ROY COOPER
Governor
MARY PENNY KELLEY
Secretary
WILLIAM F. LANE
General Counsel

NORTH CAROLINA
Environmental Quality

TO: The Coastal Resources Commission

FROM: Christine A. Goebel, DEQ Assistant General Counsel

DATE: November 8, 2024 (for the November 13-14, 2024 CRC Meeting)

RE: **Variance Request by Town of Oak Island (CRC-VR-24-07)**

Petitioner Town of Oak Island owns the streets and rights-of-way at Ocean Drive between Sherrill Street and Crowell Street in Oak Island, Brunswick County. The Site is currently being used as a street-end beach access. Petitioner proposes to develop the Site with a underground stormwater infiltration system. On March 4, 2024, DCM denied the Town's CAMA Minor Permit application as the proposed project did not meet the applicable 60' setback measured from the PPVL as required by 7H.0306 or the setback behind the frontal dune, and did not meet 7H.0308(c)(1) which us the dune protection rule. The Town now seeks a variance from these rules in order to develop the project as shown in their application.

The following additional information is attached to this memorandum:

Attachment A: Relevant Rules
Attachment B: Stipulated Facts
Attachment C: Petitioner's Positions and Staff's Responses to Variance Criteria
Attachment D: Petitioner's Variance Request Materials
Attachment E: Stipulated Exhibits including powerpoint

cc(w/enc.): Brian Edes, Esq., Petitioners' Attorney, electronically
Mary Lucasse, Special Deputy AG and CRC Counsel, electronically

ATTACHMENT A **RELEVANT RULES**

SECTION .0300 - OCEAN HAZARD AREAS

15A NCAC 07H .0301 OCEAN HAZARD CATEGORIES

The Ocean Hazard categories of AECs encompass the natural hazard areas along the Atlantic Ocean shoreline where, because of their vulnerability to erosion or other adverse effects of sand, wind, and water, uncontrolled or incompatible development could endanger life or property. Ocean hazard areas include beaches, frontal dunes, inlet lands, and other areas in which geologic, vegetative and soil conditions may subject the area to erosion or flood damage.

15A NCAC 07H .0302 SIGNIFICANCE OF THE OCEAN HAZARD CATEGORY

(a) Hazards associated with ocean shorelines are due to the constant forces exerted by waves, winds, and currents upon the unstable sands that form the shore. During storms, these forces are intensified and can cause changes in the bordering landforms and to structures located on them. Ocean hazard area property is in the ownership of a large number of private individuals as well as several public agencies and is used by a vast number of visitors to the coast. Ocean hazard areas are critical due to both the severity of the hazards and the intensity of interest in these areas.

(b) The location and form of the various hazard area landforms, in particular the beaches, dunes, and inlets, are in a permanent state of flux, responding to meteorologically induced changes in the wave climate. For this reason, the siting of development on and near these landforms shall be subject to the provisions in this Section in order to avoid their loss or damage. The flexible nature of these landforms presents hazards to development situated immediately on them and offers protection to the land, water, and structures located landward of them. The value of each landform lies in the particular role it plays in affording protection to life and property. Development shall not diminish the energy dissipation and sand storage capacities of the landforms essential to the maintenance of the landforms' protective function.

15A NCAC 07H .0303 MANAGEMENT OBJECTIVE OF OCEAN HAZARD AREAS

(a) The CRC recognizes that absolute safety from the destructive forces of the Atlantic Ocean shoreline is an impossibility for development located adjacent to the coast. The loss of life and property to these forces, however, can be greatly reduced by the proper location and design of structures and by care taken in prevention of damage to natural protective features particularly primary and frontal dunes. Therefore, it is the CRC's objective that development in ocean hazard areas shall be sited to minimize danger to life and property and achieve a balance between the financial, safety, and social factors that are involved in hazard area development.

(b) The rules set forth in this Section shall further the goals set out in G.S. 113A-102(b), to minimize losses to life and property resulting from storms and long-term erosion, prevent encroachment of permanent structures on public beach areas, preserve the natural ecological conditions of the barrier dune and beach systems, and reduce the public costs of development within ocean hazard areas, and protect common-law and statutory public rights of access to and use of the lands and waters of the coastal area.

15A NCAC 07H .0306 GENERAL USE STANDARDS FOR OCEAN HAZARD AREAS

(a) In order to protect life and property, all development not otherwise specifically exempted or allowed by law or elsewhere in the Coastal Resources Commission's rules shall be located according to whichever of the following is applicable:

(1) The ocean hazard setback for development shall be measured in a landward direction from the vegetation line, the pre-project vegetation line, or the measurement line, whichever is applicable.

(2) The ocean hazard setback shall be determined by both the size of development and the shoreline long term erosion rate as defined in Rule .0304 of this Section. "Development size" is defined by total floor area for structures and buildings or total area of footprint for development other than structures and buildings. Total floor area includes the following:

(A) The total square footage of heated or air-conditioned living space;

(B) The total square footage of parking elevated above ground level; and

(C) The total square footage of non-heated or non-air-conditioned areas elevated above ground level, excluding attic space that is not designed to be load-bearing.

Decks, roof-covered porches, and walkways shall not be included in the total floor area unless they are enclosed with material other than screen mesh or are being converted into an enclosed space with material other than screen mesh.

(3) With the exception of those types of development defined in 15A NCAC 07H .0309(a), no development, including any portion of a building or structure, shall extend oceanward of the ocean hazard setback. This includes roof overhangs and elevated structural components that are cantilevered, knee braced, or otherwise extended beyond the support of pilings or footings. The ocean hazard setback shall be established based on the following criteria:

(A) A building or other structure less than 5,000 square feet requires a minimum setback of 60 feet or 30 times the shoreline erosion rate, whichever is greater;

***

(I)Infrastructure that is linear in nature, such as roads, bridges, pedestrian access such as boardwalks and sidewalks, and utilities providing for the transmission of electricity, water, telephone, cable television, data, storm water, and sewer requires a minimum setback of 60 feet or 30 times the shoreline erosion rate, whichever is greater;

1. Petitioner, Town of Oak Island ("Petitioner" or "Town"), is a North Carolina municipal corporation and body politic organized and existing in Brunswick County, North Carolina.

2. The Proposed project ("Project") is located along Ocean Drive, between the intersections of Crowell Street and Sherrill Street. The extent of the project spans approximately 540 linear feet of Ocean Drive and includes the public beach access located between 1009 and 1101 Ocean Drive (the "Site"). Photographs of the Site are shown on the PowerPoint attached as a stipulated exhibit.

3. The Town owns Ocean Drive and Crowell Street, which is the Site of the Project. These streets were publicly dedicated to and accepted by the Town, as shown on the 1955 plat recorded at Map Book 4, Page 34 of the Brunswick County Registry, attached as a stipulated exhibit.

4. The average annual erosion rate in the Site is 2'/year, as shown on the attached diagram from the DCM Map Viewer, attached as a stipulated exhibit. Per 15A NCAC 7H.0306(a)(3)(I) which allows for a setback of 60' landward of the pre-project vegetation line for "infrastructure that is linear in nature, such as roads, bridges, pedestrian access such as boardwalks and sidewalks, and utilities providing for the transmission of electricity, water, telephone, cable television, data, storm water…"

5. This Site is within the boundaries of a large-scale nourishment project and is subject to a pre-project vegetation line from 1998. The location of this line, as well as the historic ocean shorelines, is shown on the attached diagram from the DCM Map Viewer, attached as a stipulated exhibit.

6. The Site is located within the Ocean Erodible Area of Environmental Concern ("AEC") and so any development within this AEC requires approval through a CAMA permit per G.S. 113A-118.

7. The Town asserts that its existing stormwater infrastructure is insufficient to manage the increased frequency and intensity of flooding events that impact Ocean Drive and the properties adjacent to Ocean Drive. Examples of these flooding events are depicted in the pictures of flooding provided by the Town, attached as a stipulated exhibit.

8. The Town asserts that the Project will address persistent roadway and driveway flooding along Ocean Drive as well as the side streets with the installation of an underground stormwater dune infiltration system.

9. The Project narrative describes the Project as follows: the Project will use 540 linear feet of 18" reinforced concrete pipe and five NCDOT catch basins installed in the dune to capture ponding eater from Ocean Drive. A small pump station with wet well and 100' of 6" PVC force main will push stormwater into an approximately 2,670 SF underground infiltration chamber system. The chambers will be located underneath the existing beach access in the dune system. The existing ramp and dune topography will be rebuilt and revegetated. A copy of the narrative is attached as a stipulated exhibit.

10. The Town asserts that thirty-one residential properties will directly benefit from this project, as road and driveway access are severely impacted due to the periodic roadway flooding of Ocean Drive. These 31 lots are shown on the project drawing as lots touching the blue shaded "flooding" area.

11. The Town asserts that the reduction of flooding severity and duration will restore access to Ocean Drive, which has four (4) public beach access points within the flooded area and is a very busy road during tourist seasons. A popular restaurant and community building is located just east of the flooding area, meaning these areas have limited road access during frequent flooding events. The flooding can impede emergency responders.

12. The Town asserts that Ocean Drive and the immediate surrounding area has experienced growth and property development in the last ~~5~~ 12 years adding increased demand to the public infrastructure, including roads, sanitary sewer, other utility service, and stormwater management. In addition, there are vacant parcels within this area that may exacerbate these conditions as future development occurs. Developed and vacant parcels are shown on the aerial 2023 Development Site Map attached as a stipulated exhibit.

13. The proposed project will construct an underground dune infiltration system (DIS) within the frontal dune system at the Crowell Street public beach access to, as the Town asserts, reduce the chronic flooding on Ocean Drive between SE 78th Street and Barbee Boulevard. Roadway flooding in this area spans approximately 1,300 linear feet and impacts driveway access to thirty-one (31) residential properties shown touching the blue shaded area on the project plan.

14. The Town asserts that flooding also impacts the operation of a sanitary sewer pump station located at the corner of Sherrill St and Ocean Drive. Active erosion has been observed around the lid. Pump station failure could lead to dangerous sanitary sewer overflows. The Town asserts that frequent flooding of pavement and other adjacent utilities is causing deterioration of those assets and decreased service life as well.

15. The proposed DIS project includes approximately 540 linear feet of 18" reinforced concrete pipe (RCP) and five (5) standard NCDOT catch-basins installed to capture ponding water on Ocean Drive. A small pump station with wet well and 100 linear feet of a 6" PVC force main will push stormwater across the beach access area and up to an approximately 2,670 square-foot underground infiltration chamber system. The infiltration system will be located underneath the existing beach access in the dune system. The beach access ramp and the dune topography and ecosystem will be rebuilt and restored with native plantings.

16. The proposed site's proximity to public beach access provides educational opportunities for visitors and residents to learn about the benefits of infiltration systems and stormwater management. The Town now proposes to install signage at the Site explaining the DIS system and how it functions.

17. The Town asserts that the project site was selected to maximize the use of the existing dune system and the available publicly owned land near known flooding locations. The feasibility of other DIS sites was investigated by engineering firm WK Dickson as part of the "Ocean Drive Drainage Study" dated August 24, 2021, a copy of which is attached as a stipulated exhibit. This study evaluated eight other sites in the vicinity of areas of known flooding for the following:

    • Feasibility of using the Town's Public Beach accesses to determine if the ponded flood waters can be infiltrated into the Secondary Dune system.

    • Feasibility of diverting flood waters to the existing Town Right-of-Way on E. Pelican Drive to determine if the existing Right-of-Way can be converted into an infiltration gallery to infiltrate the ponded flood waters.

    • Feasibility of diverting flood waters to the existing Satellite Water Reclamation Facility (SWRF).

    • A geotechnical analysis to determine the Seasonally High-Water Table (SHWT) and hydraulic conductivity of in-situ soils.

    • The available site area ensures proper ground elevation and vertical separation to SHWT and horizontal separation between the infiltration system and surrounding structures, including residential walkways and residential buildings.

    • Estimate of the volume of water ponding within the roads.

    • Evaluation of the size of the pumps to be comparable to the stormwater infiltration rate based upon the surface area of the proposed infiltration system.

    • Evaluation of reducing flooding level (draw-down) in less than twelve hours.

18. After the Town's review and consultation with the engineering firm, it was determined by both the engineering firm and Town staff that the Crowell Street DIS site to be the most feasible site based on the above criteria. Reduced efficacy and increased costs would be assessed if a different method or site was selected to improve flooding along Ocean Drive in the vicinity of the Crowell Street intersection.

19. On September 20, 2023, DCM Field Representative Patrick Amico met with the Town's CAMA Agents WK Dickson Consultants (Mark Horstman, PE) on the Site to discuss the Project.

20. On or about October 6, 2023, the Town, through its authorized CAMA agent WK Dickson Consultants (Mark Horstman, PE), submitted application materials for a CAMA Minor Permit to DCM. A copy of the cover letter, minor permit application form, agent form, notice map, site plans, AEC Hazard Notice are attached as stipulated exhibits.

21. On December 14, 2023, Mr. Amico emailed the Town's agent with a list of items needed for a complete application. On January 10, 2024, the Town's agent responded through a letter addressing the items needed and the documents were sent on January 17, 2024. A copy of this email and response are attached as stipulated exhibits.

22. Notice of the proposed project was received by24 adjacent owners, some of whom were riparian and others were adjacent but not riparian. A list of the owners whom the Town notified is attached as a stipulated exhibit, along with notice information.
23. As shown in the site plans, portions of the project did not the 60' setback from the pre-project vegetation line. The most waterward portion of the DIS is approximately 5' landward of the vegetation line and there is approximately 1000 SF of structure waterward of the 60' setback from the PPVL.

24. On March 4, 2024, DCM, through District Manager Tara MacPherson, denied the Town's minor permit application on the grounds that the proposed development was inconsistent with The rules of the Commission, including:

    - 15A NCAC 7H.0306(a)(3) as portions of the Project do not meet the applicable 60'oceanfront erosion setback as measured landward from the PPVL.
    - 15A NCAC 7H.0309- to show that the Project does not meet any of the exceptions to the oceanfront setback.
    - 15A NCAC 7H.0306(a)(5) requires development to be landward of the frontal dune or oceanfront setback whichever is landward. In this case, the PPVL is landward.
    - 15A NCAC 7H.0308(b)(1) *** the correct cite is actually (c)(1)** – dune protection

25. In April of 2024, the Town received a Golden Leaf Foundation grant in the amount of $579,500 for this project. A copy of the award letter is attached as a stipulated exhibit.

26. The Town seeks a variance from the Commission's oceanfront erosion setback rules found at 15A NCAC 7H .0306 *et seq*, in order to develop the proposed stormwater infiltration system as proposed.

27. The Town stipulates that the proposed project is inconsistent with the rule(s) as listed in the denial letter.

28. As part of the variance process, the Town has notified the adjacent property owners that they are seeking this variance.

29. DCM has received comment on the proposed variance from the following and copies of the comment is attached as stipulated exhibits:

    - Pamela Wedding of 1101 Ocean Drive in support (9/11/24)
    - Patrick Timm of 1106 Ocean Drive in support (9/5/24)

STIPULATED EXHIBITS:

1. Plat Map 4/34
2. Erosion Rate for Site on Map Viewer
3. PPVL on Map Viewer
4. Historic Shorelines on Map Viewer
5. 2023 Ocean Dr. Development Site Map
6. CAMA Minor Permit Application Materials
7. Incomplete letter and response
8. Notice of project to Adjacent Riparian Owners (and other adjacent owners)
9. August 2021 Ocean Drainage Study by WK Dickson
10. March 4, 2024 Denial Letter
11. Golden Leaf Award Letter
12. Golden Leaf Appendices 11 - Crowell St Flooding Pics
13. Golden Leaf Appendices 12 - Documentation of Flooding
14. July 15, 2024 letter – WK Dickson
15. Notice of Variance Request to adjacent riparian owners with tracking
16. Two emails in support
17. PowerPoint with aerial and ground level photographs of the Site and surrounding area

ATTACHMENT C PETITIONER'S and STAFF'S POSITIONS

I. Will strict application of the applicable development rules, standards, or orders issued by the Commission cause the petitioner unnecessary hardships? If so, the petitioner must identify the hardships.

Petitioners' Position: Yes.

The Town's existing stormwater infrastructure is insufficient to manage the increased frequency and intensity of flooding events that impact Ocean Drive and the properties adjacent to Ocean Drive. The reduction of flooding severity and duration will restore access to Ocean Drive, which has four (4) public beach access points within the flooded area and is a very busy road during tourist seasons. A popular restaurant and community building is located just east of the flooding area, meaning these areas have limited road access during frequent flooding events. Additionally, flooding of Ocean Drive prevents emergency responders and limits access to critical facilities. Moreover, the flooding has also started to undermine critical sanitary sewer infrastructure and other utilities in the road right-of-way. The Town of Oak Island has secured grant funding from the Golden Leaf Foundation in the amount of $579.5000 to install a stormwater dune infiltration system (DIS). The DIS is designed to work within/under the dunes. These hardships will be alleviated if the Town is allowed to install the proposed DIS project. The Commission's Ocean Hazard rules are intended to protect oceanfront dunes by keeping significant development landward of these important features, and also to minimize losses to property from storms and long-term erosion. In this case, the dune infiltration system (DIS) is designed to be buried under the dunes near the location of the floodwater collection point and to filter stormwater underneath the dunes. Also, the existing dune will be reconstructed and revegetated over the top of the DIS after the system is put in place. As the proposed DIS is designed to work within/under the dunes, a strict application of the ocean erosion setback causes the Town unnecessary hardships.

Staff's Position: Yes.

The Town seeks a variance from three of the Commission's oceanfront rules including 1) the oceanfront setback which requires development to be landward of the 60' setback as measured from the applicable PPVL (and does not meet any of the .0309 exceptions), 2) the setback rules which also requires development to be landward of primary and frontal dunes, and 3) 7H.0308(c)(1) which prohibits the removal of primary or frontal dunes. The Commission's Ocean Hazard rules are intended to protect oceanfront dunes by keeping significant development landward of these important features, and also to minimize losses to property from storms and long-term erosion. In this case, the dune infiltration project is designed to be buried under the frontal dune near the location of the floodwater collection point and to filter stormwater underneath the dunes. While Staff are particularly concerned about the short 5' distance of the project to the vegetation line, and the future success of the planned dune reconstruction and revegetation project after the underground systems are installed, Staff agree that strict application of the Commission's setback rules and rules protecting dunes causes the Town an unnecessary hardship where the development will be placed under the dune.

II. Do such hardships result from conditions peculiar to the petitioner's property, such as location, size, or topography of the property? Explain.

Petitioner's Position: Yes.

The project area is prone to frequent flooding events. There are no publicly owned properties in the vicinity large enough to accommodate the proposed DIS. The project site is the most viable site for this project.

Staff's Position: Yes.

Staff agree that the Town's hardships result from conditions peculiar to the Town's property, where there do not appear to be properties that are large enough to accommodate the project but are also wide enough to locate them more than 60' from the static line and which have the proper elevation, and are also near this area of flooding. When combined, these requirements for the system narrow the site selection.

III. Do the hardships result from the actions taken by the Petitioner? Explain.

Petitioners' Position: No.

The Town has not taken any action that has resulted in this hardship.

Staff's Position: No.

Staff agree that the Town's hardships do not result from their actions. There are limited location options for addressing flooding along Ocean Drive in this portion of Town. This project would work to reduce or eliminate flooding on Ocean Drive and would have limited long-term impacts on the existing dune within the setback.

IV. Will the variance requested by the petitioner (1) be consistent with the spirit, purpose, and intent of the rules, standards, or orders issued by the Commission; (2) secure the public safety and welfare; and (3) preserve substantial justice? Explain.

Petitioners' Position: Yes.

A variance to allow the development of the DIS is consistent with the spirit, purpose, and intent of the Commission's rules where the spirit of the oceanfront erosion setback rules is to protect oceanfront dune systems and to locate development more landward to reduce storm impacts. In this case, the impacts to the dune system will be short-term as the existing dune will be revegetated after installation of the DIS. Also, the risk of impacts to the DIS will be reduced because it will be buried under the dune. The proposed DIS system will address public safety and welfare by both limiting the need to close Ocean Drive due to stormwater flooding, and by reducing water quality impacts where the amount of stormwater needed to be pumped off the road will be reduced or eliminated. Locating the DIS within the existing dune in the setback area will only cause short-term impacts to the protective nature of the oceanfront dune.

Staff's Position: Yes.

Staff contends that granting a variance in order to vary the Commission's oceanfront erosion setback rules and dune protection rules to allow the development of the project is consistent with the spirit, purpose, and intent of the Commission's rules where the spirit of the oceanfront erosion setback rules is to protect oceanfront dune systems and to locate development more landward to reduce storm impacts. In this case, the impacts to the dune system are planned to be short-term as the existing dune will be rebuilt and revegetated after installation of the project. Also, the risk of impacts to the project will be reduced because it will be buried under the dune, despite it's very close 5' distance from the vegetation line. The Town has a beach management plan approved by the Commission in 2023, and a nourishment project planned for this winter or possibly next winter. That future renourishment will also help protect the reconstructed dunes and project underneath them. The proposed project will address public safety and welfare by both limiting the need to close Ocean Drive due to stormwater flooding. Locating the project within the existing dune in the setback area will cause only short-term impacts to the protective nature of the oceanfront dune. Staff agree that granting a variance would preserve substantial justice where the CAMA statute makes exceptions for buried utilities, but which do not include this project's technology, despite the similarities in purpose.

ATTACHMENT D

Petitioner's Petition Materials

(without initial proposed facts or duplicative exhibits)

CAMA VARIANCE REQUEST FORM

DCM FORM 11
DCM FILE No. OI 13-24_

PETITIONER'S NAME Town of Oak Island
COUNTY WHERE THE DEVELOPMENT IS PROPOSED Brunswick

Pursuant to N.C.G.S. § 113A-120.1 and 15A N.C.A.C. 07J .0700 *et seq.*, the above named Petitioner hereby applies to the Coastal Resources Commission (CRC) for a variance.

VARIANCE HEARING PROCEDURES

A variance petition will be considered by the CRC at a regularly scheduled meeting, heard in chronological order based upon the date of receipt of a complete petition. 15A N.C.A.C. 07J .0701(e). A complete variance petition, as described below, must be *received* by the Division of Coastal Management (DCM) a minimum of six (6) weeks in advance of the first day of a regularly scheduled CRC meeting to be eligible for consideration by the CRC at that meeting. 15A N.C.A.C. 07J .0701(e). The final set of stipulated facts must be agreed to at least four (4) weeks prior to the first day of a regularly scheduled meeting. 15A N.C.A.C. 07J .0701(e). The dates of CRC meetings can be found at DCM's website: **www.nccoastalmanagement.net**

If there are controverted facts that are significant in determining the propriety of a variance, or if the Commission determines that more facts are necessary, the facts will be determined in an administrative hearing. 15A N.C.A.C. 07J .0701(b).

VARIANCE CRITERIA

The petitioner has the burden of convincing the CRC that it meets the following criteria:

(a) Will strict application of the applicable development rules, standards, or orders issued by the Commission cause the petitioner unnecessary hardships? Explain the hardships.

(b) Do such hardships result from conditions peculiar to the petitioner's property such as the location, size, or topography of the property? Explain.

(c) Do the hardships result from actions taken by the petitioner? Explain.

(d) Will the variance requested by the petitioner (1) be consistent with the spirit, purpose, and intent of the rules, standards or orders issued by the Commission; (2) secure the public safety and welfare; and (3) preserve substantial justice? Explain.

Please make your written arguments that Petitioner meets these criteria on a separate piece of paper.
The Commission notes that there are some opinions of the State Bar which indicate that non-attorneys may not represent others at quasi-judicial proceedings such as a variance hearing before the Commission. These opinions note that the practice of professionals, such as engineers, surveyors or contractors, representing others in quasi-judicial proceedings through written or oral argument, may be considered the practice of law. Before you proceed with this variance request, you may wish to seek the advice of counsel before having a non-lawyer represent your interests through preparation of this Petition.

For this variance request to be complete, the petitioner must provide the information listed below. The undersigned petitioner verifies that this variance request is complete and includes:

____ The name and location of the development as identified on the permit application;

____ A copy of the permit decision for the development in question;

____ A copy of the deed to the property on which the proposed development would be located;

____ A complete description of the proposed development including a site plan;

____ A stipulation that the proposed development is inconsistent with the rule at issue;

____ Proof that notice was sent to adjacent owners and objectors*, as required by 15A N.C.A.C. 07J .0701(c)(7);

____ Proof that a variance was sought from the local government per 15A N.C.A.C. 07J .0701(a), if applicable;

____ Petitioner's written reasons and arguments about why the Petitioner meets the four variance criteria, listed above;

____ A draft set of proposed stipulated facts and stipulated exhibits. Please make these verifiable facts free from argument. Arguments or characterizations about the facts should be included in the written responses to the four variance criteria instead of being included in the facts.

____ This form completed, dated, and signed by the Petitioner or Petitioner's Attorney.

**Please contact DCM or the local permit officer for a full list of comments received on your permit application. Please note, for CAMA Major Permits, the complete permit file is kept in the DCM Morehead City Office.*

Due to the above information and pursuant to statute, the undersigned hereby requests a variance.

Signature of Petitioner or Attorney

July 17, 2024
Date

Brian Edes
Printed Name of Petitioner or Attorney

briane@cmclawfirm.com
Email address of Petitioner or Attorney

5002 Randall Parkway
Mailing Address

(910) 762-9711
Telephone Number of Petitioner or Attorney

Wilmington NC 28412
City State Zip

(910) 256-0310
Fax Number of Petitioner or Attorney

DELIVERY OF THIS HEARING REQUEST

This variance petition must be **received by** the Division of Coastal Management at least six (6) weeks before the first day of the regularly scheduled Commission meeting at which it is heard. A copy of this request must also be sent to the Attorney General's Office, Environmental Division. 15A N.C.A.C. 07J .0701(e).

Contact Information for DCM:

By mail, express mail or hand delivery:
Director
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

By Fax:
(252) 247-3330

By Email:
Check DCM website for the email address of the current DCM Director
www.nccoastalmanagement.net

Contact Information for Attorney General's Office:

By mail:
Environmental Division
9001 Mail Service Center
Raleigh, NC 27699-9001

By express mail:
Environmental Division
114 W. Edenton Street
Raleigh, NC 27603

By Fax:
(919) 716-6767

Revised: July 2014

ATTACHMENT E

Stipulated Exhibits

STATE of NORTH CAROLINA
COUNTY of BRUNSWICK

I J.E. Brown _____ Clerk of the Superior Court do hereby certify that H.R. Hewett a surveyor personally appeared before me this day and by oath and examination proved the due execution of the foregoing instrument. Let the said instrument be registered

Witness my hand and official seal this the
13th day of April 1935
J.E. Brown, C.S.C.

This Map supersedes maps
Book of map No. 2 page 166
Book of map No 3 page 112

PLAN of YAUPON VILLAGE

BARBEE INC. DEVELOPERS

BEING LOCATED IN A PORTION OF THE FT. CASWELL RESERVATION WHICH IS AN ADDITION TO LONG BEACH DEVELOPMENT

SMITHVILLE TWP.
BRUNSWICK Co
N.C.

scale 1" = 200FT

Resur. Feb. 29-1935
H.R. Hewett Surv.

All distance in feet
The same "

ATLANTIC OCEAN

ELIZABETH RIVER

YAUPON DRIVE

LIVEOAK

OCEAN

BOULEVARD

BARBEE

MIDDLETON

CROWELL

SHERRILL

WOMBLE

KEZIAH

TROTT

NORTON

MERCER

SELLERS

McGLAMERY

RICHMOND

M.C. GORE

McGLAMERY

Board walk

20ft walk

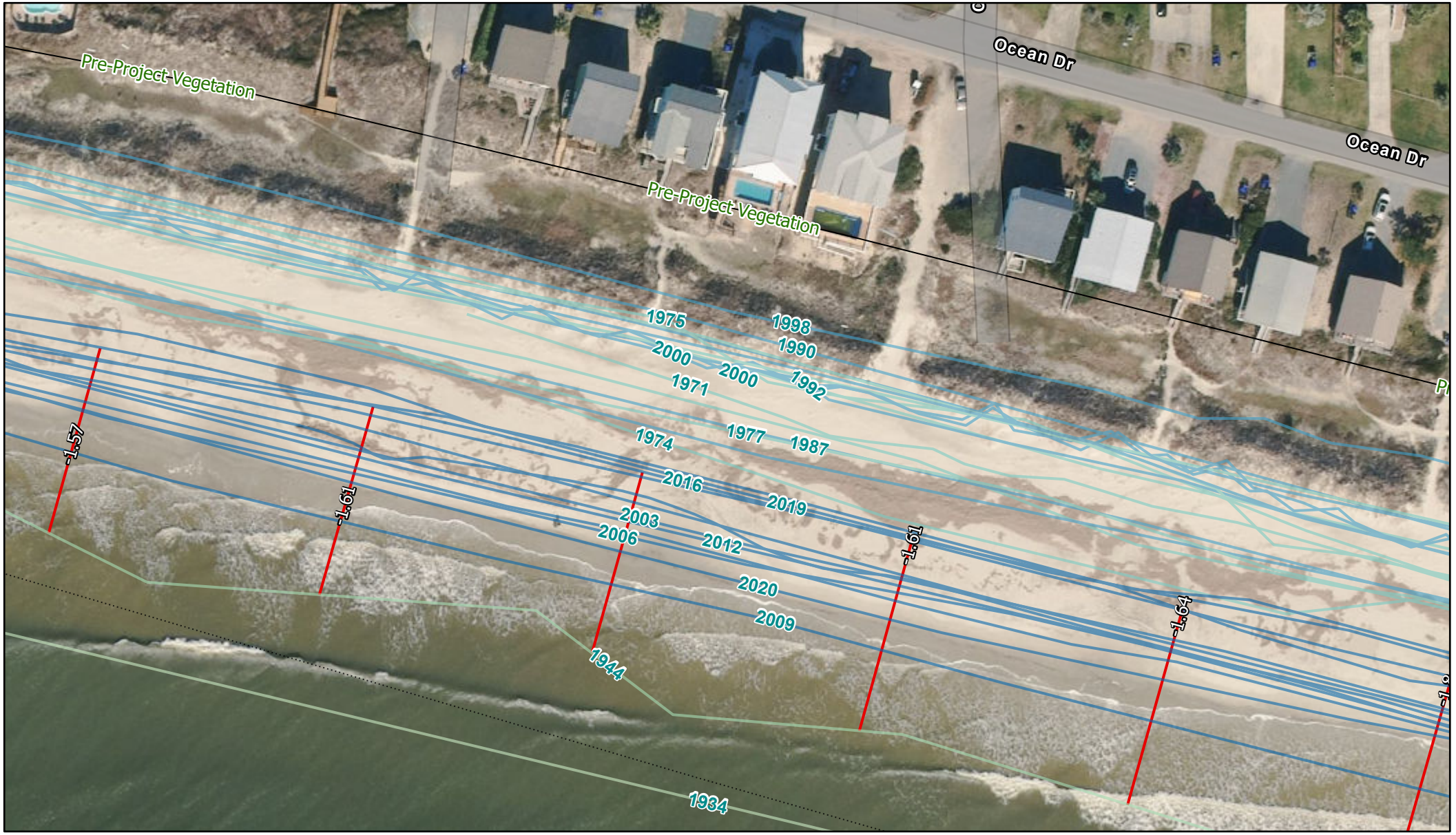
Fishing pier

Highwater mark

To Long Beach

Division of Coastal Management

018



11/8/2024, 12:14:10 PM

Setback Factors (2020)

Pre-Project Vegetation Lines

Shorelines - Oceanfront & Inlet (1849-2020)

> 1,900 – 1,940

> 1,940 – 1,960

> 1,960 – 1,980

> 1,980 – 2,000

> 2,000 – 2,020

Erosion Rates (2020)

Erosion

2020 Imagery

Red: Band_1

Green: Band_2

Blue: Band_3

1:1,128

0 0.01 0.01 0.03 mi

0 0.01 0.03 0.05 km

Town of Oak Island
2023 Development Ocean Dr Area

VACANT LAND

NEW DEVELOPMENT SINCE 2012

WK DICKSON
community infrastructure consultants

October 6, 2023 received 11/20

Patrick J. Amico
NC Division of Coastal Management/CAMA
127 Cardinal Drive Ext.
Wilmington, NC 28405

RE: Town of Oak Island, North Carolina
Minor Permit Application for the Crowell Street DIS Design Services Project

Dear Mr. Amico:

On behalf of the Town of Oak Island, we are pleased to submit a CAMA Minor Permit application and associated documents for your review and approval. This permit application is in support of the Crowell Street DIS Design Services Project, which includes the construction of a proposed system that will reduce flooding near the public beach access at the intersection of Crowell Street and Ocean Drive. This proposed system includes approximately 4 linear feet of 12" RCP (Reinforced Concrete Pipe), 534 linear feet of 18" RCP, 6 (six) standard NCDOT drop inlets, small pump with wet well, sand separator, 56 linear feet of a 4" PVC force main and a Dune Infiltration System (DIS), located near the Town's public beach access. The project will include installation of Dune Infiltration Chambers which will occupy approximately 1,627 square feet.

