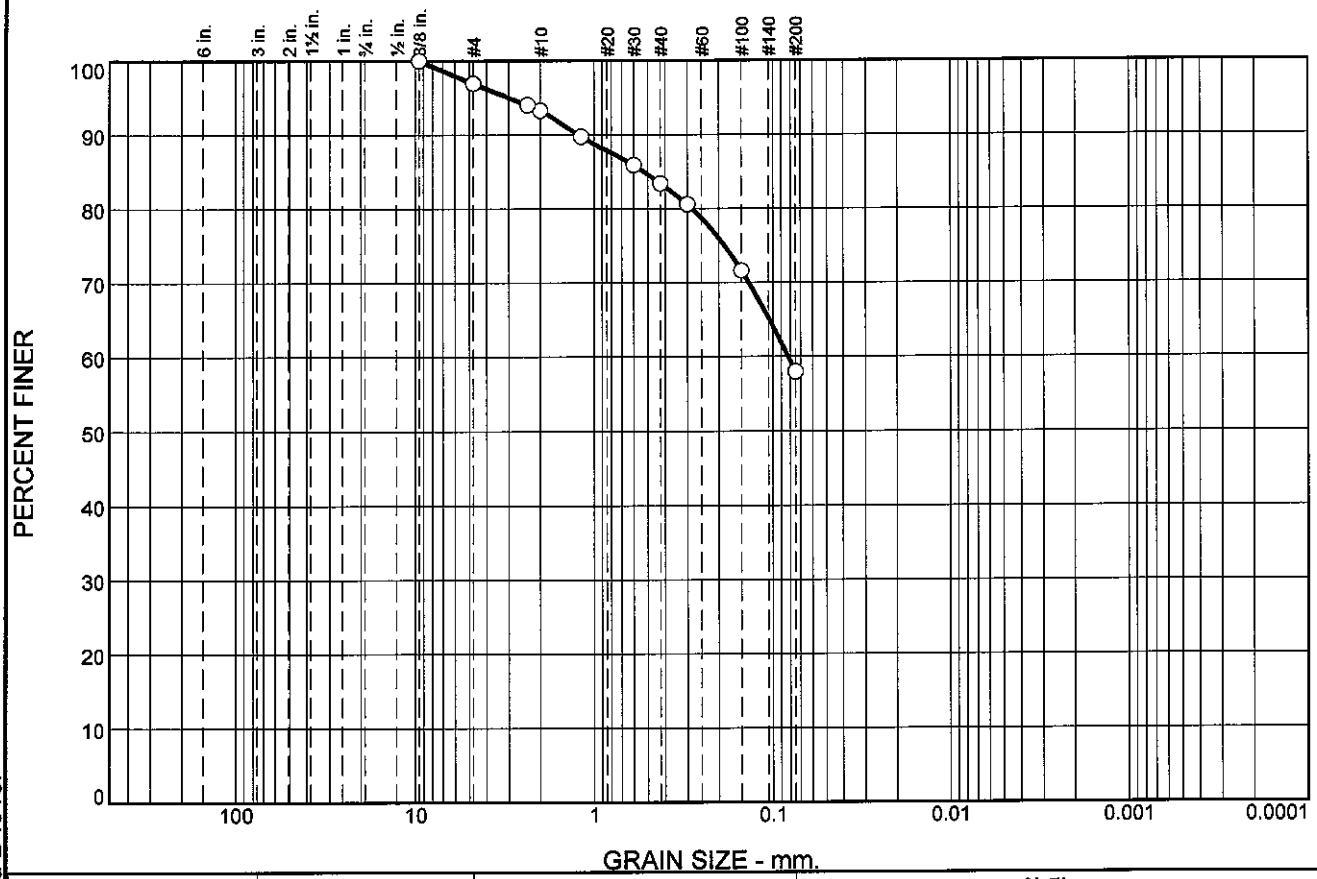
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	3.6	9.9	25.4	58.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	96.9		
#8	94.0		
#10	93.3		
#16	89.8		
#30	85.9		
#40	83.4		
#50	80.6		
#100	71.6		
#200	58.0		

