AECOM

Town of South Bethany
York Road
Flood Mitigation & Design Study

June 23, 2025

Delivering a better world

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Acknowledgements

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South Bethany Town Council

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1 INTRODUCTION

The York Road corridor located in the southern municipal limits of the Town of South Bethany has long been subjected to nuisance flooding both during storm events and daily tide cycles. Multiple variables including the low-lying elevation of York Road and the presence of adjacent wetlands and waterbodies to the street are direct causes of the consistent flooding. Ongoing flooding has led to property damage, the inability of residents to access their homes, the deterioration of the roadway, and the surpassed capacity of stormwater infrastructure and drainage to adequately function. The Town of South Bethany seeks to address the ongoing flooding by mobilizing practical and economical mitigation measures and selected AECOM to assist in developing an engineered design that would fulfill this goal by reducing the flooding and the associated impacts.

This study was prepared to provide a practical engineering design solution for approximately 750 +/- linear feet of roadway based upon historical water elevation data, subsurface sampling, and the delineation of wetlands, that could be implemented short-term by the Town and be put out to bid upon the completion of this project.

Figure 1.1. A flooded portion of York Road.

2 PROJECT BACKGROUND

In Winter 2024, the Town of South Bethany put out a RFP seeking a consultant to assist in the preparation of a Flood Mitigation and Design Study for the York Road area. The Town had received a secondary subgrant via the Hazard Mitigation Grant Program (HMGP) to complete the project and identify an economical engineered design solution to abate the flooding of York Road. For years South Bethany has dealt with York Road and contiguous streets flooding on a near daily basis due to the presence of adjacent wetlands and the areas low-lying elevation. By remaining diligent and applying for funding opportunities, the Town of South Bethany has found itself in a position to address the flooding and drainage problems along York Road in a robust manner.

AECOM was selected in early Spring of 2024 to assist the Town in completing a flood mitigation and design study for the York Road corridor in addition to updating the Town's stormwater mapping. Having worked with the Town in the past on a range of projects in addition to completing previous stormwater mapping exercises, AECOM has a strong familiarity with the flooding issues in South Bethany. For this assessment, the project team started with a review of existing planning and analysis efforts as outlined in Section 4 of this document. The overarching conclusion that was reached from the analysis of the documents was the need for flood mitigation measures to be deployed throughout the community. York Road has consistently been identified as a priority area.

On March 18, 2024, members of the AECOM project team held a kick-off meeting with town staff to discuss the project area and the problems affecting it. Town staff helped propose potential solutions and provided further resources to the project team for review. On April 16, the AECOM project team met to discuss the project area and determine the segment of roadway to be included in the York Road Flood Mitigation and Design Study engineering plans based on investigation of mapping and input from the kick-off meeting with town staff. The specific section of York Road that was identified as being the primary focus of the study was 750 +/- linear feet of roadway spanning from just before the intersection with Carlisle Road to just before the canal located between Plymouth and Bristol Roads. The Town of South Bethany's overarching goal at the conclusion of this flood mitigation study was to have a final engineering design with completed plans drafted to be implemented, minimizing if not resolving the flooding issues along York Road.

It was the aim of the Town of South Bethany to fund a second phase of the York Road project corridor to mitigate flooding for the remaining length of the roadway and for those streets just off York Road at the completion of this study. Funding was going to be applied for through the Building Resiliency Infrastructure and Communities (BRIC) Grant Program administered by FEMA, however, the program was canceled on April 4, 2025, as announced by the Federal Government, so the second phase of the project is presently on hold.

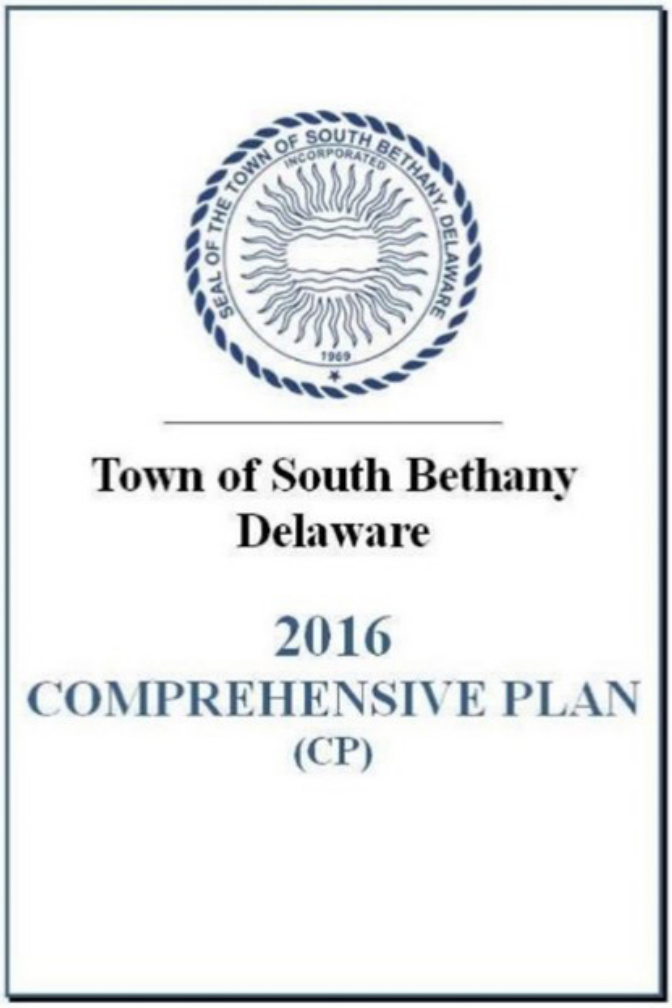
Figure 2.1. Inundation of York Road just south of the intersection with Plymouth Road during a typical rainfall.

3 DOCUMENT REVIEW

The AECOM project team utilized the following published documents to assist in the development of the York Road Flood Mitigation Study.

3.1 Town of South Bethany Delaware Comprehensive Plan (CP) 2016, Certified 2017 and Amended 2022

In the summer of 2016, the Town of South Bethany Planning Commission (PC) worked diligently with the Office of State Planning and Coordination (OSPC) staff and a consultant to develop their updated comprehensive plan from the previously certified 2006 comprehensive plan. A key component of the plan is the Natural Resources and Infrastructure sections which discuss flooding and drainage within the Town. The plan identifies key factors causing the community to flood, including Sea Level Rise (SLR), nuisance flooding, and storm surges. Mitigation measures that were completed while the plan was being developed include the installation of backflow check valves and the completion of Phase 1 of an SLR and flooding comprehensive study. The plan was amended in 2022 to incorporate information regarding the Town beginning work on a Resiliency Implementation Plan that would provide strategies to mitigate and address flooding issues. In 2015, a community survey showed that a greater number of residents were dissatisfied with street drainage than results from a previous survey conducted in 2011 showed. Those streets located on the bayside or west of Route 1 are identified as being the most vulnerable to flooding and therefore the Town would seek additional funding sources for drainage infrastructure. Reviewing the 2016 Comprehensive Plan provides a clear picture of the Town of South Bethany's priorities in seeking to address the ongoing flooding that the community continuously faces. The Town is going on eight years since the goals of the plan have begun to be implemented and further measures are needed to alleviate flooding on York Road and the surrounding area.



3.2 Resiliency Implementation Plan Town of South Bethany, Delaware, March 2023

The Town of South Bethany in coordination with their engineering consultant GMB completed a Resiliency Implementation Plan in March of 2023. This plan evaluates challenges related to SLR and flooding throughout the Town. Furthermore, vulnerable areas were identified, including the York Road corridor with it being of the highest priority for future action. Numerous images were utilized throughout the plan depicting the extensive flooding that takes place on York Road and the inability of existing stormwater and drainage infrastructure to work effectively.

Viable approaches to increase resiliency have been included as part of the plan with the elevating of York Road being listed as part of Phase 1: January 2023 – December 2025. York Road is exposed to multiple water sources with Jefferson Creek and the canal system often overtopping the street resulting in inundation. Additionally, the topography of the road and surrounding area is low in elevation which allows for tidal cycles to affect the transportation route daily. The plan makes clear that a design process should be commenced by the Town to elevate the existing roadway that will be effective in preventing flooding but also will not have a detrimental impact on adjacent residential properties. Engineering and design costs associated with elevating the road are substantial and therefore the plan recommends the Town seek out grant funding sources from FEMA and other state and federal agencies to offset the significant costs. The Resiliency Implementation Plan will continue to serve as a roadmap for the Town of South Bethany to address current flooding troubles.

4 EXISTING CONDITIONS

4.1 Data Analysis

4.1.1 Road Survey and Street Elevation

York Road currently has an average elevation of 1.70’ NAVD88 as determined by the road survey that was completed by the AECOM project team and is shown as Figure 4.1 below. The average elevation of York Road is relatively low and therefore exacerbates the flooding issues that plague the roadway.

The number of days when the water level exceeds the elevation of York Road is increasing annually. Paired with a low roadway elevation, York Road faces significant flooding issues.

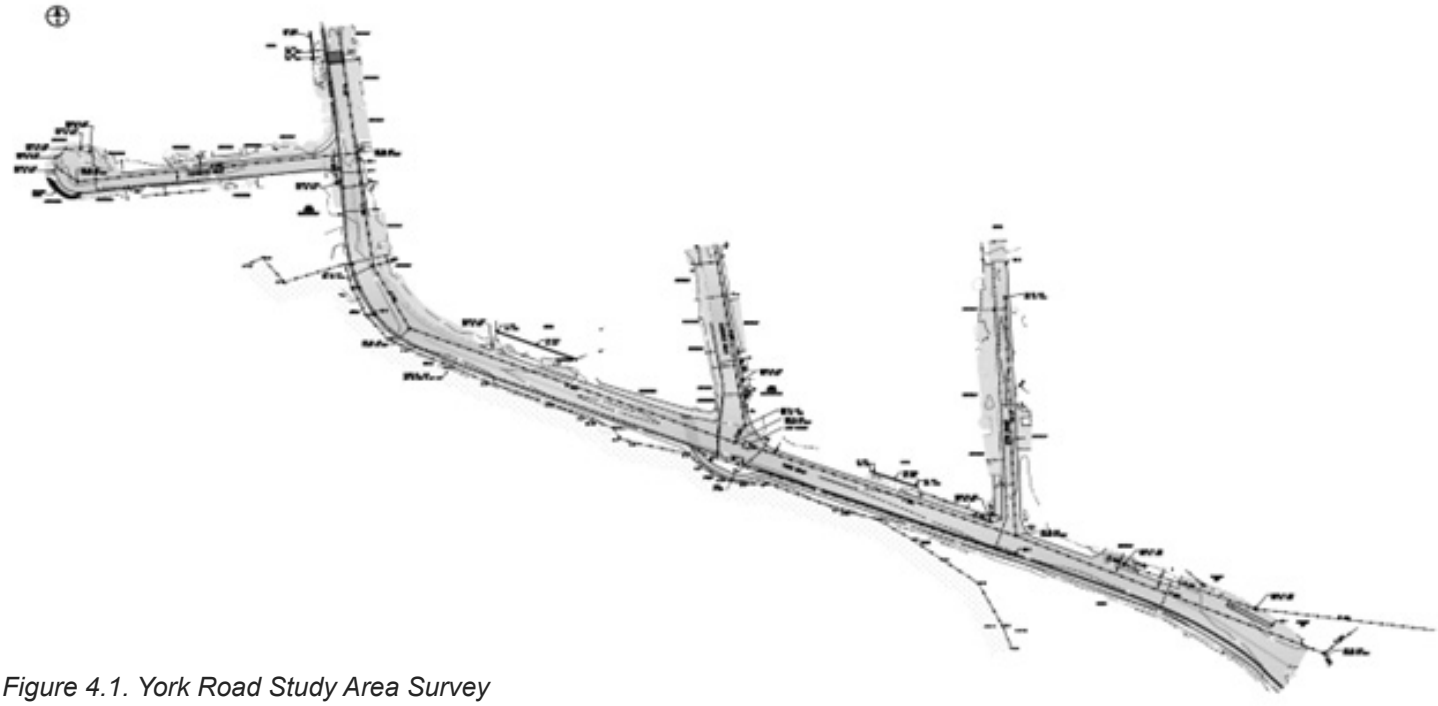


Figure 4.1. York Road Study Area Survey

4.1.2 Jefferson Creek Tidal Station Water Elevation Data

The Jefferson Creek tidal station is located at the end of West 1st Street and due northwest of York Road in South Bethany near the mouth of the canal. The tidal station collects water level data on behalf of the U.S. Geological Survey. Data extracted from the tide station can be utilized to monitor water levels over a set time range and assist in providing the mathematical basis for engineering solutions. Water level daily values from the Jefferson Creek tidal station were taken for one full calendar year from October 1, 2022 – September 30, 2023. Two sets of calculations were done to arrive at the average daily tidal height and the average maximum daily tidal height for the year provided. The average values for each of the two data sets and the methodology for arriving at these figures are included below.

1. The average daily tidal height for the year was calculated by taking the mean tide height for each month and dividing the sum by 12. The average daily height for the period of October 1, 2022 – September 30, 2023, is 1.03' NAVD88.
2. The average maximum daily tidal height for the year was calculated by taking the maximum tide height for each month and dividing the sum by 12. The average maximum daily height for the period of October 1, 2022 – September 30, 2023, is 1.89' NAVD88.

The two values shown above paint a picture of why York Road is commonly faced with flooding issues. Although the average daily water elevation for the one-year period referenced above is 0.67' less than the elevation of York Road, this number does not consider future sea level rise (SLR). However, the average maximum daily water elevation for the same timeframe does show that the water levels exceed the elevation of York Road and therefore overtopping of the roadway would ensue leading to flooding.

Further analysis of historic water elevation data was undertaken to identify those days where the water level, as measured by the Jefferson Creek tidal station, would have exceeded the elevation of York Road at 1.70' NAVD88. The period examined was from October 12, 2018, to September 26, 2024. Each of the highest daily values for the water elevation were taken and those values that were greater than 1.70' were then organized into Table 4.1 below for each calendar year from 2018 through 2024.

Dates	Number of Days Water Level > 1.7 ft. NAVD88
October 12, 2018 - December 31, 2018	1
January 1, 2019 - December 31, 2019	11
January 1, 2020 - December 31, 2020	14
January 1, 2021 - December 31, 2021	8
January 1, 2022 - December 31, 2022	11
January 1, 2023 - December 31, 2023	21
January 1, 2024 - September 26, 2024	30

Table 4.1. Days Water Level Exceeds Roadway Elevation

Based on the results of the historic water elevation data analysis and the information contained in Table 4.1, it can be concluded that year after year, apart from 2021, the number of days where York Road experiences flooding are increasing. It is important to note that the full year for 2024 is not included in the table and therefore the total number of days may be more than the 30 identified above. It can be inferred that based on the identified trend the total number of days each year where the water elevation exceeds the elevation of York Road will only continue to increase resulting in further flooding and associated issues.

The AECOM project team and their subconsultant CGC Geoservices conducted two different kinds of field analyses and associated testing to assess the subsurface conditions and presence of wetlands within the study area. The information presented by the final test borings completed by CGC Geoservices and the Wetland Delineation Report completed by AECOM were drawn upon to assist in the development of several engineering design scenarios. These design scenarios were then presented to the Town's appointed and elected bodies with one scenario being selected for implementation as identified in the conclusion of this document.

4.2 Field Studies and Analysis

4.2.1 Wetland Delineation Report

A team of AECOM wetland scientists was deployed on June 5, 2024, to conduct a wetland and watercourse delineation of the York Road study area. The project study area is comprised of approximately 5.76 acres with the total wetland area being delineated per the attached report in Appendix A as 1.81 acres. Five wetlands were identified comprising the 1.81 acres of delineated wetland. By completing the delineation and documenting the findings in the attached report (Appendix A), AECOM engineers were able to incorporate those identified wetlands into the proposed design plans.

The next phase of the York Road project will be to implement the selected design resulting in required permitting that will need to be undertaken for regulated wetlands. The United States Environmental Protection Agency (USEPA) under Section 404 of the Clean Water Act and delegated by the United States Army Corps of Engineers (USACE), in addition to regulations adopted under the Department of Natural Resources and Environmental Control (DNREC) under Title 7 of the Delaware Administrative Code, will need to be complied with in full as the York Road flood mitigation project is initiated.

4.2.2 Subsurface Evaluation Report

To evaluate the subsurface conditions along the 750 +/- linear feet of York Road that comprises the project study area, AECOM hired a subconsultant CGC Geoservices, LLC. Three Standard Penetration Test (SPT) borings were completed along various points of York Road at an extended depth of 20 feet below grade with the boring logs and encountered conditions documented. For each of the three borings, a 4-to-8-inch layer of bituminous concrete was encountered overlying granular soils with loose to medium density. As the borings went deeper a layer of loose/soft organic material was observed on TB-1 and TB-2 within the granular soils at 8 to 12 feet in depth, however, this same organic layer was not observed during TB-3 as you move East along York Road.

The findings of the test borings, a stratigraphic profile, evaluation notes, and a marked-up site plan demonstrating where the borings were done are all included as part of this report as Appendix B. Subsurface and soil borings were completed as part of this project for future construction purposes and to help facilitate the design for proposed engineering scenarios. Depending on the presence of specific soil types and subsurface conditions, certain engineering and design alternatives may not be feasible. The selected final engineered design is suitable based upon the findings of the subsurface borings.

5 RECOMMENDED DESIGN SCENARIOS AND PROJECT MEETINGS

5.1 November 8, 2024, Town Council Meeting

After concluding the project study area wetland delineation, road survey, subsurface evaluation, and the analysis of historical water elevation data and flooding events AECOM engineers were tasked with drafting preliminary design plans to address the flooding issues along York Road. A total of three preliminary design scenarios were developed and first presented to the South Bethany Town Council at their meeting held on November 8, 2024. The three preliminary design scenarios are provided below.

The first design scenario that was presented was for a seawall to be constructed along York Road bordering the delineated wetlands located directly south of the street. Additional interior seawalls would also be constructed as part of this option at the ends of the canals between York, Carlisle, Plymouth and Bristol Roads. The top of the seawalls would be set at an elevation of 2.50' NAVD88 with 1,800' in total seawalls being constructed. The design scenario plans are contained Appendix C.