I have enclosed a completed and signed CAMA Minor application, half-size set of plans (including project survey), signed agent authorization form, list of adjacent property owners, a map illustrating the adjacent property owners, copies of the property owner letters, and documents confirming that the adjacent owners were notified of the project by certified mail. Please note that the Town is the "Local Government" permittee, and as such, no check is included with this submittal.

If you have any questions or require additional information, please do not hesitate to contact me at (919) 782-0495 or mhorstman@wkdickson.com.

Sincerely,

Marc Horstman, PE
Project Manager
WK Dickson & Co., Inc.

RECEIVED
NOV 20 2023
DCM WILMINGTON

720 Corporate Center Drive
Raleigh, NC 27607
Tel. 919.782.0495
Fax 919.782.9672
www.wkdickson.com

Locality Oak Island Permit Number 01 13-24

Ocean Hazard ✓ Estuarine Shoreline ____ ORW Shoreline ____ Public Trust Shoreline ____ Other ____

(For official use only)

GENERAL INFORMATION

LAND OWNER - MAILING ADDRESS

Name Town of Oak Island; Mr. Rick Patterson

Address 4601 E. Oak Island Drive

City Oak Island State NC Zip 28465 Phone 910-933-4026

Email rpatterson@oakislandnc.gov

AUTHORIZED AGENT

Name Mr. Marc T. Horstman

Address 720 Corporate Center Drive

City Raleigh State NC Zip 27607 Phone 919-782-0495

Email mhorstman@wkdickson.com

LOCATION OF PROJECT: (Address, street name and/or directions to site; name of the adjacent waterbody.)

Intersection of Crowell St. and Ocean Dr. Beach Access

DESCRIPTION OF PROJECT: (List all proposed construction and land disturbance.)

Proposed 1,627 square feet of infiltration area and new stormwater piping to drain road flooding.

SIZE OF LOT/PARCEL: _____ square feet _____ acres

PROPOSED USE: Residential ☐ (Single-family ☐ Multi-family ☐) Commercial/Industrial ☐ Other ☑

COMPLETE EITHER (1) OR (2) BELOW (*Contact your Local Permit Officer if you are not sure which AEC applies to your property*):

(1) OCEAN HAZARD AECs: TOTAL FLOOR AREA OF PROPOSED STRUCTURE: N/A square feet (includes air conditioned living space, parking elevated above ground level, non-conditioned space elevated above ground level but excluding non-load-bearing attic space)

(2) COASTAL SHORELINE AECs: SIZE OF BUILDING FOOTPRINT AND OTHER IMPERVIOUS OR BUILT UPON SURFACES: N/A square feet (includes the area of the foundation of all buildings, driveways, covered decks, concrete or masonry patios, etc. that are within the applicable AEC. Attach your calculations with the project drawing.)

STATE STORMWATER MANAGEMENT PERMIT: Is the project located in an area subject to a State Stormwater Management Permit issued by the NC Division of Energy, Mineral and Land Resources (DEMLR)?
YES ✓ NO ____

If yes, list the total built upon area/impervious surface allowed for your lot or parcel: Note that this project is not increasing any impervious area.

OTHER PERMITS MAY BE REQUIRED: The activity you are planning may require permits other than the CAMA minor development permit, including, but not limited to: Drinking Water Well, Septic Tank (or other sanitary waste treatment system), Building, Electrical, Plumbing, Heating and Air Conditioning, Insulation and Energy Conservation, FIA Certification, Sand Dune, Sediment Control, Subdivision Approval, Mobile Home Park Approval, Highway Connection, and others. Check with your Local Permit Officer for more information.

STATEMENT OF OWNERSHIP:
I, the undersigned, an applicant for a CAMA minor development permit, being either the owner of property in an AEC or a person authorized to act as an agent for purposes of applying for a CAMA minor development permit, certify that the person listed as landowner on this application has a significant interest in the real property described therein. This interest can be described as: (check one)

✓ an owner or record title, Title is vested in name of Town of Oak Island, as a beach access located within the Town's Right-of-Way

____ an owner by virtue of inheritance. Applicant is an heir to the estate of _____ ; probate was in _____ County.

____ if other interest, such as written contract or lease, explain below or use a separate sheet & attach to this application.

NOTIFICATION OF ADJACENT RIPARIAN PROPERTY OWNERS:
I furthermore certify that the following persons are owners of properties adjoining this property. I affirm that I have given ACTUAL NOTICE to each of them concerning my intent to develop this property and to apply for a CAMA permit.

(Name) (Address)

(1) See attached property owner notification sheet.
(2) _____
(3) _____
(4) _____

ACKNOWLEDGEMENTS:
I, the undersigned, acknowledge that the land owner is aware that the proposed development is planned for an area which may be susceptible to erosion and/or flooding. I acknowledge that the Local Permit Officer has explained to me the particular hazard problems associated with this lot. This explanation was accompanied by recommendations concerning stabilization and floodproofing techniques.

I furthermore certify that I am authorized to grant, and do in fact grant, permission to Division of Coastal Management staff, the Local Permit Officer and their agents to enter on the aforementioned lands in connection with evaluating information related to this permit application.

This the 3rd day of October 2023

_____
Landowner or person authorized to act as his/her agent for purpose of filing a CAMA permit application

This application includes: general information (this form), a site drawing as described on the back of this application, the ownership statement, the Ocean Hazard AEC Notice where necessary, a check for $100.00 made payable to the locality, and any information as may be provided orally by the applicant. The details of the application as described by these sources are incorporated without reference in any permit which may be issued. Deviation from these details will constitute a violation of any permit. Any person developing in an AEC without permit is subject to civil, criminal and administrative action.

RECEIVED
NOV 20 2023
DCM WILMINGTON

AGENT AUTHORIZATION FOR CAMA PERMIT APPLICATION

Name of Property Owner Requesting Permit: Town of Oak Island

Mailing Address: 4601 E. Oak Island Drive
Oak Island, NC 28465

Phone Number: 910-278-5011

Email Address: rpatterson@oakislandnc.gov

I certify that I have authorized Marc T. Horstman / WK Dickson, Inc.,
Agent / Contractor

to act on my behalf, for the purpose of applying for and obtaining all CAMA permits necessary for the following proposed development: Crowell St DIS Design Services

at my property located at public beach access at intersection of Crowell Street and Ocean Drive,

in Brunswick County.

I furthermore certify that I am authorized to grant, and do in fact grant permission to Division of Coastal Management staff, the Local Permit Officer and their agents to enter on the aforementioned lands in connection with evaluating information related to this permit application.

Property Owner Information:

Signature

DAVID Kelly JR
Print or Type Name

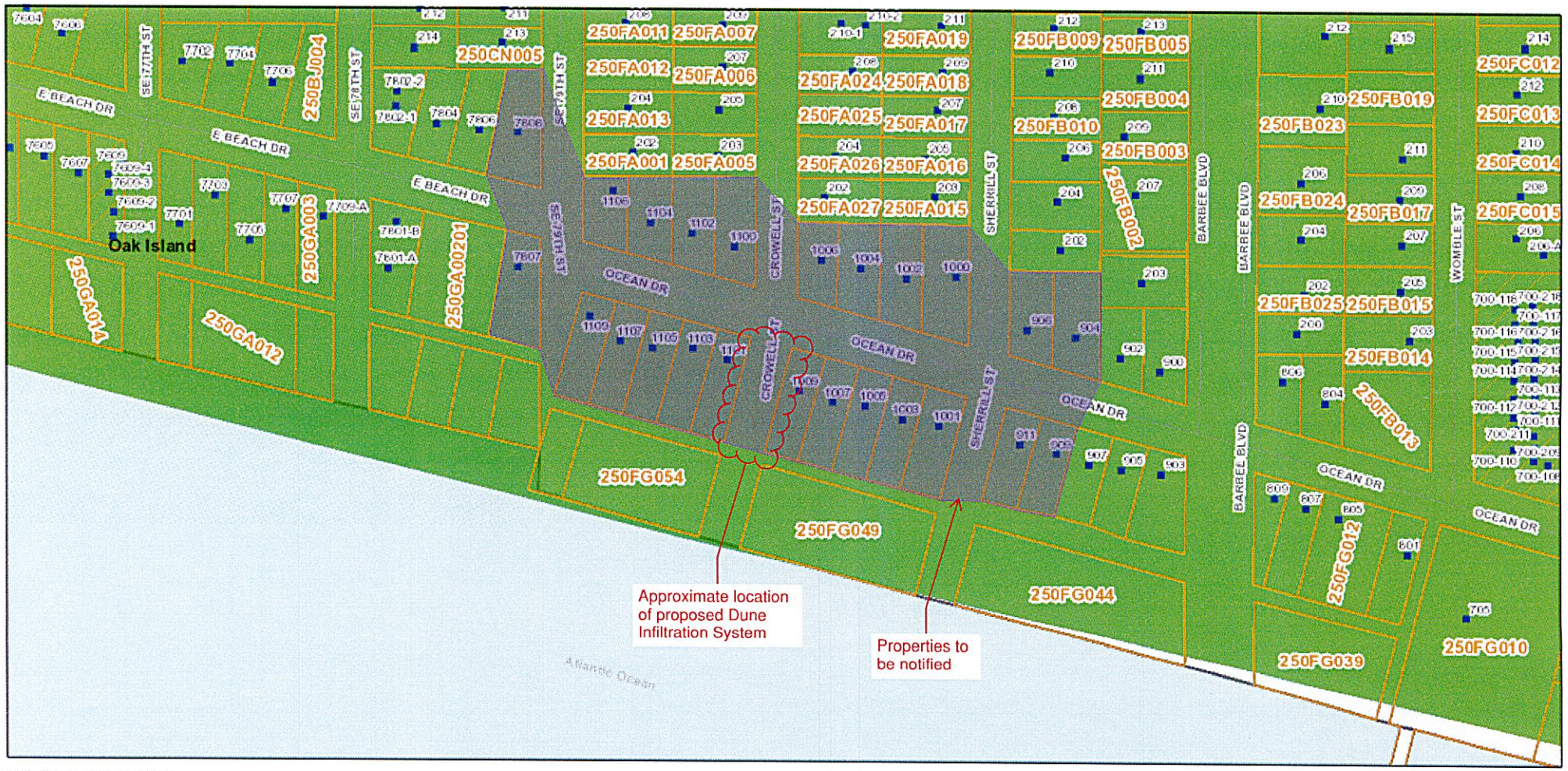
Town Manager
Title

10 / 03 / 2023
Date

This certification is valid through _____/_____/_____

RECEIVED
JAN 18 2024
DCM WILMINGTON

Brunswick County GIS Data Viewer



10/3/2023, 1:44:56 PM

1:2,000

0 0.02 0.04 0.08 mi

0 0.03 0.06 0.12 km

County Boundary

Municipalities

Bald Head Island City
Belville City
Boiling Spring Lakes City
Bolivia City
Bolivia ETJ
Calabash City
Calabash ETJ
Carolina Shores City
Carolina Shores ETJ
Caswell Beach City
County Jurisdiction
Holden Beach City
Leland City
Navassa City
Northwest City
Oak Island City
Oak Island ETJ
Ocean Isle Beach City
Ocean Isle Beach ETJ
Sandy Creek City
Shallotte City
Shallotte ETJ
Southport City
Southport ETJ
St James City
Sunset Beach City
Sunset Beach ETJ
Varnamtown City

Parcels

Condo Unit
Condo Common Area
Parcel

Roads

Interstate
US Hwy
NC Hwy
Addresses

LETTER OF TRANSMITTAL

WK DICKSON
community infrastructure consultants

720 Corporate Center Drive Raleigh, North Carolina 27607 919.782.0495 tel.

TO: NC Div. of Coastal Management
CAMA Permitting
127 Cardinal Drive Ext.
Wilmington, NC 28405
ATTENTION: Patrick J. Amico

DATE: January 17, 2024

CAMA Minor Permit Application
Crowell St DIS Design Services

We are sending via: ☒ Overnight ☐ Regular Mail ☐ Pick-up ☐ Hand Delivered

The following items: ☐ Correspondence ☐ Plans ☐ Specifications ☒ Other as listed below:

COPIES	DATE	NO.	DESCRIPTION
1	01-10-24	1	Comment Response Letter
1	01-02-24	2	Signed AEC Form
1	01-10-24	3	Revised Plans – Full Size
1	12-22-23	4	Certified Mail Receipts
1	01-17-24	5	UPS Proof of Delivery
1	10-04-23	6	$100 Check made payable to NCDEQ

THESE ARE TRANSMITTED as checked below:

☐ For Approval ☐ As Requested ☐ Approved as Submitted ☐ Returned for Corrections

☒ For Your Use ☐ For Review and Comment ☐ Approved as Noted ☐ Forward to Subcontractor

REMARKS:

Marc Horstman, PE, Project Manager, WK Dickson

RECEIVED
JAN 18 REC'D 2024
DCM WILMINGTON, NC

COPY TO: Rick Patterson, Town of Oak Island

SIGNED: Alex McMillan, PE

OCEAN HAZARD AEC NOTICE

Project is in an: X **Ocean Erodible Area** _____ **Inlet Hazard Area**

Property Owner: Town of Oak Island - David Kelly, Town Manager

Property Address: Crowell Street - Public Beach Access

Date Lot Was Platted: N/A - Town ROW

This notice is intended to make you, the applicant, aware of the special risks and conditions associated with development in this area, which is subject to natural hazards such as storms, erosion and currents. The rules of the Coastal Resources Commission require that you receive an AEC Hazard Notice and acknowledge that notice in writing before a permit for development can be issued.

The Commission's rules on building standards, oceanfront setbacks and dune alterations are designed to minimize, but not eliminate, property loss from hazards. By granting permits, the Coastal Resources Commission does not guarantee the safety of the development and assumes no liability for future damage to the development. Permits issued in the Ocean Hazard Area of Environmental Concern include the condition that structures be relocated or dismantled if they become imminently threatened by changes in shoreline configuration. The structure(s) must be relocated or dismantled within two (2) years of becoming imminently threatened, and in any case upon its collapse or subsidence.

The best available information, as accepted by the Coastal Resources Commission, indicates that the annual long-term average ocean erosion rate for the area where your property is located is 2 feet per year.

The rate was established by careful analysis of aerial photographs of the coastline taken over the past 50 years.

Studies also indicate that the shoreline could move as much as 330 feet landward in a major storm.

The flood waters in a major storm are predicted to be about 10-13 feet deep in this area.

Preferred oceanfront protection measures are beach nourishment and relocation of threatened structures. Hard erosion control structures such as bulkheads, seawalls, revetments, groins, jetties and breakwaters are prohibited. Temporary sand bags may be authorized under certain conditions.

The applicant must acknowledge this information and requirements by signing this notice in the space below. Without the proper signature, the application will not be complete.

1/2/2024

Applicant Signature *Date*

SPECIAL NOTE: This hazard notice is required for development in areas subject to sudden and massive storms and erosion. Permits issued for development in this area expire on December 31 of the third year following the year in which the permit was issued. Shortly before work begins on the project site, the Local Permit Officer must be contacted to determine the vegetation line and setback distance at your site. If the property has seen little change since the time of permit issuance, and the proposed development can still meet the setback requirement, the LPO will inform you that you may begin work. Substantial progress on the project must be made within 60 days of this setback determination, or the setback must be re-measured. Also, the occurrence of a major shoreline change as the result of a storm within the 60-day period will necessitate re-measurement of the setback. It is important that you check with the LPO before the permit expires for official approval to continue the work after the permit has expired. Generally, if foundation pilings have been placed and substantial progress is continuing, permit renewal can be authorized. It is unlawful to continue work after permit expiration.

For more information, contact:

Patrick Amico

Local Permit Officer

127 Cardinal Drive Extension, Wilmington, NC 28405

Address

NC Division of Coastal Management

Locality

910-515-5792

Phone Number

RECEIVED
JAN 18 2024
DCM WILMINGTON

Revised May 2010

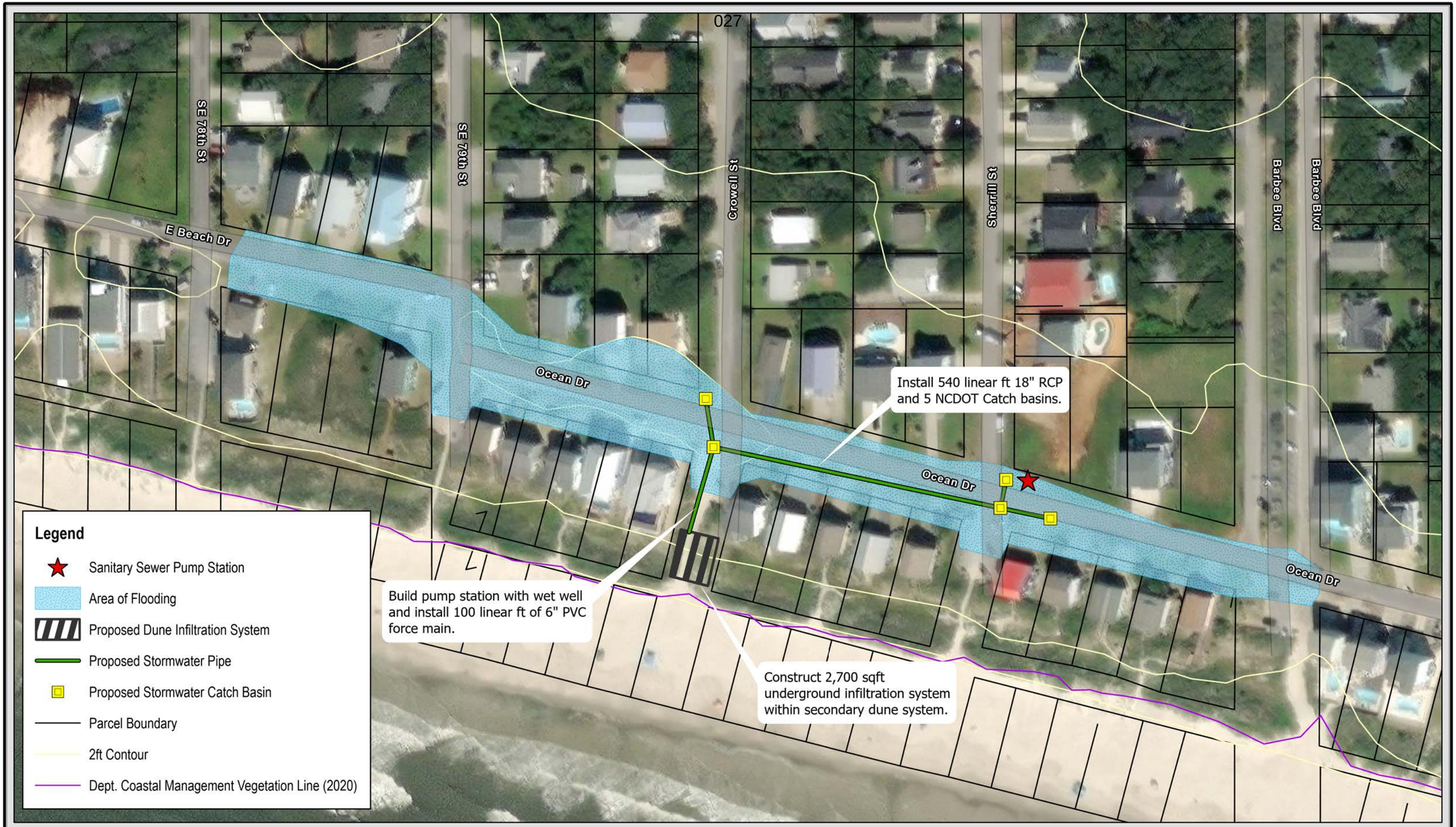
Project Narrative

This project will serve the Town of Oak Island, NC, located within Brunswick County. The project is located along Ocean Drive, between the intersections of Crowell Street and Sherrill Street. The extent of the project spans approximately 540 linear feet of Ocean Drive and includes the public beach access located between 1009 and 1101 Ocean Drive. Thirty-one (31) residential properties will directly benefit from this project, as road and driveway access are severely impacted due to roadway flooding of Ocean Drive. Reduction of flooding severity and duration will restore access to Ocean Drive, which has four (4) public beach access points within the flooded area and is a very busy road during tourist seasons. A popular restaurant and community building is located just east of the flooding area, meaning these areas have limited road access during frequent flooding events. Additionally, flooding of Ocean Drive prevents emergency responders and limits access to critical facilities. Not only does flooding affect road access, but it has also started to undermine critical sanitary sewer infrastructure and other utilities in the road right-of-way.

Oak Island has experienced rapid growth and property development in the last 5 years. Dense residential development has occurred along the beach front, adding increased demand to the public infrastructure, including roads, sanitary sewer, other utility service, and stormwater management. Both protection of public assets and reduction of flooding are critical to the Town given the ongoing development trends.

The proposed project will construct an innovative underground dune infiltration system (DIS) within the secondary dune system at the Crowell Street public beach access to significantly reduce the chronic and hazardous flooding on Ocean Drive between SE 78th Street and Barbee Boulevard. Roadway flooding in this area spans approximately 1,300 linear feet and prevents driveway access to thirty-one (31) residential properties. In some cases, flooding occurs underneath homes that are elevated on stilts, thus threatening foundations. Of even more concern, flooding impacts the operation of a sanitary sewer pump station located at the corner of Sherrill St and Ocean Drive. Active erosion has been observed around the lid. Pump station failure could lead to dangerous sanitary sewer overflows. Frequent flooding of pavement and other adjacent utilities is causing deterioration of those assets and decreased service life as well.

The proposed dune infiltration system includes approximately 540 linear feet of 18” reinforced concrete pipe (RCP) and five (5) standard NCDOT catch-basins installed to capture ponding water on Ocean Drive. A small pump station with wet well and 100 linear feet of a 6” PVC force main will push stormwater across the beach access area and up to an approximately 2,670 square-foot underground infiltration chamber system. The infiltration system will be located underneath the existing beach access in the secondary dune system. The beach access ramp and the dune topography and ecosystem will be rebuilt and restored with native plantings.



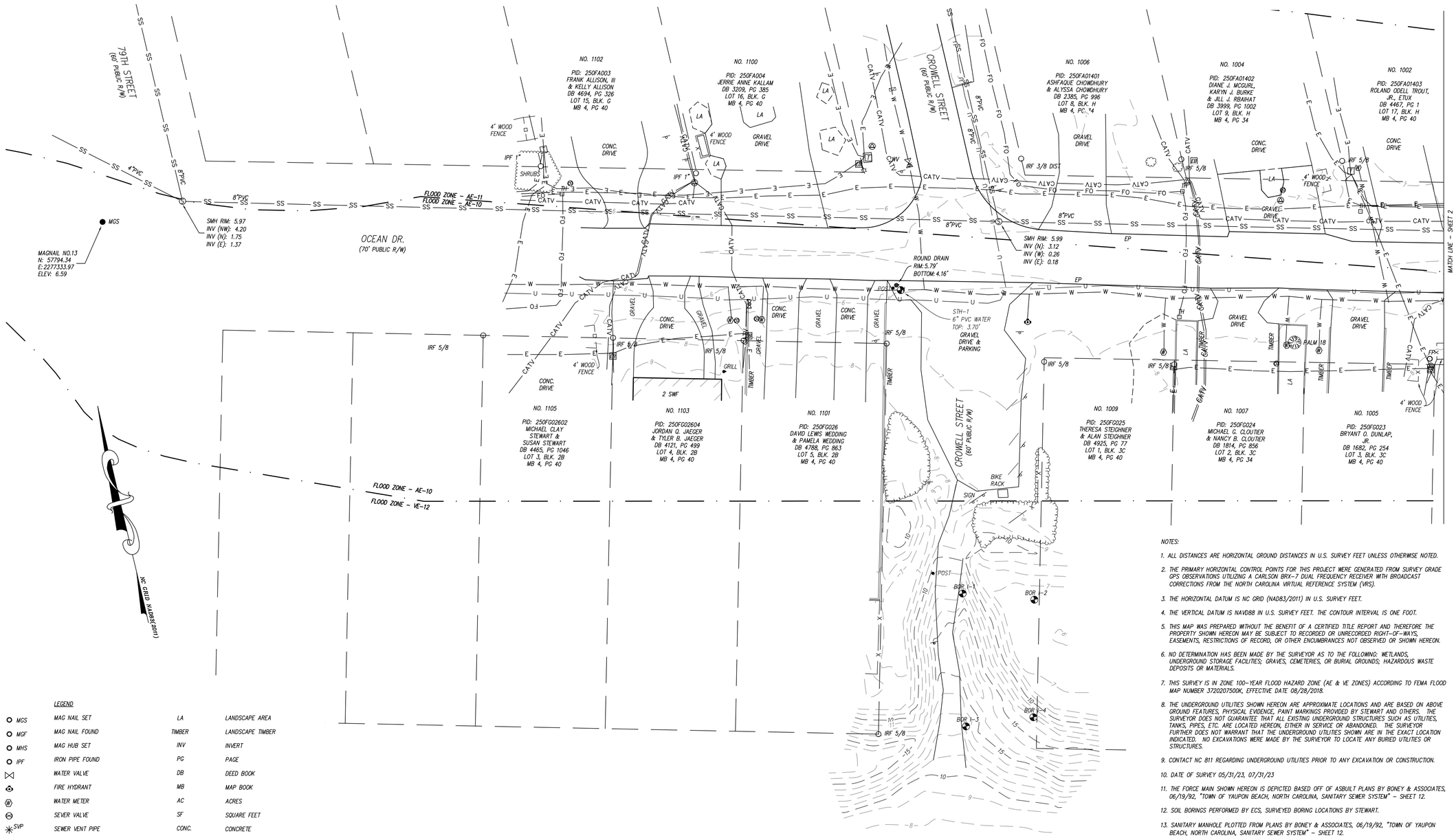
WK DICKSON
community infrastructure consultants

Town of Oak Island
"A Place to Coast" North Carolina

Crowell St Dune Infiltration System Project
Town of Oak Island
Attachment 10 - Project Map

0 50 100 200 Feet
1 in =100 ft

N
W E
S



Vicinity Map: ~1"=500'

GRAPHIC SCALE
0 10 20 40 80
SCALE: 1"=20'

LEGEND

MGS	MAG NAIL SET	LA	LANDSCAPE AREA
MGF	MAG NAIL FOUND	TIMBER	LANDSCAPE TIMBER
MHS	MAG HUB SET	INV	INVERT
IPF	IRON PIPE FOUND	PG	PAGE
	WATER VALVE	DB	DEED BOOK
	FIRE HYDRANT	MB	MAP BOOK
W	WATER METER	AC	ACRES
	SEWER VALVE	SF	SQUARE FEET
SVP	SEWER VENT PIPE	CONC.	CONCRETE
S	SANITARY SEWER MANHOLE	ROW	RIGHT OF WAY
	SANITARY SEWER CLEANOUT	EP	EDGE OF PAVEMENT
	CATCH BASIN	NTS	NOT TO SCALE
	IRRIGATION CONTROL VALVE	PVC	POLYVINYL CHLORIDE PIPE
	UTILITY POLE	ACP	ASBESTOS CEMENT PIPE
	TELEPHONE PEDESTAL		GIS PROPERTY LINES
	MAILBOX	OHW	OVERHEAD WIRES
	SHRUB	5	CONTOUR LINE
	SIGN		FEMA FLOOD ZONE LINE
CP	CABLE WITNESS POST		TREE LINE
FP	FIBER OPTIC WITNESS POST	FM	UNDERGROUND FORCE MAIN
	TV PEDESTAL	SS	UNDERGROUND SANITARY SEWER
T	TRANSFORMER	W	UNDERGROUND WATER
	BACK FLOW PREVENTER	FO	UNDERGROUND FIBER OPTIC
	GUY ANCHOR	T	UNDERGROUND TELEPHONE
		CATV	UNDERGROUND CABLE TV
		E	UNDERGROUND ELECTRIC

NOTES:

1. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
2. THE PRIMARY HORIZONTAL CONTROL POINTS FOR THIS PROJECT WERE GENERATED FROM SURVEY GRADE GPS OBSERVATIONS UTILIZING A CARLSON BRX-7 DUAL FREQUENCY RECEIVER WITH BROADCAST CORRECTIONS FROM THE NORTH CAROLINA VIRTUAL REFERENCE SYSTEM (VRS).
3. THE HORIZONTAL DATUM IS NC GRID (NAD83/2011) IN U.S. SURVEY FEET.
4. THE VERTICAL DATUM IS NAVD88 IN U.S. SURVEY FEET. THE CONTOUR INTERVAL IS ONE FOOT.
5. THIS MAP WAS PREPARED WITHOUT THE BENEFIT OF A CERTIFIED TITLE REPORT AND THEREFORE THE PROPERTY SHOWN HEREON MAY BE SUBJECT TO RECORDED OR UNRECORDED RIGHT-OF-WAYS, EASEMENTS, RESTRICTIONS OF RECORD, OR OTHER ENCUMBRANCES NOT OBSERVED OR SHOWN HEREON.
6. NO DETERMINATION HAS BEEN MADE BY THE SURVEYOR AS TO THE FOLLOWING: WETLANDS, UNDERGROUND STORAGE FACILITIES; GRAVES, CEMETERIES, OR BURIAL GROUNDS; HAZARDOUS WASTE DEPOSITS OR MATERIALS.
7. THIS SURVEY IS IN ZONE 100-YEAR FLOOD HAZARD ZONE (AE & VE ZONES) ACCORDING TO FEMA FLOOD MAP NUMBER 3720207500K, EFFECTIVE DATE 08/28/2018.
8. THE UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE LOCATIONS AND ARE BASED ON ABOVE GROUND FEATURES, PHYSICAL EVIDENCE, PAINT MARKINGS PROVIDED BY STEWART AND OTHERS. THE SURVEYOR DOES NOT GUARANTEE THAT ALL EXISTING UNDERGROUND STRUCTURES SUCH AS UTILITIES, TANKS, PIPES, ETC. ARE LOCATED HEREON, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. NO EXCAVATIONS WERE MADE BY THE SURVEYOR TO LOCATE ANY BURIED UTILITIES OR STRUCTURES.
9. CONTACT NC 811 REGARDING UNDERGROUND UTILITIES PRIOR TO ANY EXCAVATION OR CONSTRUCTION.
10. DATE OF SURVEY 05/31/23, 07/31/23
11. THE FORCE MAIN SHOWN HEREON IS DEPICTED BASED OFF OF ASBUILT PLANS BY BONEY & ASSOCIATES, 06/19/92, "TOWN OF YAUPON BEACH, NORTH CAROLINA, SANITARY SEWER SYSTEM" - SHEET 12.
12. SOIL BORINGS PERFORMED BY ECS, SURVEYED BORING LOCATIONS BY STEWART.
13. SANITARY MANHOLE PLOTTED FROM PLANS BY BONEY & ASSOCIATES, 06/19/92, "TOWN OF YAUPON BEACH, NORTH CAROLINA, SANITARY SEWER SYSTEM" - SHEET 12.
14. SUE LEVEL A TEST HOLES PERFORMED AND SURVEYED BY STEWART ON 09/07/23.