* (no specification provided)

Soil Description

Orange and brown, wet, Sandy SILT

Atterberg Limits

PL= 28 LL= 42 PI= 14 NM= 26.7

Coefficients

D_{90}= 1.2150 D_{85}= 0.5233 D_{60}= 0.0825
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-6(7)

Remarks

Source of Sample: B-5 **Depth:** 18.0 to 20.0
Sample Number: S-7

Date: 5/23/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

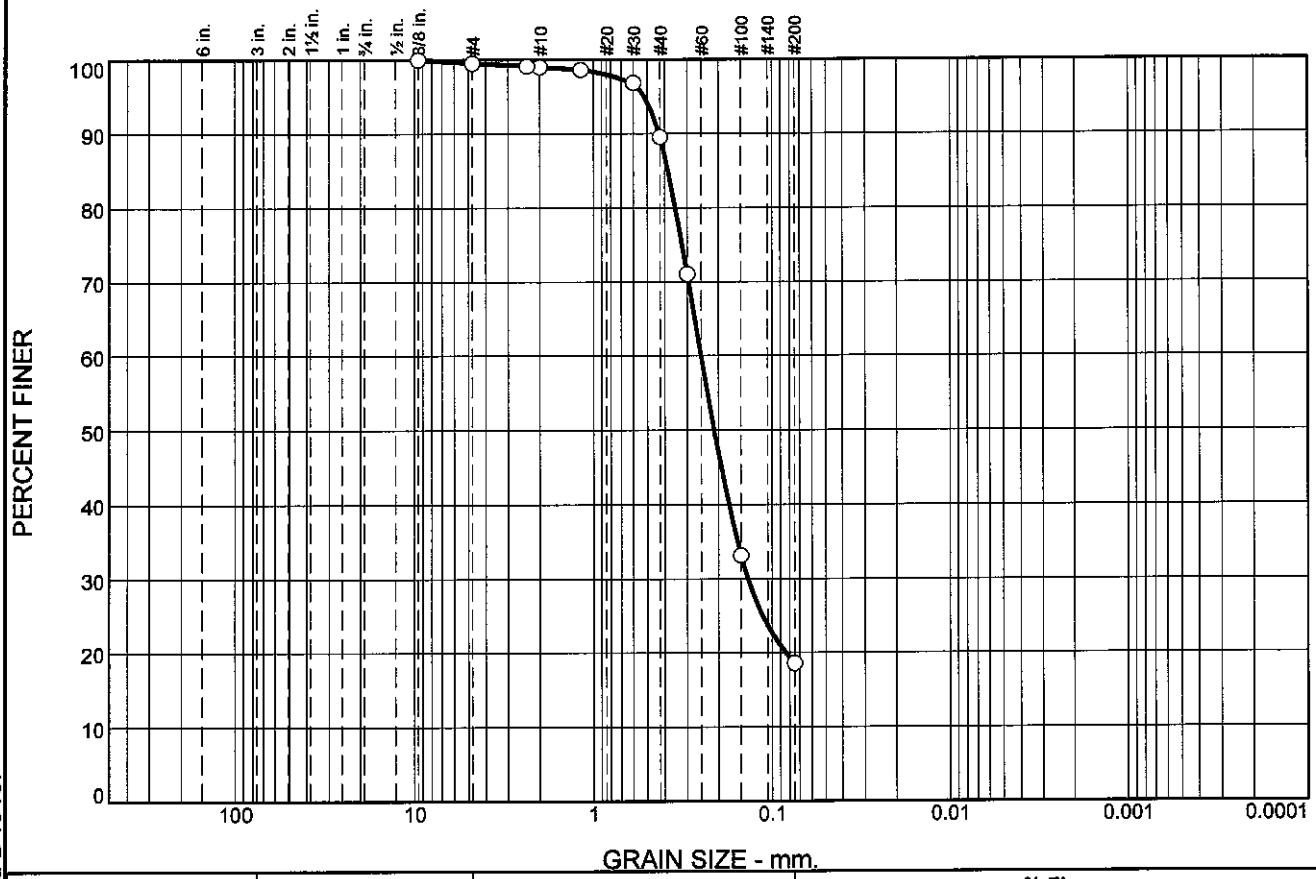
GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.5	9.4	71.0	18.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.5		
#8	99.1		
#10	99.0		
#16	98.6		
#30	96.9		
#40	89.6		
#50	71.1		
#100	33.2		
#200	18.6		