The second design scenario would be to elevate 750' +/- of York Road beginning before the intersection with Carlisle Road by six (6) inches in elevation with the low point being 2.10' NAVD88. The justification for the street to be elevated by six (6) inches was dependent upon the historical water elevation data provided in Table 4.1 above. Of the 96 days where the Jefferson Creek Tide station recorded the elevation of the water surface exceeding that of York Road at 1.70' NAVD88, 83 of those 96 days or 86% would have been prevented if the roadway were raised to the elevation above. The design scenario plans are contained in Appendix D.

The third and final design scenario that was presented to the Town Council was for the combination of scenarios one and two. This third scenario would see 750' +/- of York Road shown on the plan included as Appendix E of this study being elevated by a total of six (6) inches and seawalls being constructed along the delineated marsh and within the interior canals.

5.2 December 19, 2024, Resiliency Committee Meeting

After meeting with the South Bethany Town Council, members of the AECOM project team presented a refined design scenario to the Resiliency Committee at their meeting on December 19, 2024. The design scenario that was presented was for the elevation of 750' +/- of York Road by six (6) inches, the construction of a partial seawall along the Jefferson Creek side of York Road across from Carlisle Road, and the installation of an additional drainage inlet on the north side of York Road that would connect into the existing system. Cost estimates for asphalt and porous paving were provided to the committee to assist in their decision making. No recommendation to the Town Council was made at this meeting as further discussion and exploration of design alternatives was warranted.

5.3 February 4, 2025, Resiliency Committee Meeting

The AECOM project team reappeared before the South Bethany Resiliency Committee on February 4, 2025, to review several other design scenario alternatives after meeting on December 19, 2024. The three initial design scenario options that were presented to Town Council on November 8, 2024, were provided to the Resiliency Committee for their review. Two new design options were brought forth as result of inquiries from members of the Town Council, Resiliency Committee, and members of the public and are provided below.

The fourth design scenario that was developed was for the construction of a wooden causeway that would permit vehicular traffic to navigate above the flooded project study area. However, a wooden causeway of that magnitude would be expensive to construct and cumbersome to adequately maintain. York Road only has 30' of R.O.W. making it incredibly narrow and as a result, being able to provide access to those homes abutting York Road would be difficult.

The fifth design scenario and second new option would be to elevate York Road by eight (8) inches from its current elevation. This design scenario would provide several challenges had it been recommended to the Town Council by the Resiliency Committee. Several of those challenges that were identified included a greater chance of subsidence occurring and being able to achieve the proper grading leading to increased drainage issues and the flooding of adjacent residential properties from the street.

The Resiliency Committee voted at the February 4, 2025, meeting to recommend the second design scenario to the Town Council for implementation. This option would elevate 750' +/- of York Road by 6" and employ porous pavement rather than asphalt to facilitate drainage.

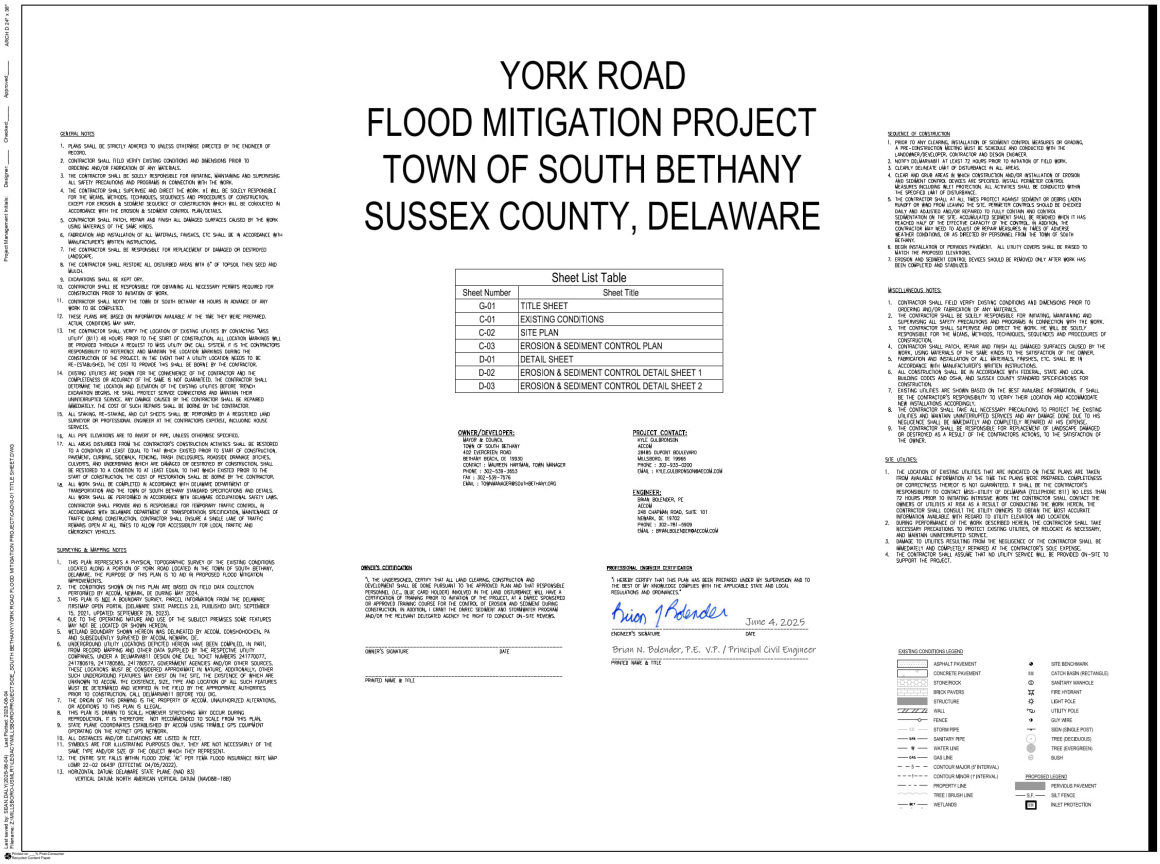
5.4 February 14, 2025, Town Council Meeting

At the February 14, 2025, Town Council meeting, AECOM project staff presented the five design scenario options to the body for their consideration. After reviewing each scenario and contemplating the recommendation by the Resiliency Committee to move forward with design scenario #2, the South Bethany Town Council approved the option unanimously to move forward with elevating 750' +/- of York Road to be constructed out of porous pavement. Members of the public provided input regarding the proposed design plans with some stating that they believed the plans did not go far enough and further measures should be investigated including the construction of causeways and seawalls. The Town Council selected the design option due to its practicality and the ability of the Town to fund the construction and complete it in a timely fashion. AECOM was then directed to finalize design engineering plans for the selected scenario to be presented at the May 21, 2025, Resiliency Committee meeting for final approval.

5.5 May 21, 2025, Resiliency Committee Meeting

AECOM's project engineers drafted final design plans for the York Road flood mitigation project and presented these plans to the Resiliency Committee at their meeting convened on May 21, 2025. The Resiliency Committee approved the final design plans for the project and directed AECOM staff to finalize the plans and submit them as part of this study. The Town of South Bethany upon receipt of the approved plans will utilize them for the bidding process to begin the implementation and construction of the selected engineered design scenario to mitigate flooding on York Road. The final engineered design plans are incorporated as part of this document under Section 6.

6 FINAL ENGINEERING DESIGN PLANS



YORK ROAD
FLOOD MITIGATION PROJECT
TOWN OF SOUTH BETHANY
SUSSEX COUNTY, DELAWARE

Sheet List Table	
Sheet Number	Sheet Title
G-01	TITLE SHEET
C-01	EXISTING CONDITIONS
C-02	SITE PLAN
C-03	EROSION & SEDIMENT CONTROL PLAN
D-01	DETAIL SHEET
D-02	EROSION & SEDIMENT CONTROL DETAIL SHEET 1
D-03	EROSION & SEDIMENT CONTROL DETAIL SHEET 2

GENERAL NOTES

1. PLANS SHALL BE STRICTLY ADHERED TO UNLESS OTHERWISE DIRECTED BY THE ENGINEER OF RECORD.
2. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO ORDERING AND/OR FABRICATION OF ANY MATERIALS.
3. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANING, MAINTAINING AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK.
4. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK. HE WILL BE SOLELY RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES OF CONSTRUCTION, EXCEPT FOR EROSION & SEDIMENT SEQUENCE OF CONSTRUCTION WHICH WILL BE CONDUCTED IN ACCORDANCE WITH THE EROSION & SEDIMENT CONTROL PLAN/DETAILS.
5. CONTRACTOR SHALL PATCH, REPAIR AND FINISH ALL DAMAGED SURFACES CAUSED BY THE WORK USING MATERIALS OF THE SAME KINDS.
6. FABRICATION AND INSTALLATION OF ALL MATERIALS, FINISHES, ETC SHALL BE IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACEMENT OF DAMAGED OR DESTROYED LANDSCAPE.
8. THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITH 6" OF TOPSOIL THEN SEED AND MULCH.
9. EXCAVATIONS SHALL BE KEPT DRY.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS REQUIRED FOR CONSTRUCTION PRIOR TO INITIATION OF WORK.
11. CONTRACTOR SHALL NOTIFY THE TOWN OF SOUTH BETHANY 48 HOURS IN ADVANCE OF ANY WORK TO BE COMPLETED.
12. THESE PLANS ARE BASED ON INFORMATION AVAILABLE AT THE TIME THEY WERE PREPARED. ACTUAL CONDITIONS MAY VARY.
13. THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING UTILITIES BY CONTACTING "MISS UTILITY" (811) 48 HOURS PRIOR TO THE START OF CONSTRUCTION. ALL LOCATION MARKINGS WILL BE PROVIDED THROUGH A REQUEST TO MISS UTILITY ONE CALL SYSTEM. IT IS THE CONTRACTORS RESPONSIBILITY TO REFERENCE AND MAINTAIN THE LOCATION MARKINGS DURING THE CONSTRUCTION OF THE PROJECT. IN THE EVENT THAT A UTILITY LOCATION NEEDS TO BE RE-ESTABLISHED, THE COST TO PROVIDE THIS SHALL BE BORNE BY THE CONTRACTOR.
14. EXISTING UTILITIES ARE SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR AND THE COMPLETENESS OR ACCURACY OF THE SAME IS NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE THE LOCATION AND ELEVATION OF THE EXISTING UTILITIES BEFORE TRENCH EXCAVATION BEGINS. HE SHALL PROTECT SERVICE CONNECTIONS AND MAINTAIN THEM UNINTERRUPTED SERVICE. ANY DAMAGE CAUSED BY THE CONTRACTOR SHALL BE REPAIRED IMMEDIATELY. THE COST OF SUCH REPAIRS SHALL BE BORNE BY THE CONTRACTOR.
15. ALL STAKING, RE-STAKING, AND CUT SHEETS SHALL BE PERFORMED BY A REGISTERED LAND SURVEYOR OR PROFESSIONAL ENGINEER AT THE CONTRACTORS EXPENSE, INCLUDING HOUSE SERVICES.
16. ALL PIPE ELEVATIONS ARE TO INVERT OF PIPE, UNLESS OTHERWISE SPECIFIED.
17. ALL AREAS DISTURBED FROM THE CONTRACTOR'S CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT WHICH EXISTED PRIOR TO START OF CONSTRUCTION. PAVEMENT, CURBING, SIDEWALK, FENCING, TRASH ENCLOSURES, ROADSIDE DRAINAGE DITCHES, CULVERTS, AND UNDERGROUND UTILITIES THAT ARE DAMAGED OR DESTROYED BY CONSTRUCTION, SHALL BE RESTORED TO A CONDITION TO AT LEAST EQUAL TO THAT WHICH EXISTED PRIOR TO THE START OF CONSTRUCTION. THE COST OF RESTORATION SHALL BE BORNE BY THE CONTRACTOR.
18. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH DELAWARE DEPARTMENT OF TRANSPORTATION AND THE TOWN OF SOUTH BETHANY STANDARD SPECIFICATIONS AND DETAILS. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH DELAWARE OCCUPATIONAL SAFETY LAWS. CONTRACTOR SHALL PROVIDE AND IS RESPONSIBLE FOR TEMPORARY TRAFFIC CONTROL IN ACCORDANCE WITH DELAWARE DEPARTMENT OF TRANSPORTATION SPECIFICATIONS. MAINTENANCE OF TRAFFIC DURING CONSTRUCTION. CONTRACTOR SHALL ENSURE A SINGLE LANE OF TRAFFIC REMAINS OPEN AT ALL TIMES TO ALLOW FOR ACCESSIBILITY FOR LOCAL TRAFFIC AND EMERGENCY VEHICLES.

SURVEYING & MAPPING NOTES

1. THIS PLAN REPRESENTS A PHYSICAL TOPOGRAPHIC SURVEY OF THE EXISTING CONDITIONS LOCATED ALONG A PORTION OF YORK ROAD LOCATED IN THE TOWN OF SOUTH BETHANY, SUSSEX COUNTY. THE PURPOSE OF THIS PLAN IS TO AID IN PROPOSED FLOOD MITIGATION IMPROVEMENTS.
2. THE CONDITIONS SHOWN ON THIS PLAN ARE BASED ON FIELD DATA COLLECTION PERFORMED BY AECOM, NEWARK, DE DURING MAY 2024.
3. THIS PLAN IS NOT A BOUNDARY SURVEY. PARCEL INFORMATION FROM THE DELAWARE FIRSTMAP OPEN PORTAL (DELAWARE STATE PARCELS 2.0, PUBLISHED DATE: SEPTEMBER 15, 2021, UPDATED: SEPTEMBER 29, 2023).
4. DUE TO THE OPERATING NATURE AND USE OF THE SUBJECT PREMISES SOME FEATURES MAY NOT BE LOCATED OR SHOWN HEREON.
5. WETLAND BOUNDARY SHOWN HEREON WAS DELINEATED BY AECOM, DORSH-SHOCKEN, PA AND SUBSEQUENTLY SURVEYED BY AECOM, NEWARK, DE.
6. UNDERGROUND UTILITIES SHOWN HEREON HAVE BEEN COMPILED, IN PART, FROM RECORD MAPPING AND OTHER DATA SUPPLIED BY THE RESPECTIVE UTILITY COMPANIES, UNDER A DELAWAREMISS DESIGN ONE CALL TICKET NUMBERS 241700072, 241700093, 241700071. GOVERNMENT AGENCIES AND/OR OTHER SOURCES. THESE LOCATIONS MUST BE CONSIDERED APPROXIMATE IN NATURE. ADDITIONALLY, OTHER SUCH UNDERGROUND FEATURES MAY EXIST ON THE SITE. THE EXISTENCE OF WHICH ARE UNKNOWN TO AECOM. THE EXISTENCE, SIZE, TYPE AND LOCATION OF ALL SUCH FEATURES MUST BE DETERMINED AND VERIFIED IN THE FIELD BY THE APPROPRIATE AUTHORITIES PRIOR TO CONSTRUCTION. CALL DELAWAREMISS BEFORE YOU DIG.
7. THE USE OF THIS PLAN BY ANYONE OTHER THAN THE PROPERTY OF AECOM, UNAUTHORIZED ALTERATIONS, OR ADDITIONS TO THIS PLAN IS ILLEGAL.
8. THIS PLAN IS DRAWN TO SCALE. HOWEVER STRETCHING MAY OCCUR DURING REPRODUCTION. IT IS THEREFORE NOT RECOMMENDED TO SCALE FROM THIS PLAN.
9. STATE PLANE COORDINATES ESTABLISHED BY AECOM USING TRIMBLE GPS EQUIPMENT OPERATING ON THE KEYNET GPS NETWORK.
10. ALL DISTANCES AND/OR ELEVATIONS ARE LISTED IN FEET.
11. SYMBOLS ARE FOR ILLUSTRATING PURPOSES ONLY. THEY ARE NOT NECESSARILY OF THE SAME TYPE AND/OR SIZE OF THE OBJECT WHICH THEY REPRESENT.
12. THE ENTIRE SITE FALLS WITHIN FLOOD ZONE "AE" PER FEMA FLOOD INSURANCE RATE MAP (DMP 22-02 DR43P (EFFECTIVE 04/05/2022).
13. HORIZONTAL DATUM: DELAWARE STATE PLANE (NAD 83)
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM (NAVD88-188)

SEQUENCE OF CONSTRUCTION

1. PRIOR TO ANY CLEARING, INSTALLATION OF SEDIMENT CONTROL MEASURES OR GRADING, A PRE-CONSTRUCTION MEETING MUST BE SCHEDULED AND CONDUCTED WITH THE LANDOWNER/DEVELOPER, CONTRACTOR AND DESIGN ENGINEER.
2. NOTIFY DELAWAREMISS (811) AT LEAST 48 HOURS PRIOR TO INITIATION OF FIELD WORK.
3. CLEAR AND GRUB ONLY AREA OF DISTURBANCE AS ALLOWED.
4. CLEAR AND GRUB AREAS OF EACH CONSTRUCTION AND/OR INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES ARE SEQUENCED. INSTALL PERIMETER CONTROL MEASURES INCLUDING INLET PROTECTION. ALL ACTIVITIES SHALL BE CONDUCTED WITHIN THE SPECIFIED LIMIT OF DISTURBANCE.
5. 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 CONFINE SEDIMENT AND DEBRIS. SEDIMENT SHALL BE REMOVED FROM BEHIND CONTROLS ONCE 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, OR AS DIRECTED BY PERSONNEL FROM THE TOWN OF SOUTH BETHANY.
6. BEGIN INSTALLATION OF PERMANENT PAVEMENTS. ALL UTILITY COVERS SHALL BE RAISED TO MATCH THE PROPOSED ELEVATIONS.
7. EROSION AND SEDIMENT CONTROL DEVICES SHOULD BE REMOVED ONLY AFTER WORK HAS BEEN COMPLETED AND STABILIZED.