CERTIFICATE OF SURVEY AND ACCURACY

I, DAVID M. EDWARDS, CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION BASED ON RECORD INFORMATION AS NOTED HEREON; THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DRAWN FROM INFORMATION AS NOTED HEREON; AND THAT THIS MAP MEETS THE REQUIREMENTS OF THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA (21 NCAC 56.1600).

I FURTHER CERTIFY THAT THIS SURVEY WAS BASED ON HORIZONTAL CONTROL POINTS DETERMINED FROM AN ACTUAL GPS (OR GNSS) SURVEY MADE UNDER MY DIRECT SUPERVISION AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE SURVEY:

CLASS OF SURVEY: A
HORIZONTAL POSITIONAL ACCURACY: 0.10 FEET
TYPE OF GPS: RTK/VRS
HORIZONTAL DATUM/EPOCH: NAD83(2011)
VERTICAL DATUM: NAVD 88
PUBLISHED/FIXED-CONTROL: NGS "RED"
GEOID MODEL USED: GEOID18
UNITS: U.S. SURVEY FEET

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER AND SEAL THIS 26th DAY OF September, A.D. 2023.

DAVID M. EDWARDS, NCPLS NO. L-3901

STEWART
2018 EASTWOOD RD, STE 207 / 208
WILMINGTON, NC 28403
T 910-796-0145
FIRM LICENSE #: C-1051
www.stewartinc.com
Project #:

Title:

TOPOGRAPHIC SURVEY
OCEAN DRIVE,
OAK ISLAND, BRUNSWICK COUNTY,
NORTH CAROLINA
FOR
W.K. DICKSON AND CO, INC.
720 CORPORATE CENTER DRIVE, RALEIGH,
NORTH CAROLINA 27607

Revisions:

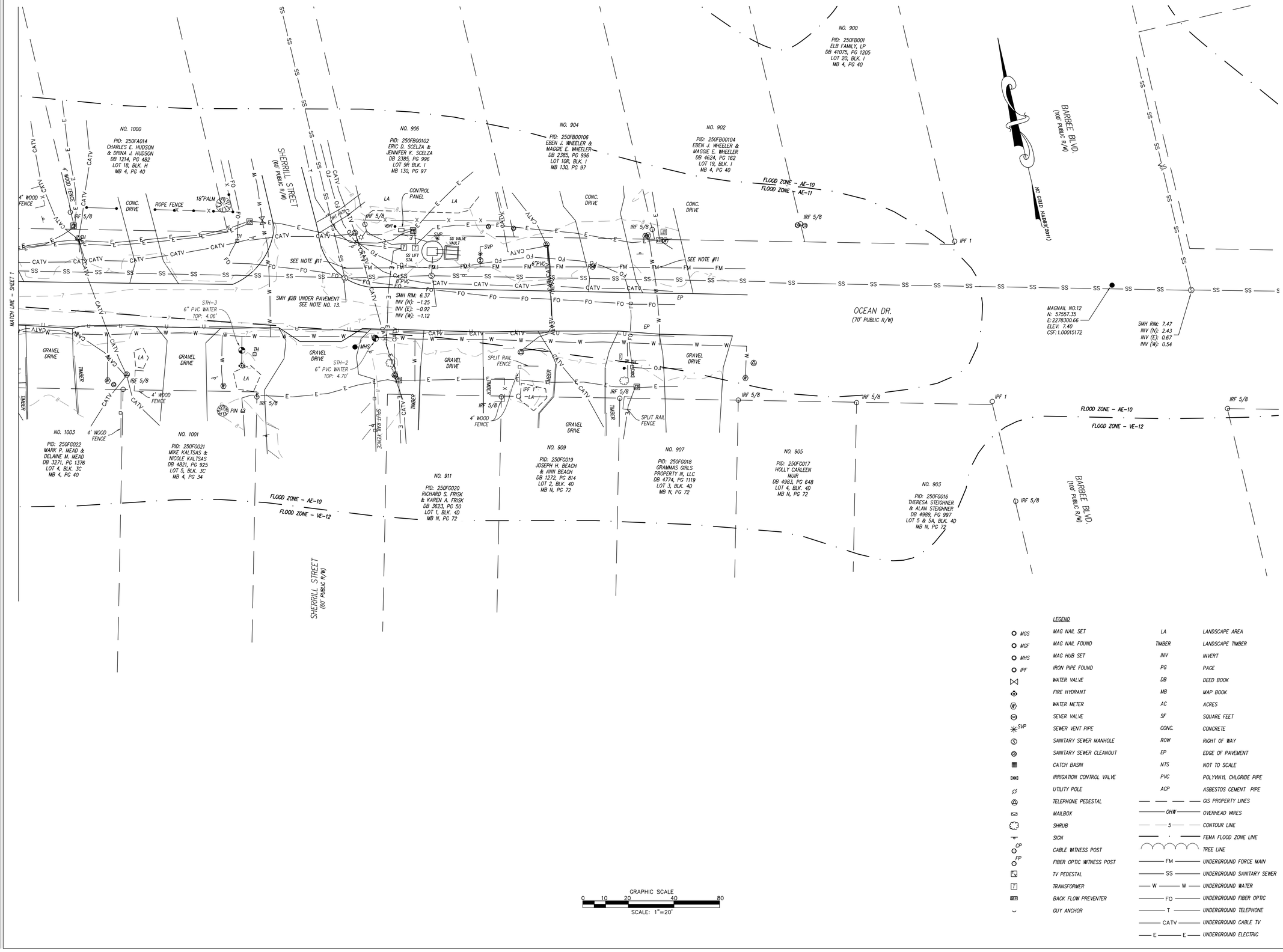
No.	Date	Description
1	08/08/2023	CHANGE SHEET SIZE & SCALE
2	08/14/2023	CHANGE PSPACE LIMIT
3	09/26/2023	SUE LEVEL A TEST HOLES ADDED

Seal:

NORTH CAROLINA PROFESSIONAL SEAL L-3901 09/26/22 REGISTERED LAND SURVEYOR DAVID M. EDWARDS

Project number: G21127 Sheet: 1 OF 2
Date: 08/08/23
Drawn by: DME/KLL
Approved by: DSL

G:\Projects\2021\G21127.01 - WKD-Oak Island Crowell St\OUTGOING\September 2023\G21127.01-WKD-Oak Island Bldg 801-V-Base 092623.dwg Sep 26, 2023 - 5:58pm

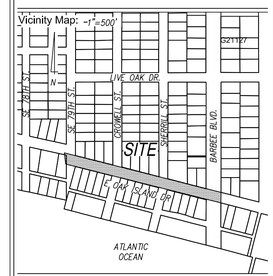


LEGEND

MGS	MAG NAIL SET	LA	LANDSCAPE AREA
MGF	MAG NAIL FOUND	TIMBER	LANDSCAPE TIMBER
MHS	MAG HUB SET	INV	INVERT
IPF	IRON PIPE FOUND	PG	PAGE
	WATER VALVE	DB	DEED BOOK
	FIRE HYDRANT	MB	MAP BOOK
W	WATER METER	AC	ACRES
	SEWER VALVE	SF	SQUARE FEET
SVP	SEWER VENT PIPE	CONC.	CONCRETE
S	SANITARY SEWER MANHOLE	ROW	RIGHT OF WAY
	SANITARY SEWER CLEANOUT	EP	EDGE OF PAVEMENT
	CATCH BASIN	NTS	NOT TO SCALE
	IRRIGATION CONTROL VALVE	PVC	POLYVINYL CHLORIDE PIPE
	UTILITY POLE	ACP	ASBESTOS CEMENT PIPE
	TELEPHONE PEDESTAL		GIS PROPERTY LINES
	MAILBOX	OHW	OVERHEAD WIRES
	SHRUB	5	CONTOUR LINE
	SIGN		FEMA FLOOD ZONE LINE
CP	CABLE WITNESS POST		TREE LINE
FP	FIBER OPTIC WITNESS POST	FM	UNDERGROUND FORCE MAIN
	TV PEDESTAL	SS	UNDERGROUND SANITARY SEWER
T	TRANSFORMER	W	UNDERGROUND WATER
BFP	BACK FLOW PREVENTER	FO	UNDERGROUND FIBER OPTIC
	GUY ANCHOR	T	UNDERGROUND TELEPHONE
		CATV	UNDERGROUND CABLE TV
		E	UNDERGROUND ELECTRIC

STEWART
2018 EASTWOOD RD, STE 207 / 208
WILMINGTON, NC 28403
T 910-796-0145
FIRM LICENSE #: C-1051
www.stewartinc.com
Project #:

Vicinity Map: ~1"=500'



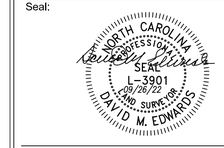
Title:

TOPOGRAPHIC SURVEY
OCEAN DRIVE,
OAK ISLAND, BRUNSWICK COUNTY,
NORTH CAROLINA
FOR
W.K. DICKSON AND CO, INC.
720 CORPORATE CENTER DRIVE, RALEIGH,
NORTH CAROLINA 27607

Revisions:

No.	Date	Description
1	08/08/2023	CHANGE SHEET SIZE & SCALE
2	08/14/2023	CHANGE PSPACE LIMIT
3	09/26/2023	SUE LEVEL A TEST HOLES ADDED

Seal:



Project number: G21127.01 Sheet: 2 OF 2
Date: 07/31/2023
Drawn by: DME/KLL
Approved by: DSL

G:\Projects\2021\G21127.01 - WKD-Oak Island Crowell St\DWG\G21127.01-WKD-Oak Island Bldg 801-V-Base.dwg Sep 26, 2023 - 5:51pm

WK DICKSON
community infrastructure consultants

January 10, 2024

RE: **Crowell Street DIS Project**
CAMA Minor Permit – Additional Information Request
Town of Oak Island, NC
WK Dickson # 20200803.00.RA

Comment responses addressing CAMA reviewer comments via email from Patrick Amico (attached) dated December 14th, 2023.

1. A Permit application fee, in the form of a check, made out to NCDEQ, in the amount of $100.00.

   WK Dickson Response: $100.00 check made payable to NCDEQ is included with this submittal.

2. A copy of the Ocean Hazard AEC form, signed by Property Owner (Town Manager). Form is attached to this email.

   WK Dickson Response: Please see attached Ocean Hazard AEC form signed by David Kelly, Town Manager of Oak Island.

3. Please include the FLSNV, Pre Project Vegetation Line, and AEC line on all drawings submitted where practical.

   WK Dickson Response: FLSNV, Pre Project Vegetation Line, and AEC lines added to SD1, SD2, EC1, P1 (Pre Project Vegetation Line outside of viewport on P1).

4. Please indicate where FLSNV line came from (date that it was flagged and by whom).

   WK Dickson Response: Callouts on plans revised to mention that the FLSNV is approximate, based on flagging done on 9/21/2023 by Patrick Amico.

5. On Drawing SD1, please add AEC line (180 feet from FLSNV). Please indicate the date of the aerial photograph used for the drawing.

720 Corporate Center Drive
Raleigh, NC 27607
Tel. 919.782.0495
www.wkdickson.com

WK Dickson Response: 180' AEC line shown and labeled. Year of aerial photography provided in SD1's notes block.

6. On Drawing SD 2, Please add pre Project Vegetation Line and Setback, please remove the development line, please add the Waterward and Landward Toe of Frontal Dune, 180' AEC line, date of aerial photography, **and please indicate how FLSNV was obtained (flagged by whom and what date)**.

   WK Dickson Response: Pre-project Vegetation Line obtained from NC Division of Coastal Management GIS website and added to plans. Town development line removed. Added landward and waterward toes of the frontal dunes. 180' AEC line shown and labeled. Year of aerial photography provided in SD2's notes block. FLSNV callout revised to indicate that flagging was performed by Patrick Amico on September 21, 2023.

7. On drawing EC 1, please label the FLSNV and 60' setback, and 180' AEC

   WK Dickson Response: Labeled FLSNV, 60' setback, and 180' AEC.

8. On drawing P1, please indicate flagging date of FLSNV.

   WK Dickson Response: Added (September 21, 2023).

9. If impacts to frontal dune cannot be avoided, please provide a purpose and need statement (can be in the form of a paragraph/supplemental document/memo) about why these impacts are necessary.

   WK Dickson Response: The purpose of implementing a coastal dune infiltration system (DIS) is to address and mitigate the recurrent flooding issues along Ocean Drive. Ocean Drive has experienced chronic inundation, posing a significant threat to public safety, property, and infrastructure. The proposed coastal dune infiltration system aims to provide a sustainable and nature-based solution to alleviate the flooding impact on the affected street. The proposed catch basins will collect stormwater runoff and transport it to a proposed pump station which will then pump the stormwater into the DIS for infiltration.

   The need for this DIS is underscored by the escalating risks associated with climate change and sea level rise. The existing stormwater infrastructure is insufficient to manage the increased frequency and intensity of flooding events impacting Ocean Drive's functionality for emergency response vehicles. The proposed system will enhance the

area's resilience by utilizing natural dune formations to infiltrate stormwater runoff, reducing the likelihood of flooding. Furthermore, this solution aligns with the community's commitment to sustainable development and environmental stewardship, promoting a holistic approach that not only addresses the immediate flooding concerns but also contributes to the overall ecological health of the coastal environment in Oak Island, North Carolina. Impacts to the primary dune system are necessary to set the DIS at an elevation above the Seasonal High-Water Table (SHWT) to function as an infiltration device most effectively.

10. Please resend notification to Wallace Harrelson, property owner, at 1109 Ocean Drive, Oak Island NC 28465 with mailing address 523 White Road, Elkin NC 28621.

    WK Dickson Response: A new Property Owner notification package was mailed to Harrelson on December 20th, 2023, through certified mail. Please refer to attached certified mail receipt.

11. Please clarify status of notification to Roland Odell Trout Jr, Tracking number 70212720000317308311. Please resend if delivery was not successful.

    WK Dickson Response: A new Property Owner notification package was mailed to Trout on December 20th, 2023, through certified mail. Please refer to attached certified mail receipt.

12. Please clarify status of notification to Michael and Nancy Cloutier, Tracking number 70212720000317308366. Please resend if delivery was not successful.

    WK Dickson Response: A new Property Owner notification package was mailed to Cloutier on December 20th, 2023, through certified mail. Please refer to attached certified mail receipt.

13. As discussed, once the CAMA minor permit is accepted as complete, the permit application will ultimately be denied which would allow the applicant to file for a future variance proceeding.

    WK Dickson Response: Understood. We look forward to filing for a future variance proceeding.

14. In accordance with the NC Department of Environment Quality regulations, we note that the application is **incomplete** for processing.

    WK Dickson Response: Understood.

Please let us know if you have any further questions regarding this submittal that we can address.

Thanks,

Alex McMillan

Alex McMillan, PE
amcmillan@wkdickson.com
919-256-5644
Project Manager
WK Dickson

From:	Amico, Patrick J
To:	Marc Horstman
Subject:	Additional Information Required: Incomplete CAMA Minor Permit Application for Crowell Street DIS Project
Date:	Thursday, December 14, 2023 4:02:59 PM
Attachments:	image002.png OCEAN HAZARD AEC NOTICE.rev02.2021.pdf

Mr. Horstman
RE: INCOMPLETE APPLICATION FOR MINOR PERMIT – ADDITIONAL INFORMATION REQUIRED
PROJECT ADDRESS – Crowell Street, Oak Island

Good afternoon Mr. Horstman:
In reviewing your application, we have discovered that additional information is needed to complete the review process. Accordingly, I am requesting that you submit the following additional information to this office:

1) A Permit application fee, in the form of a check, made out to NCDEQ, in the amount of $100.00

2) A copy of the Ocean Hazard AEC form, signed by Property Owner (Town Manager). Form is attached to this email.

3) Please include the FLSNV, Pre Project Vegetation Line, and AEC line on all drawings submitted where practical.

4)Please indicate where FLSNV line came from (date that it was flagged and by whom).

5) On Drawing SD1, please add AEC line (180 feet from FLSNV). Please indicate the date of the aerial photograph used for the drawing.

6) On Drawing SD 2, Please add pre Project Vegetation Line and Setback, please remove the development line, please add the Waterward and Landward Toe of Frontal Dune, 180' AEC line, date of aerial photography, and please indicate how FLSNV was obtained (flagged by whom and what date).

7) On drawing EC 1, please label the FLSNV and 60' setback, and 180' AEC

8) On drawing P1, please indicate flagging date of FLSNV.

9) If impacts to frontal dune cannot be avoided, please provide a purpose and need statement (can be in the form of a paragraph/supplemental document/memo) about why these impacts are necessary.

10) Please resend notification to Wallace Harrelson, property owner, at 1109 Ocean Drive, Oak Island NC 28465 with mailing address 523 White Road, Elkin NC 28621.

11) Please clarify status of notification to Roland Odell Trout Jr, Tracking number 70212720000317308311. Please resend if delivery was not successful.

12) Please clarify status of notification to Michael and Nancy Cloutier, Tracking number 70212720000317308366. Please resend if delivery was not successful.

13) As discussed, once the CAMA minor permit is accepted as complete, the permit application will ultimately be denied which would allow the applicant to file for a future variance proceeding.

14) In accordance with the NC Department of Environment Quality regulations, we note that the application is **incomplete** for processing.

Let me know if you would like to setup up a Teams/Skype meeting to discuss this additional information. Thanks!

With kind regards,
Patrick

Patrick Amico
Environmental Specialist II
Division of Coastal Management
North Carolina Department of Environmental Quality
Wilmington Regional Office
127 Cardinal Drive Extension
Wilmington NC 28405
Mobile(***preferred***): 910.515.5792
Office: 910.796.7425
patrick.amico@ncdenr.gov

Amico, Patrick J

From: Amico, Patrick J
Sent: Thursday, February 22, 2024 3:57 PM
To: mhorstman
Cc: Alex McMillan; Tai Langenbach; MacPherson, Tara; Mairs, Robb L; Courtney Milliron
Subject: FW: [External] Crowell Street Infiltration project - CAMA Follow-up

Marc:
I know that you are in the process of writing a supplemental narrative about how the dunes will be reconstructed, post proposed project construction, per your 2/20/24 email.

Additionally, DCM wanted to provide you the following comments received by review agencies that were part of our circulation discussed in previous email. The comments below are from Maria Dunn with North Carolina Wildlife Resources Commission, and Kathy Matthews of the US Fish and Wildlife Service.
DCM wanted to provide these comments to you, for a chance for your company to respond to them and/or address any concerns prior to the pending denial and variance process that we have discussed. Please see two (2) emails below.
With kind regards,
Patrick

Patrick Amico
Environmental Specialist II
Division of Coastal Management
North Carolina Department of Environmental Quality
Wilmington Regional Office
127 Cardinal Drive Extension
Wilmington NC 28405
Mobile(***preferred***): 910.515.5792
Office: 910.796.7425
patrick.amico@ncdenr.gov

From: Dunn, Maria T. <maria.dunn@ncwildlife.org>
Sent: Wednesday, February 21, 2024 10:59 AM
To: kathryn_matthews@fws.gov; MacPherson, Tara <tara.macpherson@deq.nc.gov>
Cc: Amico, Patrick J <Patrick.Amico@deq.nc.gov>
Subject: RE: [External] Crowell Street Infiltration project - CAMA Follow-up

Hello Tara.

NCWRC has similar concerns as stated by USFWS. These concerns have been previously stated for other areas that have proposed dune infiltration projects throughout coastal North Carolina. Stormwater treatment within the frontal dune systems would likely impact shorebird and nesting sea turtle habitats due to direct loss of habitats, impacts to project influenced areas, increased pollutants on the beach, and other public trust concerns. The Kure Beach project that was

installed early in the 2000's was done in an area that had an existing ocean outfall and was done to address pollutants. This project is not similar to Kure Beach in the purpose and need or beach topography.

Specific concerns included:

- The direct footprint impact of the structure, including gravel, tank, and any piping.
- The area of influence around the treatment system. This includes any area that would be subject to changes in sand wetness, temperature, pH, pollutants, and bacteria. This area may no longer be considered suitable habitat due to discharge influences. The area of influence may also affect the adjacent properties that are very close to the proposal.
- The profile of the beaches and dune systems in Oak Island do not seem to lend themselves for an engineered system beneath the frontal dune area. This island has a narrow beach berm and the dunes are more like slight changes in topography rather than dunes. The depth of structure and requested separation distances listed by USFWS below do not seem to be obtainable.
- Several frontal dune areas of Oak Island have been managed recently. Some areas received more compact material than others. It cannot be assumed that the receiving sediments would act simply as sand and easily disperse stormwater discharge. If the sediment is compacted, it could lead to pools of discharged water.
- The project area is within a public access area. Concerns would include the ability to maintain a system if conditions were ever conducive for construction and impairment of public access.
- Overall successfulness of the structure given likely impacts to the beach environment. This includes daily performance as well as response during or after large events that may lead to failure or increased erosion and/or adjacent property impacts.

Thank you for the information and the opportunity to provide comment. If there is anything additional, please let me know. NCWRC would like to be notified of any similar proposals throughout the coastal area.

Maria

Maria T. Dunn
Coastal Coordinator

NC Wildlife Resources Commission
943 Washington Sq. Mall
Washington, NC 27889
252-495-5554

www.ncwildlife.org

From: Matthews, Kathryn (Kathy) <kathryn_matthews@fws.gov>
Sent: Wednesday, February 21, 2024 8:33 AM
To: MacPherson, Tara <tara.macpherson@deq.nc.gov>; Dunn, Maria T. <maria.dunn@ncwildlife.org>
Cc: Amico, Patrick J <Patrick.Amico@deq.nc.gov>
Subject: Re: [External] Crowell Street Infiltration project - CAMA Follow-up

Hi Tara,

Below are my comments. Thanks for the opportunity to comment!

- The Service is concerned that installation of the system would effectively remove over 1,600 sf of sea turtle nesting habitat, in and adjacent to designated breeding critical habitat for loggerhead sea turtle. Any other hardened structures associated with the facility, if located in what is now suitable habitat for nesting sea turtles, would also result in a loss of habitat. Storm water often carries oils and greases, animal feces, bacteria, and other pollutants. Adverse changes to sand quality or sand temperature as a result of effluent from the device would also be considered an impact to sea turtle habitat. We would recommend formal consultation under ESA Section 7 (if there is a federal nexus) or Section 10 (if there is no federal nexus) for the installation of one or more of these devices.

- In order to minimize impacts to most nesting sea turtle species, the top of the system must be maintained at a depth greater than 24 inches or so. It should be maintained at more than 36 inches deep to avoid potential impacts to nesting leatherback sea turtles. It does not appear that this depth is proposed, nor is it clear how such a depth would be maintained.

- There is currently no dune in the area where the system is proposed, and the area appears to be a public access. The Service is concerned that it may be difficult to maintain the depth of the system while also providing public access.

- The Service is concerned that these structures adds to those requiring protection from storms and erosion, resulting in increased sand placement or other shoreline protection measures.

- The Service is concerned that large rain or tidal events may overwhelm the device. Is there the potential for erosion or a blow-out associated with flow from the device? Where would water flow if there was a rapid or uncontrolled discharge, or if the pump continues to move water rapidly toward an overwhelmed device? How would that affect the beach shoreline?

- It will be very important to keep the device maintained clear of clogging materials, so that water may move through it as designed. The Service is concerned that over time, a clogged system may not perform as designed, potentially causing smaller rain events to overwhelm it.

- If the device becomes eroded during high tide or a storm, wave energy may be reflected off of device and cause increased erosion to adjacent properties.

Have a good week,

We are temporarily lacking a physical office. Electronic and phone correspondence is preferred. For snail mail, please use the P.O. Box listed below, rather than our former physical address. We will update our physical courier address when we move into the new space (expected by June 2024). Thanks!

Kathy Matthews
NC Renewable Energy Coordinator
U.S. Fish and Wildlife Service
P.O. Box 33726
Raleigh, NC 27636-3726
NEW Phone! 984-308-0852

NC Wildlife Resources Commission
943 Washington Sq. Mall
Washington, NC 27889
252-495-5554

www.ncwildlife.org

From: MacPherson, Tara
Sent: Tuesday, February 13, 2024 12:16 PM
To: Matthews, Kathryn (Kathy) <kathryn_matthews@fws.gov>; Dunn, Maria T. <maria.dunn@ncwildlife.org>
Subject: RE: [External] Crowell Street Infiltration project - CAMA Follow-up

Hi Kathy,

It is going to be denied by rule, but if they comments are part of the permit file for the Variance that would be good. Within the next week ok?
Thank you!

Tara MacPherson
Wilmington Region District Manager
North Carolina Division of Coastal Management
Department of Environmental Quality

910 796-7266 office
tara.macpherson@deq.nc.gov

127 Cardinal Drive Ext
Wilmington, NC 28405

As part of DEQ's phased email update, all Division of Coastal Management emails are now @deq.nc.gov. Our email addresses may look different, but email performance will not be impacted.

Find a Field Rep (arcgis.com)
Join the DCM Interested Parties List

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: MacPherson, Tara <tara.macpherson@deq.nc.gov>
Sent: Tuesday, February 13, 2024 11:00 AM
To: Matthews, Kathryn (Kathy) <kathryn_matthews@fws.gov>
Subject: RE: [External] Crowell Street Infiltration project - CAMA Follow-up

Here is the application and narrative.
Thanks,
Tara

Tara MacPherson
Wilmington Region District Manager
North Carolina Division of Coastal Management
Department of Environmental Quality

910 796-7266 office
tara.macpherson@deq.nc.gov

127 Cardinal Drive Ext
Wilmington, NC 28405

As part of DEQ's phased email update, all Division of Coastal Management emails are now @deq.nc.gov. Our email addresses may look different, but email performance will not be impacted.

Find a Field Rep (arcgis.com)
Join the DCM Interested Parties List

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

Amico, Patrick J

From: Dunn, Maria T.
Sent: Wednesday, February 21, 2024 10:59 AM
To: kathryn_matthews@fws.gov; MacPherson, Tara
Cc: Amico, Patrick J
Subject: RE: [External] Crowell Street Infiltration project - CAMA Follow-up

Hello Tara.

NCWRC has similar concerns as stated by USFWS. These concerns have been previously stated for other areas that have proposed dune infiltration projects throughout coastal North Carolina. Stormwater treatment within the frontal dune systems would likely impact shorebird and nesting sea turtle habitats due to direct loss of habitats, impacts to project influenced areas, increased pollutants on the beach, and other public trust concerns. The Kure Beach project that was installed early in the 2000's was done in an area that had an existing ocean outfall and was done to address pollutants. This project is not similar to Kure Beach in the purpose and need or beach topography.

Specific concerns included:

- The direct footprint impact of the structure, including gravel, tank, and any piping.
- The area of influence around the treatment system. This includes any area that would be subject to changes in sand wetness, temperature, pH, pollutants, and bacteria. This area may no longer be considered suitable habitat due to discharge influences. The area of influence may also affect the adjacent properties that are very close to the proposal.
- The profile of the beaches and dune systems in Oak Island do not seem to lend themselves for an engineered system beneath the frontal dune area. This island has a narrow beach berm and the dunes are more like slight changes in topography rather than dunes. The depth of structure and requested separation distances listed by USFWS below do not seem to be obtainable.
- Several frontal dune areas of Oak Island have been managed recently. Some areas received more compact material than others. It cannot be assumed that the receiving sediments would act simply as sand and easily disperse stormwater discharge. If the sediment is compacted, it could lead to pools of discharged water.
- The project area is within a public access area. Concerns would include the ability to maintain a system if conditions were ever conducive for construction and impairment of public access.
- Overall successfulness of the structure given likely impacts to the beach environment. This includes daily performance as well as response during or after large events that may lead to failure or increased erosion and/or adjacent property impacts.

Thank you for the information and the opportunity to provide comment. If there is anything additional, please let me know. NCWRC would like to be notified of any similar proposals throughout the coastal area.

Maria

Maria T. Dunn
Coastal Coordinator

NC Wildlife Resources Commission
943 Washington Sq. Mall
Washington, NC 27889
252-495-5554

www.ncwildlife.org

From: Matthews, Kathryn (Kathy) <kathryn_matthews@fws.gov>
Sent: Wednesday, February 21, 2024 8:33 AM
To: MacPherson, Tara <tara.macpherson@deq.nc.gov>; Dunn, Maria T. <maria.dunn@ncwildlife.org>
Cc: Amico, Patrick J <Patrick.Amico@deq.nc.gov>
Subject: Re: [External] Crowell Street Infiltration project - CAMA Follow-up

Hi Tara,

Below are my comments. Thanks for the opportunity to comment!

- The Service is concerned that installation of the system would effectively remove over 1,600 sf of sea turtle nesting habitat, in and adjacent to designated breeding critical habitat for loggerhead sea turtle. Any other hardened structures associated with the facility, if located in what is now suitable habitat for nesting sea turtles, would also result in a loss of habitat. Storm water often carries oils and greases, animal feces, bacteria, and other pollutants. Adverse changes to sand quality or sand temperature as a result of effluent from the device would also be considered an impact to sea turtle habitat. We would recommend formal consultation under ESA Section 7 (if there is a federal nexus) or Section 10 (if there is no federal nexus) for the installation of one or more of these devices.

- In order to minimize impacts to most nesting sea turtle species, the top of the system must be maintained at a depth greater than 24 inches or so. It should be maintained at more than 36 inches deep to avoid potential impacts to nesting leatherback sea turtles. It does not appear that this depth is proposed, nor is it clear how such a depth would be maintained.

- There is currently no dune in the area where the system is proposed, and the area appears to be a public access. The Service is concerned that it may be difficult to maintain the depth of the system while also providing public access.

- The Service is concerned that these structures adds to those requiring protection from storms and erosion, resulting in increased sand placement or other shoreline protection measures.

- The Service is concerned that large rain or tidal events may overwhelm the device. Is there the potential for erosion or a blow-out associated with flow from the device? Where would water flow if there was a rapid or uncontrolled discharge, or if the pump continues to move water rapidly toward an overwhelmed device? How would that affect the beach shoreline?

- It will be very important to keep the device maintained clear of clogging materials, so that water may move through it as designed. The Service is concerned that over time, a clogged system may not perform as designed, potentially causing smaller rain events to overwhelm it.

- If the device becomes eroded during high tide or a storm, wave energy may be reflected off of device and cause increased erosion to adjacent properties.

Have a good week,

We are temporarily lacking a physical office. Electronic and phone correspondence is preferred. For snail mail, please use the P.O. Box listed below, rather than our former physical address. We will update our physical courier address when we move into the new space (expected by June 2024). Thanks!

Kathy Matthews
NC Renewable Energy Coordinator
U.S. Fish and Wildlife Service
P.O. Box 33726
Raleigh, NC 27636-3726
NEW Phone! 984-308-0852

From: MacPherson, Tara <tara.macpherson@deq.nc.gov>
Sent: Monday, February 19, 2024 12:35 PM
To: Dunn, Maria T. <maria.dunn@ncwildlife.org>; Matthews, Kathryn (Kathy) <kathryn_matthews@fws.gov>
Cc: Amico, Patrick J <Patrick.Amico@deq.nc.gov>
Subject: RE: [External] Crowell Street Infiltration project - CAMA Follow-up

That would be great.
Thanks Maria.