* (no specification provided)

Soil Description

Dark Brown, moist, Silty SAND

Atterberg Limits

PL= NP LL= NP PI= NP NM= 12.3

Coefficients

D_{90}= 0.4300 D_{85}= 0.3829 D_{60}= 0.2506
D_{50}= 0.2117 D_{30}= 0.1371 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4(0)

Remarks

Source of Sample: B-6 **Depth:** 6.0 to 8.0
Sample Number: S-4

Date: 5/23/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

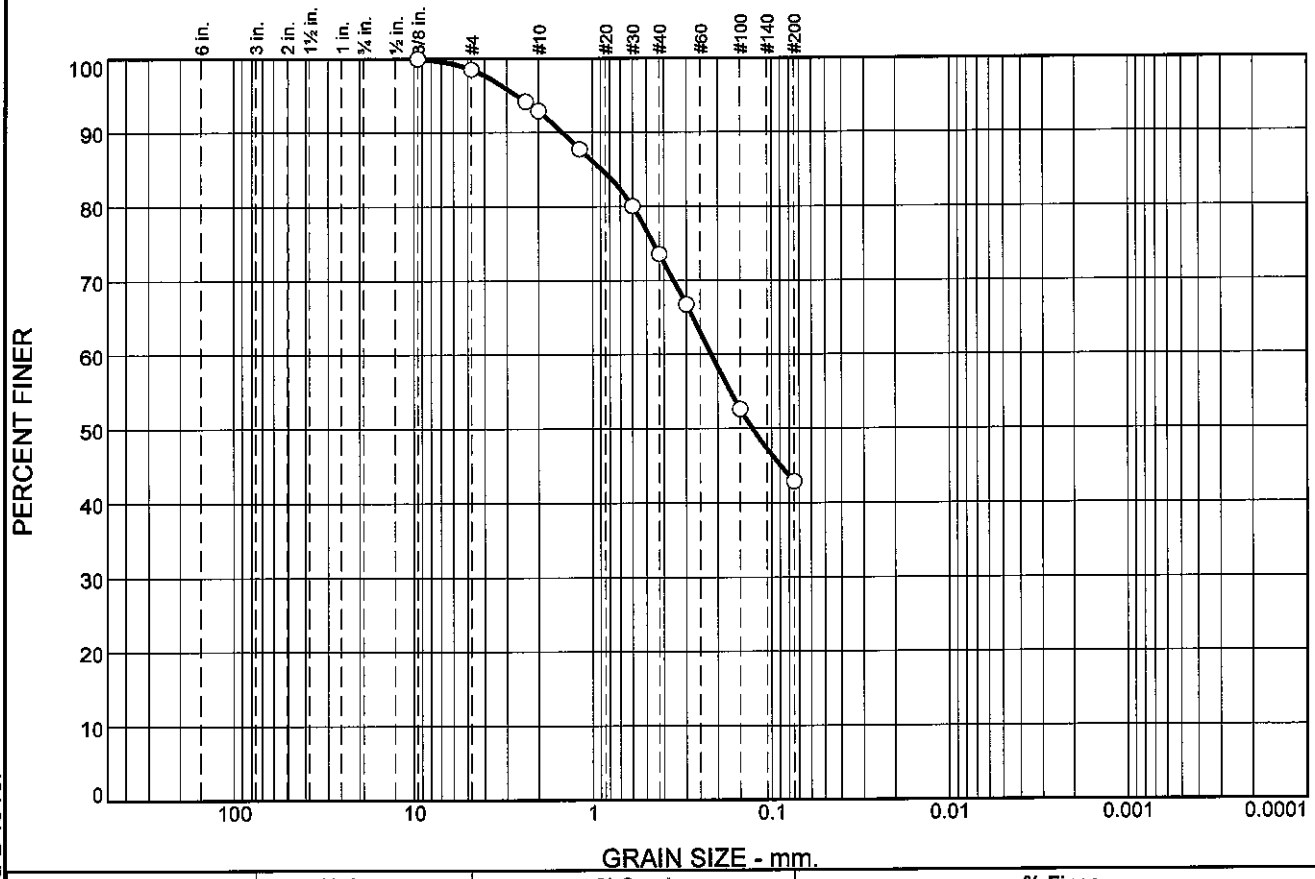
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	5.6	19.3	30.7	42.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	98.5		
#8	94.2		
#10	92.9		
#16	87.8		
#30	80.1		
#40	73.6		
#50	66.8		
#100	52.6		
#200	42.9		