MISCELLANEOUS NOTES:

1. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO ORDERING AND/OR FABRICATION OF ANY MATERIALS.
2. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANING, MAINTAINING AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK.
3. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK. HE WILL BE SOLELY RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES OF CONSTRUCTION.
4. CONTRACTOR SHALL PATCH, REPAIR AND FINISH ALL DAMAGED SURFACES CAUSED BY THE WORK, USING MATERIALS OF THE SAME KINDS TO THE SATISFACTION OF THE OWNER.
5. FABRICATION AND INSTALLATION OF ALL MATERIALS, FINISHES, ETC. SHALL BE IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
6. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL, INCLUDING OSHA AND SUSSEX COUNTY STANDARD SPECIFICATIONS FOR CONSTRUCTION.
7. EXISTING UTILITIES ARE SHOWN BASED ON THE BEST AVAILABLE INFORMATION. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY THEIR LOCATION AND ACCOMMODATE NEW INSTALLATIONS ACCORDINGLY.
8. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE EXISTING UTILITIES AND MAINTAIN UNINTERRUPTED SERVICES AND ANY DAMAGE DONE DUE TO HIS NEGLIGENCE SHALL BE IMMEDIATELY AND COMPLETELY REPAIRED AT HIS EXPENSE.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACEMENT OF LANDSCAPE DAMAGED OR DESTROYED AS A RESULT OF THE CONTRACTORS ACTIONS, TO THE SATISFACTION OF THE OWNER.

SITE UTILITIES:

1. THE LOCATION OF EXISTING UTILITIES THAT ARE INDICATED ON THESE PLANS ARE TAKEN FROM AVAILABLE INFORMATION AT THE TIME THE PLANS WERE PREPARED. COMPLETENESS OR CORRECTNESS THEREOF IS NOT GUARANTEED. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT MISS-UTILITY OF DELAWARE (TELEPHONE 811) NO LESS THAN 72 HOURS PRIOR TO INITIATING INTRUSIVE WORK. THE CONTRACTOR SHALL CONTACT THE OWNER OF ANY UTILITY NOT A MEMBER OF MISS UTILITY OF DELAWARE. THE CONTRACTOR SHALL CONSULT THE UTILITY OWNERS TO OBTAIN THE MOST ACCURATE INFORMATION AVAILABLE WITH REGARD TO UTILITY ELEVATION AND LOCATION.
2. DURING PERFORMANCE OF THE WORK DESCRIBED HEREIN, THE CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES, OR RELOCATE AS NECESSARY, AND MAINTAIN UNINTERRUPTED SERVICE.
3. DAMAGE TO UTILITIES RESULTING FROM THE NEGLIGENCE OF THE CONTRACTOR SHALL BE IMMEDIATELY AND COMPLETELY REPAIRED AT THE CONTRACTOR'S SOLE EXPENSE.
4. THE CONTRACTOR SHALL ASSUME THAT NO UTILITY SERVICE WILL BE PROVIDED ON-SITE TO SUPPORT THE PROJECT.

OWNER/DEVELOPER:
MAYOR & COUNCIL
TOWN OF SOUTH BETHANY
400 EVERGREEN ROAD
BETHANY BEACH, DE 19930
CONTACT : LAUREN HARTMAN, TOWN MANAGER
PHONE : 302-539-3553
FAX : 302-539-7576
EMAIL : TOWNMANAGER@SOUTHBETHANY.ORG

PROJECT CONTACT:
KYLE GULBRONSON
AECOM
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MILLSBORO, DE 19966
PHONE : 302-933-0200
EMAIL : KYLE.GULBRONSON@AECOM.COM

ENGINEER:
BRIAN BOLENDER, PE
AECOM
240 CHAPMAN ROAD, SUITE 101
NEWARK, DE 19702
PHONE : 302-981-8939
EMAIL : BRIAN.BOLENDER@AECOM.COM

OWNER'S CERTIFICATION

"I, THE UNDERSIGNED, CERTIFY THAT ALL LAND CLEARING, CONSTRUCTION AND DEVELOPMENT SHALL BE DONE PURSUANT TO THE APPROVED PLAN AND THAT RESPONSIBLE PERSONNEL (I.E., BLUE CARD HOLDER) INVOLVED IN THE LAND DISTURBANCE WILL HAVE A CERTIFICATION OF TRAINING PRIOR TO INITIATION OF THE PROJECT, AT A DNREC SPONSORED OR APPROVED TRAINING COURSE FOR THE CONTROL OF EROSION AND SEDIMENT DURING CONSTRUCTION. IN ADDITION, I GRANT THE DNREC SEDIMENT AND STORMWATER PROGRAM AND/OR THE DELAWARE CONSERVATION DISTRICT THE RIGHT TO CONDUCT ON-SITE REVIEWS."

OWNER'S SIGNATURE — DATE

PRINTED NAME & TITLE

PROFESSIONAL ENGINEER CERTIFICATION

"I HEREBY CERTIFY THAT THIS PLAN WAS BEEN PREPARED UNDER MY SUPERVISION AND TO THE BEST OF MY KNOWLEDGE COMPLIES WITH THE APPLICABLE STATE AND LOCAL REGULATIONS AND ORDINANCES."

Brian J Bolender — June 4, 2025
ENGINEER'S SIGNATURE — DATE

Brian N. Bolender, P.E. V.P. / Principal Civil Engineer
PRINTED NAME & TITLE

EXISTING CONDITIONS LEGEND

ASPHALT PAVEMENT; CONCRETE PAVEMENT; STORMROCK; BRICK PAVERS; STRUCTURE; WALL; FENCE; STORM PIPE; SANITARY PIPE; WATER LINE; GAS LINE; CONTOUR-MAJOR (5' INTERVAL); CONTOUR-MINOR (1' INTERVAL); PROPERTY LINE; TREE / BRUSH LINE; WETLANDS; SITE BENCHMARK; CATCH BASIN (RECTANGLE); SANITARY MANHOLE; FIRE HYDRANT; LIGHT POLE; UTILITY POLE; GUY WIRE; SIGN (SINGLE POST); TREE (DECIDUOUS); TREE (EVERGREEN); BUSH

PROPOSED LEGEND

PERVIOUS PAVEMENT; SILT FENCE; INLET PROTECTION

AECOM

PROJECT
YORK ROAD
FLOOD MITIGATION
PROJECT
YORK ROAD
TOWN OF SOUTH BETHANY
DELAWARE

CLIENT
TOWN OF SOUTH BETHANY

CONSULTANT
AECOM
28488 DUPONT BOULEVARD
MILLSBORO, DE 19966
PHONE: 302-933-0200
WWW.AECOM.COM

LOCATION MAP

Google Earth — Not To Scale

SCALE

REGISTRATION

Brian J Bolender

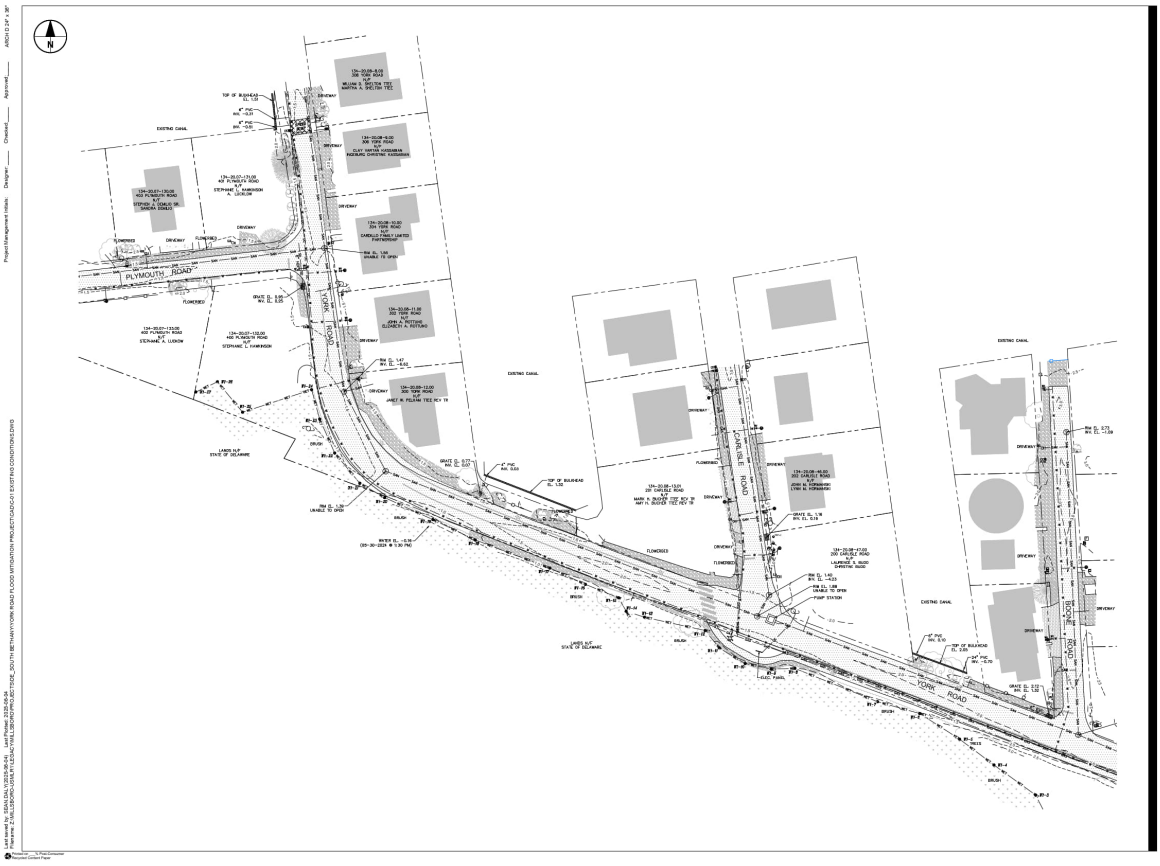
ISSUE/REVISION

	8-4-25	ISSUED FOR CONSTRUCTION
I/R	DATE	DESCRIPTION

PROJECT NUMBER
60727673

SHEET TITLE
TITLE SHEET

SHEET NUMBER
G-01



AECOM

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YORK ROAD
TOWN OF SOUTH BETHANY
DELAWARE

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LOCATION MAP

Google Earth — Not To Scale

SCALE
0 30' 60'
1" = 30'

REGISTRATION

Brian J Bolender

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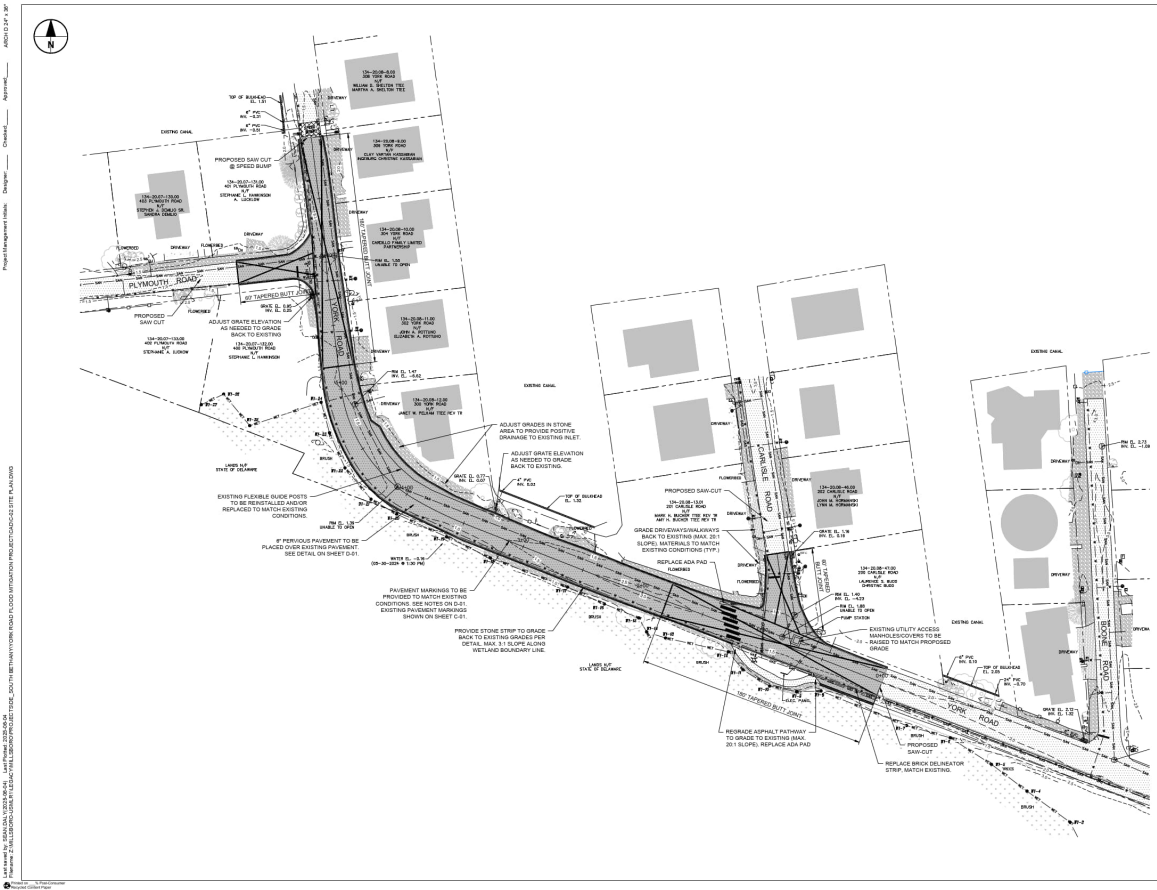
I/R	DATE	DESCRIPTION

PROJECT NUMBER
60727673

SHEET TITLE
EXISTING CONDITIONS

SHEET NUMBER
C-01



AECOM

PROJECT
YORK ROAD FLOOD MITIGATION PROJECT
YORK ROAD
TOWN OF SOUTH BETHANY
DELAWARE

CLIENT
TOWN OF SOUTH BETHANY

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LOCATION MAP

Google Earth Not To Scale

SCALE
0 30' 60'
1" = 30'

REGISTRATION
BRIAN N. BOLENDER REGISTERED No. 8215 PROFESSIONAL ENGINEER DELAWARE

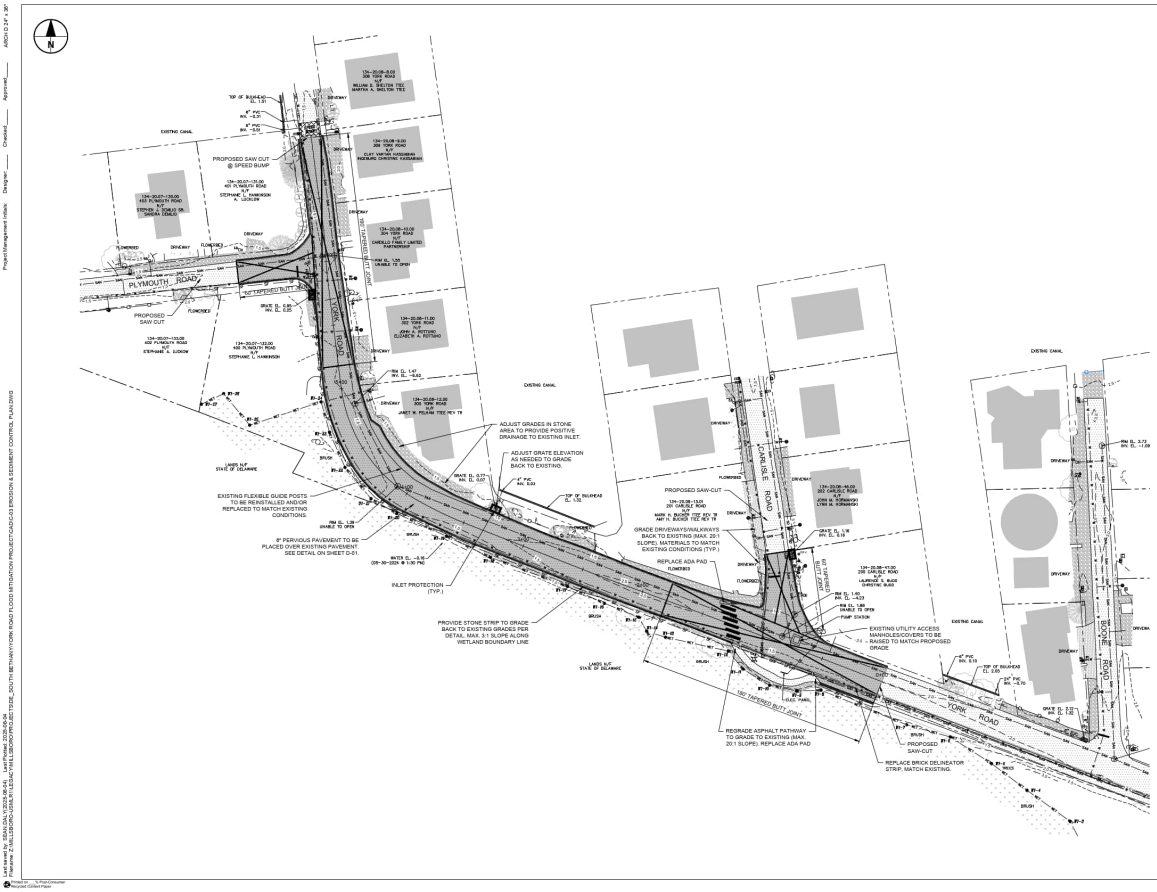
ISSUE/REVISION

1	6-4-25	ISSUED FOR CONSTRUCTION
I/R	DATE	DESCRIPTION

PROJECT NUMBER
60727673

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-02



AECOM

PROJECT
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YORK ROAD
TOWN OF SOUTH BETHANY
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LOCATION MAP

Google Earth Not To Scale

SCALE
0 30' 60'
1" = 30'

REGISTRATION
BRIAN N. BOLENDER REGISTERED No. 8215 PROFESSIONAL ENGINEER DELAWARE

ISSUE/REVISION

1	6-4-25	ISSUED FOR CONSTRUCTION
I/R	DATE	DESCRIPTION

PROJECT NUMBER
60727673

SHEET TITLE
EROSION & SEDIMENT CONTROL PLAN

SHEET NUMBER
C-03

PERVIOUS ASPHALT PAVEMENT NOTES

1. ALL MATERIALS AND WORK SHALL BE DONE IN ACCORDANCE WITH THE DELDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION.
2. TACK COAT SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 1011 OF THE STANDARD SPECIFICATIONS.
3. ALL ASPHALT SHALL BE PROVIDED IN ACCORDANCE WITH DIVISION 400 OF THE STANDARD SPECIFICATIONS EXCEPT AS NOTED BELOW.
4. MATERIALS:

A. ASPHALT CEMENT SHALL BE PG 76–22 PER AASHTO MP–1.

B. COARSE AGGREGATE SHALL CONSIST OF CLEAN, TOUGH, DURABLE FRAGMENTS OF CRUSHED STONE, OR CRUSHED GRAVEL OF UNIFORM QUALITY THROUGHOUT. IN THE MIXTURE, AT LEAST 75 PERCENT, BY MASS (WEIGHT) OF THE MATERIAL COARSER THAN THE 4.75 MM (NO. 4) SIEVE SHALL HAVE AT LEAST TWO FRACTURED FACES, AND 90 PERCENT SHALL HAVE ONE OR MORE FRACTURED FACES (ASTM D5821). COARSE AGGREGATE SHALL BE FREE FROM CLAY BALLS, ORGANIC MATTER, DELETERIOUS SUBSTANCES, AND NOT MORE THAN 8% OF FLAT OR ELONGATED PIECES AS SPECIFIED IN ASTM D4791 WITH A VALUE OF 5:1.