Tara MacPherson
Wilmington Region District Manager
North Carolina Division of Coastal Management
Department of Environmental Quality

910 796-7266 office
tara.macpherson@deq.nc.gov

127 Cardinal Drive Ext
Wilmington, NC 28405

Frank III & Kelly Allison
6835 Breyerton Way SE
Owens X Rds, AL 35763-8806

Joseph & Ann Beach
2910 Queens Ct
Norcross, GA 30071

Ashfaque & Alyssa Chowdhury
4800 Goldena Acres Rd
Oak Ridge, NC 27310

Michael & Nancy Cloutier
8100 Cranes View Place W
Raleigh, NC 27615-4746

Bryant Dunlap, Jr
250 Culbreth Rd
Chapel Hill, NC 27516

Robert & Mary Edmonds
7020 Dension Rd
Summerfield, NC 27358-9235

Richard & Karen Frisk
144 Conestoga Way
Glastonbury, CT 06033-3362

Wallace Harrelson
523 White Rd
Elkin, NC 28621

Charles & Drina Hudson
903 Brief Road West
Indian Trail, NC 28079

Jordan & Tyler Jaeger
409 Hampton Trail Dr
Fort Mill, SC 29708-0184

Jerri Anne Kallam
1338 Rollins Ave
Charlotte, NC 28205

Mike & Nicole Kaltsas
305 65th Ave N
Myrtle Beach, SC 29572-3343

Diane McGurl, Etals
124 Singleton St
Raleigh, NC 27606-1137

Mark & Delaine Mead
5410 Callander Ct
Charlotte, NC 28277

Kirby & Terry Pearce
PO Box 160
Rolesville, NC 27571

Erica & Jennifer Seelza
515 Lindbergh Ave
Stroudsburg, PA 18360-2221

Jessee & Janice Shelton Trustees
18640 Waterford Dr
Sutherland, VA 23885

Theresa & Alan Steighner
PO Box 1143
Davidson, NC 28036-1143

Michael & Susan Stewart
1208 Prairie Pond Cir
Raleigh, NC 27614-8679

John Timm, Living Trust
PO Box 1024
Oak Island, NC 28465-6860

Roland Odell Trout, Jr.
1311 Wellington Dr
Columbia, SC 29204-2349

Stephen Ural
513 Sweet Juliet Way
Greer, SC 29650

David & Pamela Wedding
PO Box 490
Oak Island, NC 28465-6854

Eben & Maggie Wheeler
8902 Longview Club Dr
Waxhaw, NC 28173-6804

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Wallace C Harrelson
523 White Road
Elkin, NC 28621

9590 9402 7110 1251 8305 31

2. Article Number *(Transfer from service label)*
7021 2720 0003 1730 8557

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

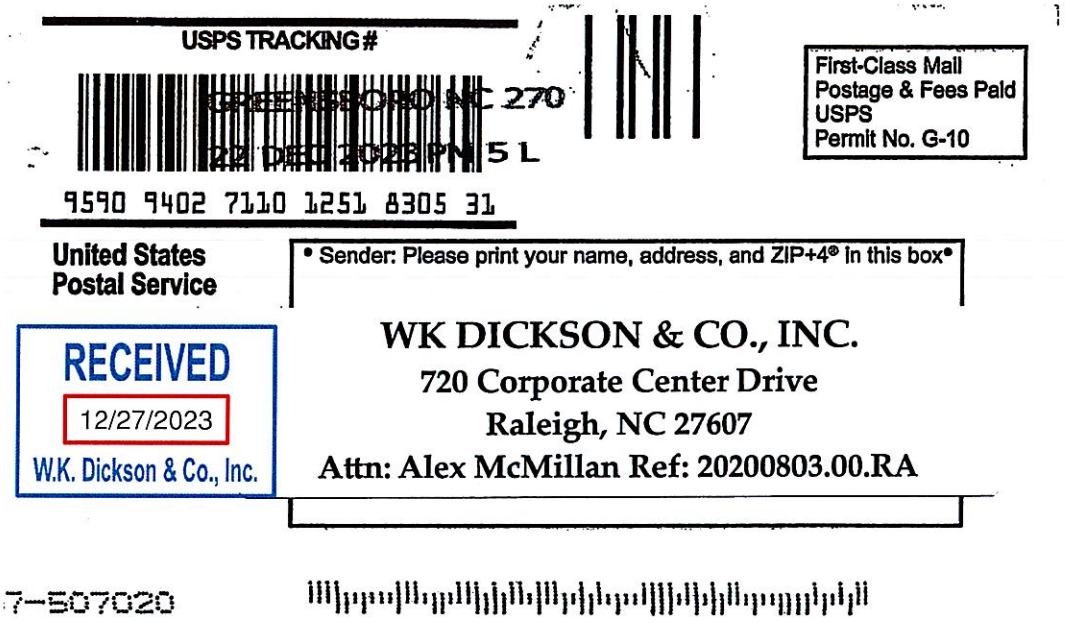
B. Received by *(Printed Name)* C. Date of Delivery 1/2/24

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☑ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

RECEIVED
JAN 18 2024
DCM WILMINGTON



SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Roland O Trout Jr
1311 Wellington Drive
Columbia, SC 29204-2349

9590 9402 7110 1251 8305 48

2 Article Number *(Transfer from service label)*
7021 2720 0003 1730 8540

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* Roland Trout | C. Date of Delivery 12-22-23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☒ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

RECEIVED
JAN 18 2024
DCM WILMINGTON

USPS TRACKING #

9590 9402 7110 1251 8305 48

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

RECEIVED
12/27/2023
W.K. Dickson & Co., Inc.

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
JAN 18 2024
DCM WILMINGTON

3rd Attempt to Property Owner

ALEX MCMILLAN, PE
919-782-0495
WK DICKSON - RALEIGH
720 CORPORATE CENTER DRIVE
RALEIGH NC 27607

1 LBS

1 OF 1

SHIP TO:
MICHAEL G. & NANCY B. CLOUTIER
8100 CRANES VIEW PLACE W
RALEIGH NC 27615-4746

NC 276 9-03

UPS GROUND
TRACKING #: 1Z 225 F39 03 9643 8447

BILLING: P/P

Project/Phase/Task: 20200803.00.RA, 22
Account Code 521/621/721; 621

CS 23.7.00. WNTNV50 3.0A 01/2024*

TM

RECEIVED
JAN 18 2024
DCM WILMINGTON

Proof of Delivery

Dear Customer,

This notice serves as proof of delivery for the shipment listed below.

Tracking Number
1Z225F390396438447

Weight
1.00 LBS

Service
UPS Ground

Shipped / Billed On
01/16/2024

Delivered On
01/17/2024 2:11 P.M.

Delivered To
RALEIGH, NC, US

Left At
Front Door

Please print for your records as photo and details are only available for a limited time.

Sincerely,

UPS

Tracking results provided by UPS: 01/17/2024 2:29 P.M. EST

undelivered ones

7021 2720 0003 1730 8311

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Columbia SC 29204

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	$0.00
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504
22

Postmark Here
CARY NC 27511
OCT 10 2023
CARY POST OFFICE
10/10/2023

Sent To: Roland Odell Trout, Jr.
Street and Apt: 1311 Wellington Drive
City, State, Z: Columbia, SC 29204-2349

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Tracking Number:

70212720000317308311

Copy Add to Informed Delivery

Latest Update

Your package will arrive later than expected, but is still on its way. It is currently in transit to the next facility.

Get More Out of USPS Tracking:

USPS Tracking Plus®

- Delivered
- Out for Delivery
- Preparing for Delivery

Moving Through Network

In Transit to Next Facility, Arriving Late
October 20, 2023

Arrived at USPS Regional Destination Facility
COLUMBIA SC PROCESSING CENTER
October 12, 2023, 1:42 pm

Departed USPS Regional Facility
RALEIGH NC DISTRIBUTION CENTER
October 11, 2023, 2:56 am

Arrived at USPS Regional Origin Facility
RALEIGH NC DISTRIBUTION CENTER
October 10, 2023, 11:22 pm

Departed Post Office
CARY, NC 27511
October 10, 2023, 5:44 pm

USPS in possession of item
CARY, NC 27511
October 10, 2023, 9:21 am

RECEIVED
NOV 20 2023
DCM WILMINGTON

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Raleigh NC 27615

OFFICIAL USE

7021 2720 0003 1730 8366

Certified Mail Fee $4.35
$ $3.55
Extra Services & Fees (check box, add fee as appropriate)
☑ Return Receipt (hardcopy) $ $0.00
☐ Return Receipt (electronic) $ $0.00
☐ Certified Mail Restricted Delivery $ $0.00
☐ Adult Signature Required $ $0.00
☐ Adult Signature Restricted Delivery $
Postage $2.79
$
Total Postage and Fees $10.69
$

0504

CARY POST OFFICE
Postmark Here
OCT 10 2023
CARY, NC 27511-9998

Sent To Michael G. & Nancy B. Cloutier
Street and 8100 Cranes View Place W
City, State Raleigh, NC 27615-4746

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Tracking Number:

70212720000317308366

Copy Add to Informed Delivery

Latest Update

Your package will arrive later than expected, but is still on its way. It is currently in transit to the next facility.

Get More Out of USPS Tracking:

USPS Tracking Plus®

- Delivered
- Out for Delivery
- Preparing for Delivery

Moving Through Network

In Transit to Next Facility, Arriving Late
October 15, 2023

Departed USPS Regional Facility
RALEIGH NC DISTRIBUTION CENTER
October 11, 2023, 2:56 am

Arrived at USPS Regional Facility
RALEIGH NC DISTRIBUTION CENTER
October 10, 2023, 11:22 pm

Departed Post Office
CARY, NC 27511
October 10, 2023, 5:44 pm

USPS in possession of item
CARY, NC 27511
October 10, 2023, 9:06 am

RECEIVED
NOV 20 2023
DCM WILMINGTON

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Glastonbury, CT 06033

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	$3.55
☒ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$
☐ Adult Signature Restricted Delivery	$2.79
Postage	$10.69
Total Postage and Fees	

CARY POST OFFICE 27511 OCT 10 2023 Postmark Here
CARY, NC 27511-9998
10/10/2023

Sent To: Richard S. & Karen A. Frisk
Street and: 144 Conestoga Way
City, State: Glastonbury, CT 06033-3362

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8168

Tracking Number:

70212720000317308168

Copy Add to Informed Delivery

Latest Update

Your item was delivered to an individual at the address at 10:29 am on October 17, 2023 in GLASTONBURY, CT 06033.

Get More Out of USPS Tracking:

USPS Tracking Plus®

Delivered
Delivered, Left with Individual
GLASTONBURY, CT 06033
October 17, 2023, 10:29 am

Out for Delivery
GLASTONBURY, CT 06033
October 17, 2023, 8:53 am

Arrived at Post Office
GLASTONBURY, CT 06033
October 17, 2023, 8:42 am

In Transit to Next Facility
October 15, 2023

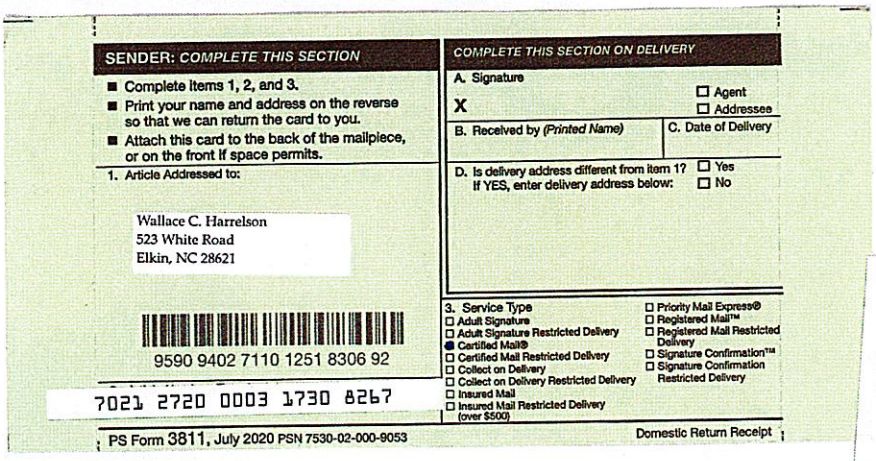
Departed USPS Regional Facility
RALEIGH NC DISTRIBUTION CENTER
October 11, 2023, 2:56 am

Arrived at USPS Regional Origin Facility
RALEIGH NC DISTRIBUTION CENTER
October 10, 2023, 11:22 pm

Departed Post Office
CARY, NC 27511
October 10, 2023, 5:44 pm

USPS in possession of item
CARY, NC 27511
October 10, 2023, 9:09 am

RECEIVED
NOV 20 2023
DCM WILMINGTON



SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Wallace C. Harrelson
523 White Road
Elkin, NC 28621

9590 9402 7110 1251 8306 92

7021 2720 0003 1730 8267

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X
☐ Agent
☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Adult Signature
☐ Adult Signature Restricted Delivery
● Certified Mail®
☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
☐ Collect on Delivery Restricted Delivery
☐ Insured Mail
☐ Insured Mail Restricted Delivery (over $500)
☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

CERTIFIED MAIL

NIXIE 220 DE 1 0
RETURN TO SENDER
UNCLAIMED
UNABLE TO FORWARD
BC: 27607507020 2027N3121-
267

Retail

RDC 99

28621

$10.69

R2308M154382-22

U.S. POSTAGE PAID
FCM LG ENV
CARY, NC 27511
OCT 10, 2023

UNC

Wallace C. Harrelson
523 White Road
Elkin, NC 28621

WK DICKSON
community infrastructure consultants

720 Corporate Center Drive
Raleigh, NC 27607
919.782.0495

Attempted delivery 3 times

10/12
10/17
10/27

RECEIVED
11/14/2023
W.K. Dickson & Co., Inc.

RECEIVED
NOV 20 2023
DCM WILMINGTON

Crowell Street DIS Design Services Project Property Owners

E Beach Dr: West of SE 79th St

North side of the road
Robert P. & Mary K. Edmonds ✓
Street Address = 7808 E Beach Dr, Oak Island, NC 28465
Mailing Address = 7020 Denison RD, Summerfield, NC 27358-9235

South side of the road
Jessee B. & Janice Shelton, Trustees ✓
Street Address = 7807 E Beach Dr, Oak Island, NC 28465
Mailing Address = 18640 Waterford Drive, Sutherland, VA 23885

Ocean Dr: Between SE 79th St and Crowell St

North side of the road

John F. Timm, Living Trust ✓
Street Address = 1106 Ocean Dr, Oak Island, NC 28465
Mailing Address = PO Box 1024, Oak Island, NC 28465-6860

Stephen C. Ural ✓
Street Address = 1104 Ocean Dr, Oak Island, NC 28465
Mailing Address = 513 Sweet Juliet Way, Greer, SC 29650-4555

Frank Iii & Kelly Allison ✓
Street Address = 1102 Ocean Dr, Oak Island, NC 28465
Mailing Address = 6835 Breyerton Way Se, Owens X Rds, AL 35763-8806

Jerri Anne Kallam ✓
Street Address = 1100 Ocean Dr, Oak Island, NC 28465
Mailing Address = 1338 Rollins Ave, Charlotte, NC 28205

South side of the road

Wallace C. Harrelson ○ resend
Street Address = 1109 Ocean Dr, Oak Island, NC 28465
Mailing Address = 523 White Road, Elkin, NC 28621

Kirby & Terry Pearce ✓
Street Address = 1107 Ocean Dr, Oak Island, NC 28465
Mailing Address = PO Box 160, Rolesville, NC 27571

Michael Clay & Susan Stewart ✓
Street Address = 1105 Ocean Dr, Oak Island, NC 28465
Mailing Address = 1208 Prairie Pond Cir, Raleigh, NC 27614-8679

Jordan Q. & Tyler B. Jaeger ✓
Street Address = 1103 Ocean Dr, Oak Island, NC 28465
Mailing Address = 409 Hampton Trail Dr, Fort Mill, SC 29708-0184

David Lewis & Pamela Wedding ✓
Street Address = 1101 Ocean Dr, Oak Island, NC 28465
Mailing Address = PO Box 490, Oak Island, NC 28465-6854

Ocean Dr: Between Crowell St and Sherrill St

North side of the road

Ashfaque & Alyssa Chowdhury ✓
Street Address = 1006 Ocean Dr, Oak Island, NC 28465
Mailing Address = 4800 Goldena Acres Rd, Oak Ridge, NC 27310

Diane J. Mcgurl, Etals ✓
Street Address = 1004 Ocean Dr, Oak Island, NC 28465
Mailing Address = 124 Singleton St, Raleigh, NC 27606-1137

Roland Odell Trout Jr. ○ check tracking
Street Address = 1002 Ocean Dr, Oak Island, NC 28465
Mailing Address = 1311 Wellington Dr, Columbia, SC 29204-2349

Charles E. & Drina J. Hudson ✓
Street Address = 1000 Ocean Dr, Oak Island, NC 28465
Mailing Address = 903 Brief Road West, Indian Trail, NC 28079

South side of the road

Theresa & Alan Steighner ✓
Street Address = 1009 Ocean Dr, Oak Island, NC 28465
Mailing Address = PO Box 1143, Davidson, NC 28036-1143

Michael G. & Nancy B. Cloutier ○ check for delivery
Street Address = 1007 Ocean Dr, Oak Island, NC 28465
Mailing Address = 8100 Cranes View Place W, Raleigh, NC 27615-4746

Bryant O. Dunlap Jr. ✓
Street Address = 1005 Ocean Dr, Oak Island, NC 28465
Mailing Address = 250 Culbreth Rd, Chapel Hill, NC 27516

Mark P. & Delaine M. Mead ✓
Street Address = 1003 Ocean Dr, Oak Island, NC 28465
Mailing Address = 5410 Callander Ct, Charlotte, NC 28277

Mike & Nicole Kaltsas ✓
Street Address = 1001 Ocean Dr, Oak Island, NC 28465
Mailing Address = 302 65th Ave N, Myrtle Beach, SC 29572-3343

Ocean Dr: East of Sherrill St

North side of the road

Eric D. & Jennifer K. Scelza ✓
Street Address = 906 Ocean Dr, Oak Island, NC 28465
Mailing Address = 515 Lindbergh Ave, Stroudsburg, PA 18360-2221

Eben J. & Maggie E. Wheeler ✓
Street Address = 904 Ocean Dr, Oak Island, NC 28465
Mailing Address = 8902 Longview Club Dr, Waxhaw, NC 28173-6804

South side of the road

Richard S. & Karen A. Frisk ✓
Street Address = 911 Ocean Dr, Oak Island, NC 28465
Mailing Address = 144 Conestoga Way, Glastonbury, CT 06033-3362

Joseph & Ann Beach ✓
Street Address = 909 Ocean Dr, Oak Island, NC 28465
Mailing Address = 2910 Queens Ct, Norcross, GA 30071

October 9, 2023

Frank Lii & Kelly Allison
6835 Breyerton Way SE
Owens X Roads, AL 35763-8806

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

October 9, 2023

Joseph & Ann Beach
2910 Queens Court
Norcross, GA 30071

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Ashfaque & Alyssa Chowdhury
4800 Goldena Acres Road
Oak Ridge, NC 27310

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Michael G. & Nancy B. Cloutier
8100 Cranes View Place W
Raleigh, NC 27615-4746

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Bryant O. Dunlap Jr.
250 Culbreth Road
Chapel Hill, NC 27516

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Robert P. & Mary K. Edmonds
7020 Denison Road
Summerfield, NC 27358-9235

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

October 9, 2023

Richard S. & Karen A. Frisk
144 Conestoga Way
Glastonbury, CT 06033-3362

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Wallace C. Harrelson
523 White Road
Elkin, NC 28621

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Charles E. & Drina J. Hudson
903 Brief Road West
Indian Trail, NC 28079

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Jordan Q. & Tyler Jaeger
409 Hampton Trail Drive
Fort Mill, SC 29708-0184

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

October 9, 2023

Jerri Anne Kallam
1338 Rollins Avenue
Charlotte, NC 28205

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Mike & Nicole Kaltsas
302 65th Avenue N
Myrtle Beach, SC 29572-3343

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Diane J. McGurl, Etals
124 Singleton Street
Raleigh, NC 27606-1137

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Mark P. & Delaine M. Mead
5410 Callander Court
Charlotte, NC 28277

Receipts for

Certified Mail

(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Kirby & Terry Pearce
P O Box 160
Rolesville, NC 27571

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Eric D. & Jennifer K. Scelza
515 Lindbergh Avenue
Stroudsburg, PA 18360-2221

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Jessee B. & Janice Shelton, Trustees
18640 Waterford Drive
Sutherland, VA 23885

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Theresa & Alan Steighner
P O Box 1143
Davidson, NC 28036-1143

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Michael Clay & Susan Stewart
1208 Prairie Pond Circle
Raleigh, NC 27614-8679

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

John F. Timm, Living Trust
P O Box 1024
Oak Island, NC 28465-6860

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

October 9, 2023

Roland Odell Trout Jr.
1311 Wellington Drive
Columbia, SC 29204-2349

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner

Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

October 9, 2023

Stephen C. Ural
513 Sweet Juliet Way
Greer, SC 29650-4555

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

October 9, 2023

Receipts for
Certified Mail
(Staple Here)

David Lewis & Pamela Wedding
P O Box 490
Oak Island, NC 28465-6854

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

October 9, 2023

Eben J. & Maggie E. Wheeler
8902 Longview Club Drive
Waxhaw, NC 28173-6804

Receipts for
Certified Mail
(Staple Here)

Dear Adjacent Property:

This letter is to inform you that I, Town of Oak Island, have applied for a CAMA Minor
Property Owner
Permit on my property at beach access at intersection of Crowell St. and Ocean Dr., in Brunswick County.
Property Address

As required by CAMA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed no objection form. If you have any questions or comments about my proposed project, please contact me at 910-933-4026, or by mail at the address listed below. If you wish to file written comments or objections with the Town of Oak Island CAMA Minor Permit Program, you may submit them to:

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

Sincerely,

Town of Oak Island
Mr. Rick Patterson
4601 E. Oak Island Drive
Oak Island, NC 28465

RECEIVED
NOV 20 2023
DCM WILMINGTON

20200803.CC.RA 084 OAK Island (1)

RECEIVED
OCT 20 2023
PCM WILMINGTON

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

7021 2720 0003 1730 8243

Owens Cross Roads, AL 35763

Certified Mail Fee $4.35 — $3.55

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $2.79

Total Postage and Fees $10.69

0504 22

Postmark Here — CARY POST OFFICE — 10/10/2023

Sent To: Frank Lii & Kelly Allison
Street and Apt.: 6835 Breyerton Way SE
City, State, ZIP: Owens X Rds, AL 35763-8806

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

7021 2720 0003 1730 8366

Raleigh, NC 27615

Certified Mail Fee $4.35 — $3.55

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $2.79

Total Postage and Fees $10.69

0504 22

Postmark Here — CARY POST OFFICE — OCT 10 2023 — CARY, NC 27511-9998 — 10/10/2023

Sent To: Michael G. & Nancy B. Cloutier
Street and Apt.: 8100 Cranes View Place W
City, State, ZIP: Raleigh, NC 27615-4746

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

7021 2720 0003 1730 8151

Norcross, GA 30071

Certified Mail Fee $4.35 — $3.55

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $2.79

Total Postage and Fees $10.69

0504 22

CARY POST OFFICE — Postmark Here — OCT 10 2023 — CARY, NC 27511-9998 — 10/10/2023

Sent To: Joseph & Ann Beach
Street and Apt.: 2910 Queens Court
City, State, ZIP: Norcross, GA 30071

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

7021 2720 0003 1730 8359

Chapel Hill, NC 27516

Certified Mail Fee $4.35 — $3.55

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $2.79

Total Postage and Fees $10.69

0504 22

CARY POST OFFICE — Postmark Here — 10/10/2023

Sent To: Bryant O. Dunlap, Jr.
Street and Apt.: 250 Culbreth Road
City, State, ZIP: Chapel Hill, NC 27516

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

7021 2720 0003 1730 8298

Oak Ridge, NC 27310

Certified Mail Fee $4.35 — $3.55

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $2.79

Total Postage and Fees $10.69

0504 22

Postmark Here — CARY POST OFFICE — 10/10/2023

Sent To: Ashfaque & Alyssa Chowdhury
Street and Apt.: 4800 Goldena Acres Road
City, State, ZIP: Oak Ridge, NC 27310

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

7021 2720 0003 1730 8199

Summerfield, NC 27358

Certified Mail Fee $4.35 — $3.55

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $2.79

Total Postage and Fees $10.69

0504 22

CARY POST OFFICE — Postmark Here — OCT 10 2023 — 10/10/2023

Sent To: Robert P. & Mary K. Edmonds
Street and Apt.: 7020 Denison Road
City, State, ZIP: Summerfield, NC 27358-9235

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

RECEIVED
NOV 20 2023
DCM WILMINGTON

(2)

7021 2720 0003 1730 8168

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Glastonbury, CT 06033

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$3.55
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
Total Postage and Fees	$10.69

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Richard S. & Karen A. Frisk
Street and Apt. No.: 144 Conestoga Way
City, State, ZIP+4: Glastonbury, CT 06033-3362

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8274

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Fort Mill, SC 29708

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$3.55
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
Total Postage and Fees	$10.69

0504 22

CARY POST OFFICE CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Jordan Q. & Tyler B. Jaeger
Street and Apt. No.: 409 Hampton Trail Drive
City, State, ZIP+4: Fort Mill, SC 29708-0184

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8267

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Elkin, NC 28621

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$3.55
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
Total Postage and Fees	$10.69

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Wallace C. Harrelson
Street and Apt. No.: 523 White Road
City, State, ZIP+4: Elkin, NC 28621

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8236

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Charlotte, NC 28205

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$3.55
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
Total Postage and Fees	$10.69

0504 22

CARY POST OFFICE CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Jerri Anne Kallam
Street and Apt. No.: 1338 Rollins Avenue
City, State, ZIP+4: Charlotte, NC 28205

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8342

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Indian Trail, NC 28079

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$3.55
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
Total Postage and Fees	$10.69

0504 22

CARY, NC 27511-9998 CARY POST OFFICE

Postmark Here

10/10/2023

Sent To: Charles E. & Drina J. Hudson
Street and Apt. No.: 903 Brief Road West
City, State, ZIP+4: Indian Trail, NC 28079

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8380

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Myrtle Beach, SC 29572

OFFICIAL USE

Certified Mail Fee	$4.35
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$3.55
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
Total Postage and Fees	$10.69

0504 22

CARY, NC 27511-9998 CARY POST OFFICE

Postmark Here

10/10/2023

Sent To: Mike & Nicole Kaltsas
Street and Apt. No.: 302 65th Avenue N
City, State, ZIP+4: Myrtle Beach, SC 29572-3343

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

(3)

RECEIVED
NOV 20 2023
DCM WILMINGTON

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT

Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

7021 2720 0003 1730 8328

Raleigh NC 27606

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Diane J. McGurl, Etals
Street and Apt.: 124 Singleton Street
City, State, Z: Raleigh, NC 27606-1137

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT

Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

7021 2720 0003 1730 8182

Stroudsburg PA 18360

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Eric D. Jennifer K. Scelza
Street and Apt.: 515 Lindbergh Avenue
City, State, Zi: Stroudsburg, PA 18360-2221

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT

Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

7021 2720 0003 1730 8373

Charlotte NC 28277

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Mark P. & Delaine M. Mead
Street and A: 5410 Callander Court
City, State, : Charlotte, NC 28277

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT

Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

7021 2720 0003 1730 8205

Sutherland VA 23885

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Jessee & Janice Shelton, Trustees
Street and: 18640 Waterford Drive
City, State: Sutherland, VA 23885

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT

Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

7021 2720 0003 1730 8250

Rolesville NC 27571

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504 22

CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Kirby & Terry Pearce
Street and Apt.: P O Box 160
City, State, ZIP: Rolesville, NC 27571

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™ CERTIFIED MAIL® RECEIPT

Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

7021 2720 0003 1730 8335

Davidson NC 28036

OFFICIAL USE

Certified Mail Fee	$4.35
$	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$2.79
$	
Total Postage and Fees	$10.69
$	

0504 22

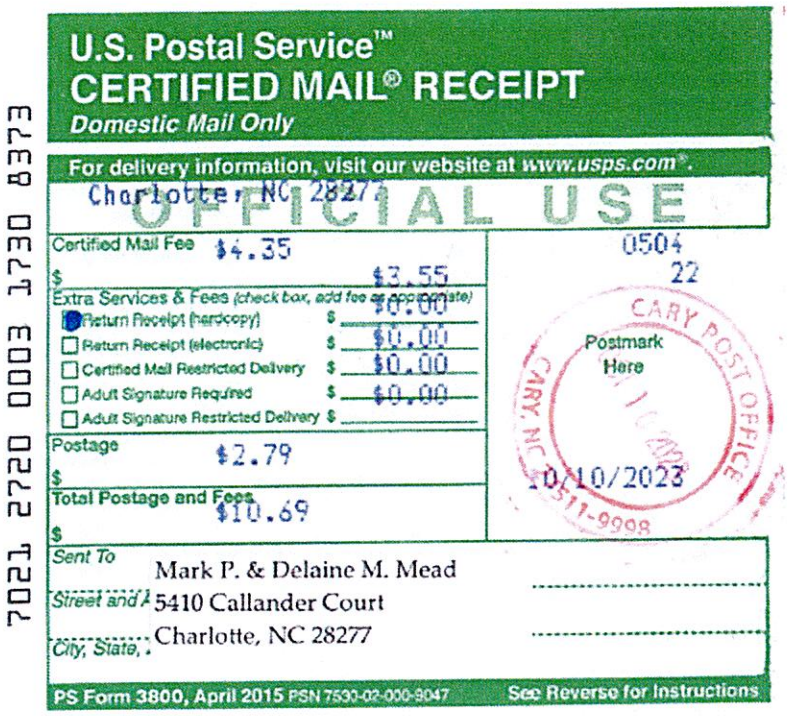
CARY POST OFFICE OCT 10 2023 CARY, NC 27511-9998

Postmark Here

10/10/2023

Sent To: Theresa & Alan Steighner
Street and Ap: P O Box 1143
City, State, Zi: Davidson, NC 28036-1143

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions



U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Charlotte, NC 28277

OFFICIAL USE

Certified Mail Fee $4.35	$3.55
Extra Services & Fees (check box, add fee as appropriate)	
☑ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage $2.79	
Total Postage and Fees $10.69	

0504
22

Postmark Here
CARY POST OFFICE
CARY, NC
10/10/2023

Sent To: Mark P. & Delaine M. Mead
Street and A: 5410 Callander Court
City, State,: Charlotte, NC 28277

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8373

RECEIVED

NOV 20 2023

DCM WILMINGTON

(4)

7021 2720 0003 1730 8281

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Raleigh, NC 27614

OFFICIAL USE

Certified Mail Fee $4.35
$3.55
Extra Services & Fees (check box, add fee as appropriate) $0.00
☑ Return Receipt (hardcopy) $0.00
☐ Return Receipt (electronic) $0.00
☐ Certified Mail Restricted Delivery $0.00
☐ Adult Signature Required
☐ Adult Signature Restricted Delivery $
Postage $2.79
Total Postage and Fees $10.69

0504 22

CARY POST OFFICE OCT 10 2023 CARY NC 27511-9998

Postmark Here

10/10/2023

Sent To: Michael Clay & Susan Stewart
Street and: 1208 Prairie Pond Circle
City, State: Raleigh, NC 27614-8679

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8212

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Greer, SC 29650

OFFICIAL USE

Certified Mail Fee $4.35
$3.55
Extra Services & Fees (check box, add fee as appropriate) $0.00
☑ Return Receipt (hardcopy) $0.00
☐ Return Receipt (electronic) $0.00
☐ Certified Mail Restricted Delivery $0.00
☐ Adult Signature Required
☐ Adult Signature Restricted Delivery $
Postage $2.79
Total Postage and Fees $10.69

0504 22

CARY POST OFFICE OCT 10 2023 CARY NC 27511-9998

Postmark Here

10/10/2023

Sent To: Stephen C. Ural
Street and: 513 Sweet Juliet Way
City, State: Greer, SC 29650-4555

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8229

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Oak Island, NC 28465

OFFICIAL USE

Certified Mail Fee $4.35
$3.55
Extra Services & Fees (check box, add fee as appropriate) $0.00
☑ Return Receipt (hardcopy) $0.00
☐ Return Receipt (electronic) $0.00
☐ Certified Mail Restricted Delivery $0.00
☐ Adult Signature Required
☐ Adult Signature Restricted Delivery $
Postage $2.79
Total Postage and Fees $10.69

0504 22

CARY NC 27511-9998 OCT 10 2023 CARY POST OFFICE

Postmark Here

10/10/2023

Sent To: John F. Timm, Living Trust
Street and: P O Box 1024
City, State: Oak Island, NC 28465-6860

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8304

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Oak Island, NC 28465

OFFICIAL USE

Certified Mail Fee $4.35
$3.55
Extra Services & Fees (check box, add fee as appropriate) $0.00
☑ Return Receipt (hardcopy) $0.00
☐ Return Receipt (electronic) $0.00
☐ Certified Mail Restricted Delivery $0.00
☐ Adult Signature Required
☐ Adult Signature Restricted Delivery $
Postage $2.79
Total Postage and Fees $10.69

0504 22

CARY NC 27511-9998 OCT 10 2023 CARY POST OFFICE

Postmark Here

10/10/2023

Sent To: David Lewis & Pamela Wedding
Street and: P O Box 490
City, State: Oak Island, NC 28465-6854

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8311

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Columbia, SC 29204

OFFICIAL USE

Certified Mail Fee $4.35
$3.55
Extra Services & Fees (check box, add fee as appropriate) $0.00
☑ Return Receipt (hardcopy) $0.00
☐ Return Receipt (electronic) $0.00
☐ Certified Mail Restricted Delivery $0.00
☐ Adult Signature Required
☐ Adult Signature Restricted Delivery $
Postage $2.79
Total Postage and Fees $10.69

0504 22

CARY NC 27511-9998 OCT 10 2023 CARY POST OFFICE

Postmark Here

10/10/2023

Sent To: Roland Odell Trout, Jr.
Street and Ap: 1311 Wellington Drive
City, State, Z: Columbia, SC 29204-2349

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8175

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Waxhaw, NC 28173

OFFICIAL USE

Certified Mail Fee $4.35
$3.55
Extra Services & Fees (check box, add fee as appropriate) $0.00
☑ Return Receipt (hardcopy) $0.00
☐ Return Receipt (electronic) $0.00
☐ Certified Mail Restricted Delivery $0.00
☐ Adult Signature Required
☐ Adult Signature Restricted Delivery $
Postage $2.79
Total Postage and Fees $10.69

0504 22

CARY NC 27511-9998 OCT 10 2023 CARY POST OFFICE

Postmark Here

10/10/2023

Sent To: Eben J. & Maggie E. Wheeler
Street and Apt.: 8902 Longview Club Drive
City, State, ZIP: Waxhaw, NC 28173-6804

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Tracking Number:

70212720000317308373

Copy Add to Informed Delivery

Latest Update

Your item was delivered to an individual at the address at 11:56 am on October 17, 2023 in CHARLOTTE, NC 28277.