* (no specification provided)

Soil Description

Brown, orange, and black, moist, micaceous, Silty SAND

Atterberg Limits

PL= 33 LL= 49 PI= 16 NM= 28.0

Coefficients

D_{90}= 1.4705 D_{85}= 0.8861 D_{60}= 0.2173
D_{50}= 0.1280 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-7-5(4)

Remarks

Source of Sample: B-6 **Depth:** 23.0 to 25.0
Sample Number: S-8

Date: 5/23/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

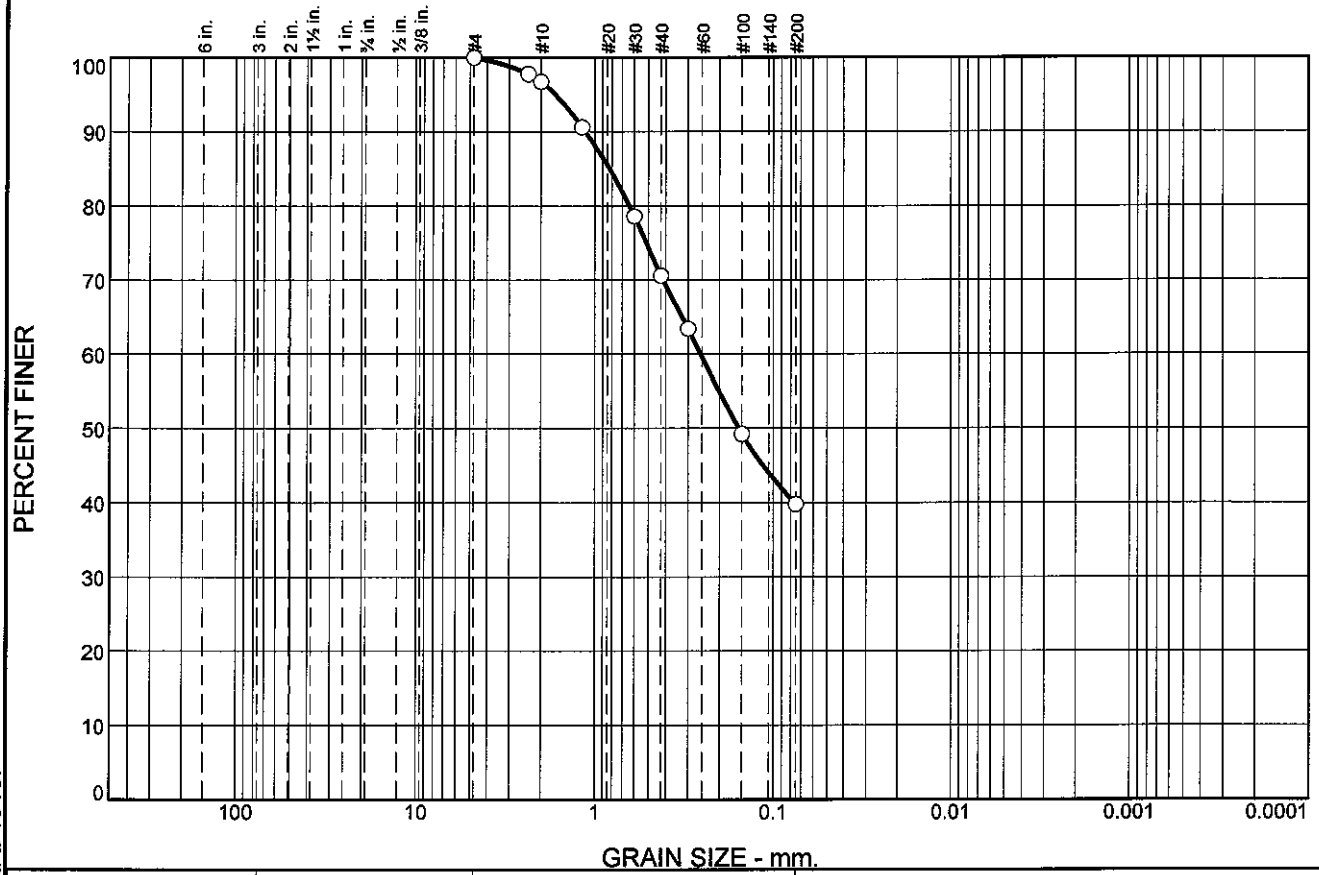
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.3	26.1	30.8	39.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.8		
#10	96.7		
#16	90.6		
#30	78.6		
#40	70.6		
#50	63.4		
#100	49.2		
#200	39.8		