C. FINE AGGREGATE SHALL CONSIST OF CLEAN, SOUND, DURABLE, ANGULAR SHAPED PARTICLES PRODUCED BY CRUSHING STONE OR GRAVEL THAT MEETS THE REQUIREMENTS FOR WEAR AND SOUNDNESS SPECIFIED FOR COARSE AGGREGATE. THE AGGREGATE MATERIALS SHALL BE FREE FROM COATINGS OF CLAY, SILT, OR OTHER OBJECTIONABLE MATTER AND SHALL CONTAIN NO CLAY BALLS. THE FINE AGGREGATE, INCLUDING ANY BLENDED MATERIAL FOR THE FINE AGGREGATE, SHALL HAVE A PLASTICITY INDEX OF NOT MORE THAN 6 AND A LIQUID LIMIT OF NOT MORE THAN 25 WHEN TESTED IN ACCORDANCE WITH ASTM 4318.

D. MIX DESIGN.

1. PERVIOUS ASPHALT PAVEMENT SHALL HAVE A BINDER CONTENT OF 5.75% TO 6.50% BY WEIGHT OF DRY AGGREGATE. IN ACCORDANCE WITH ASTM D6390, DRAIN DOWN OF THE ASPHALT BINDER SHALL BE NO GREATER THAN 03%. IF MORE ABSORPTIVE AGGREGATES, SUCH AS LIMESTONE, ARE USED IN THE MIX, THEN THE AMOUNT OF BINDER SHALL BE BASED ON THE TESTING PROCEDURES OUTLINE IN THE NATIONAL ASPHALT PAVEMENT ASSOCIATION'S INFORMATION SERIES 131 – "PERVIOUS ASPHALT PAVEMENTS FOR STORMWATER MANAGEMENT" (2008).
2. SUBMIT A MIX DESIGN OF AT LEAST 10 WORKING DAYS PRIOR TO THE BEGINNING OF PRODUCTION. MAKE AVAILABLE SAMPLES OF COARSE AGGREGATE, FINE AGGREGATE, MINERAL FILLER, FIBERS AND A SAMPLE OF THE PERFORMANCE GRADED ASPHALT BINDER (PGAB) THAT WILL BE USED IN THE DESIGN OF THE MIXTURE. A CERTIFICATE OF ANALYSIS (COA) OF THE PGAB SHALL BE SUBMITTED WITH THE MIX DESIGN. THE COA SHALL BE CERTIFIED BY THE DELAWARE DOT OR QUALIFIED UNDER ASTM D3666. HMA PLANT/FIELD TECHNICIANS SHALL BE CERTIFIED BY THE MID–ATLANTIC REGION TECHNICIAN CERTIFICATION PROGRAM (MARTCP) AND THE DELAWARE TECHNICIAN CERTIFICATION PROGRAM.
3. BULK SPECIFIC GRAVITY (SG) USED IN AIR VOID CONTENT CALCULATIONS SHALL NOT BE DETERMINED AND RESULTS WILL NOT BE ACCEPTED USING AASHTO T166 (SATURATED SURFACE DRY), SINCE IT IS NOT INTENDED FOR OPEN GRADED SPECIMENS (>10% AV). BULK SG SHALL BE CALCULATED USING AASHTO T275 (PARAFFIN WAX) OR ASTM D6752 (AUTOMATIC VACUUM SEALING). AIR VOID CONTENT SHALL BE CALCULATED FROM THE BULK SG AND MAXIMUM THEORETICAL SG (AASHTO T209) USING ASTM D3203.
4. THE MATERIALS SHALL BE COMBINED AND GRADED TO MEET THE COMPOSITION LIMITS BY MASS (WEIGHT) AS SHOWN IN TABLE 1 BELOW.

TABLE 1. PERVIOUS ASPHALT PAVEMENT MIX DESIGN CRITERIA

	NMAS (% PASSING)		
SIEVE SIZE	19.0 MM	12.5 MM	9.5 MM
19 MM	90–100	100	100
12.5 MM	90 MAX	90–100	100
9.5 MM		90 MAX	90–100
4.75 MM			90 MAX
2.36 MM	5–15	5–15	5–15
0.0075 MM	2–4	2–4	2–4

PROPERTY	SPECIFICATION
ASPHALT BINDER CONTENT	5.75 – 6.50%
FIBER CONTENT BY TOTAL MIXTURE MASS MINERAL	0.3% CELLULOSE OR 0.4%
AIR VOID CONTENT (ASTM D6752/AASHTO T275)	16.0 – 22.0%
DRAIN DOWN (ASTM D6390)*	<0.3%
TENSILE STRENGTH RATIO (AASHTO 283)**	>80%
CANTABRO ABRASION TEST UNAGED SAMPLES (ASTM D7064–04)	<20%
CANTABRO ABRASION TEST ON 7 DAY AGED SAMPLES	<30%

* CELLULOSE OR MINERAL FIBERS MAY BE USED TO REDUCE DRAIN DOWN.

** IF THE TSR (RETAINED TENSILE STRENGTH) VALUES FALL BELOW 80% WHEN TESTED PER NAPA IS131 (WITH A SINGLE FREEZE THAW CYCLE RATHER THAN 5), THEN EMPLOY AN ANTISTRIP ADDITIVE TO RAISE THE TSR VALUE ABOVE 80%.

E. MIX PRODUCTION.

1. THE PERVIOUS ASPHALT MIX PRODUCTION SHALL BE PER SECTION 1014 OF THE DELDOT STANDARD SPECIFICATIONS AND PLANT MANUFACTURER'S RECOMMENDATIONS.

CONSTRUCTION METHODS:

A. THE CONSTRUCTION METHODS SHALL BE PER SECTION 401 EXCEPT AS NOTED HEREIN.

B. MINIMUM SURFACE TEMPERATURE OF 60 DEGREES F AT TIME OF PLACEMENT AND MINIMUM AMBIENT TEMPERATURE OF 50 DEGREES F.

C. THE PERVIOUS ASPHALT ASPHALT PAVEMENT MIX SHALL BE PLACED EITHER IN A SINGLE LIFT NOT TO EXCEED 4 INCHES THICK OR IN TWO LIFTS. IF MORE THAN ONE LIFT IS USED, SUFFICIENT CARE SHALL BE TAKEN TO INSURE THAT THE PERVIOUS ASPHALT LAYERS JOIN COMPLETELY BY KEEPING THE TIME BETWEEN LAYER PLACEMENTS MINIMAL, KEEPING THE FIRST LAYER CLEAR FROM DUST AND MOISTURE, AND MINIMIZING TRAFFIC ON THE FIRST LAYER.

D. NO TRAFFIC SHALL BE PERMITTED ON THE MATERIAL PLACED UNTIL THE MATERIAL HAS BEEN THOROUGHLY COMPACTED AND HAS BEEN PERMITTED TO COOL TO BELOW 100 DEGREES F.

E. MAKE TWO PASSES WITH A STANDARD ASPHALT PAVEMENT ROLLER (5 TON MINIMUM) OPERATED IN STATIC MODE. DO NOT OVER COMPACT THE MATERIAL IN ORDER THAT PERMEABILITY CAN BE MAINTAINED.

F. ANY MIXTURE THAT BECOMES LOOSE AND BROKEN, MIXED WITH DIRT, OR IS IN ANY WAY DEFECTIVE SHALL BE REMOVED AND REPLACED WITH FRESH MIX. THE MIX SHALL BE COMPACTED TO CONFORM TO THE SURROUNDING AREA.

G. INSTALLED PERVIOUS PAVEMENT SHALL NOT BE USED FOR EQUIPMENT OR MATERIALS STORAGE DURING CONSTRUCTION, AND UNDER NO CIRCUMSTANCES SHALL EQUIPMENT BE ALLOWED TO DEPOSIT SOIL ON PAVED PERVIOUS SURFACES.

H. THE FULL PERMEABILITY OF THE PAVEMENT SURFACE SHALL BE TESTED BY APPLICATION OF CLEAN WATER AT THE RATE OF AT LEAST 5 GMP OVER THE SURFACE, USING A HOSE OR OTHER DISTRIBUTION DEVISE. WATER USED FOR THE TEST SHALL BE CLEAN, FREE OF SUSPENDED SOLIDS AND DELETERIOUS LIQUIDS. THE TEST SHALL BE OBSERVED BY THE ENGINEER.

QUALITY OF BITUMINOUS PAVEMENT

A. AN ACCEPTABLE RIDE SURFACE SHALL BE PROVIDED IN ACCORDANCE WITH THE DELDOT STANDARD SPECIFICATIONS.

B. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING MAINTENANCE OF TRAFFIC (MOT) AS REQUIRED BY THE DELAWARE MUTCD.

C. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE TIE–INS FOR ALL DRIVEWAYS AND INTERSECTING STREETS.

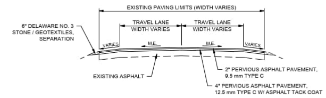
D. ALL EXISTING UTILITY ACCESS MANHOLES/COVERS WITHIN THE LIMITS OF PAVEMENT SHALL BE RAISED TO MATCH THE PROPOSED GRADE.

E. NO WETLANDS SHALL BE ENTERED, DAMAGED, OR DESTROYED DURING CONSTRUCTION.

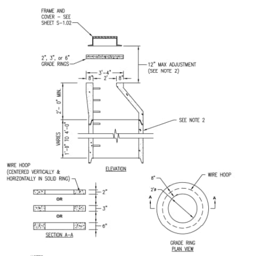
PAVEMENT MARKINGS

A. PAVEMENT MARKINGS AND FLEXIBLE GUIDE POSTS SHALL BE PROVIDED TO REPLACE EXISTING MARKINGS.

B. PAVEMENT MARKINGS SHALL BE PROVIDED IN ACCORDANCE WITH THE DELDOT STANDARD SPECIFICATIONS.



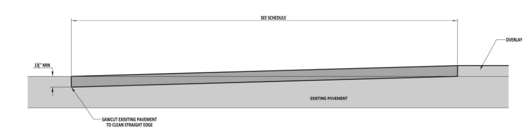
YORK ROAD PERVIOUS ASPHALT PAVEMENT DETAIL
NOT TO SCALE



NOTES:
1. PRECAST MANHOLE SHALL MEET THE REQUIREMENTS OF ASTM C–478 WITH MINIMUM 4,000 PSI CONCRETE STRENGTH AND TYPE I/II PORTLAND CEMENT.
2. IF ADJUSTMENT HEIGHT EXCEEDS 12", A ONE (1) FOOT RISER INSTALLED BELOW CONE SECTION WILL BE REQUIRED. A MAXIMUM OF THREE (3) GRADE RINGS WILL BE ALLOWED.
3. ALTERNATE MATERIAL GRADE RINGS MAY BE USED FOR MANHOLES LOCATED OUTSIDE OF ROADWAY LIMITS, SUBJECT TO COUNTY APPROVAL.
4. BRICK ADJUSTMENT COURSES PERMITTED, SUBJECT TO DIMENSION REQUIREMENTS NOTED ABOVE.
5. CONCRETE RING SHALL HAVE A DESIGN STRENGTH OF 5000 PSI IN 28 DAYS – DESIGN SHALL MEET REQUIREMENTS OF ASTM C–478

SUSSEX COUNTY ENGINEERING DEPARTMENT APPROVED: SUSSEX COUNTY ENGINEER	MANHOLE FRAME AND COVER ADJUSTMENT	DETAIL S-1.03 DATE ISSUED: 12/30/2021

SCALE : NTS



NOTES:
1). ADJUST THE PROFILE OF THE OVERLAY PAVING TO ASSURE A SMOOTH TRANSITION THROUGH THE BUTT JOINT.
2). CRACK SEAL THE JOINT BETWEEN THE BUTT JOINT AND THE EXISTING PAVEMENT.

CONDITION	SLOPE FEET:INCHES
GREATER THAN OR EQUAL TO 55 MPH	40:1
LESS THAN 55MPH	30:1
STOP CONTROLLED INTERSECTION	15:1

DELAWARE DEPARTMENT OF TRANSPORTATION	BUTT JOINTS	APPROVED SIGNATURE ON FILE 12/30/2014
	STANDARD NO. P-3 (2014) SHT. 1 OF 1	RECOMMENDED SIGNATURE ON FILE 12/11/2014

10/28/2014

AECOM

PROJECT
YORK ROAD FLOOD MITIGATION PROJECT
YORK ROAD
TOWN OF SOUTH BETHANY
DELAWARE

CLIENT
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CONSULTANT
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LOCATION MAP

SCALE

REGISTRATION

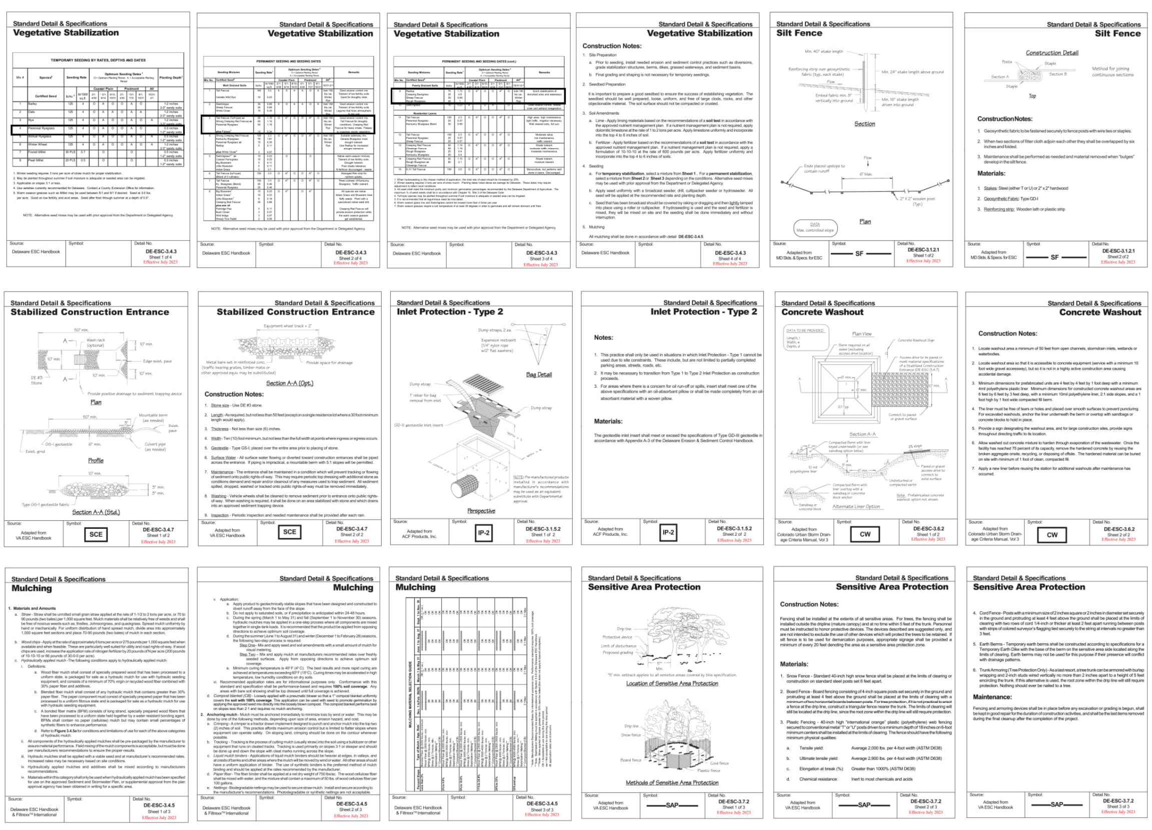
ISSUE/REVISION

I/R	DATE	DESCRIPTION
	8-4-28	ISSUED FOR CONSTRUCTION

PROJECT NUMBER
60727673

SHEET TITLE
DETAIL SHEET

SHEET NUMBER
D-01



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	8-4-28	ISSUED FOR CONSTRUCTION

PROJECT NUMBER
60727673

SHEET TITLE
EROSION & SEDIMENT CONTROL DETAIL SHEET 1

SHEET NUMBER
D-02

ARCH D 24" x 36"

Approved: ____ Checked: ____ Designer: ____ Project Management Initials:

...YORK ROAD FLOOD MITIGATION PROJECT\CAD\D-03 EROSION & SEDIMENT CONTROL DETAIL SHEET 2.DWG

Standard Detail & Specifications

Construction Site Pollution Prevention

Notes:

The Construction Site Pollution Prevention Plan includes the following elements:

1. **Material Inventory**

   Document the storage and use of the following materials:

   a. Concrete
   b. Detergents
   c. Paints (enamel and latex)
   d. Cleaning solvents
   e. Pesticides
   f. Wood scraps
   g. Fertilizers
   h. Petroleum based products

2. **Good housekeeping practices**

   a. Store only enough product required to do the job.
   b. Store all materials in a neat, orderly manner in their original labeled containers and covered.
   c. Do not mix different substances.
   d. When possible, use all of a product prior to disposal of the container.
   e. Manufacturers' instructions for disposal should be strictly adhered to.
   f. Designate someone to inspect all BMPs daily.