Get More Out of USPS Tracking:

USPS Tracking Plus®

Delivered
Delivered, Left with Individual
CHARLOTTE, NC 28277
October 17, 2023, 11:56 am

Reminder to Schedule Redelivery of your item
October 17, 2023

Notice Left (No Authorized Recipient Available)
CHARLOTTE, NC 28277
October 12, 2023, 12:49 pm

Arrived at USPS Regional Destination Facility
CHARLOTTE NC DISTRIBUTION CENTER
October 11, 2023, 9:04 am

Departed USPS Regional Facility
RALEIGH NC DISTRIBUTION CENTER
October 11, 2023, 2:56 am

Arrived at USPS Regional Origin Facility
RALEIGH NC DISTRIBUTION CENTER
October 11, 2023, 12:04 am

Departed Post Office
CARY, NC 27511
October 10, 2023, 5:44 pm

USPS in possession of item
CARY, NC 27511
October 10, 2023, 9:15 am

USPS TRACKING #

9590 9402 7110 1251 8307 84

First-Class Postage & USPS Permit No.

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this b

060

RECEIVED

10/23/2023

W.K. Dickson & Co., Inc.

WK DICKSON & CO., INC.

720 Corporate Center Drive

Raleigh, NC 27607 - 5070

Attn: Alex McMillan Ref: 20200803.00.RA

P-50720

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Eben J. & Maggie E. Wheeler
8902 Longview Club Drive
Waxhaw, NC 28173-6804

9590 9402 7110 1251 8307 84

2. Article Number (Transfer from service label)

7021 2720 0003 1730 8175

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☐ Agent
☐ Addressee

B. Received by (Printed Name) EBEN WHEELER

C. Date of Delivery 10/14/20

D. Is delivery address different from item 1?
If YES, enter delivery address below:

☐ Yes
☐ No

RECEIVED
NOV 20 2023
DCM WILMINGTON
091

3. Service Type

☐ Adult Signature
☐ Adult Signature Restricted Delivery
■ Certified Mail®
☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
☐ Collect on Delivery Restricted Delivery
☐ ed Mail
☐ ed Mail Restricted Delivery
(over $500)

☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8306 54

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

092

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

David Lewis & Pamela Wedding
P O Box 490
Oak Island, NC 28465-6854

9590 9402 7110 1251 8306 54

2. Article Number (Transfer from service label)

7021 2720 0003 1730 8304

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X Pamela Wedding ☐ Agent ☐ Addressee

B. Received by (Printed Name) C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

RECEIVED
093
NOV 20 2023
DCM WILMINGTON

OCT 12 2023
USPS OAK ISLAND NC 28465

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

USPS TRACKING #

9590 9402 7110 1251 8307 22

GREENVILLE SC 296
25 OCT 2023 PM 4 L

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

094

RECEIVED
10/30/2023
W.K. Dickson & Co., Inc.

• Sender: Please print your name, address, and ZIP+4® in this box•

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Stephen C. Ural
513 Sweet Juliet Way
Greer, SC 29650-4555

9590 9402 7110 1251 8307 22

2. Article Number (Transfer from service label)

7021 2720 0003 1730 8212

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☐ Agent
☐ Addressee

B. Received by (Printed Name)

Steve Ural

C. Date of Delivery

10/25/23

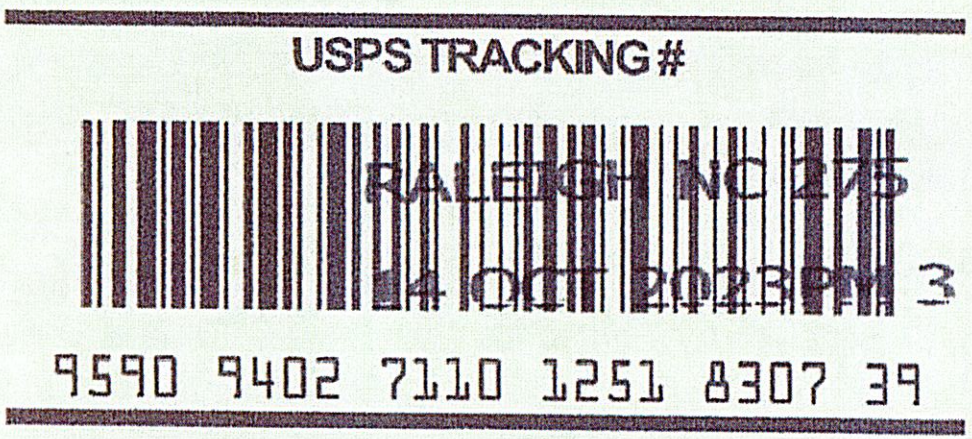
D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

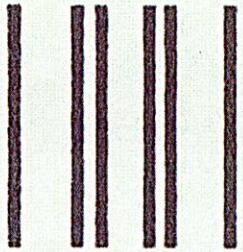
RECEIVED
NOV 20 2023
DCM WILMINGTON
095

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☑ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt





First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

096

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

7-30720

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

John F. Timm, Living Trust
P O Box 1024
Oak Island, NC 28465-6860

9590 9402 7110 1251 8307 39

2. Article Number (Transfer from service label)

7021 2720 0003 1730 8229

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X John F Timm ☐ Agent ☒ Addressee

B. Received by (Printed Name)

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

OCT 13 2023

DCM WILMINGTON NOV 20 2023 RECEIVED

097

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

Mail
Mail Restricted Delivery
00)

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8306 78

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Michael Clay & Susan Stewart
1208 Prairie Pond Circle
Raleigh, NC 27614-8679

9590 9402 7110 1251 8306 78

(Transfer from service label)
7021 2720 0003 1730 8281

COMPLETE THIS SECTION ON DELIVERY

A. Signature

x Susan Stewart ☐ Agent ☐ Addressee

B. Received by (Printed Name) Susan Stewart

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

RECEIVED
NOV 20 2023
DCM WILMINGTON
099

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Expres
- ☐ Registered Mail™
- ☐ Registered Mail Re: Delivery
- ☐ Signature Confirmat:
- ☐ Signature Confirmatic Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receip

USPS TRACKING #

9590 9402 7110 1251 8306 09

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

100

RECEIVED
10/23/2023
W.K. Dickson & Co., Inc.

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Theresa & Alan Steighner
P O Box 1143
Davidson, NC 28036-1143

9590 9402 7110 1251 8306 09

2. Article Number (Transfer from service label)

7021 2720 0003 1730 8335

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☐ Agent
☐ Addressee

B. Received by (Printed Name)

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

DAVIDSON POST OFFICE
OCT 18 2023
28036

RECEIVED
NOV 20 2023
DCM WILMINGTON
101

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- sured Mail
- sured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8307 46

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

102

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/23/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Jessee & Janice Shelton, Trustees
18640 Waterford Drive
Sutherland, VA 23885

9590 9402 7110 1251 8307 46

7021 2720 0003 1730 8205

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Patricia Shelton ☐ Agent ☐ Addressee

B. Received by (Printed Name) Patricia Shelton

C. Date of Delivery 10/16/23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

RECEIVED
NOV 20 2023
103
DCM WILMINGTON

3. Service Type
- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ ect on Delivery Restricted Delivery
- ☐ ired Mail
- ☐ ired Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricte Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8308 14

HARRISBURG PA 171
14 OCT 2023 PM 1 L

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

104

RECEIVED
10/18/2023
W.K. Dickson & Co., Inc.

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

-507020

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Eric D. Jennifer K. Scelza
515 Lindbergh Avenue
Stroudsburg, PA 18360-2221

9590 9402 7110 1251 8308 14

7021 2720 0003 1730 8182

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☐ Agent
☐ Addressee

B. Received by (Printed Name) Eric D Scelza

C. Date of Delivery 10/14/2

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

RECEIVED
NOV 20 2023
DCM WILMINGTON
105

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8306 85

RALEIGH NC 275
12 OCT 2023 PM 3 L

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

106

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

7-50720

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Kirby & Terry Pearce
P O Box 160
Rolesville, NC 27571

9590 9402 7110 1251 8306 85

7021 2720 0003 1730 8250

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X Kirby Pearce ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

RECEIVED
NOV 20 2023
DCM WILMINGTON
107

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

lail
lail Restricted Delivery
(over $500)

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8306 30

RALEIGH NC 275
12 OCT 2023 PM 4 L

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

108

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Diane J. McGurl, Etals
124 Singleton Street
Raleigh, NC 27606-1137

9590 9402 7110 1251 8306 30

7021 2720 0003 1730 8328

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X [signature] ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery 10/2/23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

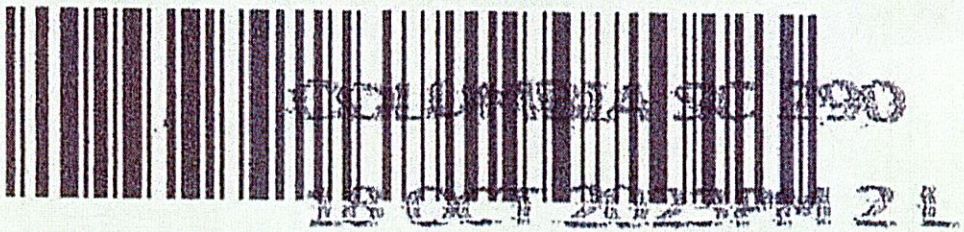
RECEIVED
NOV 20 2023
PCM WILMINGTON
109

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ● Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #



9590 9402 7110 1251 8305 62

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

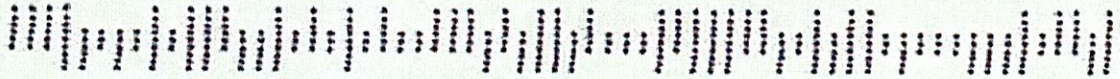
• Sender: Please print your name, address, and ZIP+4® in this box•

110

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/23/2023
W.K. Dickson & Co., Inc.

-507020



SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mike & Nicole Kaltsas
302 65th Avenue N
Myrtle Beach, SC 29572-3343

9590 9402 7110 1251 8305 62

7021 2720 0003 1730 8380

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X [signature] ☐ Agent ☐ Addressee

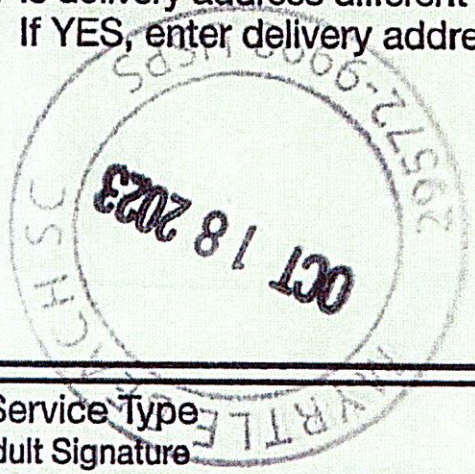
B. Received by (Printed Name)

Michael Kaltsas

C. Date of Delivery

10/18/23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No



RECEIVED
NOV 20 2023
PCM WILMINGTON

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ● Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ sured Mail
- ☐ sured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricte Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8307 08

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

112

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 -5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/23/2023
W.K. Dickson & Co., Inc.

37-807020

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Jerri Anne Kallam
1338 Rollins Avenue
Charlotte, NC 28205

9590 9402 7110 1251 8307 08

7021 2720 0003 1730 8236

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

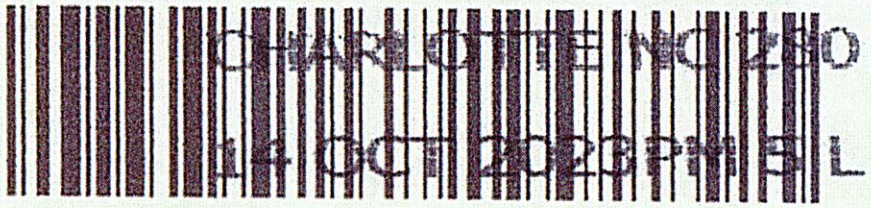
RECEIVED
NOV 20 2023
DCM WILMINGTON
113

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return

USPS TRACKING #



9590 9402 7110 1251 8306 61

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

114

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Jordan Q. & Tyler B. Jaeger
409 Hampton Trail Drive
Fort Mill, SC 29708-0184

9590 9402 7110 1251 8306 61

71 2720 0003 1730 8274

COMPLETE THIS SECTION ON DELIVERY

A. Signature

x TYLER JAEGER ☐ Agent ☒ Addressee

B. Received by *(Printed Name)* TYLER JAEGER

C. Date of Delivery 10/14/23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

RECEIVED
NOV 20 2023
DCM WILMINGTON
115

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8306 16

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

116

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Charles E. & Drina J. Hudson
903 Brief Road West
Indian Trail, NC 28079

9590 9402 7110 1251 8306 16

2. Article Number (Transfer from service label)

021 2720 0003 1730 8342

COMPLETE THIS SECTION ON DELIVERY

A. Signature

x Drina J. Hudson ☐ Agent ☐ Addressee

B. Received by (Printed Name)

C. Date of Delivery 10/12/23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ● Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

RECEIVED
NOV 20 2023
BGM WILMINGTON

117

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8307 53

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

118

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 -5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/17/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Robert P. & Mary K. Edmonds
7020 Denison Road
Summerfield, NC 27358-9235

9590 9402 7110 1251 8307 53

7021 2720 0003 1730 8199

COMPLETE THIS SECTION ON DELIVERY

A. Signature

x Mary Edmonds ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery 10.12

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ ollect on Delivery Restricted Delivery
- ☐ sured Mail
- ☐ ...sured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricte Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

119

RECEIVED
DCM WILMINGTON
NOV 20 2023

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8305 86

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

120

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607- 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/25/2023
W.K. Dickson & Co., Inc.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Bryant O. Dunlap, Jr.
250 Culbreth Road
Chapel Hill, NC 27516

9590 9402 7110 1251 8305 86

2. Article Number (Transfer from service label)

7021 2720 0003 1730 8359

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☑ Agent
☐ Addressee

B. Received by (Printed Name) C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

121

RECEIVED
NOV 20 2020
CLERK WILMINGTON

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8306 47

GREENSBORO NC 270
20 OCT 2023PM 3 L

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

122

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

RECEIVED
10/25/2023
W.K. Dickson & Co., Inc.

37-50720

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Ashfaque & Alyssa Chowdhury
4800 Goldena Acres Road
Oak Ridge, NC 27310

9590 9402 7110 1251 8306 47

7021 2720 0003 1730 8298

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X Alyssa Chowdhury ☐ Agent ☒ Addressee

B. Received by (Printed Name) Alyssa Chowdhury

C. Date of Delivery 10/20/2023

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

123

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ sured Mail
- ☐ sured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

RECEIVED
NOV 2023
DEAN WINGTON

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8307 60

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607 - 5070
Attn: Alex McMillan Ref: 20200803.00.RA

124

RECEIVED
10/23/2023
W.K. Dickson & Co., Inc.

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Joseph & Ann Beach
2910 Queens Court
Norcross, GA 30071

9590 9402 7110 1251 8307 60

2. Article Number *(Transfer from service label)*

7021 2720 0003 1730 8151

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☐ Agent
☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

125

3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ■ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

RECEIVED
NOV 20 2023
CLERK WILMINGTON

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

USPS TRACKING #

9590 9402 7110 1251 8307 15

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

United States
Postal Service

• Sender: Please print your name, address, and ZIP+4® in this box•

WK DICKSON & CO., INC.
720 Corporate Center Drive
Raleigh, NC 27607-5070
Attn: Alex McMillan Ref: 20200803.00.RA

126

RECEIVED
10/25/2023
W.K. Dickson & Co., Inc.

7-507020

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Frank Lii & Kelly Allison
6835 Breyerton Way SE
Owens X Rds, AL 35763-8806

9590 9402 7110 1251 8307 15

2. Article Number *(Transfer from service label)*

7021 2720 0003 1730 8243

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X Kelly Allison ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* Kelly Allison

C. Date of Delivery 10-14-23

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

127

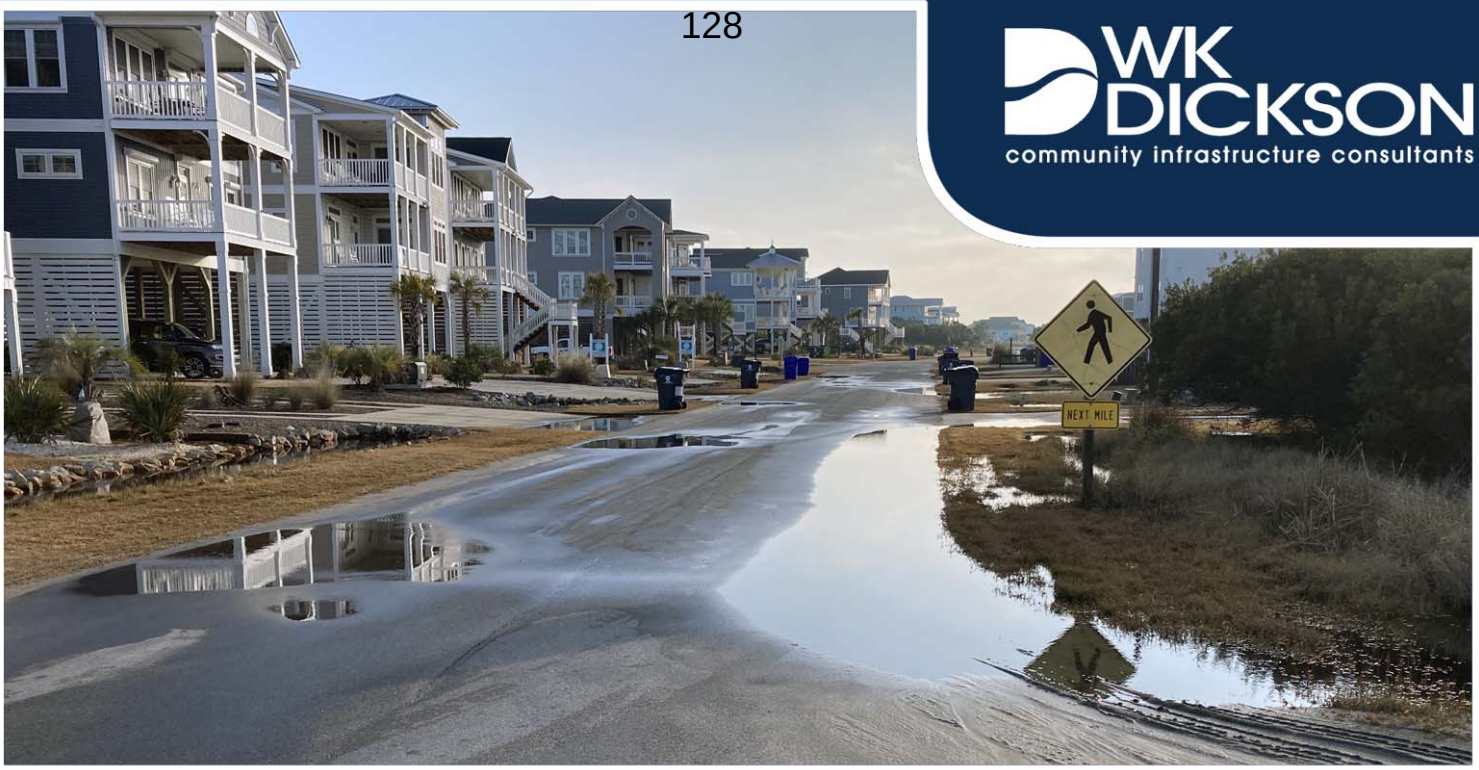
3. Service Type

- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☑ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

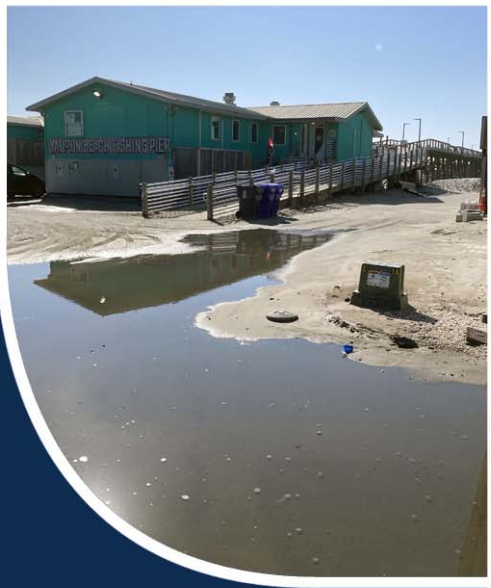
RECEIVED
DCA WILMINGTON
NOV 20 2023

PS Form 3811, July 2020 PSN 7530-02-000-9053 Domestic Return Receipt

WK DICKSON
community infrastructure consultants



Town of Oak Island, NC
Ocean Drive Drainage Study



August 2021

Town of Oak Island

Ocean Drive Drainage Study

Drainage and Infiltration System Feasibility Project

Final Submittal
August 2021

Prepared by
W. K. Dickson & Co., Inc.
Raleigh, NC
919-782-0495
NC License No. F-0374

Table of Contents

List of Tables

List of Figures

List of Appendices

Section 1. Executive Summary

This study's purpose is to evaluate the feasibility of diverting flood waters from four critical flooding areas on E. Beach Drive and Ocean Drive between 74th Street and Womble Street to potential infiltration areas (Sites 1-6), to the existing storm drainage system on the North side (sound side) of E. Oak Island Drive (SR-1190) and Womble Street (Site 7), or to the existing Satellite Water Reclamation Facility (SWRF) at 5209 E. Yacht Drive (Site 8).

The Town of Oak Island has four flooding areas that cause routine road flooding even during moderate rainfall events. These are shown in Figure 1A and Figure 1B. This study includes evaluation of pumping stormwater from the road during storm events, into a series of infiltration chambers embedded within the existing Secondary Dune system (Sites 1-4) or within the existing Town's Right-of-Way on E. Pelican Drive (Sites 5-6). The infiltration systems utilize the in-situ soil as infiltration media. Alternatives evaluated are to pump the stormwater to the existing storm drainage system at the intersection of E. Oak Island Drive (SR-1190) and Womble Street (Site 7) or to pump the stormwater to the existing Satellite Water Reclamation Facility (SWRF) (Site 8).

To address the above stated issues, this study presents the following:

- Evaluation of the feasibility of using the Town's Public Beach accesses to determine if the ponded flood waters can be infiltrated into the Secondary Dune system (Sites 1-4).
- Evaluation of the feasibility of diverting flood waters to the existing Town Right-of-Way on E. Pelican Drive to determine if the existing Right-of-Way can be converted into an infiltration gallery to infiltrate the ponded flood waters (Sites 5-6).
- Evaluation of the feasibility of diverting flood waters from the 801 Building on Ocean Drive to an existing NCDOT storm drainage system on the North side (sound side) of E. Oak Island Drive at Womble Street (Site 7).
- Evaluation of the feasibility of diverting flood waters to the existing Satellite Water Reclamation Facility (SWRF) (Site 8).
- A geotechnical analysis to determine the Seasonally High Water Table (SHWT) and hydraulic conductivity of in-situ soils.
- Evaluation of available site area to ensure proper ground elevation and vertical separation to SHWT and horizontal separation between the infiltration system and surrounding structures, including residential walkways and residential buildings.
- Estimate of the volume of water ponding within the roads.
- Evaluation of the size of the pumps to be comparable to the stormwater infiltration rate based upon the surface area of the proposed infiltration system.

- Evaluation of reducing flooding level (draw down) in less than twelve hours.

This study's findings include the following:

- Sites 1-4 are located within the VE Floodzone, where adding fill material is not allowed. Therefore, given the high SHWT and restrictions on adding fill material, the infiltration systems for Sites 1-4 are required to be located in the Secondary Dune system where elevations are several feet higher than surrounding lower dune elevations where associated soil borings were performed.
- Sites 1-4 have very limited site area available at the required higher elevations associated with the Secondary Dune system.
- Sites 1-4 are located in the Ocean Hazard Area of Environmental Concern (AEC); therefore, a Coastal Area Management Area (CAMA) minor permit is required, and a CRC variance for ocean setback requirements is anticipated. If the project disturbed area exceeds 1.0 acre of disturbance, a CAMA major permit would be required. A CAMA major permit would increase the overall project timeline.
- Sites 5-6 have slightly lower SHWT elevations and are not located in the VE Floodzone, however, adequate separation to the SHWT is not provided without adding fill material depth over the Infiltration System within the existing Town's Right-of-Way.
- Sites 1-4 construction costs are significantly below the comparable alternative Sites 5-8 options; however, construction costs do not include easement acquisition.
- Site 8 construction costs are significantly higher than the other combined Site options.
- Sites 1-3 and a small portion of Site 7 are located within private residential property and will require easements from the private landowners.

Based on this feasibility analysis, it is concluded that Sites 1-6 are feasible, Site 7 is not likely to be feasible based on currently available information, and Site 8 is feasible; however, the higher construction cost may make this Site option cost prohibitive. A survey provided by a NC Professional Land Surveyor and verification of geotechnical values used would provide improved information allowing for a more accurate evaluation of the feasibility of these systems. Also, several items should be considered during the design process, including private property easement acquisition as well as sources of funding available, and required permits.

Diverting flood waters to infiltration systems will provide flood reduction on E. Beach Drive and Ocean Drive and allow for safer vehicular travel within twelve hours of a moderate rainfall event for all the Sites except Site 8.

WK DICKSON
community infrastructure consultants

N W E S

Figure 1A
Vicinity Map
Ocean Drive Drainage Study

The Town of Oak Island North Carolina

0 250 500
Feet
1 inch = 500 feet

WK DICKSON
community infrastructure consultants

N W E S

Figure 1B
Vicinity Map
Ocean Drive Drainage Study

The Town of Oak Island North Carolina

0 500 1,000
Feet
1 inch = 1,000 feet

Section 2: Project Feasibility

Analyzed Site Locations and Feasibility Parameters

Eight different sites/options were considered for this analysis based upon the chronic and sometimes hazardous stormwater flooding from four areas on E. Beach Drive and Ocean Drive between 74th Street and Womble Street. Flooding along E. Beach Drive and Ocean Drive, which reaches depths of approximately 6-inches, prevents residents from safely accessing their driveways for several days after storm events greater than 0.5 inches of rainfall. The analyzed sites were identified and selected based upon locations where stormwater infiltration systems with pumping systems (Sites 1-6) and where pumping systems only (Sites 7-8) could be installed near areas where ponding stormwater occurs during moderate rainfall events. Refer to Appendix F for photos of the Sites and examples of ponding stormwater taken during the field site visits on January 14-15, 2021 and March 9, 2021. Please note, the photos do not reflect typical examples of extreme stormwater ponding, but only reflect the site conditions at the time of the site visit. The analyzed sites include:

- Site 1: 74th Street at E. Beach Drive (Vacant Lot Adjacent 115 SE 74th St)
- Site 2: 76th Street at E. Beach Drive (7507 E. Beach Drive)
- Site 3: 79th Street at Ocean Drive (7807 E. Beach Drive)
- Site 4: Barbee Blvd at Ocean Drive (Public R/W)
- Site 5: E. Pelican Drive R/W in-between 77th and 78th Street
- Site 6: E. Pelican Drive R/W in-between 78th and 79th Street
- Site 7: Existing storm drainage system at E. Oak Island Drive (SR-1190) and Womble Street
- Site 8: Existing Satellite Water Reclamation Facility (SWRF) at 5209 E. Yacht Drive

Sites 1-4 are located in the existing Secondary Dune system in-between the primary dune system and the oceanfront of private residences, and are generally confined by residential walkways, houses, public beach access paths, and or public parking areas that allow pedestrian traffic between the beachfront and a private residence or public parking area. Sites 1-3 are located on private property, and Site 4 is located on public property. Because the infiltration systems are installed within the dune system, they are commonly referred to as Dune Infiltration Systems (DIS). The DIS are a relatively new installation practice, and a recent North Carolina State University Extension publication is included as Appendix E and was used as a resource to aid in this feasibility study. Additionally, Sites 1-4 with DIS can be used for educational and research purposes. Researchers at North Carolina State University or local universities such as UNC-Wilmington can utilize the infiltration system for research purposes to better understand the effectiveness of DIS.

The proximity of the infiltration system to a public beach access provides educational opportunities for visitors and residents to learn about the benefits of infiltration systems and stormwater improvements. Sites 5-6 are located on public property within the Town Right-of-Way on E. Pelican Drive between 77th Street and 79th Street. The E. Pelican Drive is wooded and grassed with no road infrastructure present. Site 7 is located almost exclusively within public Right-of-Way along Ocean Drive near Womble Street and continuing to the intersection of E. Oak Island Drive (SR-1190) and Womble Street; however, a small portion of the proposed storm drain infrastructure is on private property. Site 8 is located exclusively within public Right-of-Way along Ocean Drive and E. Beach Drive between 74th Street and Womble Street and continuing to the north along 76th Street until reaching E. Oak Drive, and then continuing to the west along E. Oak Drive until reaching 54th Street, and then continuing to the north on 54th Street until reaching the SWRF at 5209 E. Yacht Drive.

The eight sites analyzed provide at least one infiltration option (Sites 1-4) within the Secondary Dune system for each of the four flooding areas. In addition, two separate infiltration options are provided for three of the flooding areas (Sites 5-6) and Site 8 combines all four of the flooding areas with discharge to the existing SWRF. The options are as follows:

- The 74th-75th flooding area has three options considered (Site 1, Site 5, Site 8).
- The 75th-77th flooding area has three options considered (Site 2, Site 5, and Site 8).
- The 79th-Crowell flooding area has three options considered (Site 3, Site 6, and Site 8).
- The Barbee-Womble flooding area including #801 Building has three options considered (Site 4, Site 7, and Site 8).

The Infiltration feasibility analysis (Sites 1-6) investigated the following five parameters to evaluate the suitability of each site, including:

- Distance to Seasonal High Water Table (SHWT);
- In-Situ Soil Saturated Hydraulic Conductivity;
- Available Site Area;
- Draw Down Time; and
- Estimated Construction Costs.