* (no specification provided)

Soil Description

Orange, black and brown, wet, micaceous, Silty SAND

Atterberg Limits

PL= 28 LL= 37 PI= 9 NM= 28.4

Coefficients

D_{90}= 1.1310 D_{85}= 0.8269 D_{60}= 0.2550
D_{50}= 0.1566 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(1)

Remarks

Source of Sample: B-6 **Depth:** 33.0 to 35.0
Sample Number: S-10

Date: 5/23/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

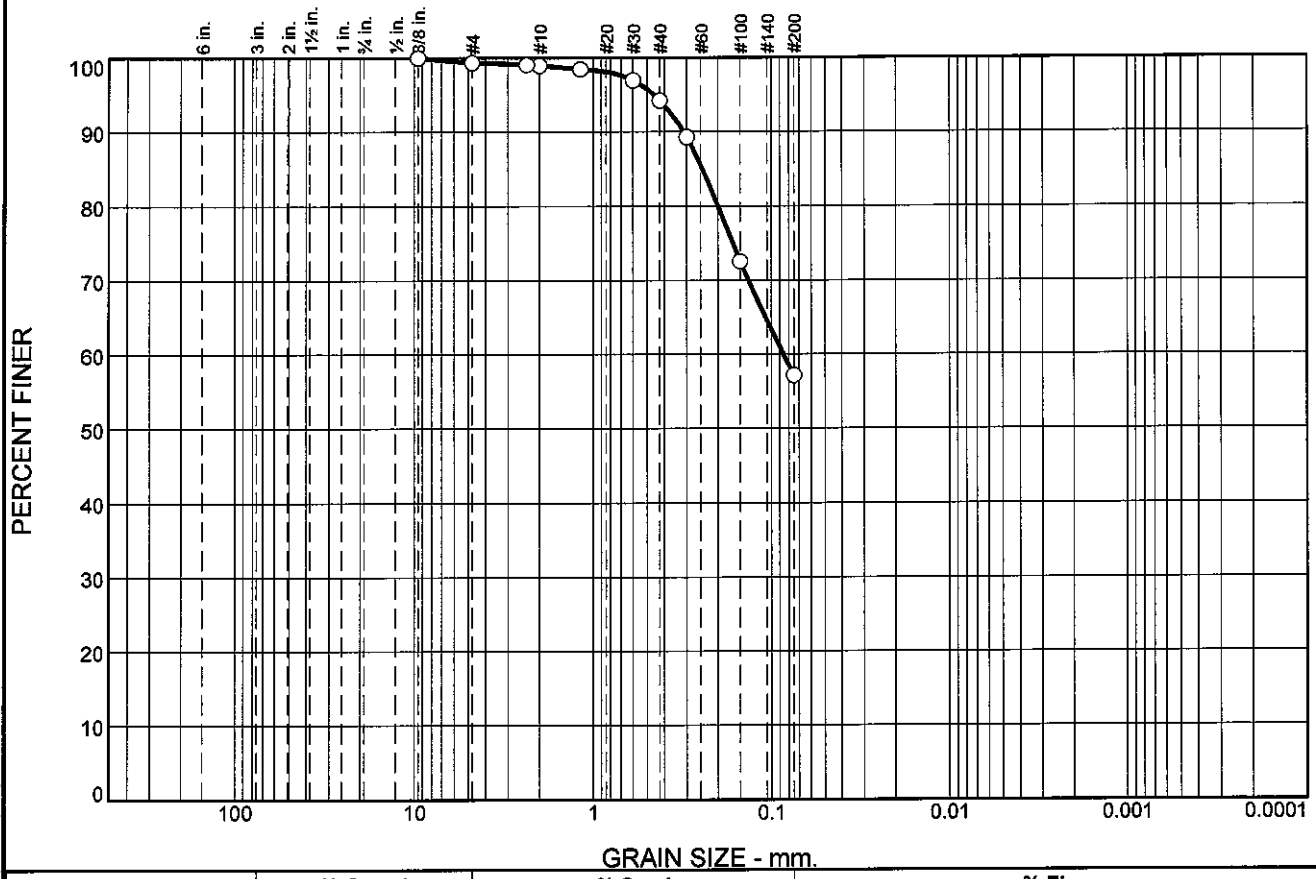
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.4	4.8	37.1	57.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#8	99.1		
#10	99.0		
#16	98.4		
#30	97.0		
#40	94.2		
#50	89.3		
#100	72.6		
#200	57.1		

* (no specification provided)

Soil Description

Brown, moist, Sandy Lean CLAY

Atterberg Limits

PL= 24 LL= 36 PI= 12 NM= 25.5

Coefficients

D_{90}= 0.3121 D_{85}= 0.2450 D_{60}= 0.0859
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

Source of Sample: B-7 **Depth:** 2.0 to 4.0
Sample Number: S-2

Date: 4/26/2016

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.