3. **Waste management practices**

   a. Collect and store all waste materials in securely lidded dumpsters in a location that does not drain to a waterbody.
   b. Salvage and/or recycle waste materials whenever possible.
   c. The dumpsters shall be emptied a minimum of twice per week, or more if necessary. The licensed trash hauler is responsible for cleaning out dumpsters.

Source:	Symbol:	Detail No.
Adapted from USEPA Pub. 840-B-92-002		**DE-ESC-3.6.1** Sheet 2 of 4 Effective July 2023

Standard Detail & Specifications

Construction Site Pollution Prevention

Notes (cont.)

   d. Dispose of all trash in accordance with all applicable Delaware laws.
   e. Littering is strictly prohibited. Trash cans should be placed at all lunch spots and recycle bins should be placed near the construction trailer.
   f. If fertilizer bags can not be stored in a weather-proof location, they should be kept on a pallet and covered with plastic sheeting which is overlapped and anchored.

4. **Equipment maintenance practices**

   a. If possible, equipment should be taken to off-site commercial facilities for washing and maintenance.
   b. If performed on-site, wash vehicles with high-pressure water spray without detergents in an area contained by an impervious berm.
   c. Use drip pans for all equipment maintenance.
   d. Inspect equipment for leaks on a daily basis.
   e. Direct washout from concrete trucks into a temporary pit for hardening and proper disposal.
   f. Equip fuel nozzles with automatic shut-off valves.
   g. Dispose of all used products such as oil, antifreeze, solvents and tires in accordance with manufacturers' recommendations and local, state and federal laws and regulations.

5. **Spill prevention practices**

   a. Identify potential spill areas and contain them in covered areas with no connection to the storm drain system.
   b. Post warning signs in hazardous material storage areas.
   c. Perform preventive maintenance on all tanks, valves, pumps, pipes and other equipment as necessary.
   d. Prioritize low or non-toxic substances for use.

Source:	Symbol:	Detail No.
Adapted from USEPA Pub. 840-B-92-002		**DE-ESC-3.6.1** Sheet 3 of 4 Effective July 2023

Standard Detail & Specifications

Construction Site Pollution Prevention

Notes (cont.)

   e. Prominently post contact information for reporting spills through the DNREC 24-Hour Toll Free Number.

6. **Education**

   a. Include Best Management Practices (BMPs) for construction site pollution control as part of regular progress meetings.
   b. Information regarding waste management, equipment maintenance and spill prevention should be prominently posted in the construction trailer.

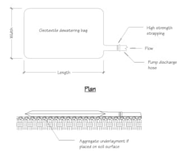
CONTACT INFORMATION

DNREC 24-Hour Toll Free Number	**800-662-8802**
DNREC Solid & Hazardous Waste Management Section	**302-739-9403**

Source:	Symbol:	Detail No.
Adapted from USEPA Pub. 840-B-92-002		**DE-ESC-3.6.1** Sheet 4 of 4 Effective July 2023

Standard Detail & Specifications

Geotextile Dewatering Bag



NOTE: Pre-manufactured products installed in accordance with manufacturer's recommendations may be used as an equivalent substitute with Departmental approval.

Source:	Symbol:	Detail No.
Adapted from ACF Products, Inc.	GB	**DE-ESC-3.2.1.2** Sheet 1 of 2 Effective July 2023

Standard Detail & Specifications

Geotextile Dewatering Bag

Construction Notes:

1. The dewatering bag should be placed so the incoming water flows into and through the bag, and then flow off the site without creating more erosion. The neck should be tied off tightly to stop the water from flowing out of the bag without going through the walls. The dewatering bag should be placed on a gravel bed to allow water to flow in all directions.
2. The dewatering bag is considered full and should be disposed when it is impractical for the bag to filter the sediment out at a reasonable flow rate. At this point, it should be replaced with a new bag.
3. Disposal may be accomplished as directed by the construction reviewer. If the site allows, the bag may be buried on site and seeded, visible fabric removed and seeded or removed from site to a proper disposal area.

Materials:

1. The geotextile fabric shall be a Type GD-IV.
2. The dewatering bag shall be sewn with a double needle machine using high strength thread. All structural seams will be sewn with high strength, double stitched "J" type. Seam strength test will have the following minimum average roll values:

Type	TEST METHOD	TEST RESULT
Heavy duty	ASTM D-4884	100 lb / in

3. The dewatering bag shall have an opening large enough to accommodate a four (4) inch discharge hose with attached strap to tie off the hose to prevent the pumped water from escaping from the bag without being filtered.

Source:	Symbol:	Detail No.
Adapted from ACF Products, Inc.	GB	**DE-ESC-3.2.1.2** Sheet 2 of 2 Effective July 2023

Standard Detail & Specifications

Dust Control

Temporary Methods:

1. Mulches - See **DE-ESC-3.4.5**, Standard Detail and Specifications for Mulching.
2. Vegetative cover - See **DE-ESC-3.4.3**, Std. Detail and Specifications for Vegetative Stabilization.
3. Adhesives - Use on mineral soils only (not effective on muck soils). Keep traffic off these areas. The following table may be used for general guidance.

Type of Emulsion	Water Dilution	Type of Nozzle	Apply Gal/Ac.
Latex emulsion	12.5:1	Fine spray	235
Resin-in-water emulsion	4:1	Fine spray	300
Acrylic emulsion (non-traffic)	7:1	Coarse spray	450
Acrylic emulsion (traffic)	3.5:1	Coarse spray	350

4. Tillage - For emergency temporary treatment, scarify the soil surface to prevent or reduce the amount of blowing dust until a more appropriate solution can be implemented. Begin the tillage operation on the windward side of the site using a chisel-type plow for best results.
5. Sprinkling - Sprinkle site with water until the surface is moist. Repeat as needed.
6. Calcium Chloride - Apply as flakes or granular material with a spreader at a rate that will keep the soil surface moist. Re-apply as necessary.
7. Barriers - Place barriers such as solid board fences, snow fences, hay bales, etc. at right angles to the prevailing air currents at intervals of approx. 10X their height.

Permanent Methods:

1. Vegetative cover - See **DE-ESC-3.4.3**, Std. Detail and Specifications for Vegetative Stabilization.
2. Stone - Apply layer of crushed stone or coarse gravel to protect soil surface.

Source:	Symbol:	Detail No.
Adapted from VA ESC Handbook		**DE-ESC-3.4.8** Sheet 1 of 1 Effective July 2023

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Notes for Figure 6H-18—Typical Application 18
Lane Closure on a Minor Street
(Delaware Revision)

Standard:

1. This TTC zone application shall be used only for low-speed facilities having low traffic volumes, such as subdivision streets.

Option:

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

Standard:

3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure 6H-10.

Option:

4. Truck-mounted attenuators may be used for all operations along roadways with a posted speed limit or 85th-percentile speed less than or equal to 40 mph.
5. Arrow boards may be omitted from work vehicles that cannot support the installation of an arrow board.

Revision 3, May 2018

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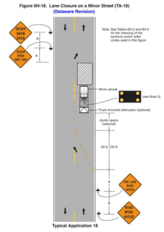
Figure 6H-18. Lane Closure on a Minor Street (TA-18)
(Delaware Revision)



Typical Application 18

Revision 3, May 2018

AECOM

PROJECT

YORK ROAD FLOOD MITIGATION PROJECT
YORK ROAD
TOWN OF SOUTH BETHANY
DELAWARE

CLIENT

TOWN OF SOUTH BETHANY

CONSULTANT

AECOM
28485 DUPONT BOULEVARD
MILLSBORO, DE 19966
PHONE: 302-933-0200
WWW.AECOM.COM

LOCATION MAP

SCALE

REGISTRATION

BRIAN M. BOLENDER REGISTERED No. 8215 DELAWARE PROFESSIONAL ENGINEER

ISSUE/REVISION

I/R	DATE	DESCRIPTION
	6-4-25	ISSUED FOR CONSTRUCTION

PROJECT NUMBER

60727673

SHEET TITLE

EROSION & SEDIMENT CONTROL DETAIL SHEET 2

SHEET NUMBER

D-03

References

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Appendices

Appendix A: Wetland Delineation Report

Appendix B: Subsurface Evaluation Report

Appendix C: Seawall Design Plans

Appendix D: Elevating York Road Design Plans

Appendix E: Combination of Seawall and Elevating York Road Design Plans

APPENDIX A
Wetland Delineation Report

WETLANDS AND OTHER WATERS OF THE U.S. DELINEATION REPORT

YORK ROAD FLOOD MITIGATION PROJECT

TOWN OF SOUTH BETHANY
SUSSEX COUNTY, DELAWARE

Prepared for:
Town of South Bethany
902 S Ocean Drive
Bethany Beach, DE 19930

Prepared by:
AECOM
625 West Ridge Pike, Suite E-100
Conshohocken, Pennsylvania 19428
AECOM Project No. 60707136

AECOM

July 2024

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TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The York Road Flood Mitigation Project is located in the Town of South Bethany, DE in a residential community bordered by Fenwick Island State Park on the south end (Site). The Site has a history of flooding, which has necessitated a study of potential mitigation actions. The existing roads are at a low elevation and are surrounded by open tidal waters, as well as tidal marsh areas. The Project Study Area (PSA) is approximately 5.76 acres and was determined based on an approximate buffer of 40 feet around the roads expected to be impacted by project activities, as well as a greater area to the south of York Road to capture the tidal marsh (Figure 1).

On behalf of the town of South Bethany, AECOM conducted a wetland and watercourse delineation within the PSA as described in Section 1.1. The delineation involved a desktop review of existing information and a field delineation of wetlands and watercourses. Information collected during the desktop review was used in conjunction with the field delineation to identify regulated areas pursuant to regulations established by the United States Environmental Protection Agency (USEPA) under Section 404 of the Clean Water Act and delegated to the United States Army Corps of Engineers (USACE), as well as regulations established by the Department of Natural Resources and Environmental Control (DNREC) under Title 7 of the Delaware Administrative Code.

This report was prepared to document findings of the wetland and watercourse delineation and to support, as needed, future permit applications.

1.1 SITE DESCRIPTION

The Project Study Area (PSA) is approximately 5.76 acres and includes a buffer around a section of York Road, Plymouth Road, Boone Road, and Carlisle Road, as well as an additional area to the south of York Road covered by tidal marsh. Several canal boundaries were also included in the PSA, where they extend close to the edge of roadways. The Site is bordered on the east side by the southbound lane of the Coastal Highway (U.S. Route 1) and bordered by Fenwick State Park on the south.

2.0 METHODS

This section describes the sources used in the desktop data review and the methods used during the field delineation process.

2.1 DESKTOP DATA REVIEW

A desktop data review of existing information was conducted to assess the potential presence of watercourses, wetlands, and/or wetland indicators within the study area prior to conducting the field delineation. Information reviewed included:

- United States Geological Survey (USGS) Bethany Beach, DE 7.5-minute series topographical quadrangles (NGS, 2024) (Figure 1);
- United States Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS) soil survey (USDA-NRCS, 2023) (Figure 2);
- United States Fish and Wildlife Services' (USFWS) National Wetland Inventory (NWI) Wetland Mapper (USFWS, 2024) (Figure 3);
- USGS National Hydrography Dataset (NHD) (USGS, 2024)(Figure 3);
- Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) (FEMA, 2022) (Figure 3); and

- Delaware Department of Natural Resources and Environmental Control (DNREC) State Regulated Wetlands Map Index (DNREC 2024) (Figure 4).

2.2 FIELD DELINEATION METHODS

Field delineation of the study area was conducted on June 5, 2024 by AECOM wetland scientists. Permission to enter private property was not given as part of this project, and therefore some areas were visually assessed from the street and using aerial imagery.

2.2.1 Wetlands

Wetlands were delineated using the routine method defined by the USACE *Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2.0* (USACE, 2010). The routine method documents three parameters: vegetation, soil characteristics, and hydrology. It evaluates these parameters for evidence of wetland conditions. Wetland boundaries were identified, and the limits were documented using a Trimble R8 GNSS receiver running Trimble Access software on TC3 data collectors. Trimble Access software uses real time correction to provide survey grade locations. These boundaries were then projected onto georeferenced aerial images to create maps used to illustrate the location and size of the delineated wetlands and waterways for incorporation into the wetland delineation report. Paired upland and wetland data points were established at each wetland area to confirm delineated boundary conditions. Information regarding the vegetation, soil characteristics, and hydrology for each data point was documented using the USACE Atlantic and Gulf Coastal Plain Wetland Determination Data Form (Appendix A). Wetlands were classified based on water source (i.e., fresh water (palustrine); salt water (estuarine)) and dominant plant community or mix of communities [i.e., palustrine forested (PFO), palustrine emergent (PEM); estuarine emergent (EEM)].

Vegetation
Vegetation evaluation included identification of trees, saplings and shrubs, herbaceous plants, and woody vine species. As per the USACE guidance for this region, all vegetation strata were evaluated in an approximate 30-foot radius plot. For each stratum, plants were identified to the lowest taxon possible, and the dominant species were determined based on the absolute percent cover of each species. The wetland indicator status of each species was determined using the USACE *2020 National Wetland Plant List* (USACE, 2020).

Soils
At each wetland sample location, a spade shovel or a one-piece hand-auger was used to excavate the soil for inspection of the soil profile. Soil horizon depths were measured and recorded. Each distinct horizon in the soil profile was also examined for hue, value, and chroma using a Munsell Soil color chart (Munsell Color, 2019). In addition, the texture, physical characteristics, and redoximorphic features, if present, of each horizon were noted. This information was used to evaluate the indicators of hydric soil conditions that meet USACE criteria.

Hydrology
Wetland areas were evaluated by visual inspection for the presence of wetland hydrologic indicators, including but not limited to inundation, observed saturation, water marks, drift lines, sediment deposits, water-stained leaves, surface scour, drainage patterns, and/or morphological plant adaptations.

2.2.2 Watercourses

Watercourses were identified by a defined streambed and bank; hydrologically-sorted substrate material; observable dimension, pattern and profile; and the presence of an ordinary high-water mark (OHWM). Watercourse limits were delineated by identifying the OHWM of each bank. The OHWM was determined by the first substantial break in slope between the edge of the stream bed and the surrounding terrain, often displaying a clear line from scour where terrestrial vegetation was not present. All watercourse boundaries were marked with sequentially numbered flags on the left and right banks (when facing downstream), and boundary points were collected using the survey unit. Watercourses Information regarding the stream including geomorphology, flow regime, and other streams characteristics was documented using an AECOM-modified *Physical Characterization/Water Quality Field Data Sheet*. The original base data sheets can be found in the United States Environmental Protection Agency's (USEPA) *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish* (Barbour et al., 1999).

2.2.3 Mapping

GPS data collected during the delineation was projected onto georeferenced aerial images to create maps used to illustrate the location and size of the delineated wetlands and watercourses for incorporation into the wetland delineation report and future use in agency consultations, permit applications, and plans.

3.0 RESULTS AND DISCUSSIONS

The following is a summary of findings from the desktop data review and the results of the field delineation efforts.

3.1 DESKTOP DATA

The following provides the results of the desktop data review conducted for the soils, watercourses, and NWI wetlands within the study area.

3.1.1 Soils

Soils mapped within the study area were identified from the USDA-NRCS soils database. The review indicated that five soil mapping units are present in the PSA. Two of the soil mapping units are listed as being major hydric soils, and three are listed as having hydric soil inclusions (USDA-NRCS, 2023). The soils mapped in the study area are listed in Table 1 and are illustrated on Figure 2.

TABLE 1: Mapped Soils within the Project Study Area

Soil Map Unit	Description	Hydric Rating by Map Unit (%)
AcC	Acquango sand, 5 to 10 percent slopes, occasionally flooded	15
BuA	Brockatonorton-Urban land complex, 0 to 2 percent slopes	7
WDc2	Dredge Channel, 1 to 4 meter water depth	100
Pu	Purnell peat, very frequently flooded, tidal	100
AuB	Acquango-Urban land complex, 0 to 5 percent slopes	7

3.1.2 NWI Wetlands

USFWS NWI maps illustrate wetland habitats and vegetation communities using interpretation of aerial photography. The data on these maps provide general boundaries of potential wetlands and require ground surveys to accurately define the boundaries of wetlands present, if any, and determine their proper classification. The habitats and communities identified are classified according to the scheme provided in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979).

A review of the USFWS NWI Wetlands Mapper website identified four NWI features within the PSA (Figure 2). The features include the canals surrounding the community, and the marsh area to the south. These features are described as:

- Estuarine, subtidal, unconsolidated bottom, subtidal (E1UBL)
- Estuarine, subtidal, unconsolidated bottom, subtidal, excavated (E1UBLx)
- Estuarine, intertidal, emergent persistent vegetation, regularly flooded, partly drained/ditched (E2EM1Nd)
- Palustrine, forested, broad-leaved deciduous/needle-leaved evergreen, seasonally flooded-fresh tidal (PFO1/4R)

3.1.3 Watercourses

The Site drains into several named canals, as well as into Jefferson Creek, which is part of Little Bay. The Site also receives hydrology from tidal action in Jefferson Creek and the surrounding canals. It is within the Little Assawoman Bay Watershed (HUC12 Code 020403030301), which is within the Chincoteague subbasin and Mid Atlantic Coastal basin. Based on available National Flood Hazard Layer (FEMA, 2022), the entire PSA is mapped as a 100-year FEMA floodplain. Floodplain data is displayed on Figure 3.

According to 7 DE Administrative Code: 7401 Surface Water Quality Standards, Little Assawoman Bay and its drainage basin have Designated Use categories of Industrial Water Supply, Primary Contact Recreation, Secondary Contact Recreation, Fish, Aquatic Life & Wildlife, Agricultural Water Supply (freshwater sections only), ERES (waters of exceptional recreational or ecological significance) waters, and Fish Consumption (DNREC 2024).