These five parameters evaluate the site constraints to accept and infiltrate the runoff that will be pumped from the flooded sections of E. Beach Drive and Ocean Drive into the proposed Infiltration Systems.

Utilizing the existing storm drain systems (Site 7) and the SWRF to collect and pump stormwater to existing infiltration basins (Site 8) were investigated for the following three parameters to evaluate the suitability, including:

- Capacity of Existing Storm Drain System (Site 7 only);
- Storage Volume of SWRF and Infiltration Basins (Site 8 only);
- Draw Down Time; and
- Estimated Construction Costs.

The following provides a short summary of how each parameter impacts the feasibility of the proposed system.

Existing Storm Drain System

Sites 1-2 existing storm drain system consists of driveway culverts, roadside ditches, and storm drain pipe that is intended to convey the storm drainage to the low lying area/wetland area immediately to the west of 74th street; however, the low lying areas do not provide positive drainage, and this results in the storm water accumulating, and eventually backing up into the streets and driveways. Sites 1-3 have inadequate culverts to drain the areas.

The Site 7 existing storm drain system consists of a closed storm drain system along E. Oak Island Drive (SR-1190) to Womble Street, and eventually discharging into a natural area that provides positive drainage to the Sound. A planning level capacity analysis of this existing storm drain system from the intersection of E. Oak Island Drive (SR-1190) and Womble Street to the existing storm drain pipe outlet was performed for Site 7 and the results indicate that the existing storm drain system, especially the main trunk of the storm drain system along Womble Street to the pipe outlet, are significantly undersized and under capacity. Therefore, adding additional discharge to the system is not practical. The pumped storm drainage discharge would occur at the same time the existing storm drain system was receiving and discharging its drainage flow, and this would adversely impact the existing system capacity. A detailed survey of the existing storm drainage system to ensure that the existing storm drain system's configuration is approximately as shown per the GIS information would help validate drainage areas and associated storm drain discharges.

Existing Satellite Water Reclamation Facility (SWRF)

The existing Satellite Water Reclamation Facility (SWRF) was built in the late 2000's and is approximately 15 years old. The SWRF is a 400,000 gallon per day reclaimed water generation treatment system that can discharge reclaimed water to a 2.71 acre spray

utilization area, a 0.53 acre high-rate infiltration basin, and a 0.39 acre high-rate infiltration basin. Both infiltration basins are located at the Oak Island Golf Club. A groundwater lowering system with nine wells, each with a 30 gallon per minute (gpm) pump, lowers the groundwater level to allow the infiltration basins to function as designed with the reclaimed water infiltrating through the bottom of the infiltration basins. The SWRF treatment components consist of: an influent pump station with dual 300 gallon per minute (gpm) submersible pumps; a fine screen; two 10,500 gallon anoxic tanks; two 42,000 gallon aeration tanks; two 5,420 gallon membrane tanks; one 131,000 gallon effluent storage tank; an effluent pump station with dual 300 gpm effluent pumps; one 75,000 gallon elevated storage and distribution tank; 4-inch sludge discharge force main; and 8-inch reclaimed water force main. In recent years, primarily because of operational issues and higher treatment costs associated with the membrane system at the SWRF, the Town has been sending sewage to the Brunswick County Sewer Treatment Plant and not using the SWRF; however, the SWRF is still in use for overflow events.

A planning level storage capacity analysis of the existing SWRF was performed for Site 8 and the results indicate that the existing SWRF could be converted to store and discharge ponded stormwater from the four ponding areas. The SWRF has a combined storage capacity of 321,900 gallons and the two infiltration basins combined provide an additional 283,300 gallons of storge. This results in a total storage volume of 605,200 gallons. Additional storge may be available within the two infiltration basins, and this has been estimated to be an additional storage depth of 8-inches above the normal pool elevation in the basins for a combined additional storage volume of 201,000 gallons. If the additional 8-inch storage depth is available in the infiltration basins, then the total storage volume would increase to 806,200 gallons. The total ponding volume from the four ponding areas is estimated to be 597,100 gallons. Therefore, the existing SWRF has adequate capacity to store and discharge the routinely ponded stormwater.

The existing SWRF has two 300 gpm pumps for both the influent and effluent pump stations. If both pumps are utilized, maintaining the existing pump stations and assuming a pumping rate of 550 gpm of the SWRF for the proposed stormwater pump station at E. Beach Drive and 76th Street requires a proposed 10-inch PVC force main to the SWRF with a drawdown time of approximately 18.1 hours for the four flooding areas. If a drawdown time of 12 hours is desired, significant changes would need to be made to the SWRF and the existing force main. In addition, the existing infiltration basins storage capacity and infiltration capabilities would require further analysis.

The conversion of the SWRF from treating raw sewage to store and discharge stormwater could be accomplished with minimal changes to the SWRF. The existing

tanks would be maintained for storage volume. Some unnecessary equipment to include membranes, blowers, chemical feed pumps, and associated piping should be removed. The facility would need to be cleaned to include removal of solids and chemical spraying of tanks. The existing sewage sludge could be removed from the facility by utilizing the existing sludge discharge force main.

Distance to Seasonal High Water Table (SHWT)

ECS performed a soil analysis on January 12th, 13th, and 21st, 2021 at potential sites to evaluate the relative SHWT elevation. This soil analysis is included within Appendix A of this report, where the SHWT findings are reported on Pages 1-2. For this feasibility study, due to the shallow depths to the SHWT elevation, it is the most significant physical constraint. In addition, it is worth noting that the soil borings I-7 to I-11 were performed near the toe of the slope of the primary dune system i.e. near the lowest elevation in the dune system.

The Seasonal High Water Table (SHWT) indicates the shallowest depth to free water that stands in an unlined borehole or where the soil moisture tension is zero for a significant period, long enough to produce anaerobic conditions. The resulting anaerobic conditions promotes biogeochemical processes such as the reduction, translocation, and accumulation of iron and manganese forming redoximorphic markers, such as reduction/oxidation indicators and organic matter accumulation.

The separation or distance to the SHWT from the bottom of any infiltration device is imperative to successful infiltration, as this separation will promote groundwater flow from the infiltration device to existing groundwater. North Carolina Department of Environmental Quality (NCDEQ) requires the lowest point of the infiltration system to be a minimum of two feet above the SHWT. However, the separation may be reduced to no less than one foot if a hydrogeologic evaluation demonstrates that the water table will subside to its pre-storm elevation within five days or less. Due to shallow depths to the SHWT and based upon the geotechnical engineer's experience with similar types of projects where one foot separation has proven to be acceptable, 1.0-foot separation was utilized in this analysis to evaluate the feasibility of each proposed Infiltration System.

In-Situ Soil Saturated Hydraulic Conductivity

The In-Situ Soil Saturated Hydraulic Conductivity describes the physical ability of groundwater to be transmitted through the in-situ soil. Generally, this parameter describes the resistance the soil imparts on the groundwater flow and is a function of

the soil water characteristic, or soil water retention curve. The soil water characteristic is mainly influenced by the soil's particle size distribution, which relates to the static tension potential of this soil to hold water. As indicated in the soil analysis report and shown in Table 1, all proposed infiltration system locations (Sites 1-4) within the existing dune system (Boring I-7 to I-11) have very high recorded Saturated Hydraulic Conductivity results, where the values ranged between 26.0 to 28.5 inches/hr. The measured results are consistent with the common soil type for sand dunes along the Southeastern North Carolina Coast. The proposed infiltration system locations (Sites 5-6) within the existing Town Right-of-Way on E. Pelican Drive (Boring I-3 to I-6) have high recorded Saturated Hydraulic Conductivity results, where the values ranged between 7.98 to 16.02 inches/hr. The high value results for the Saturated Hydraulic Conductivity provide a greater infiltration capacity of the proposed infiltration system for each Site 1-6 and promote the feasibility of these systems. In addition, it is worth pointing out that within the existing Town Right-of-Way on E. Pelican Drive (Boring I-1 to I-2), although the recorded Saturated Hydraulic Conductivity results were in an acceptable range of 2.20 inches/hr.; these results in conjunction with high SHWT make this portion of E. Pelican Drive R/W more difficult to provide an infiltration solution.

Table 1: SHWT and Hydraulic Conductivity

	Site 1 [1]	**Site 2**	**Site 3**	**Site 4**	**Site 5** [2]	**Site 6**	**Site 7**	**Site 8**
SHWT (ft) [3]	2.0	2.0	2.0	2.5	2.5	3.5	N/A	N/A
Hydraulic Conductivity (K, in/hr)	26.0	26.0	28.3	27.8	12.0	14.6	N/A	N/A

[1]Site 1 information is estimated using the lowest values from boring I-7 to I-11.
[2]Site 5 information is estimated using boring I-3 to I-4.
[3]Site 2-4 SHWT elevations were measured at the elevation low point within the dune system and not within the Secondary Dune elevation.

Available Site Area

In addition to depth to SHWT and the Saturated Hydraulic Conductivity, the available infiltration area at the required elevation contributes significantly to the overall infiltration system capacity. The larger the infiltration system surface area footprint, the higher the overall infiltration capacity.

Sites 1-4 are located within the VE Floodzone and adding fill material within this zone is not allowed. Therefore, given the high SHWT and restrictions on adding fill material, the infiltration systems for Sites 1-4 are required to be located in the Secondary Dune

system where elevations are approximately a couple feet higher than surrounding lower dune elevations where associated soil borings were performed. This elevation increase will provide the necessary depth to install the infiltration system while meeting vertical separation requirements to the SHWT. Sites 1-4 have very limited site area available at the required higher elevations associated with the Secondary Dune system. In addition, the Infiltration Systems are located within all or mostly private residential property and will require easements from the private landowners.

Sites 5-6 have slightly lower SHWT elevations and are not located in the VE Floodzone, however, adequate separation to the SHWT is not provided without adding fill material depth over the Infiltration System within the existing Town Right-of-Way. Site 5 will require approximately two feet of fill and Site 6 will require approximately one feet of fill to be provided. Sites 5-6 have more usable space available within the Town Right-of-Way than currently shown and increasing the surface area would increase the storage volume.

The infiltration systems were located taking into consideration at least 3 horizontal feet from residential walkways and parking lots, and 10 feet from houses. The infiltration system design uses 1-foot separation between each chamber row and along the outside perimeter of the infiltration system. Calculations are provided in Appendix D and Figures 2-7 illustrate the proposed infiltration system layout for each Site 1-6 based upon the provided site area and the equivalent infiltration capacity.

It is noted that available site area was estimated based upon information provided by Brunswick County GIS data, including topographic contours, parcel limits and existing structural footprints as well as using Google Earth for both aerial images and topographic information in conjunction with field exploration. Given the approximate nature of the Secondary Dune system area available at the required elevations and how these areas are very limited, it is recommended that a more detailed site survey especially for these site areas, but also for all site areas, be performed by a NC licensed Professional Land Surveyor before any design plans are generated. The detailed survey with addition geotechnical soil borings would provide improved information allowing for a more accurate evaluation of the feasibility of these systems. This detailed survey might reveal that less or additional site area is available as the dune topography and existing structural footprints become better defined.

Draw Down Time

Another physical component for the overall feasibility study is evaluating the anticipated time it will take to pump down and infiltrate the ponded volume. Three

parameters that influence the critical flooding areas include ponded volume, infiltration capacity of the infiltration system, and maximum pumping flowrate.

Ponded volume was estimated as the total runoff volume contained in a critical flooding area based upon GIS contours, Town photographs, and field exploration. Based upon these sources of information, all the critical flooding areas are contained within a natural low spot, or "bowl", that prevents the ponded water from leaving as surface runoff. This estimate volume represents the reasonable amount of volume that the infiltration system would need to infiltrate, as it is assumed that any excess volume would spill over the "bowl" lip. It is noted that the ponded volume is just an estimate based upon provided source information and should be reevaluated once a detailed survey is obtained for each critical area.

The infiltration capacity of the infiltration system is a function of available surface area and saturated hydraulic conductivity. The details of the mathematical relationship between these parameters are further explored in the calculations in Appendix D. However, it is noted that the infiltration capacity of the infiltration system, infiltration flowrate, is the constraining parameter for calculating the draw down time to pump the street free of standing water. For the purposes of this feasibility study, the draw down time for Sites 1-6 was calculated by dividing the estimated water ponded volume by the infiltration capacity of the infiltration system, assuming the pump flowrate matches this infiltration flowrate. Site 7, the pump flowrate of 500 gallons per minute (gpm) was deemed an appropriate value and was used in the analysis. Site 8, the pump flowrate of 550 gallons per minute (gpm) was used to match the existing pumping capacity within the SWRF. This takes into account some assumed losses, and this results in a drawdown time of 18.1 hours. The existing pumping capacity of 550 gpm would need to be confirmed during the design stage. The drawdown time for Site 8 could be reduced to approximately 12 hours; however, significant modifications to the SWRF and existing force main would be required.

Refer to Table 2 and Figure 2-9B for Sites 1-8 concept infiltration system, storm drain pump station, and closed storm drain system information.

Table 2: Site 1-8 Information

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Infiltration Surface Area Provided (sf)	900	1,540	1,768	700	4,020	3,600	N/A	N/A
Number of Chambers	21	36	42	18	102	90	N/A	N/A
Hydraulic Conductivity (K, in/hr)	26.0	26.0	28.3	27.8	12.0	14.6	N/A	N/A
Infiltration Capacity (cfs)	0.54	0.93	1.16	0.45	1.12	1.22	N/A	N/A
Calculated Ponded Volume (cf)	6,875	28,125	31,313	13,500	35,000	31,313	13,500	79,813
Drawdown Time (hours)	3.6	8.5	7.6	8.4	8.8	7.2	3.4	18.1
System Located on Private Property	Yes	Yes	Yes	No	No	No	Yes	No

Estimated Construction Cost

A planning level construction cost estimate for each site 1-8 is provided in Appendix C. The total estimated construction cost for each site is provided below in Table 3. Site 5 combines two of the flooding areas, Site 8 combines all four of the flooding areas, and the other Sites provide a solution for one flooding area. Therefore, to provide more accurate cost comparison evaluation the Sites have been grouped together to provide a total combined cost of addressing all four flooding areas. Sites 1-4, Sites 5-7, and Site 8 combined construction cost are provided below in Table 4. It is noted that easement acquisition, professional surveying, professional engineering design, geotechnical evaluation, construction administration and observation, and overall project administration costs are not included within this construction cost estimate.

Table 3: Construction Cost

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Estimated Construction Cost[1]	$237,200	$319,400	$364,400	$332,600	$669,500	$532,900	$461,300	$2,740,100

[1]The Estimated Construction Costs does not include easement acquisition estimates or professional services expenditures.

Table 4: Combined Site Construction Cost

	Site 1-4	Site 5-7	Site 8
Estimated Construction Cost[1]	$1,253,600	$1,663,700	$2,740,100

[1]The Estimated Construction Costs does not include easement acquisition estimates or professional services expenditures.

WK DICKSON
community infrastructure consultants

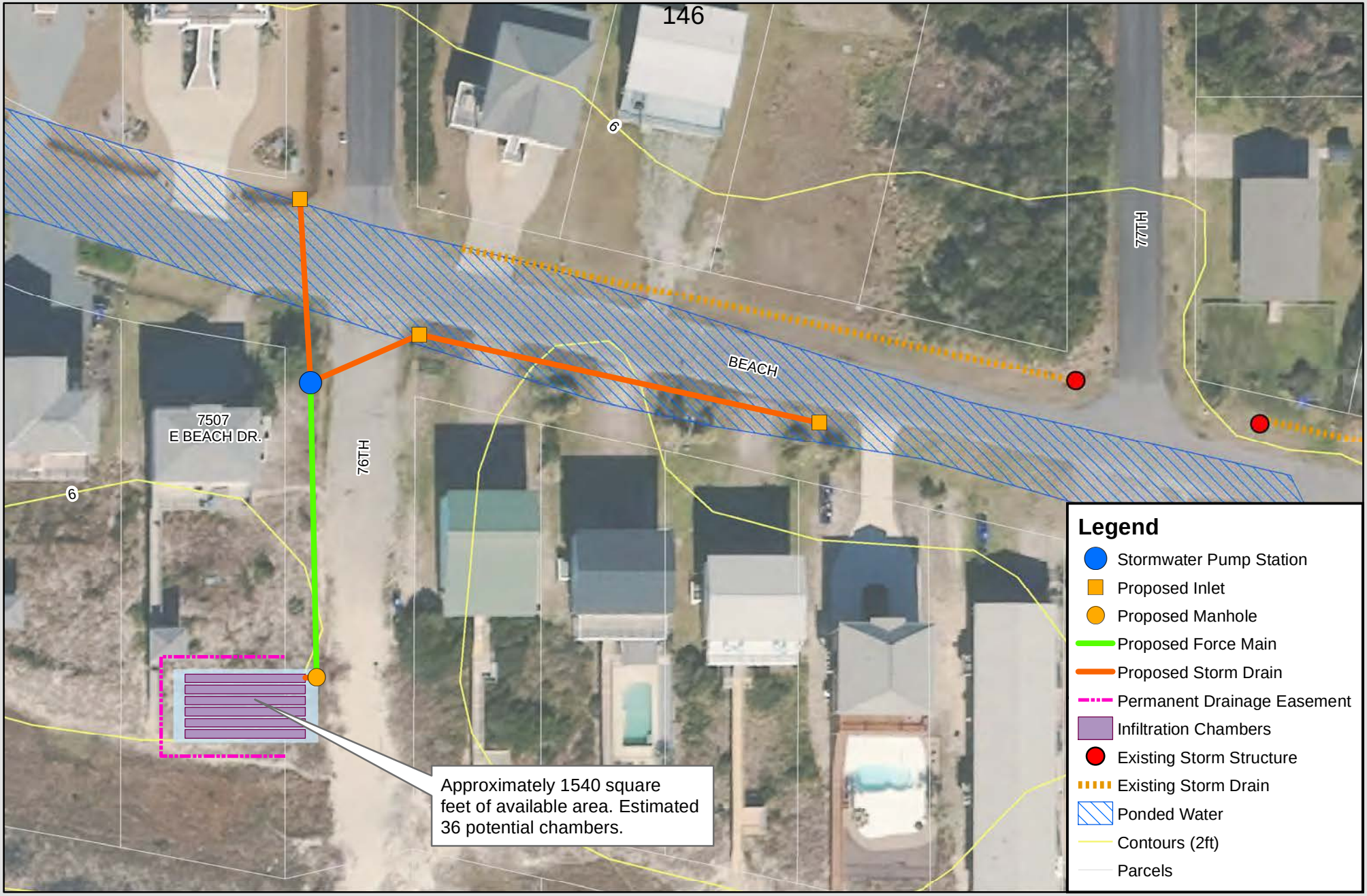
N
W E
S

Ocean Drive Drainage Study

Figure 2 - Proposed Project Aerial Map
Site #1 - 112 SE 74th St.

The Town of Oak Island
North Carolina

0 25 50
Feet
1 inch = 50 feet



WK DICKSON
community infrastructure consultants

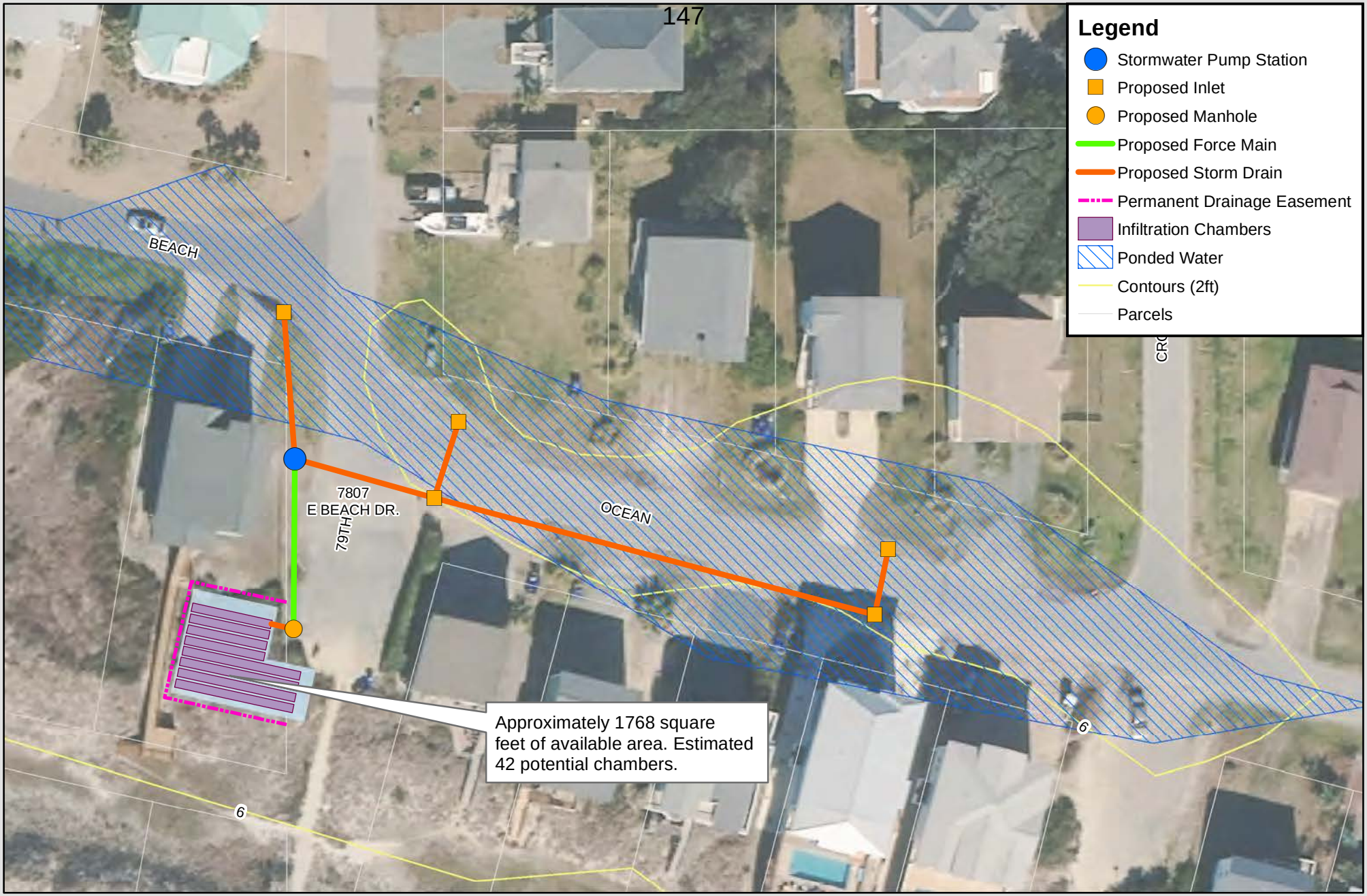
N
W E
S

Ocean Drive Drainage Study

Figure 3 - Proposed Project Aerial Map
Site #2 - 7507 E Beach Dr.

The Town of Oak Island
North Carolina

0 25 50
Feet
1 inch = 50 feet



WK DICKSON
community infrastructure consultants

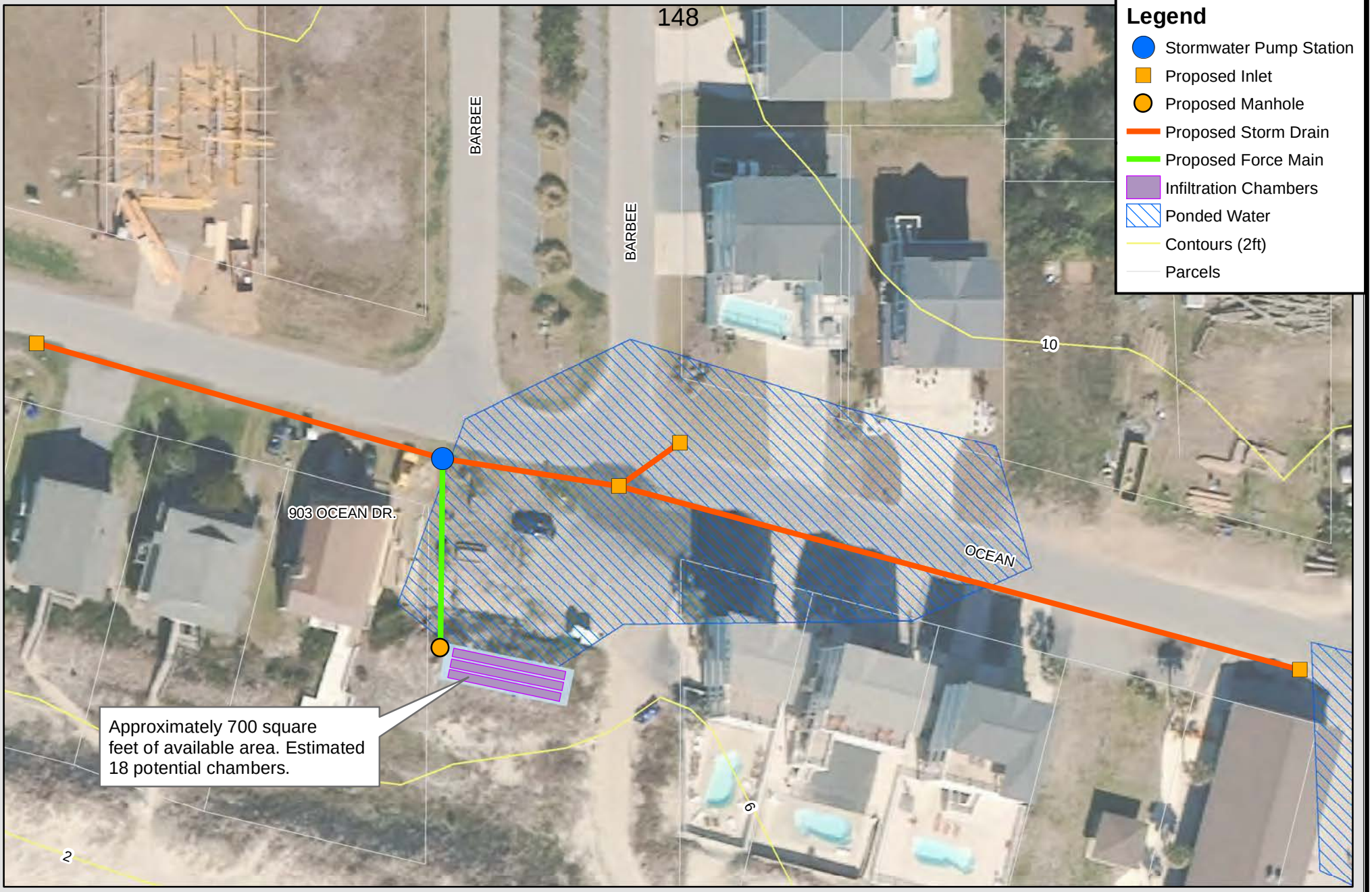
N
W E
S

Ocean Drive Drainage Study

Figure 4 - Proposed Project Aerial Map
Site #3 - 7807 E Beach Dr.

The Town of Oak Island
North Carolina

0 25 50
Feet
1 inch = 50 feet



WK DICKSON
community infrastructure consultants

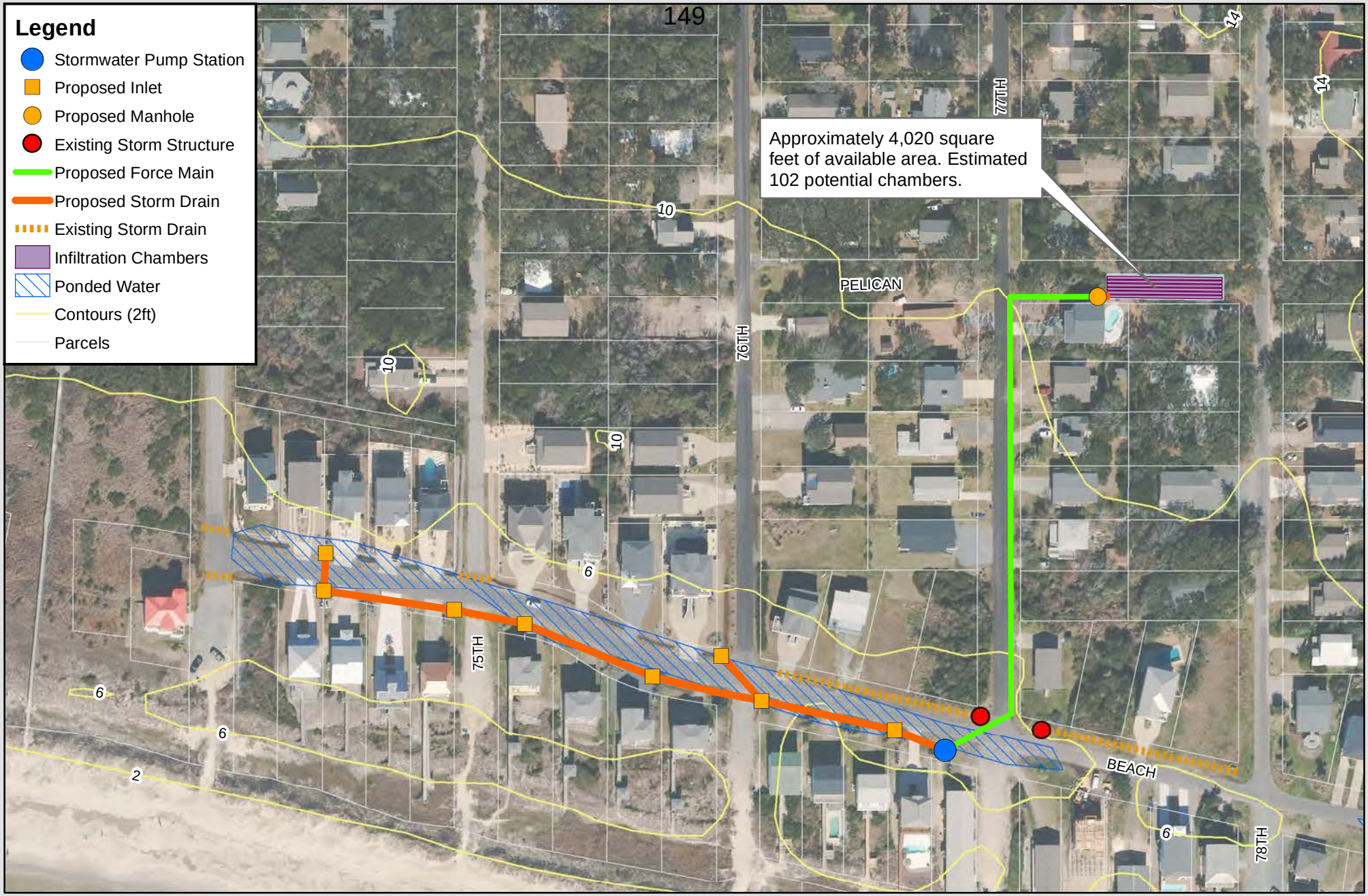
N
W E
S

Ocean Drive Drainage Study

Figure 5 - Proposed Project Aerial Map
Site #4 - Ocean Dr. at Barbee Blvd.