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18 Boulden Circle, Suite 36
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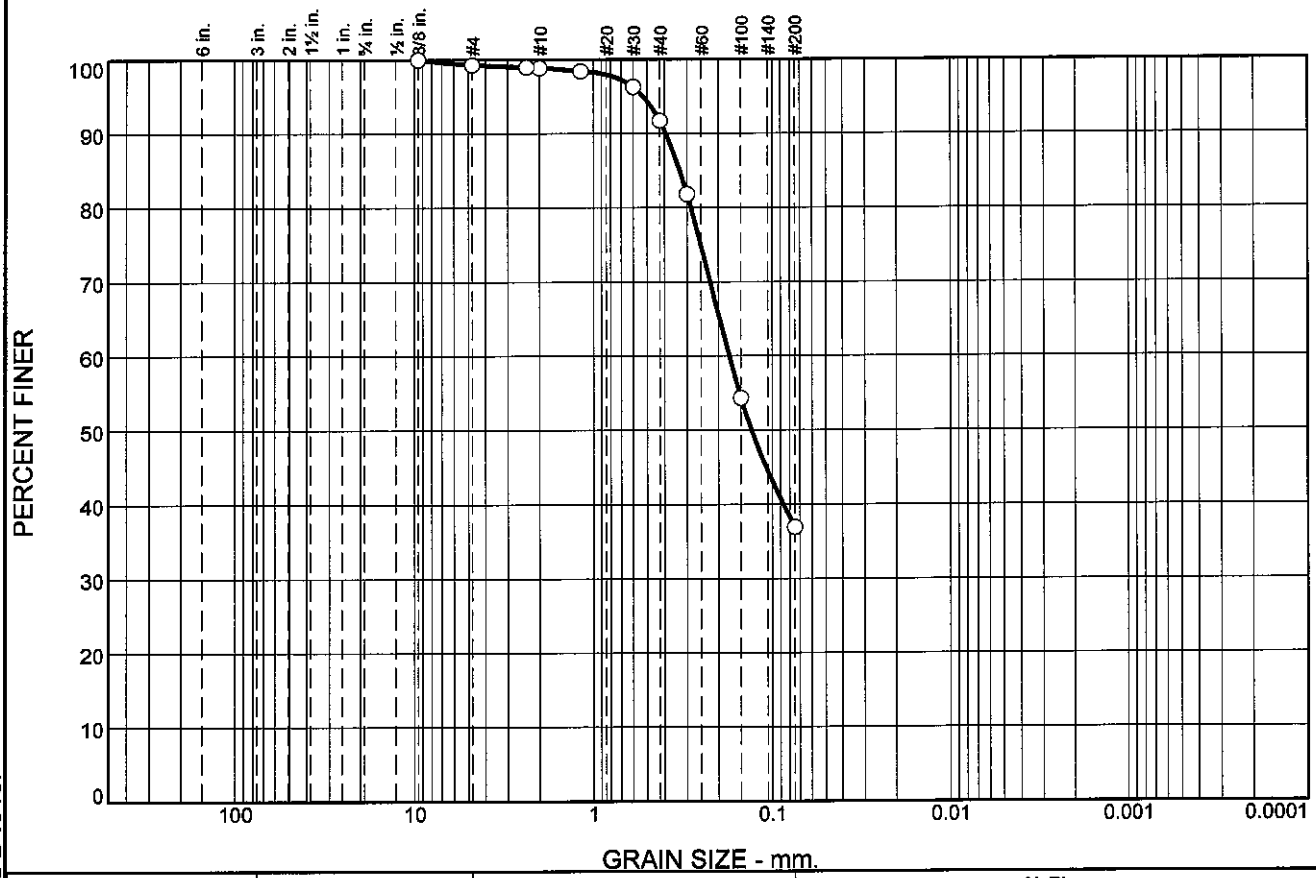
Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Emery **Checked By:** E. Williams

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.4	7.2	54.8	36.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.3		
#8	99.0		
#10	98.9		
#16	98.4		
#30	96.3		
#40	91.7		
#50	81.8		
#100	54.4		
#200	36.9		

* (no specification provided)

Soil Description

Brown, moist, Silty SAND

Atterberg Limits

PL= LL= PI= NM= 20.4

Coefficients

D_{90}= 0.3933 D_{85}= 0.3294 D_{60}= 0.1746
D_{50}= 0.1309 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B-8 **Depth:** 2.0 to 4.0
Sample Number: S-2

Date: 5/23/2016

GEO-TECHNOLOGY ASSOCIATES, INC.
18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Rummel, Klepper & Kahl, LLP
Project: NVF Flood Plain Mitigation & Culverts

Project No: 160621 **Figure**

Tested By: M. Sobus **Checked By:** E. Williams

ASTM Specifications performed may include D421, D422, D2216, D2217 and D4318.