3.2 FIELD DELINEATION

The field delineation conducted on June 5, 2024 resulted in the identification of five wetlands within the study area. Dredged canals were classified as wetland feature, and therefore no watercourses were identified. Mapping showing the location and extent of the wetlands is illustrated on Figure 5, and a photographic log is provided in Appendix B.

3.2.1 Wetlands

Five wetlands were identified within the study area. At least one wetland sample point was taken for each wetland to characterize the properties of the hydrology, vegetation, and soil of the wetland. The field data forms are provided in Appendix A.

TABLE 2: Wetlands Identified within the Project Study Area

Wetland ID[1]	Classification[2]	Description	DE State Wetland	Delineated Size (acres)[3]
W1	PFO	Forested component of W1 above the intertidal zone. *Pinus taeda* is the dominant tree species.	Yes	0.12
	EEM	Emergent component of W1 within the intertidal zone. *Juncus effusus* and *Distichlis spicata* are the dominant emergent species, with scattered *Baccharis halimifolia* shrubs.		1.61
W2	EUB	Dredged canal (Bristol Canal)	Yes	0.03
W3	EUB	Dredged canal (York Canal)	Yes	0.01
W4	EUB	Dredged canal (Carlisle Canal)	Yes	0.02
W5	EUB	Dredged canal (Boone Canal)	Yes	0.02
				Total Delineated Acres: 1.81

1. Wetland ID generated by AECOM during field delineation.
2. EEM = Estuarine Emergent, EUB = Estuarine Unconsolidated Bottom , PFO = Palustrine Forested
3. Area of the wetland as delineated within the Project Study Area.

4.0 SUMMARY AND CONCLUSIONS

The wetlands and watercourse delineation identified five wetlands within the study area. The total delineated wetland area was 1.81 acres.

Waters of the United States and Waters of the State of Delaware, which cannot be avoided, may require permitting from both DNREC under Title 7 of the Delaware Administrative Code and the USACE under the USEPA's Section 404 of the Clean Water Act.

5.0 REFERENCES

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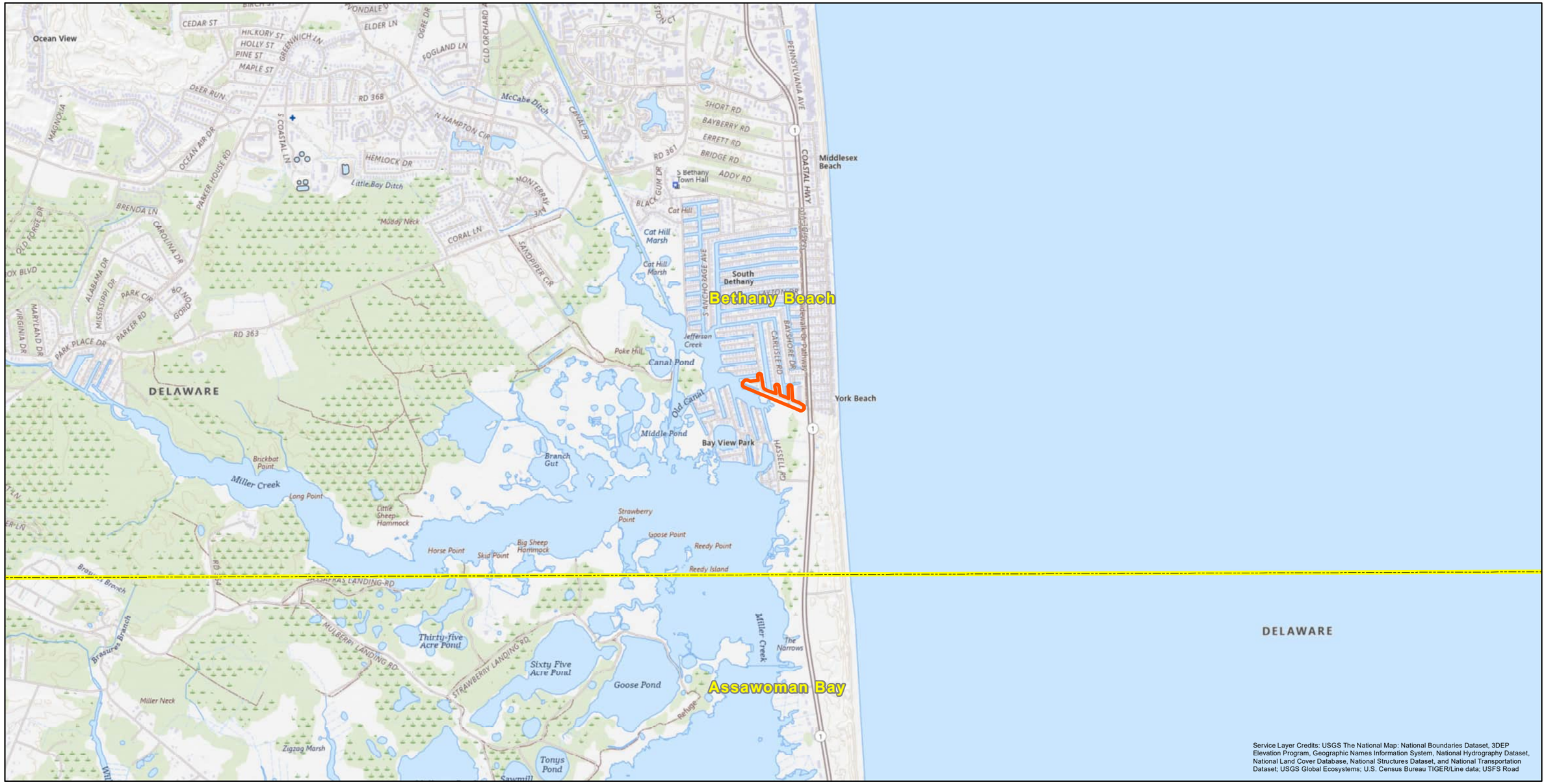
FIGURES



Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road

Legend

- Project Study Area
- USGS 24k Topo Map Boundaries

Notes

NAD 1983 State Plane
Delaware FIPS 0700 Feet

Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Quadrangles (USGS)
USGS Topographical Basemap (ESRI)

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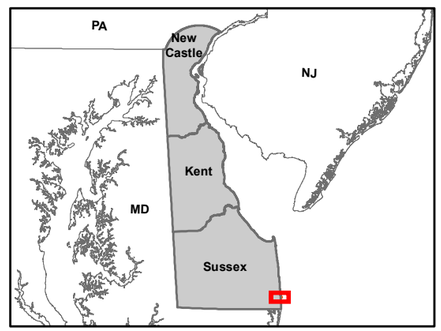
Feet



AECOM

Figure 1
Project Location

York Road Flood Mitigation Project

Town of South Bethany
Sussex County, Delaware

Prepared By: MC	Checked By: DY
Job: 60707136	Date: 7/29/2024

Legend

- Project Study Area
- Non-Hydric Soil
- Minor Hydric Soil
- Major Hydric Soil

Notes

NAD 1983 State Plane
Delaware FIPS 0700 Feet

Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
SSURGO Soils (USDA/NRCS 09/2023)

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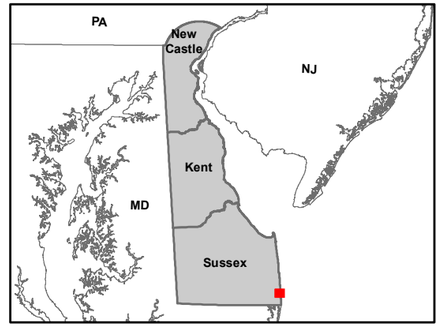


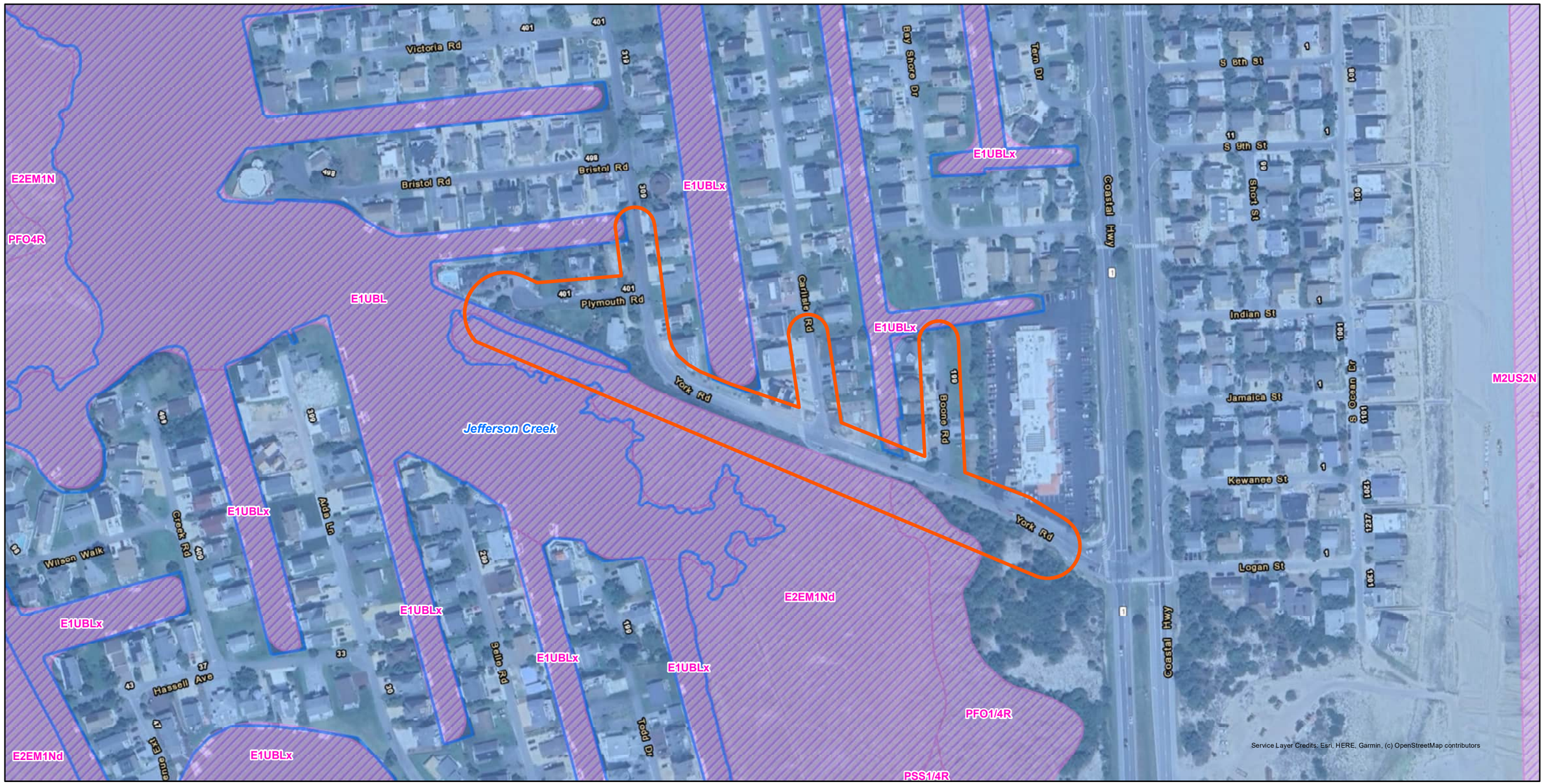
AECOM

Figure 2
Hydric Soils

York Road Flood Mitigation Project

Town of South Bethany
Sussex County, Delaware

Prepared By: MC	Checked By: DY
Job: 60707136	Date: 7/29/2024



Legend

- Project Study Area
- NHD Areas
- NWI Wetland
- 100-Year Floodplain

Notes

NAD 1983 State Plane
Delaware FIPS 0700 Feet

Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
NWI Wetlands (2024)
FEMA NFHL for Sussex County (2022)
NHD Areas (2024)

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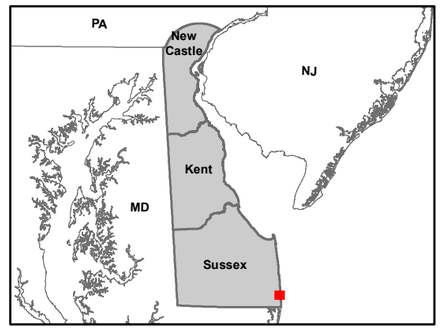

AECOM

Figure 3
Desktop Wetlands and Watercourses

York Road Flood Mitigation Project

Town of South Bethany
Sussex County, Delaware

Prepared By: MC	Checked By: DY
Job: 60707136	Date: 7/29/2024

Legend

Project Study Area

State Wetlands

B-Beach
M-Marsh
O-Other (Upland of Non-tidal wetlands less than 400 acres)
W-Water

Notes

NAD 1983 State Plane
Delaware FIPS 0700 Feet

Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
DNREC Regulated Tidal Wetlands
Map Panel DNR004 (1988)

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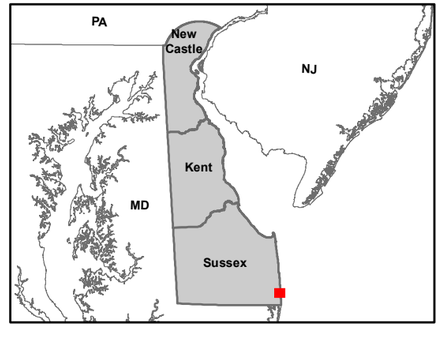

AECOM

Figure 4
State Mapped Wetlands

York Road Flood Mitigation Project

Town of South Bethany
Sussex County, Delaware

Prepared By: MC	Checked By: DY
Job: 60707136	Date: 7/29/2024

Legend

- Project Study Area
- Wetland Data Point
- Culvert
- Upland Data Point
- Wetland Boundary Point
- Delineated EEM Wetland
- Delineated PFO Wetland
- Delineated EUB Wetland

Notes

1. Wetland Delineation conducted by AECOM wetland scientists on June 5, 2024.

NAD 1983 State Plane
Delaware FIPS 0700 Feet

Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:

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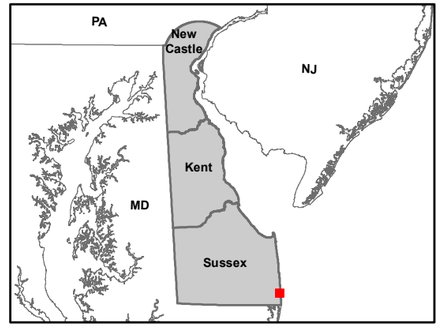
Feet



AECOM

Figure 5
Resource Delineation

York Rd Flood Mitigation Project

Sussex County, Delaware
Town of South Bethany

Prepared By: MC	Checked By: DY
Job: 60707136	Date: 7/29/2024

APPENDIX A
Wetland Data Forms

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: York Road Flood Mitigation Study and Design Project City/County: Sussex County Sampling Date: 6/5/2024

Applicant/Owner: Town of South Bethany State: DE Sampling Point: W1 PFO

Investigator(s): D. Yezuita, M. Curran Section, Township, Range: Town of South Bethany

Landform (hillside, terrace, etc.): toe of slope Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR or MLRA): LRR T, MLRA 153D Lat: 38.50943 Long: -75.05604 Datum: NAD83

Soil Map Unit Name: AcC: Acquango sand, 5 to 10 percent slopes, occasionally flooded NWI classification: PFO1/4R

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland data point taken to represent the PFO community type within the Wetland 1 complex. Tidal influence is less impactful at this upper range, which may be allowing for more persistent vegetation (trees and shrubs) to grow.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 18
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 6

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetland hydrology observed. Water table observed at 18", which is not considered a high water table, but should be noted. Other secondary indicators were also present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W1 PFO

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus taeda*	40	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	40 =Total Cover		
50% of total cover: 20	20% of total cover: 8		
Sapling/Shrub Stratum (Plot size: 30')			
1. *Juniperus virginiana*	10	No	FACU
2. *Morella cerifera*	30	Yes	FAC
3. *Morella pensylvanica*	40	Yes	FAC
4. *Baccharis halimifolia*	15	No	FAC
5.			
6.			
7.			
8.			
	95 =Total Cover		
50% of total cover: 48	20% of total cover: 19		
Herb Stratum (Plot size: 30')			
1. *Carex scoparia*	5	No	FACW
2. *Phragmites australis*	70	Yes	FACW
3. *Andropogon virginicus*	30	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	105 =Total Cover		
50% of total cover: 53	20% of total cover: 21		
Woody Vine Stratum (Plot size: 30')			
1. *Toxicodendron radicans*	30	Yes	FAC
2.			
3.			
4.			
5.			
	30 =Total Cover		
50% of total cover: 15	20% of total cover: 6		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	75	x 2 =	150
FAC species	185	x 3 =	555
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	270 (A)		745 (B)
Prevalence Index = B/A =			2.76

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)
Hydrophytic vegetation observed.

SOIL

Sampling Point: W1 PFO

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20	2.5Y 6/1	80	2.5Y 5/4	20	C	M	Sandy	Distinct redox concentrations
20-24	10YR 2/1	70	10YR 6/1	30			Mucky Sand	Co-matrix

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) (**MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(MLRA 149A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils observed.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: York Road Flood Mitigation Study and Design Project City/County: Sussex County Sampling Date: 6/5/2024

Applicant/Owner: Town of South Bethany State: DE Sampling Point: W1 EEM

Investigator(s): D. Yezuita, M. Curran Section, Township, Range: Town of South Bethany

Landform (hillside, terrace, etc.): tidal marsh Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): LRR T, MLRA 153D Lat: 38.50968 Long: -75.05643 Datum: NAD83

Soil Map Unit Name: Pu: Purnell peat, very frequently flooded, tidal NWI classification: E2EM1Nd

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland data point taken to represent the EEM community type within the greater Wetland 1 complex. This data point represents a tidal marsh, which is typically flooded and within the intertidal zone.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 2
Water Table Present?	Yes X	No ____	Depth (inches): 5
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Indicators of wetland hydrology observed.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W1 EEM

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 30')			
1. *Baccharis halimifolia*	15	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	15 =Total Cover		
50% of total cover: 8	20% of total cover: 3		
Herb Stratum (Plot size: 30')			
1. *Phragmites australis*	15	No	FACW
2. *Juncus effusus*	80	Yes	OBL
3. *Distichlis spicata*	30	Yes	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	125 =Total Cover		
50% of total cover: 63	20% of total cover: 25		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	110	x 1 =	110
FACW species	15	x 2 =	30
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	140 (A)		185 (B)

Prevalence Index = B/A = 1.32

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)
Hydrophytic vegetation observed.