The Town of Oak Island
North Carolina

0 25 50
Feet
1 inch = 50 feet



WK DICKSON
community infrastructure consultants

N
W E
S

Ocean Drive Drainage Study

Figure 6 - Proposed Project Aerial Map
Site #5 - Pelican Infiltration West

The Town of Oak Island
North Carolina

0 75 150
Feet
1 inch = 150 feet

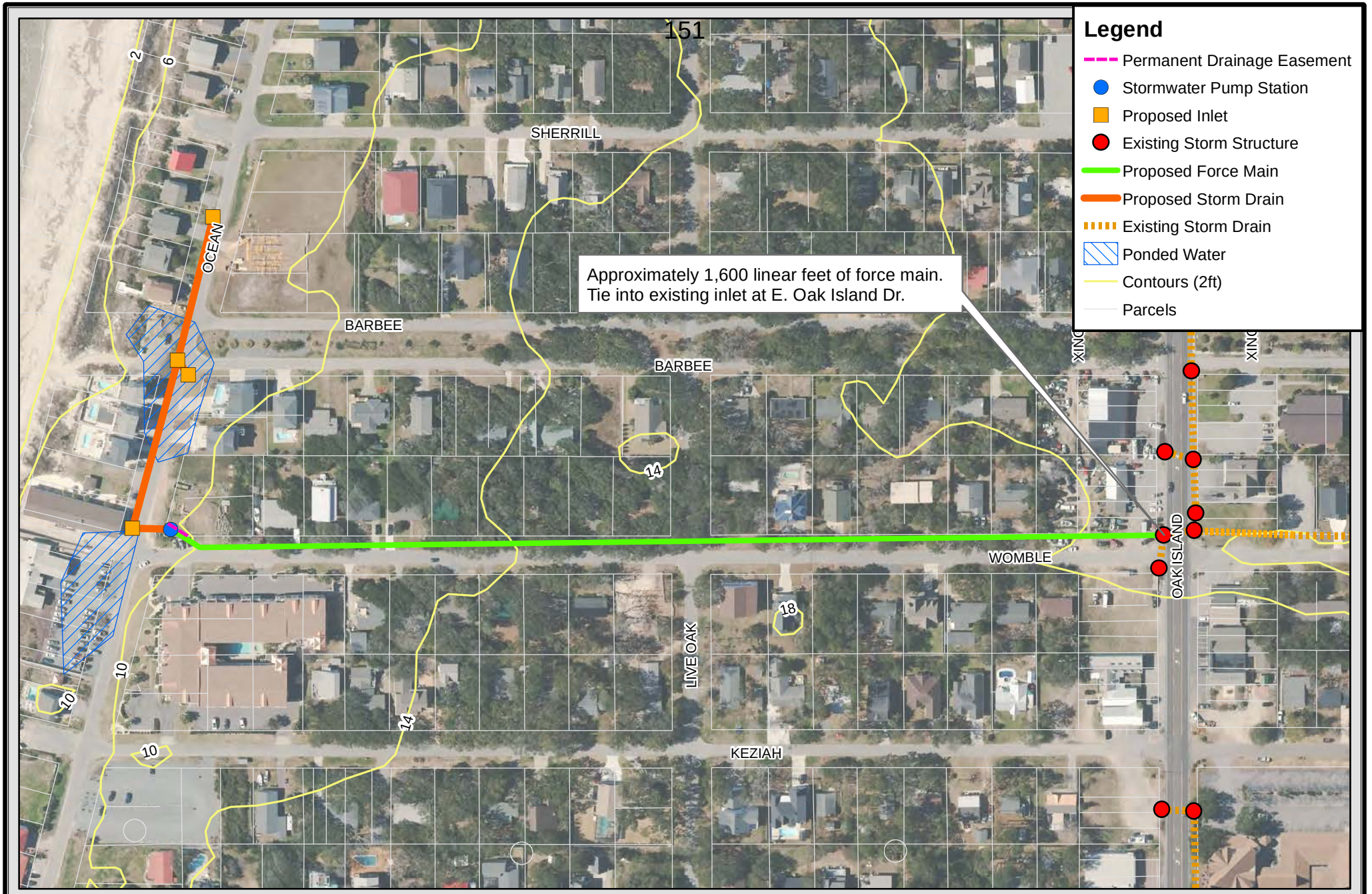
WK DICKSON
community infrastructure consultants

Ocean Drive Drainage Study

Figure 7 - Proposed Project Aerial Map
Site #6 - Pelican Infiltration East

The Town of Oak Island
North Carolina

0 50 100
Feet
1 inch = 100 feet



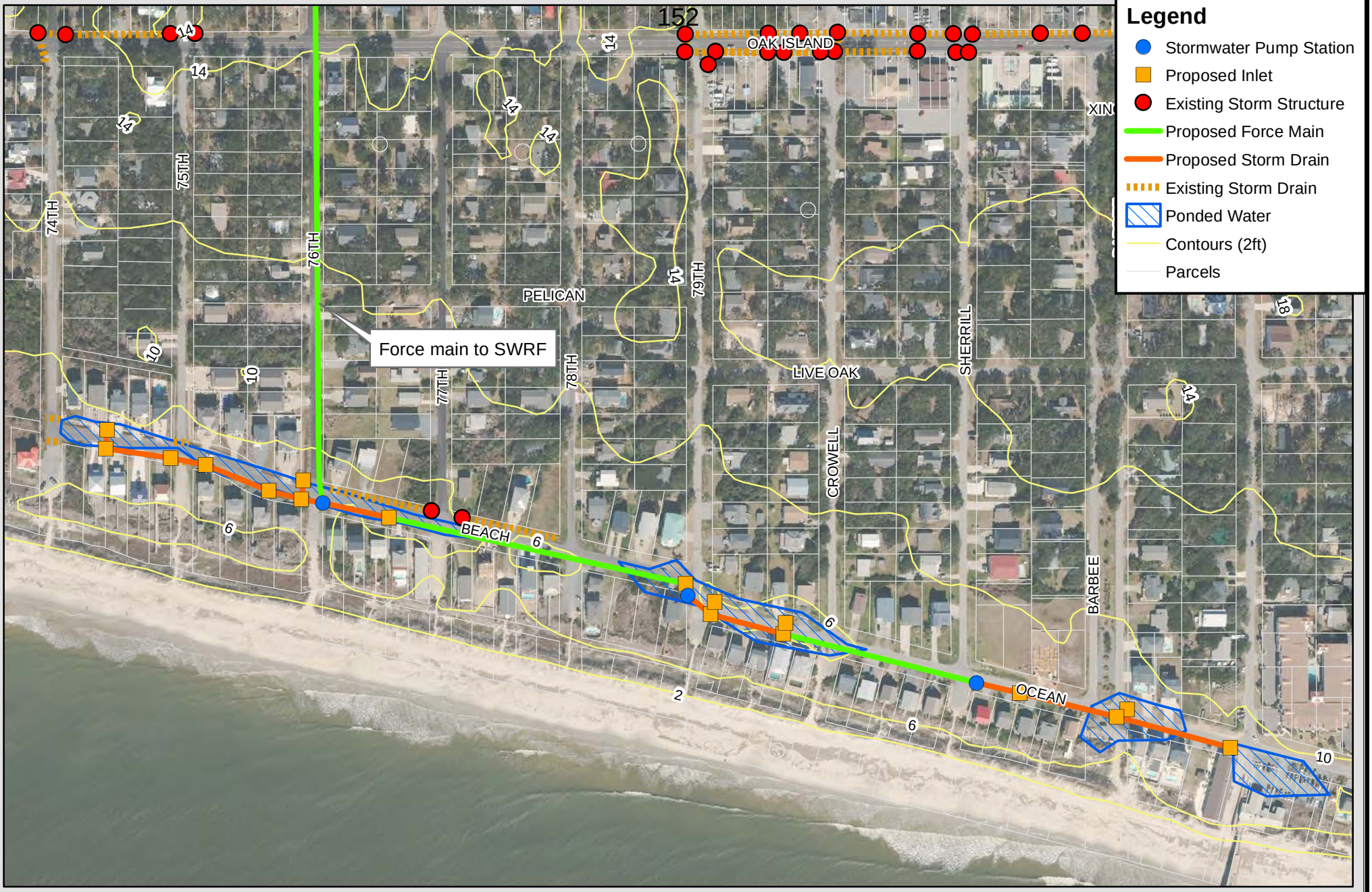
WK DICKSON
community infrastructure consultants

Ocean Drive Drainage Study

Figure 8 - Proposed Project Aerial Map
Site #7 - Existing DOT Tie-In

The Town of Oak Island
North Carolina

0 100 200
Feet
1 inch = 200 feet



WK DICKSON
community infrastructure consultants

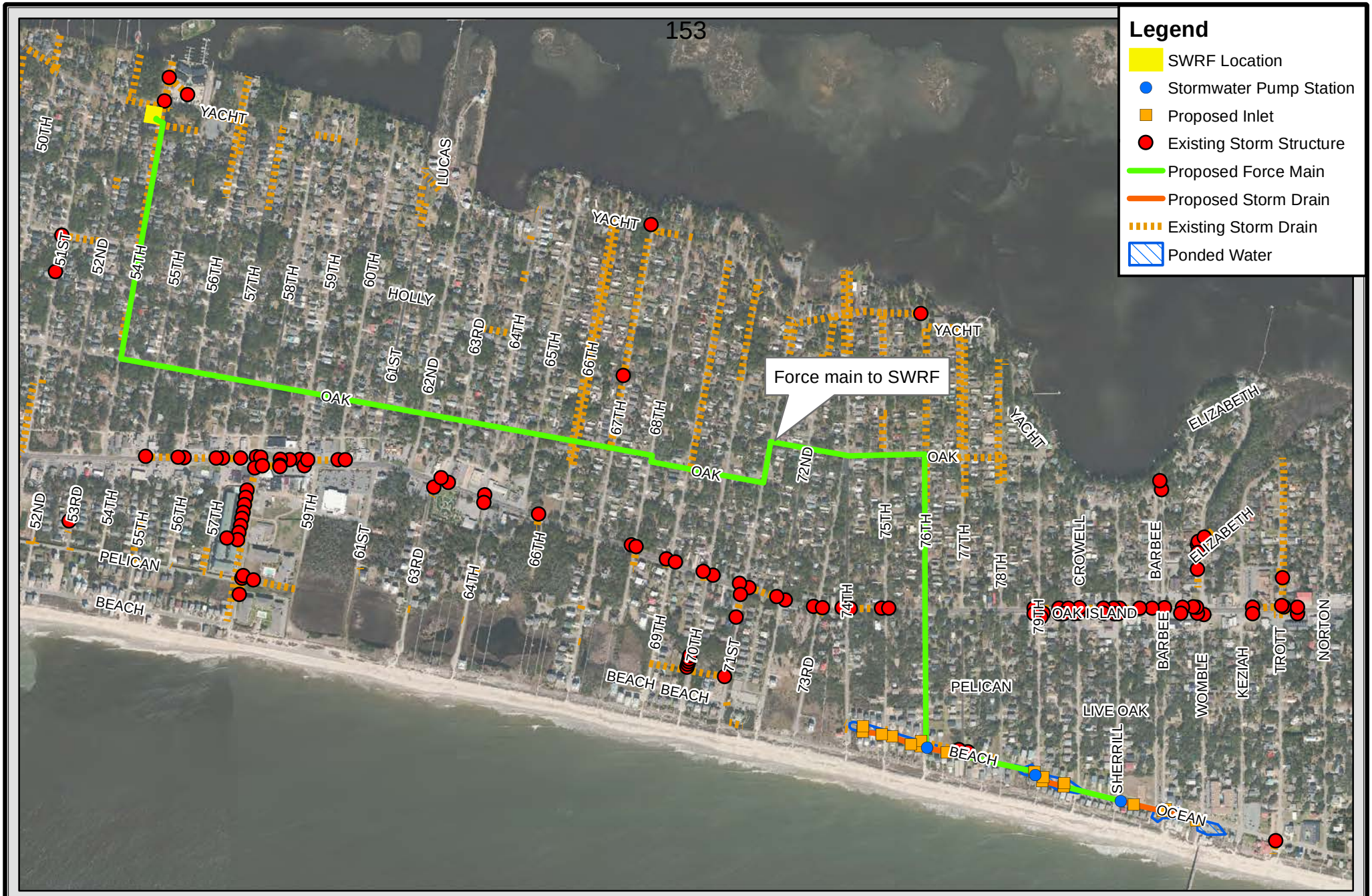
N W E S

Ocean Drive Drainage Study

Figure 9A - Proposed Project Aerial Map
Site #8 - Satellite Water Reclamation Facility (SWRF)

The Town of Oak Island North Carolina

0 150 300
Feet
1 inch = 300 feet



WK DICKSON
community infrastructure consultants

N W E S

Ocean Drive Drainage Study

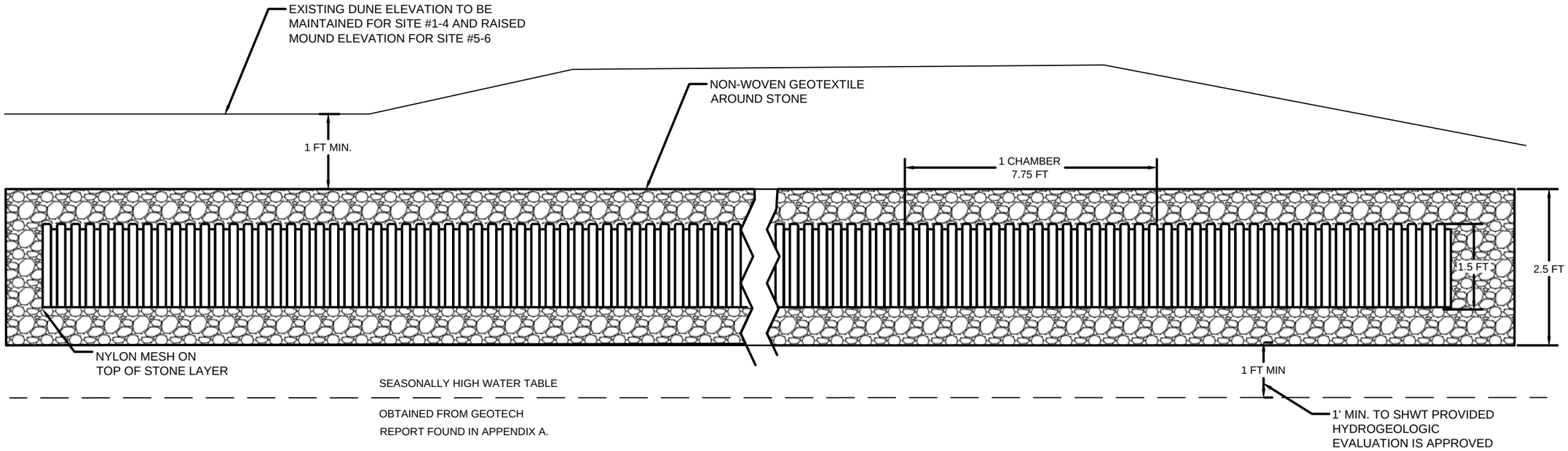
Figure 9B - Proposed Project Aerial Map
Site #8 - Satellite Water Reclamation Facility (SWRF)

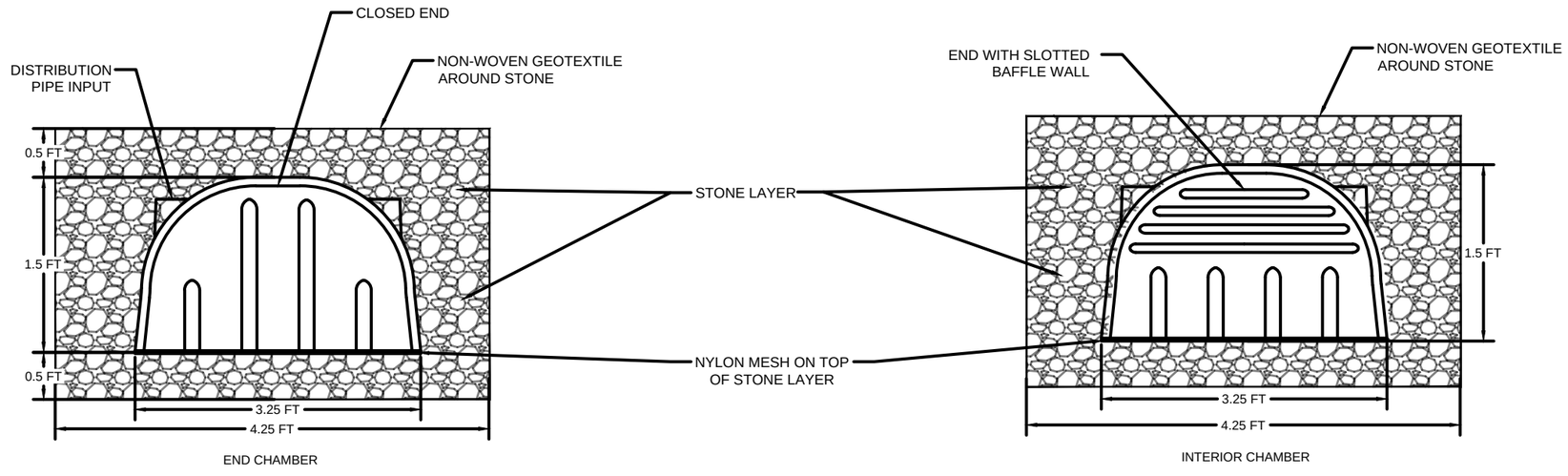
The Town of Oak Island North Carolina

0 500 1,000 Feet
1 inch = 1,000 feet

Approximate Infiltration System Profile

The Infiltration System Profile Figure include a side view of the system including the existing or proposed ground surface, infiltration chambers, nylon mesh lining, stone layer, and Seasonally High Water Table (SHWT). In addition, end of chamber profiles is included, featuring a terminal and interior chamber, to demonstrate potential pipe inputs and system placement. See Figure 10 for profile of the proposed systems.





NTS

FIGURE 10
TYPICAL INFILTRATION SYSTEM PROFILE
OCEAN DRIVE DRAINAGE STUDY

The Town of Oak Island North Carolina

WK DICKSON
community infrastructure consultants

720 CORPORATE CENTER DRIVE
RALEIGH, NC 27607
(919) 782-0495
NC LICENSE NO. F-0374
Office Locations:
North Carolina
South Carolina
Georgia

Section 3. Permits, Easements and Grant/Funding Approach

Required Permits

Since the proposed Infiltration System is located with the secondary dune system for Sites 1-4, which is in the Ocean Hazard Area of Environmental Concern (AEC), a Coastal Area Management Act (CAMA) minor development permit and a CRC variance is anticipated for ocean setback requirements, and these must be granted by the NC Division of Environmental and Natural Resources Coastal Resources Commission (CRC). These must be obtained before the project can begin, and it will authorize the temporary disturbance to the dune system.

If the Project Limits of Disturbance exceeds 1.0 acre of disturbance, a NC Department of Environmental Quality (NCDEQ) Division of Energy, Mineral & Land Resources (DEMLR) Erosion & Sediment Control Permit will be required. If an Erosion and Sediment Control Permit is required, a CAMA Major Permit will be required, which would increase the overall project timeline.

The conversion of the existing Satellite Water Reclamation Facility (SWRF) from treating raw sewage to store and discharge stormwater for Site 8 is not anticipated to require a permit; however, coordination with NCDWQ will be required.

Required Easements

Sites 1-3 and a very small portion of Site 7 are proposed to be on private property and therefore will require easements. Sites 4-6 and Site 8 are located within public property. Two easement types are recommended for consideration, the Temporary Construction Easement (TCE) and a Permanent Drainage Easement (PDE). A TCE is considered a temporary access easement allowing only contractors, Town officials and project representatives access to the site for the purposes of constructing the proposed project. The TCE should encompass the entire project's Limit of Disturbance (LOD) but will be nullified once the project is constructed. A PDE is a permanent easement established on private property to allow Town officials access to the Infiltration System and or Storm Drain System for inspection and maintenance. This permanent easement also prevents the property owner from removing or building over the installed Infiltration System and any associated pipe networks or system components. For maintenance access, it is recommended that a PDE be established to the public Right-of-Way.

Both TCEs and PDEs will impose a property restriction burden on the impacted property owner. Subsequently, most entities offer mitigatory compensation for this

restriction, which should be considered during the project budget estimation. However, it is recommended that the Town pursue the willingness of private property owners to donate easements for this project, specifically since this project will directly benefit private property owner access to their residential structures.

For Sites 7-8 since E. Oak Island Drive (SR-1190) is a NCDOT maintained road, an NCDOT Encroachment agreement will be required if any infrastructure, such as a proposed force main, is placed within the NCDOT Right-of-Way.

Finally, the proposed PDE easements shown in this feasibility study are just estimates based upon the GIS information provided. It is recommended that no easement negotiations should occur until each site design is more solidified and easement lines are established on an easement exhibit prepared by a NC licensed Professional Land Surveyor.

Funding Analysis

The funding analysis is included as Appendix B. Four (4) specific funding sources, outside of the Town financed source, have been identified in this analysis, including the FEMA-BRIC program, FEMA-FMA program, the DWI-LASII program and the GoldenLEAF foundation. Specific funding requirements and deadlines are identified within Appendix B. However, the following chart provides a summary of each funding source and the associated funding requirements.

Funding Analysis
Town of Oak Island - Ocean Drive Drainage Study
July 2021

Source	FEMA BRIC - FEMA	FEMA FMA - FEMA	Stormwater - DWI	Golden LEAF FOUNDATION Open Grants - Golden LEAF
Project Eligibility	* All elements conditionally eligible * Can include pre-award costs	* All elements conditionally eligible * Can include pre-award costs	* All elements conditionally eligible * Cannot cover expenses already paid	* Most elements conditionally eligible * Cannot cover grant/funding adminsitration or land/easment acquisition (but can be part of match)
Application Deadline	1/29/2022 (Estimated)	1/29/2022 (Estimated)	New funding to be awarded in three rounds 4/29/2022 9/30/2022 4/28/2023	Rolling Application Period
Award Date	Estimated 6/2022	Estimated 6/2022	Estimated 7/2022 2/2023 7/2023	3-6 months from full application
Match Requirements	25% match from non-federal sources	25% match from non-federal sources	Match requirements unknown at this time	No specific match requirements
Maximum Grant Award	$50 million	$30 million	$15 million (*construction*) $500,000 (*planning*)	$500,000
Period of Performance	36 months	48 months	24 months to construction contract execution	Based on approved project schedule
Partners	Needed for competitive application	Needed for competitive application	None	Needed for competitive application
Post-Project Requirements	Needed for competitive application	Needed for competitive application	None	Reports on economic factors (job creation/retention, etc.)
Other Requirements	* NEPA/Historic Preservation Compliance * FEMA-approved Hazard Mitigation Plan	* NEPA/Historic Preservation Compliance * FEMA-approved Hazard Mitigation Plan * Located in a state with at least 1 federally-declared disaster within last 7 years	* ARPA funded new Stormwater State Reserve Fund * Other requirements unknown at this time	* Projects must align with Golden LEAF's priortity focus areas * Economic factors are important

Section 4: Conclusion

This purpose of this study is to explore the feasibility of diverting flood waters from the four critical flooding areas on E. Beach Drive and Ocean Drive between 74th Street and Womble Street to potential infiltration areas (Sites 1-6) and/or to the existing storm drainage system on the North side (sound side) of E. Oak Island Drive (SR-1190) and Womble Street (Site 7) or to the existing Satellite Water Reclamation Facility (SWRF) at 5209 E. Yacht Drive (Site 8) in order to reduce flooding and provide safer vehicular passage along E. Beach Drive and Ocean Drive after moderate rainfall events.

Sites 1-4 offers the potential for future educational opportunities, including, but not limited to, university research and citizen involvement. The proposed Sites 1-4 are located in the Ocean Hazard Area of Environmental Concern (AEC); therefore, a Coastal Area Management Area (CAMA) minor permit will be required by the NC Division of Environmental and Natural Resources Coastal Resources Commission, and a CRC variance is anticipated for ocean setback requirements. A CAMA major permit may be required if the project disturbed area exceeds 1.0 acre of disturbance. A CAMA major permit would increase the overall project timeline.

Infiltration at Sites 1-6 is feasible. Site 7 is not feasible based on currently available information. For Site 8, the conversion of the existing Satellite Water Reclamation Facility (SWRF) from treating raw sewage to store and discharge stormwater could be accomplished with minimal changes to the SWRF; however, the estimated construction cost is significantly higher than the other combined Site options and it has the longest drawdown time. Sites 1-4 construction costs are significantly below the comparable alternative Sites 5-7 options; however, construction costs do not include easement acquisition, and Sites 1-3 as well as Site 7 will require easements on private residential property.

A survey provided by a NC licensed Professional Land Surveyor and verification of geotechnical values used would provide improved information allowing for a more accurate evaluation of the feasibility of these systems. The implementation of these options will provide flood reduction on E. Beach Drive and Ocean Drive and allow for safer vehicular travel within 12 hours of a moderate flooding event, at each evaluated site except Site 8. Refer to Table 6 for summary of some of the key parameters and findings.

During the design stage, several items will need to be evaluated further, including easement acquisition, potential project costs including funding sources if any, and project timeline.

Table 6: Site Feasibility Parameters and Findings

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Infiltration Capacity (cfs)	0.54	0.93	1.16	0.45	1.12	1.22	N/A	N/A
Calculated Ponded Volume (cf)	6,875	28,125	31,313	13,500	35,000	31,313	13,500	79,813
Drawdown Time (hours)	3.6	8.5	7.6	8.4	8.8	7.2	3.4	18.1
Estimated Construction Cost[1]	$237,200	$319,400	$364,400	$332,600	$669,500	$532,900	$461,300	$2,740,100
System Located on Private Property	Yes	Yes	Yes	No	No	No	Yes	No

[1]The Estimated Construction Costs does not include easement acquisition estimates or professional services expenditures.

Appendices

Appendix A

Geotechnical Report

ECS SOUTHEAST, LLP "Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities
NC Registered Engineering Firm F-1078
NC Registered Geologists Firm C-406
SC Registered Engineering Firm 3239

January 21, 2021

Mr. Marc Horstman, P.E.
WK Dickson
1213 West Morehead Street
Charlotte, North Carolina 28208

Reference: Report of Seasonal High Water Table Estimation and Infiltration Testing
Oak Island Stormwater Study
Oak Island, Brunswick County, North Carolina
ECS Project No. 49.12975 A

Dear Mr. Horstman:

ECS Southeast, LLP (ECS) recently conducted a seasonal high water table (SHWT) estimation and infiltration testing at requested locations between 76th Street and Crowell Street in Oak Island, Brunswick County, North Carolina. This letter, with attachments, is the report of our testing.

Field Testing

On January 12, 13, and 21, 2021, ECS conducted an exploration of the subsurface soil and groundwater conditions, in accordance with the NCDEQ Stormwater Design Manual section A-2, at eleven requested locations shown on the attached Boring Location Plan (Figure 1). ECS used GPS equipment in order to determine the boring locations. The purpose of this exploration was to obtain subsurface information of the in situ soils for the SCM area(s). ECS explored the subsurface soil and groundwater conditions by advancing one hand auger boring into the existing ground surface at each of the requested boring locations. ECS visually classified the subsurface soils and obtained representative samples of each soil type encountered. ECS also recorded the SHWT and groundwater elevation observed at the time of the hand auger borings. The attached Infiltration Testing Form provides a summary of the subsurface conditions encountered at the hand auger boring locations.

The SHWT and groundwater elevation was estimated at the boring locations below the existing grade elevation. A summary of the findings are as follows:

Location	SHWT	Groundwater
I-1	12 inches	18 inches
I-2	15 inches	20 inches
I-3	20 inches	36 inches
I-4	40 inches	50 inches
I-5	42 inches	50 inches
I-6	48 inches	55 inches
I-7	24 inches	30 inches
I-8	30 inches	36 inches
I-9	24 inches	30 inches

I-10	24 inches	30 inches
I-11	30 inches	36 inches

ECS has conducted eleven infiltration tests utilizing a compact constant head permeameter near the hand auger borings in order to estimate the infiltration rate for the subsurface soils. Infiltration tests are typically conducted at two feet above the SHWT or in the most restrictive soil horizon. Tests in clayey conditions are conducted for durations of up to 30 minutes. If a more precise hydraulic conductivity value is desired for these locations, then ECS recommends collecting samples and performing laboratory permeability testing.

Field Test Results

Below is a summary of the infiltration test results:

Location	Description	Depth	Inches/ hour
I-1	Brown silty SAND	10 inches	2.20
I-2	Brown/orange fine SAND w/ silt	10 inches	2.24
I-3	Brown/orange fine SAND w/ silt	10 inches	7.98
I-4	Brown/orange fine SAND	16 inches	13.48
I-5	Brown/orange fine SAND	18 inches	16.02
I-6	Brown/orange fine SAND	24 inches	14.60
I-7	Tan fine to med. SAND	10 inches	26.00
I-8	Tan fine to med. SAND	10 inches	27.43
I-9	Tan fine to med. SAND	10 inches	28.27
I-10	Tan fine to med. SAND	10 inches	28.50
I-11	Tan fine to med. SAND	10 inches	27.78

Infiltration rates and SHWT may vary within the proposed site due to changes in elevation, soil classification and subsurface conditions. ECS recommends that a licensed surveyor provide the elevations of the boring locations.

Closure

ECS's analysis of the site has been based on our understanding of the site, the project information provided to us, and the data obtained during our exploration. If the project information provided to us is changed, please contact us so that our recommendations can be reviewed and appropriate revisions provided, if necessary. The discovery of any site or subsurface conditions during construction which deviate from the data outlined in this exploration should be reported to us for our review, analysis and revision of our recommendations, if necessary. The assessment of site environmental conditions for the presence of pollutants in the soil and groundwater of the site is beyond the scope of this geotechnical exploration.

ECS appreciates the opportunity to provide our services to you on this project. If you have any questions concerning this report or this project, please contact us.