SOIL

Sampling Point: W1 EEM

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR 2/2	100					Muck	
3-18	2.5Y 4/1	100					Mucky Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- X 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) (**MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(MLRA 149A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils observed. Hydrogen sulfide smell noted when digging soil pit.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: York Road Flood Mitigation Study and Design Project City/County: Sussex County Sampling Date: 6/5/2024

Applicant/Owner: Town of South Bethany State: DE Sampling Point: W1 UPL

Investigator(s): D. Yezuita, M. Curran Section, Township, Range: Town of South Bethany

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 5

Subregion (LRR or MLRA): LRR T, MLRA 153D Lat: 38.50944 Long: -75.05599 Datum: NAD83

Soil Map Unit Name: AcC: Acquango sand, 5 to 10 percent slopes, occasionally flooded NWI classification: PFO1/4R

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Upland data point taken upslope of Wetland 1, on a sloped sandy area outside of the typical tidal zone. Hydrophytic vegetation is present, likely due to proximity to the tidal wetland and encroachment of invasive Phragmites australis. Hydric soils are not present, and no indicators of wetland hydrology were observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No indicators of wetland hydrology observed.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W1 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus taeda*	60	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	60 =Total Cover		
50% of total cover: 30	20% of total cover: 12		
Sapling/Shrub Stratum (Plot size: 30')			
1. *Rhus copallinum*	10	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10 =Total Cover		
50% of total cover: 5	20% of total cover: 2		
Herb Stratum (Plot size: 30')			
1. *Andropogon virginicus*	35	Yes	FAC
2. *Rubus flagellaris*	20	No	UPL
3. *Phragmites australis*	40	Yes	FACW
4. *Smilax rotundifolia*	25	No	FAC
5. *Thlaspi arvense*	5	No	UPL
6. *Opuntia humifusa*	5	No	UPL
7.			
8.			
9.			
10.			
11.			
12.			
	130 =Total Cover		
50% of total cover: 65	20% of total cover: 26		
Woody Vine Stratum (Plot size: 30')			
1. *Lonicera japonica*	25	Yes	FACU
2. *Toxicodendron radicans*	15	Yes	FAC
3.			
4.			
5.			
	40 =Total Cover		
50% of total cover: 20	20% of total cover: 8		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	135	x 3 =	405
FACU species	25	x 4 =	100
UPL species	40	x 5 =	200
Column Totals:	240 (A)		785 (B)

Prevalence Index = B/A = 3.27

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below.)
Hydrophytic vegetation present, likely due to the encroachment of Phragmites australis from the adjacent wetland.

SOIL

Sampling Point: W1 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	5Y 7/1	100					Sandy	
10-19	2.5Y 6/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) (**MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(MLRA 149A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

Hydric soils not observed.

APPENDIX B

Photographic Log

AECOM

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Town of South Bethany, DE	York Road Flood Mitigation Project Sussex County, Delaware	60707136

Photo No.	Date:
1	6/5/2024

Direction Photo Taken:

West

Description:

View of Wetland 1 (W1 PFO) at the palustrine forested community. The dominant tree species in this community was loblolly pine (*Pinus taeda*).

Photo No.	Date:
2	6/5/2024

Direction Photo Taken:

West

Description:

View of Wetland 1 (W1 EEM) at the estuarine emergent community. Soft rush (*Juncus effusus* and salt-grass (*Distichlis spicata*) are the dominant emergent species, with scattered groundsel (*Baccharis halimifolia*) shrubs.

AECOM

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Town of South Bethany, DE	York Road Flood Mitigation Project Sussex County, Delaware	60707136

Photo No.	Date:
3	6/5/2024

Direction Photo Taken:

South

Description:

View of Wetland 2 (W2 EUB), an estuarine unconsolidated bottom feature. This is a reinforced canal used for recreational boating and is named Bristol Canal.

Photo No.	Date:
4	6/5/2024

Direction Photo Taken:

East

Description:

View of Wetland 3 (W3 EUB), an estuarine unconsolidated bottom feature. This is a reinforced canal used for recreational boating and is named York Canal.

AECOM

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Town of South Bethany, DE	York Road Flood Mitigation Project Sussex County, Delaware	60707136

Photo No.	Date:
5	6/5/2024

Direction Photo Taken:

Southeast

Description:

View of Wetland 4 (W4 EUB), an estuarine unconsolidated bottom feature. This is a reinforced canal used for recreational boating and is named Carlisle Canal.

Photo No.	Date:
6	6/5/2024

Direction Photo Taken:

Northwest

Description:

View of Wetland 5 (W5 EUB), an estuarine unconsolidated bottom feature. This is a reinforced canal used for recreational boating and is named Boone Canal.

APPENDIX B
Subsurface Evaluation Report

August 29, 2024

Kyle Gulbronson, AICP
Associate Vice President
AECOM
28485 Dupont Boulevard
Millsboro, DE 19966

RE: Project No. CG.4007.GA
Subsurface Evaluation
York Road Flood Mitigation Project
South Bethany, Delaware

Dear Mr. Gulbronson:

This report is written to summarize the subsurface sampling recently completed by CGC Geoservices, LLC (CGCG) associated with the proposed flood mitigation project on York Road in South Bethany, Delaware. This work was performed in accordance with the agreement between AECOM and CGCG dated August 21, 2024 (AECOM Project No. 60727673)

To assist with this evaluation, CGCG was provided with the following:

- A site plan entitled "York Road, Proposed Project Area," as prepared by AECOM and dated April 17, 2024, marked up to show the proposed test boring locations.

Prior to the start of the fieldwork, a soil boring permit was obtained from the Delaware Department of Natural Resources and Environmental Control (DNREC). In addition, a Miss Utility ticket was submitted to obtain markout of public utilities in the work area. Several utilities were marked in the field, including water, cable, gas, sewer and telecommunications. Test borings were offset as needed to avoid the marked utilities.

The work area consists of an approximately 750 foot long study area section of York Road located just west of the intersection with Coastal Highway (SR1). This area consists of a two-lane bituminous concrete roadway with a bicycle lane along the southern shoulder. The roadway was observed to be fairly flat. Conditions were dry at the time of our site evaluation.

On August 27, 2024, CGCG performed three (3) Standard Penetration Test (SPT) borings at the site. A site plan showing the approximate boring locations is enclosed. The borings were extended to depths of 20 feet below grade. Boring logs summarizing the conditions encountered are enclosed. Upon completion, the boreholes were backfilled with the soil cuttings mixed with

bentonite grout. The surface was patched with bituminous concrete cold patch level with surrounding pavement.

The subsurface conditions encountered consisted of a surface layer of bituminous concrete pavement varying in thickness from 4 to 8 inches, overlying predominately granular soils of loose to medium density. In borings TB-1 and TB-2, a layer of very loose / soft organic material was observed within the granular soils at depths varying from 8 to 12 feet below grade. The organic layer was not observed in boring TB-3, located furthest east along the road section.

A stratigraphic profile depicting the conditions observed is enclosed. The profile interpolates the conditions between the boring locations, however actual stratigraphy may vary.

We appreciate this opportunity to assist you on this project. If you require any further information, please contact us.

Very truly yours,

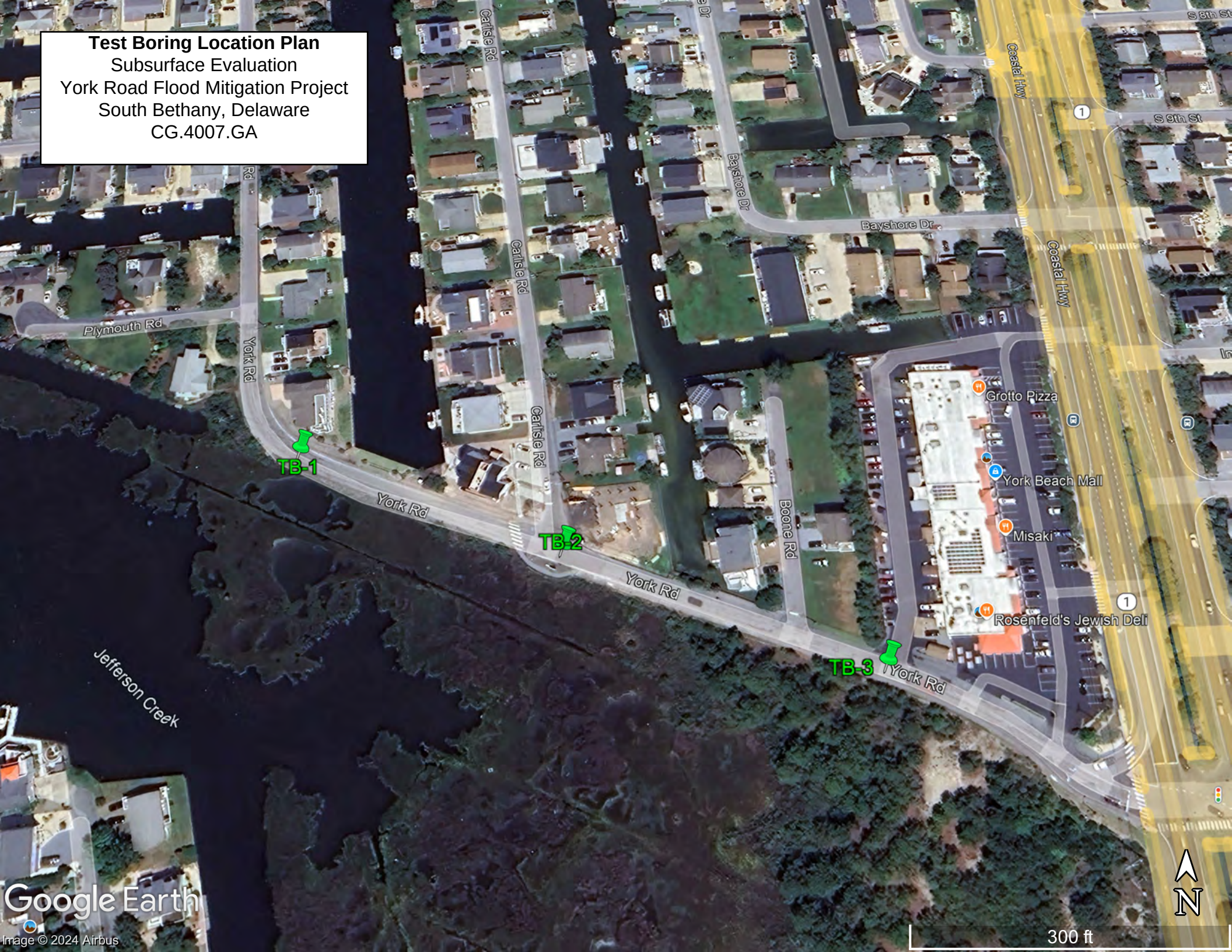
CGC GEOSERVICES, LLC

Stacy B. Ziegler, P.E., LEED AP/ BD+C
President, Senior Geotechnical Engineer

SBZ
WORD\CG4007GA.0824.York Rd Bethany Subsurface AECOM.RPT

Enclosures: Test Boring Location Plan
Test Boring Logs (3)
Stratigraphic Profile
General Notes

Test Boring Location Plan
Subsurface Evaluation
York Road Flood Mitigation Project
South Bethany, Delaware
CG.4007.GA



TEST BORING TB-1

Subsurface Evaluation
York Road Flood Study
South Bethany, Delaware
CG.4007.GA

Date Started : August 27, 2024
Date Completed : August 27, 2024
Logged by : M. Natrin
Weather : Sunny, 80s
Driller/Agency : J. Truver/CGC Geoservices

Drilling Equipment : CME 75 Truck
Drilling Methods : HSA,SPT

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0				Bituminous concrete pavement (8 inches)							
	0.7										
2				Moist, gray fine to medium SAND, little silt, trace clay		S-1	8-8-4-3	1.2			▼
4				Wet, gray fine to medium SAND, little silt, little clay		S-2	2-2-5-6	1.0			
6			SM	Wet, gray fine to coarse SAND, little silt, trace clay		S-3	5-6-5-3	1.8			
8				Wet, gray fine SAND, trace silt		S-4	2-1-1-1	1.5			
10											
12	12.0										
14			OL	Wet, brown/ gray fine SAND, some silt, some organics with wood fibers (peat)		S-5	1/18"-1	1.3			
16	16.0										
18			SP	Wet, gray fine SAND, trace silt, trace clay		S-6	4-7-7-7	1.1			
20	20.0										
22											

NOTES:
1. Boring terminated at 20 feet below grade.
2. Wet on spoon at 4.0 feet below grade. Water level through augers at 2.6 feet below grade.
3. Upon auger removal, water at 2.0 ft, caved at 3.5 feet.
4. Borehole backfilled with cuttings mixed with bentonite. Surface patched with bituminous concrete cold patch.

TEST BORING TB-2

Subsurface Evaluation
York Road Flood Study
South Bethany, Delaware
CG.4007.GA

Date Started : August 27, 2024
Date Completed : August 27, 2024
Logged by : M. Natrin
Weather : Sunny, 80s
Driller/Agency : J. Truver/CGC Geoservices

Drilling Equipment : CME 75 Truck
Drilling Methods : HSA,SPT

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0	0.3			Bituminous Concrete Pavement (4 inches)							
2				Moist, gray/ dark gray fine to medium SAND, little silt, trace clay		S-1	2-3-5-9	1.4			▼
4			SM								
				Wet, gray fine to coarse SAND, little silt		S-2	4-6-7-6	1.7			
6				Wet, gray fine SAND, trace to little silt		S-3	2-1-2-2	2.0			
8	8.0		OL	Wet, gray/ dark brown fine SAND, and woody organics (peat), trace medium sand		S-4	1-1-1-1	1.5			
10	10.0										
12			SM								
14				Wet, gray fine SAND, little silt		S-5	3-4-2-4	1.0			
16	16.0										
18			SP								
				Wet, gray fine SAND, trace silt		S-6	6-9-9-10	1.2			
20	20.0										
22											

NOTES:
1. Boring terminated at 20 feet below grade.
2. Wet on spoon at 4.0 feet below grade. Water level through augers at 2.5 feet below grade.
3. Upon auger removal, water at 2.9 ft, caved at 3.0 feet.
4. Borehole backfilled with cuttings mixed with bentonite. Surface patched with bituminous concrete cold patch.

TEST BORING TB-3

Subsurface Evaluation
York Road Flood Study
South Bethany, Delaware
CG.4007.GA

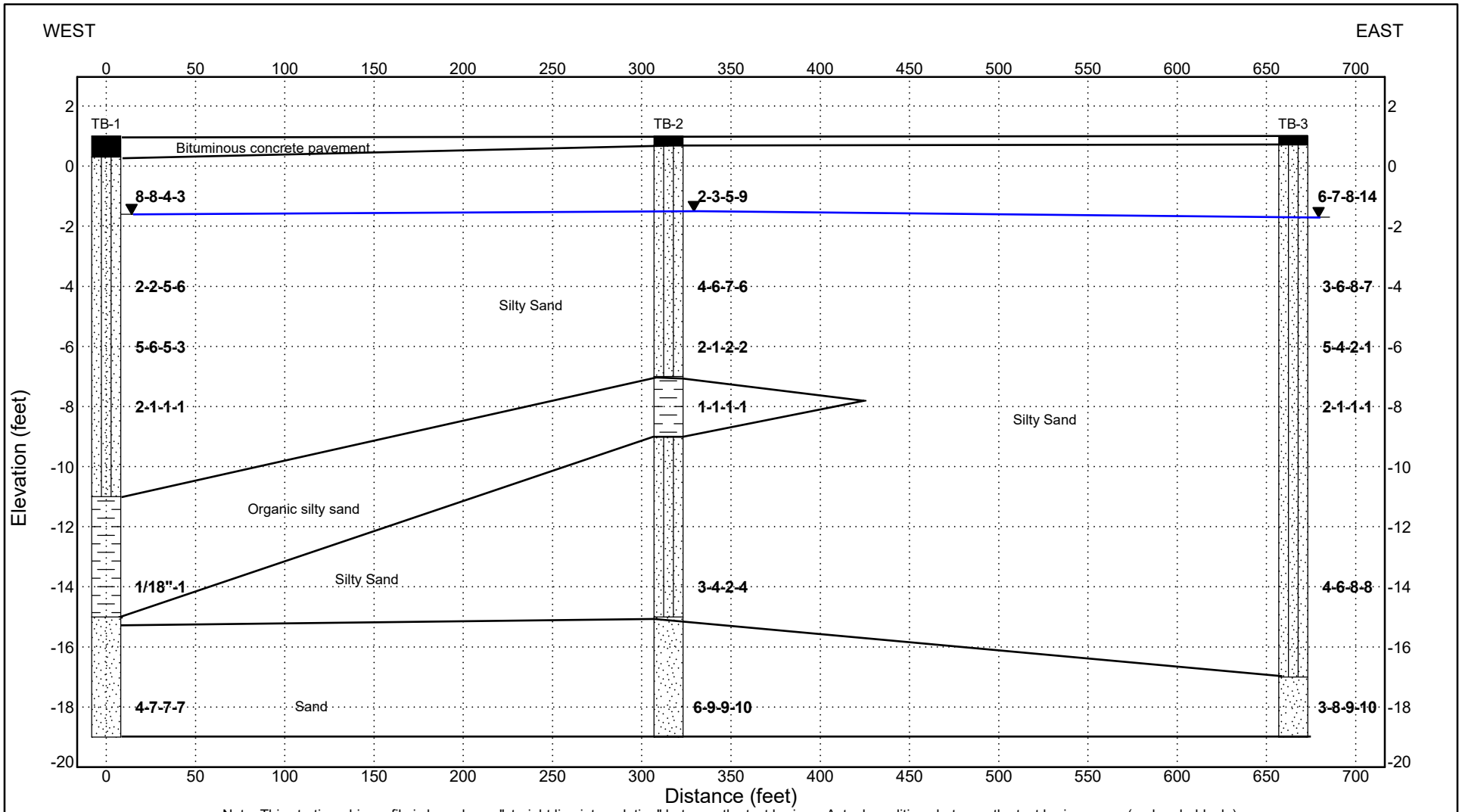
Date Started : August 27, 2024
Date Completed : August 27, 2024
Logged by : M. Natrin
Weather : Sunny, 80s
Driller/Agency : J. Truver/CGC Geoservices

Drilling Equipment : CME 75 Truck
Drilling Methods : HSA,SPT

Sample Condition: Remolded
Water Levels: During Drilling

Depth in feet	Layer Depth feet	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0	0.3			Bituminous Concrete Pavement (4 inches)							
2				Moist, brown / gray fine to medium SAND, little silt		S-1	6-7-8-14	1.9			▼
4				Moist, gray fine to medium SAND, trace silt		S-2	3-6-8-7	1.3			
6				Moist, gray fine to medium SAND, trace to little silt		S-3	5-4-2-1	1.4			
8			SM	Moist, gray fine to medium SAND, trace to little silt		S-4	2-1-1-1	2.0			
14				Moist, gray fine to medium SAND, little silt		S-5	4-6-8-8	1.1			
18	18.0		SP	Wet, brown/ gray fine SAND, trace silt		S-6	3-8-9-10	1.4			
20	20.0										
22											

NOTES:
1. Boring terminated at 20 feet below grade.
2. Wet on spoon at 4.0 feet below grade. Water level through augers at 2.7 feet below grade.
3. Upon auger removal, water at 2.9 ft, caved at 3.0 feet.
4. Borehole backfilled with cuttings mixed with bentonite. Surface patched with bituminous concrete cold patch.



Note: This stratigraphic profile is based on a "straight line interpolation" between the test borings. Actual conditions between the test borings, may (and probably do) vary. Ground surface elevation at boring locations is estimated. No topographic information provided.

STRATIGRAPHIC PROFILE

CGC GEOSERVICES

Subsurface Evaluation
York Road Flood Study
South Bethany, Delaware
CG.4007.GA

LEGEND

- Pavement
- SP - Poorly graded sand
- SM - silty sand
- OL - organic silty sand

GENERAL NOTES

VISUAL UNIFIED CLASSIFICATIONS: The soil samples are described by color, major constituent, modifiers (by percentage), and density (or consistency). Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a No. 200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a No. 200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are noncohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

The Unified Soil Classification symbols are:

COARSE GRAINED SOILS

GW - Well graded gravels
GP - Poorly graded gravels
GM - Silty gravels
GC - Clayey gravels
SW - Well graded sands
SP - Poorly graded sands
SM - Silty sands
SC - Clayey sands

FINE GRAINED SOILS

ML - Silts of low plasticity
CL - Clays of low to medium plasticity
OL - Organic silt clays of low plasticity
MH - Silts of high plasticity
CH - Clays of high plasticity
OH - Organic silt clays of high plasticity
PT - Peat and highly organic soils

SIZE DESCRIPTION

F - Fine
M - Medium
C - Coarse
G - Gravel

MODIFIERS (PERCENTAGE)

Tr -	Trace	1 - 10%
Ltl -	Little	11 - 20%
Some		21 - 35%
& -	And	36 - 50%

COLOR

Or - Orange
Yel - Yellow
Br - Brown
Blk - Black
Gr - Gray
R - Red
Vc - Varicolored
Dk - Dark
Lt - Light

DENSITY: COARSE GRAINED SOILS

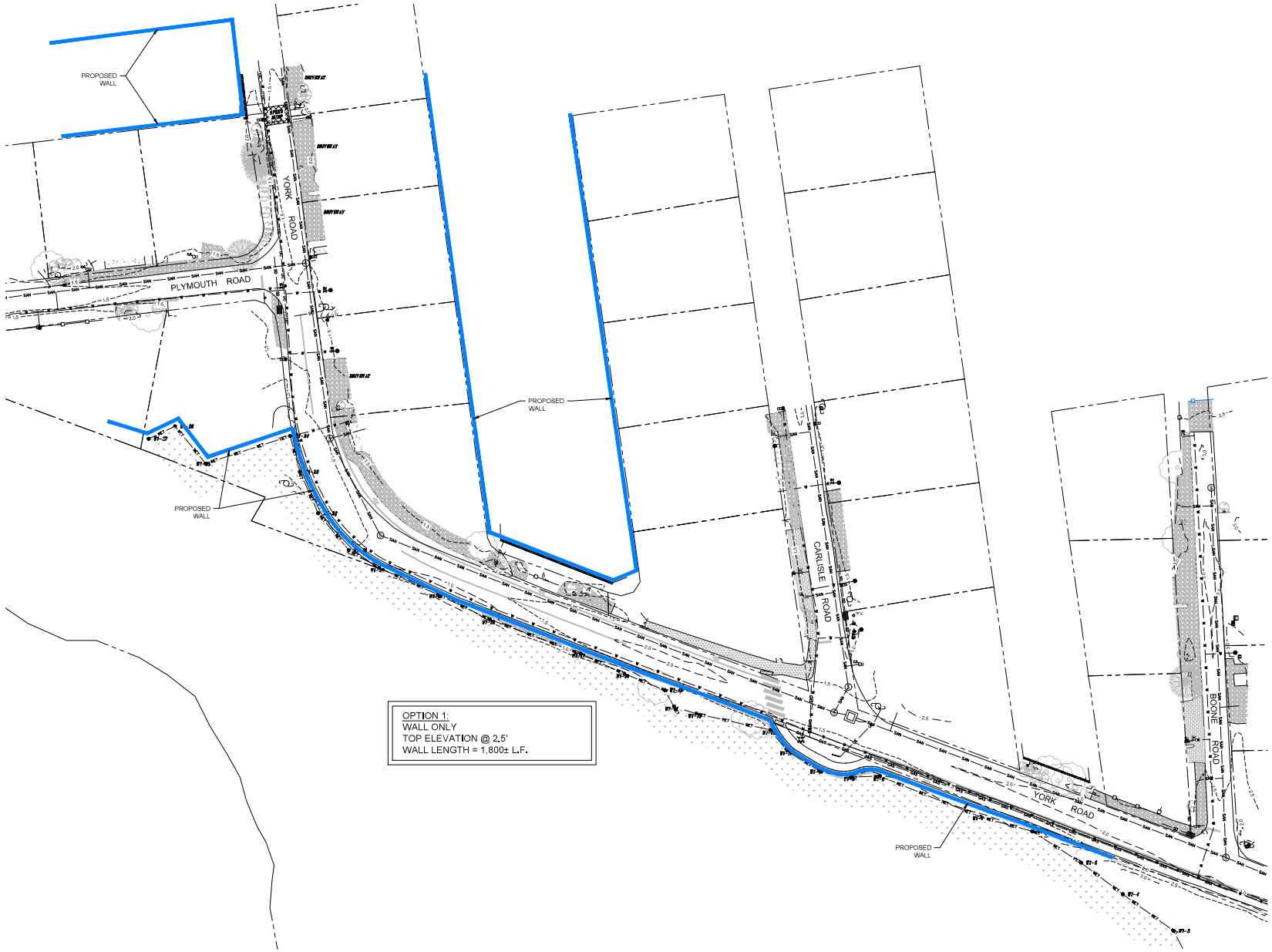
Very loose	4 blows/ft or less
Loose	5 to 10 blows/ft
Medium	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft or more

CONSISTENCY: FINE GRAINED SOILS

Very soft	2 blows/ft or less
Soft	3 to 4 blows/ft
Medium	5 to 8 blows/ft
Stiff	9 to 15 blows/ft
Very stiff	16 to 30 blows/ft
Hard	31 blows/ft or more

NOTE: The Standard Penetration Test "N" value is the number of blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

APPENDIX C
Seawall Design Plans



AECOM

PROJECT

YORK ROAD
FLOOD MITIGATION
PROJECT

YORK ROAD
SOUTH BETHANY BEACH
DELAWARE

CLIENT

SOUTH BETHANY BEACH

CONSULTANT

AECOM
248 Chapman Road, Suite 101
Newark, Delaware, 19702
302.781.5909 tel
www.aecom.com

LOCATION MAP

Google Earth Not To Scale

SCALE

0 30' 60'
1" = 30'

NOT FOR CONSTRUCTION

ISSUE/REVISION

	11-6-24	
I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60727673

SHEET TITLE

OPTION 1:
WALL ONLY

SHEET NUMBER

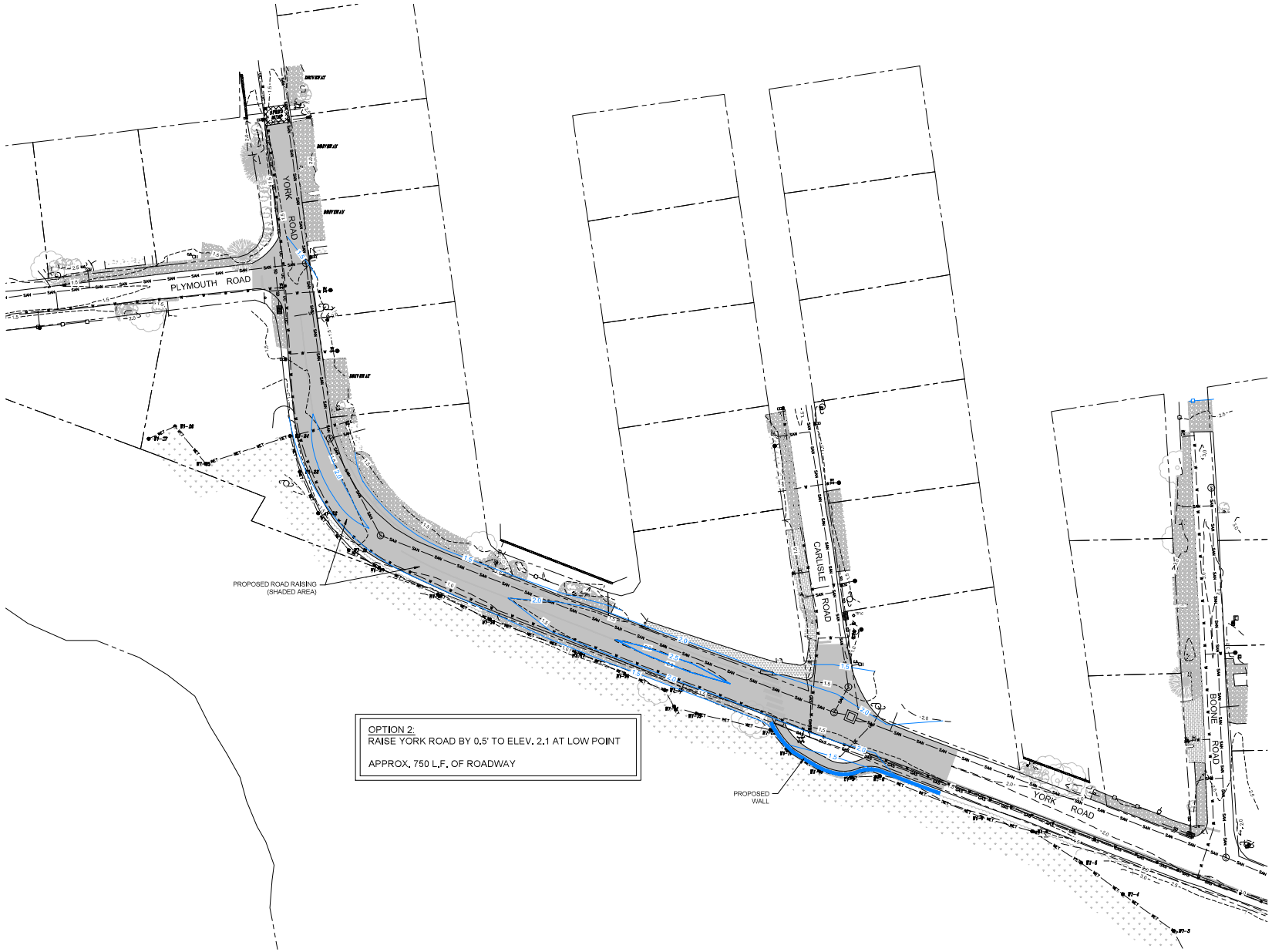
V-01

Project Management Initials Designer Checked Approved ARCH D 24" x 36"

Last saved by SEAN.DALY (2024-11-25) Last Plotted: 2024-11-25
File name: J:\WILMINGTON\CLIENT\SBB\60727673_SOUTH BETHANY\YORK ROAD FLOOD MITIGATION PROJECT\CAD\YORK ROAD OPTIONS.DWG

Printed on ___% Post-Consumer Recycled Content Paper

APPENDIX D
Elevating York Road Design Plans



AECOM

PROJECT

YORK ROAD
FLOOD MITIGATION
PROJECT

YORK ROAD
SOUTH BETHANY BEACH
DELAWARE

CLIENT

SOUTH BETHANY BEACH

CONSULTANT

AECOM
248 Chapman Road, Suite 101
Newark, Delaware, 19702
302.781.5909 tel
www.aecom.com

LOCATION MAP

Google Earth Not To Scale

SCALE

0 30' 60'
1" = 30'

NOT FOR CONSTRUCTION

ISSUE/REVISION

I/R	DATE	DESCRIPTION
	11-8-24	

KEY PLAN

PROJECT NUMBER

60727673

SHEET TITLE

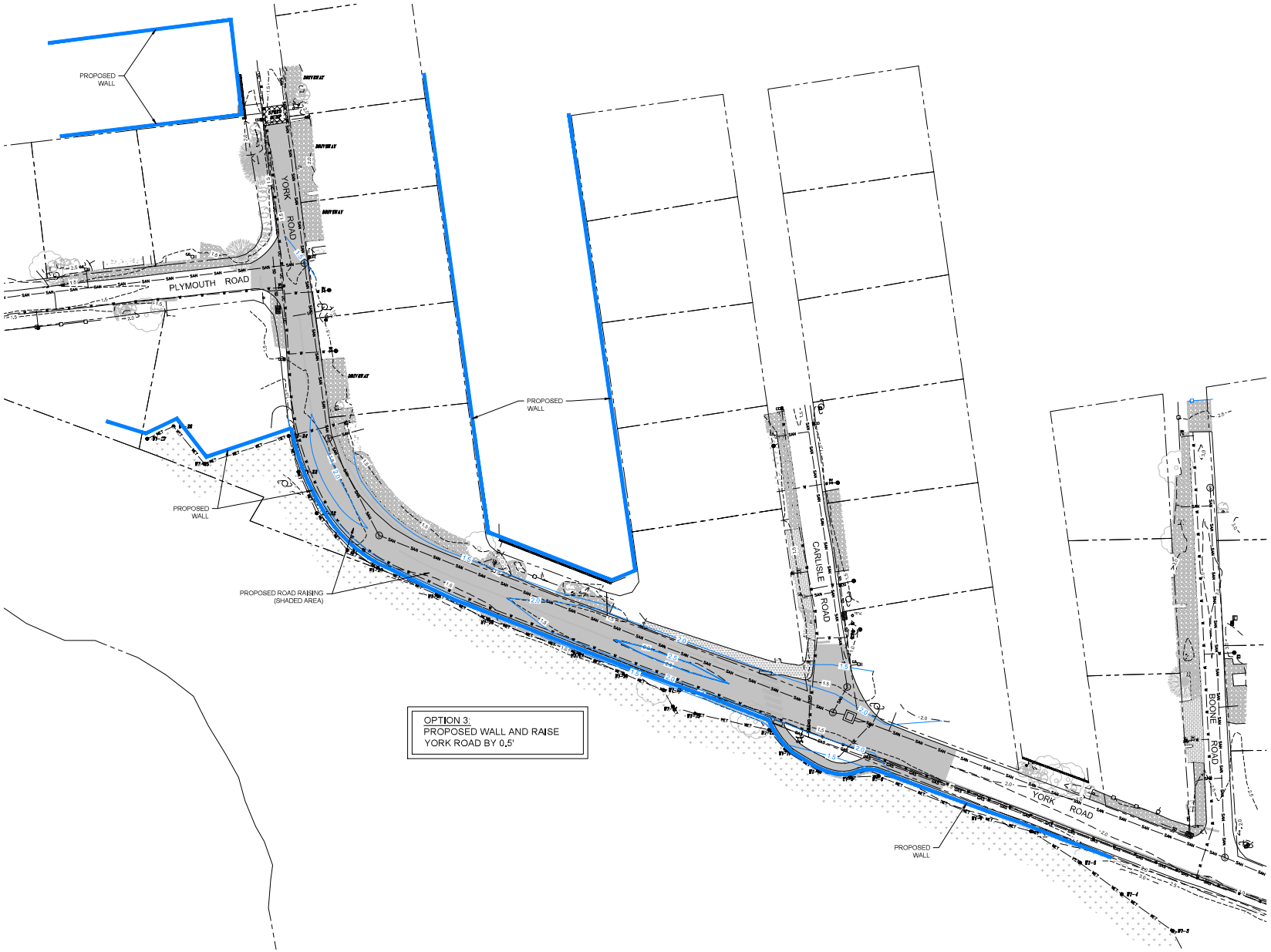
OPTION 2:
RAISE YORK ROAD 0.5'

SHEET NUMBER

V-02

APPENDIX E

Combination of Seawall and Elevating York Road Design Plans



AECOM

PROJECT

YORK ROAD
FLOOD MITIGATION
PROJECT

YORK ROAD
SOUTH BETHANY BEACH
DELAWARE

CLIENT

SOUTH BETHANY BEACH

CONSULTANT

AECOM
248 Chapman Road, Suite 101
Newark, Delaware, 19702
302.781.5909 tel
www.aecom.com

LOCATION MAP

Google Earth Not To Scale

SCALE

0 30' 60'
1" = 30'

NOT FOR CONSTRUCTION

ISSUE/REVISION

I/R	DATE	DESCRIPTION
	11-6-24	

KEY PLAN

PROJECT NUMBER

60727673

SHEET TITLE

OPTION 3:
PROPOSED WALL AND RAISE
YORK ROAD BY 0.5'

SHEET NUMBER

V-03