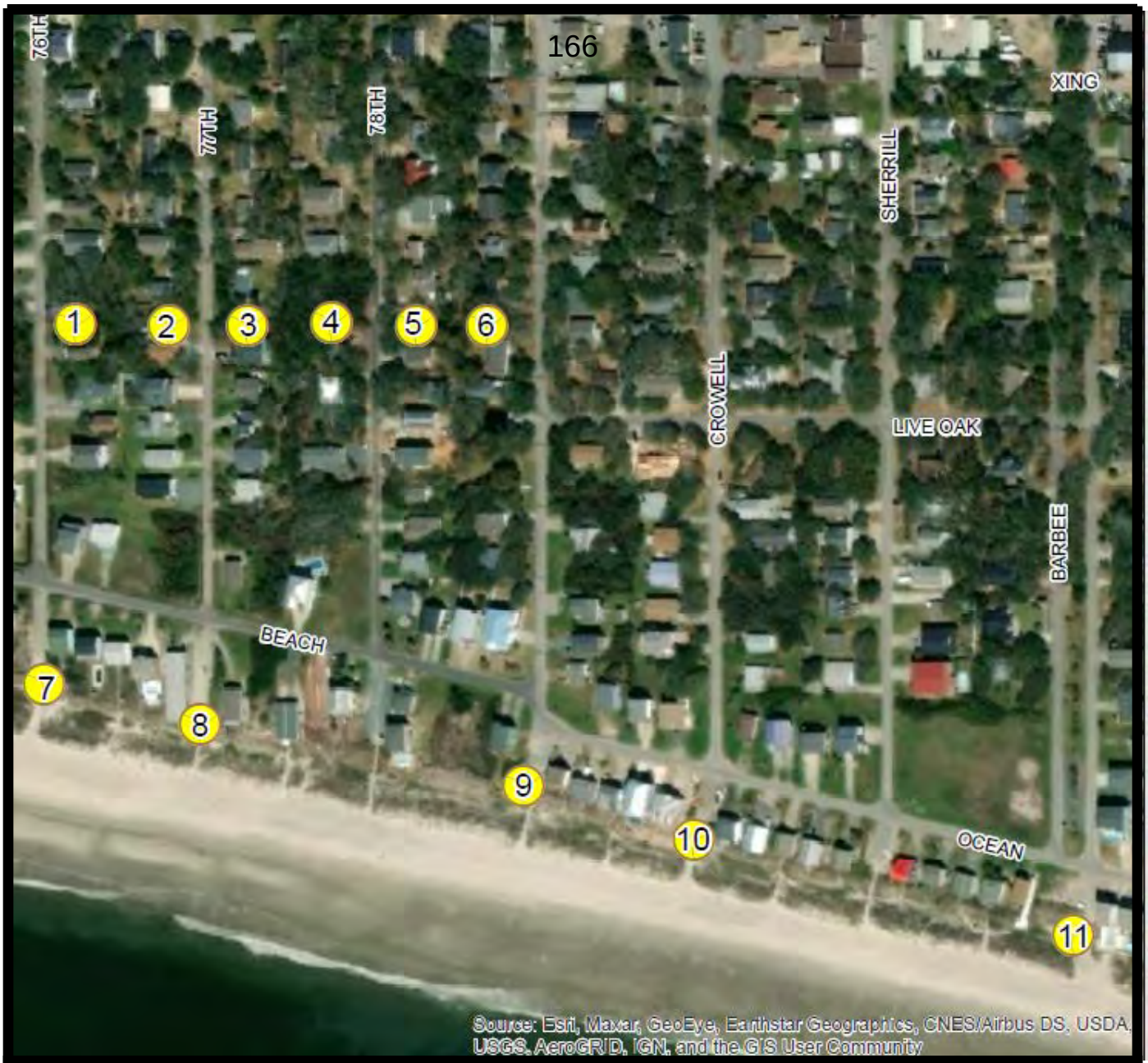
Respectfully,

ECS SOUTHEAST, LLP

K. Brooks Wall
Project Manager
bwall@ecslimited.com
910-686-9114

W. Brandon Fulton, PSC, PWS, LSS
Environmental Department Manager
bfulton@ecslimited.com
704-525-5152

Attachments: Figure 1 - Boring Location Plan
Infiltration Testing Form
GBA Document



1 **APPROXIMATE BORING LOCATIONS**

N
W E
S

SCALE SHOWN ABOVE

Oak Island Stormwater Study
Oak Island, Brunswick County,
North Carolina

ECS Project # 49.12975
January 12 and 13, 2021
KBW

Figure 1– Boring Location Plan

Provided by: WK Dickson

Infiltration Testing Form
Oak Island Stormwater Study
Oak Island, Brunswick County, North Carolina
ECS Project No. 49.12975
January 12 and 13, 2021

Location	Depth	USCS	Soil Description
I-1	0-6”	SM	Brown silty SAND
	6”-24”	SM	Brown/orange fine SAND w/ silt

Seasonal High Water Table was estimated to be at 12 inches below the existing grade elevation.
Groundwater was encountered at 18 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 2.20 inches per hour

Location	Depth	USCS	Soil Description
I-2	0-24”	SM	Brown/orange fine SAND w/ silt

Seasonal High Water Table was estimated to be at 15 inches below the existing grade elevation.
Groundwater was encountered at 20 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 2.24 inches per hour

Location	Depth	USCS	Soil Description
I-3	0-6”	SM	Brown silty SAND
	6”-36”	SM	Brown/orange fine SAND w/ silt

Seasonal High Water Table was estimated to be at 20 inches below the existing grade elevation.
Groundwater was encountered at 36 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 7.98 inches per hour

Infiltration Testing Form
Oak Island Stormwater Study
Oak Island, Brunswick County, North Carolina
ECS Project No. 49.12975
January 12 and 13, 2021

Location	Depth	USCS	Soil Description
I-4	0-50”	SP	Brown/orange fine SAND

Seasonal High Water Table was estimated to be at 40 inches below the existing grade elevation.
Groundwater was encountered at 50 inches below the existing grade elevation.
Test was conducted at 16 inches below existing grade elevation
Infiltration Rate: 13.48 inches per hour

Location	Depth	USCS	Soil Description
I-5	0-50”	SP	Brown/orange fine SAND

Seasonal High Water Table was estimated to be at 42 inches below the existing grade elevation.
Groundwater was encountered at 50 inches below the existing grade elevation.
Test was conducted at 18 inches below existing grade elevation
Infiltration Rate: 16.02 inches per hour

Location	Depth	USCS	Soil Description
I-6	0-60”	SP	Brown/orange fine SAND

Seasonal High Water Table was estimated to be at 48 inches below the existing grade elevation.
Groundwater was encountered at 55 inches below the existing grade elevation.
Test was conducted at 24 inches below existing grade elevation
Infiltration Rate: 14.60 inches per hour

Infiltration Testing Form
Oak Island Stormwater Study
Oak Island, Brunswick County, North Carolina
ECS Project No. 49.12975
January 12 and 13, 2021

Location	Depth	USCS	Soil Description
I-7	0-36”	SP	Tan fine to med SAND

Seasonal High Water Table was estimated to be at 24 inches below the existing grade elevation.
Groundwater was encountered at 30 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 26.00 inches per hour

Location	Depth	USCS	Soil Description
I-8	0-36”	SP	Tan fine to med SAND

Seasonal High Water Table was estimated to be at 30 inches below the existing grade elevation.
Groundwater was encountered at 36 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 27.43 inches per hour

Location	Depth	USCS	Soil Description
I-9	0-24”	SP	Tan fine to med SAND

Seasonal High Water Table was estimated to be at 24 inches below the existing grade elevation.
Groundwater was encountered at 30 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 28.27 inches per hour

Infiltration Testing Form
Oak Island Stormwater Study
Oak Island, Brunswick County, North Carolina
ECS Project No. 49.12975
January 12 and 13, 2021

Location	Depth	USCS	Soil Description
I-10	0-24”	SP	Tan fine to med SAND

Seasonal High Water Table was estimated to be at 24 inches below the existing grade elevation.
Groundwater was encountered at 30 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 28.50 inches per hour

Location	Depth	USCS	Soil Description
I-11	0-36”	SP	Tan fine to med SAND

Seasonal High Water Table was estimated to be at 30 inches below the existing grade elevation.
Groundwater was encountered at 36 inches below the existing grade elevation.
Test was conducted at 10 inches below existing grade elevation
Infiltration Rate: 27.78 inches per hour

Important Information about This

Geotechnical-Engineering Report

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

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

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

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

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Appendix B

Funding Analysis

I. Project Overview

The Ocean Drive Drainage and Infiltration System project is on E. Beach Drive and Ocean Drive between 74th Street and Womble Street. The area floods routinely during moderate wet weather events including flooding of an event center at 801 Ocean Drive. The objective of the overall project is to reduce flooding in the area and prevent damage to local businesses.

II. Funding Analysis

Based on the project solutions discussed in this study, four (4) specific sources have been identified as providing the best opportunity for securing the funding needed for the Ocean Drive Drainage and Infiltration System project.

Building Resilient Communities and Infrastructure Program (BRIC) - FEMA

The initial funding source for this project is the FEMA – BRIC Program. This is a new program launched by FEMA to fund pre-disaster mitigation/resilience projects. Below are the details specific to this source and the overall project:

- **Project Elements Eligible** – All elements of this project are conditionally eligible. In addition, BRIC can now fund a project in phases to allow more time for design, environmental assessment and permitting elements to be completed. In addition, pre-award costs related to these elements can also be rolled into the funding request if not phased (*i.e.*, you do not have to wait for award in order to start design-related efforts).

- **Application Deadline** – Application period generally opens on or about September 30 of each year and closes at the end of January. (Note: Specific deadlines will be provided by FEMA for the FY2021 application period in the coming week.) Applications are accepted through the new FEMA GO portal and prospective applicants need to establish an account,

which can be done now. Prior to submittal of the application to FEMA, the project must be reviewed and approved by the State Hazard Mitigation Officer (NC Department of Public Safety).

- **Anticipated Award Date** – FEMA normally provides pre-award project selections in late June/early July.

- **Match Requirements** – The federal share for this program is capped at 75%. Leveraging local funding over the 25% garners more points in this program; therefore, it would be advantageous for the Town to contribute additional local funds through both Town resources as well as securing funding from other non-federal partners. For small, impoverished communities (*i.e.*, a community of 3,000 or fewer individuals identified by the applicant that is economically disadvantaged, with residents having an average per capita annual income not exceeding 80 percent of the national per capita income, based on best available data), the federal share is capped at 90% with a local share of 10%.

- **Maximum Award** – **$50 million** (federal share cap) per sub-applicant. All projects must also comply with FEMA's benefit-cost analysis (BCA) ratio of 1 or more to validate its cost-effectiveness. The source(s) of the non-federal share will need to be identified at the time of application.

- **Period of Performance** – BRIC projects are expected to be completed within **36 months** of award date. Depending on final schedule determination, Oak Island could: apply now for the full project; complete a phased project application that would allow for upfront funding of the engineering design costs; or, apply for these funds in 2022 application cycle since pre-award costs for project development are eligible.

- **Partners** – One of the BRIC qualitative scoring criterion (15 out of 100 points) is focused on leveraging partners. This does not have to be funding partners but can be other local civic or environmental groups that support the project. Support from additional local organizations should be discussed to make the application as competitive as possible.

- **Post-Project Requirements** – Although none are specifically required, another one of the BRIC qualitative scoring criterion (15 out of 100 points) is focused on implementation measures. This encompasses both the overall feasibility of completing the project as well as how success can be measured once it is completed. This should also be a consideration when designing the project to garner as many points as possible in the application.

- **Other Requirements for Eligibility** – All projects must meet National Environmental Policy Act (NEPA) and Historic Preservation requirements. In addition, the community applying for funding must have a FEMA-approved Hazard Mitigation Plan at the time of application and award as well as be in a state that has had at least one federally-declared disaster within the last seven (7) years. (*NOTE: All states currently meet this last criterion.*)

- **Initial Project BRIC Scoring**
  - ✓ Technical Criteria (all or no points awarded) – 100 possible (*see attached BRIC Technical Criteria*)
  - ✓ Qualitative Criteria – points awarded on a scale based on evaluation by Review Panel (*see attached BRIC Qualitative Criteria)*

- **Review of Inaugural BRIC Funding**
  - ✓ The funding announcements for the inaugural BRIC funding round were just made in early July 2021. We will be attending FEMA BRIC webinars focused on

application debriefs as well as talking directly with the State Hazard Mitigation Officer to gain additional insight on preparing the most successful application possible and will share that information with the Town in the coming weeks.

- ✓ FEMA has received additional funding for the BRIC program from the American Rescue Plan Act (ARPA) and expects to receive more with the passage of an infrastructure stimulus bill. This is due in large part to the focus on infrastructure resiliency as well as the number of applications FEMA received for this first round of BRIC funding.

Flood Mitigation Assistance Program (FMA) - FEMA

FEMA makes these grant funds available to reduce or eliminate the risk of repetitive flood damage to buildings and structures insured under the National Flood Insurance Program (NFIP). FEMA has a Community Flood Program under FMA, for which this project would most likely be the most competitive. Below are the details specific to this source and the overall project:

- **Project Elements Eligible** – Elements of this project are conditionally eligible, if the building at 801 Ocean Drive is insured under NFIP. If other properties that would benefit from the project have active NFIP policies, those will help secure additional points for the application.

- **Application Deadline** – Application period generally opens on or about September 30 of each year and closes at the end of January. (Note: Specific deadlines will be provided by FEMA for the FY2021 application period in the coming weeks.) Applications are accepted through the new FEMA GO portal and prospective applicants need to establish an account, which can be done now. Prior to submittal of the application to FEMA, the project must be

reviewed and approved by the State Hazard Mitigation Officer (NC Department of Public Safety).

- **Anticipated Award Date** – FEMA normally provides pre-award project selections in late June/early July.

- **FMA Community Flood Mitigation Program Initial Scoring:**
  - ✓ Application Requirements:
    - Use the Community Flood Control code/activity type within FEMA's grant application system to be considered.
    - Be designated as a community flood mitigation project in the subapplication title, "Community Flood Mitigation Project."
    - Prove that the proposed project benefits NFIP-insured properties by submitting a benefitting area map and associated geospatial file(s) (*e.g.*, shapefile, KML/KMZ, geodatabase, or other geographic information system [GIS]-enabled document) delineating: 1) Proposed project footprint boundary; 2) Area benefitting from project; and, 3) Active NFIP policies (if data available).
  - ✓ Points are awarded based on a number of factors with community losses, number of NFIP policy holders impacted and number of severe/repetitive loss claims being the categories where the most points can be claimed. (*see attached FMA CFM scoring criteria*)

Match Requirements – The federal share for this program is capped at 75%. The State of North Carolina normally provides the local share of 25% for FEMA grants; however, that is still being finalized. Leveraging local funding over the 25% garners more points in this program; therefore, it would be advantageous for the Town to contribute additional local

funds through both Town resources even if the state covers the required 25% as well as securing funding from other non-federal partners.

- **Maximum Award** – **$30 million** (federal share cap) per sub-applicant. All projects must also comply with FEMA's benefit-cost analysis (BCA) ratio of 1 or more to validate its cost-effectiveness. The source(s) of the non-federal share will need to be identified at the time of application.

- **Period of Performance** – FMA CFM projects are expected to be completed within **48 months** of award date. Depending on final schedule determination, Oak Island could: apply now for the full project or submit an application for project scoping (advance assistance) that would allow for upfront funding of the engineering design costs. If the latter is selected, CFM project implementation application that have received funds for project scoping score an additional 20 points.

- **Partners** – One of the FMA CFM scoring criterion (150 points) is focused on leveraging funding partners, specifically private organizations and businesses. Project investment from local organizations/businesses should be discussed to make the application as competitive as possible.

- **Post-Project Requirements** – No specific post-project elements are required.

- **Other Requirements for Eligibility** – All projects must meet National Environmental Policy Act (NEPA) and Historic Preservation requirements. In addition, the community applying for funding must have a FEMA-approved Hazard Mitigation Plan at the time of application and award as well as be located in a state that has had at least one federally-

declared disaster within the last seven (7) years. (*NOTE: All states currently meet this last criterion.*) Sub applicants also must be participating in the NFIP, and not be withdrawn, on probation, or suspended for the duration of the project.

Local Assistance for Stormwater Infrastructure Investment Fund (LASII) – NCDEQ-DWI

The State Legislature has proposed the creation of this fund within the State Reserve managed by the Division of Water Infrastructure (DWI). $100 Million is allocated to this new fund from the American Recovery Plan Act (ARPA) funds awarded to the state. This new fund will provide grants for projects that will improve or create infrastructure for controlling stormwater quantity and quality. Below are the details specific to this source and the overall Ocean Drive Drainage and Infiltration System project:

- **Project Elements Eligible** – All elements of this project are conditionally eligible. However, this is a new fund therefore no specifics are available as of the date of this report. Historically costs are eligible to the extent that other funding sources are not reasonably available. This has been interpreted to mean, if the invoice has already been paid, before applying for funding, then other funding was reasonably available.

- **Application Deadline** – It is anticipated these funds will be distributed over 3 funding cycles. DWI takes applications twice a year with due dates in the Spring and Fall.

- **Anticipated Award Date** – The State Water Infrastructure Authority (SWIA) approves projects for funding twice a year, in Summer and Winter. Summer is typically at the July SWIA meeting and Winter can vary between February and March meetings.

- **Match Requirements** – In general, affordability criteria are applied to all projects to determine the amount of grant a project is eligible. However, the proposed legislation that creates this fund does not reference those criteria nor are the criteria based on stormwater utility rates.

- Maximum Award – **$15 million** for projects, **$500,000** for planning.

- **Period of Performance** – DWI puts all projects on a 24-month schedule to award date. There are no limits to time allotted for construction.

- **Partners** – No partners are required.

- **Post-Project Requirements** – No reports are required.

- **Other Requirements for Eligibility** – Because of state law, projects funded through the State Reserve do not require an environmental evaluation.

- **Priority Rating** – DWI is developing a priority rating system for stormwater projects.

Open Grants Program – NC Golden LEAF Foundation

Another funding source and potential local partner for this project may be the Golden LEAF Foundation since it involves assistance for local businesses and the details specific to this source are provided below:

- **Project Elements Eligible** – In general all aspects of this project would be eligible for funding with the exception of grant/funding management and land/easement acquisition.

When combining funding resources, it is generally advantageous to allocate the smaller funding source to a specific budget line item rather than divide across multiple line items. This improves the ease of reporting and demonstrating how/where funds are spent when submitting reimbursement requests.

- **Application Deadline** – Golden LEAF accepts Letters of Inquiry (LOIs) on a **rolling basis** and they are considered by their Board of Directors at each meeting (held at least quarterly). This is a 2-step application process. If the Board accepts the LOI for a project, a full application will be requested.

- **Anticipated Award Date** – Based on when a full application is submitted and the Board meeting schedule (*occur on at least a quarterly basis*) but, generally, funding is awarded within **3-6 months** of full application submittal.

- **Match Requirements** – No specific match requirement; however, source(s) of the additional funds needed to complete the project must be identified at the time of application.

- **Maximum Award** – **$200,000 - $500,000 (*Note: Golden LEAF just announced an increased funding limit for Open Grant awards; however, few projects will secure this level of funding and most awards will still be in the $200,000 range.*)**

- **Period of Performance** – Based on project schedule submitted with the application; however, Golden LEAF expects that their funds will be used as expeditiously as possible.

- **Partners** – Golden LEAF prefers to not be the only funding source participating in a project and also evaluates other local civic or environmental groups that support the project.

- **Post-Project Requirements** – Golden LEAF requires that a project have measurable economic-related outcomes and requires reporting on those outcomes for a period of a least 2 years following project completion.

- **Other Requirements for Eligibility** – Projects must target at least one of Golden LEAF's priority focus areas: Economic Investment and Job Creation, Workforce Preparedness and Education, Agriculture, and Community Vitality – all related to improving economic conditions of a community. Stormwater projects are not normally considered to be high priority infrastructure projects, but Golden LEAF has funded several recently. (*NOTE: In initial discussions with Golden LEAF, they want there to be a very strong tie to economic development and be focused on new infrastructure, not rehabilitation of existing infrastructure.*)

III. Funding Recommendations

Based on the funding analysis for the Ocean Drive Drainage and Infiltration System project, it is recommended to pursue BRIC and LASII funding for the entire project. Timing of the application can be discussed based on the overall project schedule as well as on discussions with the NC State Hazard Mitigation Officer, Jason Pleasant. These discussions will center on the overall competitiveness of the project as well as the state's determination on providing the non-federal share for any approved BRIC funding. We believe the funding discussed are the most advantageous for the Town, however we will continue to monitor new funding sources as they become available like USDA Rural Development and DEQ DWR.

Based on this, the recommended next steps are as follows:

1. Oak Island to register on the FEMA GO portal.
2. Set up meeting with Jason Pleasant (NCDPS) to discuss the project and the state's review/participation.
3. Review/discuss scoring criteria relative to the project elements and develop narrative discussion to ensure the application can secure as many points as possible. (*The BRIC application template is provided as an attachment to this analysis.*)
4. Complete the FEMA BCA assessment to ensure overall cost-effectiveness.
5. Identify additional local partners that can provide letters of support for the project.
6. Once the details for the new LASII program through NCDEQ-DWI are available, we will provide additional feedback to the Town to prepare for an application in the Spring of 2022.

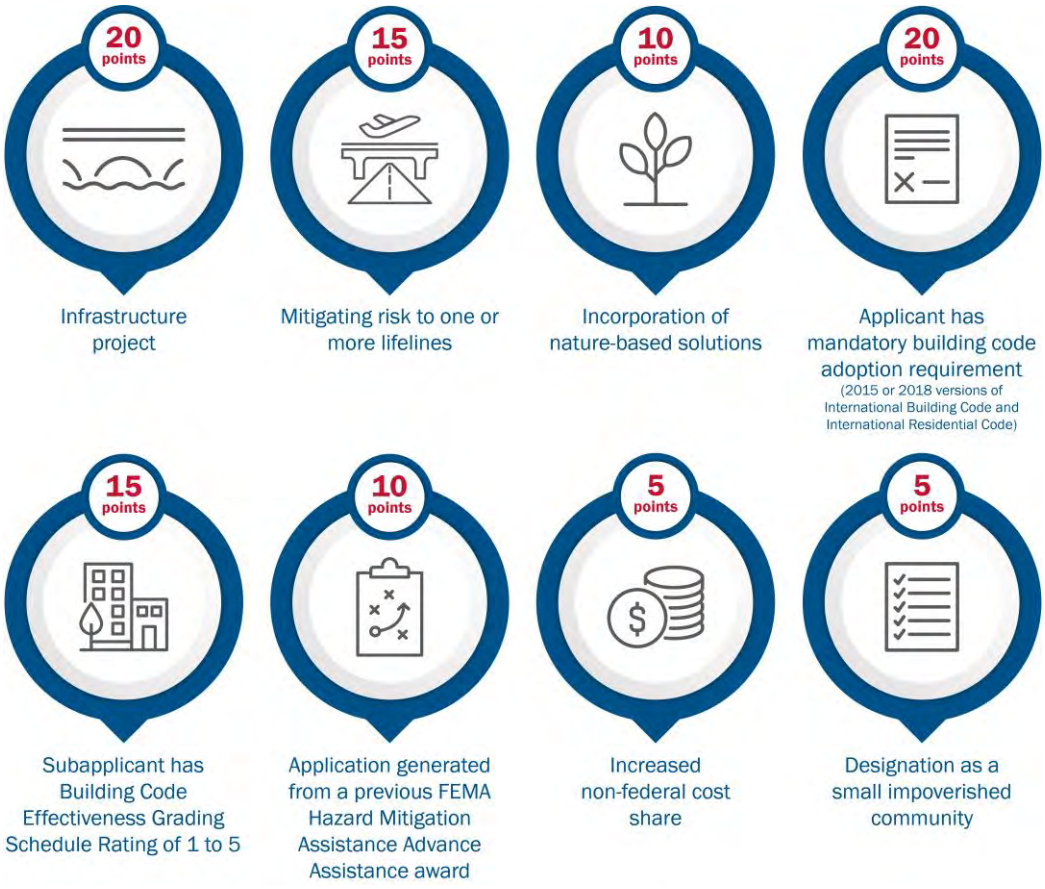
Funding Analysis
Town of Oak Island - Ocean Drive Drainage Study
July 2021

Source	FEMA BRIC - FEMA	FEMA FMA - FEMA	Stormwater - DWI	Golden LEAF FOUNDATION Open Grants - Golden LEAF
Project Eligibility	* All elements conditionally eligible * Can include pre-award costs	* All elements conditionally eligible * Can include pre-award costs	* All elements conditionally eligible * Cannot cover expenses already paid	* Most elements conditionally eligible * Cannot cover grant/funding adminsitration or land/easment acquisition (but can be part of match)
Application Deadline	1/29/2022 (Estimated)	1/29/2022 (Estimated)	New funding to be awarded in three rounds 4/29/2022 9/30/2022 4/28/2023	Rolling Application Period
Award Date	Estimated 6/2022	Estimated 6/2022	Estimated 7/2022 2/2023 7/2023	3-6 months from full application
Match Requirements	25% match from non-federal sources	25% match from non-federal sources	Match requirements unknown at this time	No specific match requirements
Maximum Grant Award	$50 million	$30 million	$15 million (*construction*) $500,000 (*planning*)	$500,000
Period of Performance	36 months	48 months	24 months to construction contract execution	Based on approved project schedule
Partners	Needed for competitive application	Needed for competitive application	None	Needed for competitive application
Post-Project Requirements	Needed for competitive application	Needed for competitive application	None	Reports on economic factors (job creation/retention, etc.)
Other Requirements	* NEPA/Historic Preservation Compliance * FEMA-approved Hazard Mitigation Plan	* NEPA/Historic Preservation Compliance * FEMA-approved Hazard Mitigation Plan * Located in a state with at least 1 federally-declared disaster within last 7 years	* ARPA funded new Stormwater State Reserve Fund * Other requirements unknown at this time	* Projects must align with Golden LEAF's priortity focus areas * Economic factors are important

FEMA PROGRAM SUPPORT MATERIAL

BRIC Technical Criteria

This program support material provides detailed information about the eight technical evaluation criteria that will be used in the Building Resilient Infrastructure and Communities (BRIC) national competition. The conditions that must be met to receive the point allotment for each criterion are described below. Additionally, application instructions are included for each respective criterion to guide information submission in FEMA Grants Outcomes (FEMA GO).



BRIC National Competition Technical Criteria and Point Values

Background

As described in Section E.1.a (Application Review Information – Application Evaluation Criteria, Programmatic Criteria) of the BRIC Notice of Funding Opportunity (NOFO), FEMA will use technical evaluation criteria to score subapplications submitted to the national competition. As referenced in the NOFO:

> *"If needed based on the number of subapplications submitted to the BRIC program, FEMA will use the technical evaluation criteria scoring as a program priority screening tool for the qualitative evaluation review. FEMA will send subapplications valued up to twice the amount of available funding to the BRIC qualitative evaluation panel. FEMA will ensure that at least one eligible subapplication from each Applicant will be sent to the qualitative evaluation panel for review.*
>
> *The technical evaluation criteria offer incentives for elements valued by FEMA. In order to ensure transparency and efficiency in competition project selection, technical evaluation criteria are binary point awards; projects either receive the full points allotted or zero points for each criterion."*

FEMA developed several of the technical evaluation criteria based upon factors it is required to consider by statute in addition to comments received through summer of 2019 stakeholder engagement efforts. For example, comments indicated that stakeholders strongly support prioritizing projects that integrate nature-based solutions, incentivizing building code improvements, and promoting previous Hazard Mitigation Assistance (HMA) Advance Assistance efforts.

For more information on BRIC and stakeholder engagement efforts, please visit https://www.fema.gov/bric. Application instructions are included below for each respective criterion to guide information submission in FEMA GO. More information on navigating the new FEMA GO system and the full application process can be found at https://www.fema.gov/grants/guidance-tools/fema-go.

Technical Criterion 1: Infrastructure Project (20 points)

To receive the point allotment for this criterion, the subapplication must explain how the project mitigates natural hazard risk to critical physical structures, facilities, and systems that provide support to a community, its population, and its economy. The following statements are provided as examples that a community might submit in a subapplication to describe how their project is an infrastructure project:

- Through the proposed nature-based solution that will reduce risk from high-intensity rainfall events, we will be providing enhanced protection to our wastewater treatment plant, which supplies fresh water to our community of 30,000 people.
- Retrofitting our food bank to have stronger structural integrity and the ability to operate off-grid will ensure a critical service in our community can remain operational following an earthquake.

Applicants/subapplicants should include this information in the Scope of Work Section of FEMA GO.

Technical Criterion 2: Mitigating Risk to One or More Lifelines (15 points)

To receive the point allotment for this criterion, the subapplication must indicate that the project will mitigate risk to at least one of the seven Community Lifelines to enable the continuous operation of critical government and business functions essential to human health and safety or economic security.

Community Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. More information on Community Lifelines can be found at https://www.fema.gov/lifelines and in the Community Lifelines Implementation Toolkit. The seven Community Lifelines are shown in the graphic below.

FEMA Community Lifelines

To better understand how mitigation projects can incorporate Community Lifelines concepts, please refer to the Mitigation Action Portfolio (MAP) at https://www.fema.gov/bric. The following MAP projects offer examples for each of the seven Community Lifelines:

- Safety and Security: Spring Creek (South Dakota) Drainage Improvement Project
- Food, Water, Shelter: Renovation of Alexander Theater (St. Croix)
- Health and Medical: Mercy Hospital (Missouri) Rebuild
- Energy (Power & Fuel): Blue Lake Rancheria Tribe (California) Microgrid
- Communications: ConnectArlington (Virginia) Communication Infrastructure Upgrades
- Transportation: La Guardia Airport (New York) Flood Control
- Hazardous Materials: Washington DOT Landslide Mitigation Action Plan and Rail Corridor Improvements

Applicants/subapplicants should include this information in the Scope of Work Section of FEMA GO.

Technical Criterion 3: Incorporation of Nature-Based Solutions (10 points)

To receive the point allotment for this criterion, the subapplication must indicate and describe how the project incorporates one or more nature-based solutions, which are sustainable environmental management practices that restore, mimic, and/or enhance nature and natural systems or processes and support natural hazard risk mitigation as well as economic, environmental, and social resilience efforts. Nature-based solutions use approaches that include, but are not limited to, restoration of grasslands, rivers, floodplains, wetlands, dunes, and reefs; living shorelines; soil stabilization; aquifer storage and recovery; and bioretention systems.

Applicants/subapplicants should include this information in the Scope of Work Section and Cost Effectiveness Section of FEMA GO.

Technical Criterion 4: Applicant has Mandatory Building Code Adoption Requirement (20 points)

For Applicants and subapplicants to receive the point allotment for this criterion, the Applicant must have adopted codes based on either the 2015 or 2018 versions of both the **International Building Code (IBC)** and the **International Residential Code (IRC)** model codes published by the International Code Council (ICC). The following adoption status combinations are the only ones that qualify for the point allotment:

- 2015 version of both the IBC and IRC
- 2018 version of both the IBC and IRC

- 2015 version of the IBC and 2018 version of the IRC
- 2018 version of the IBC and 2015 version of the IRC

If an Indian tribal government (federally recognized) has not adopted the code as listed above, the tribe must demonstrate alternative compliance with IBC and IRC (2015 or 2018) or be covered under another jurisdiction's (state or territory) code adoption status in order to receive the point allotment.

Applicants/subapplicants should include this information in the Evaluation Section of FEMA GO. Additionally, Applicants/subapplicants should attach documentation verifying adoption status. Information about Applicant adoption status may be found in the following examples of reference documents, which also represent acceptable adoption status verification documents that can be included as an attachment to the application:

- State, territory, or tribal legislation or code that demonstrates adoption status
- Insurance Services Office's (ISO's) *National Building Code Assessment Report – Building Code Effectiveness Grading Schedule* (2019 Edition)
- ICC's *Our Most Up to Date Adoption Chart: State Adoptions* located under the "Code Adoption Resources" tab of the ICC Advocacy page (https://www.iccsafe.org/advocacy/)

Technical Criterion 5: Subapplicant has Building Code Effectiveness Grading Schedule (BCEGS) Rating of 1 to 5 (15 points)

The BCEGS is an independent assessment of a community's building code adoption and enforcement activities, resulting in a score of 1 (best) to 10. For more information on BCEGS, please visit the ISO-Mitigation website at https://www.isomitigation.com/bcegs/.

To receive the point allotment for this criterion, a subapplicant at the local level (including those located in territories) must have a BCEGS rating between 1 and 5 (considered by FEMA as a disaster-resistant code) when the application is submitted. To receive the point allotment for this criterion, a state or territory acting as a subapplicant must:

- Have a class ranking between 1 and 5 on both the Commercial and Residential BCEGS State Averages as indicated on the respective State Page in ISO's *National Building Code Assessment Report – Building Code Effectiveness Grading Schedule* (2019 Edition); or
- Submit a BCEGS score provided by ISO (for territories and the District of Columbia)

Subapplicants at the state or territory level may submit documentation verified by ISO that provides more updated information on their BCEGS rating, if applicable. BCEGS scores for tribal Applicants/subapplicants are required but can be dependent on the relationship between the local municipality and the tribal entity that determines how building code requirements are managed.

The best source for relevant information at the community level is the local building inspector or code enforcement office.

Bureau States

Bureau states have their own insurance rating organization that is not part of ISO. To receive the point allotment for this criterion, a subapplicant at the state or territory level for the five Bureau states not included in *ISO's National*

Building Code Assessment Report – Building Code Effectiveness Grading Schedule (2019 Edition) must provide a state-verified BCEGS score at the state level. For subapplicants at the local level within Bureau states, BCEGS scores should be provided by the state. BCEGS Bureau state contact information is as follows:

Hawaii Insurance Bureau, Inc.
715 South King Street, Suite 320
Honolulu, HI 96813-4118
808-531-2771

Idaho Surveying and Rating Bureau, Inc.
5440 Franklin Road, Suite 101
P.O. Box 6430
Boise, ID 83707
208-343-5483

Property Insurance Association of Louisiana
433 Metairie Road, Suite 400
Metairie, LA 70005
504-831-6930

Mississippi State Rating Bureau
2685 Insurance Center Drive
Jackson, MS 39216-5231
or
P.O. Box 5231
Jackson, MS 39296-5231
601-981-2915

Washington Surveying and Rating Bureau
200 1st Avenue W, Suite 500
Seattle, WA 98119-4219
206-217-9772

If a subapplicant does not have a BCEGS score, a survey to obtain one can be requested. **BCEGS surveys are provided at no cost, do not negatively impact credit ratings, and can take 2 to 4 months to complete. Communities intending to apply for BRIC funding are encouraged to initiate the process as soon as possible.** To request a BCEGS survey, please refer to the submission instructions referenced on the ISO-Mitigation website at https://www.isomitigation.com/bcegs/. Questions about the BCEGS survey can be directed to BCEGS_Info@verisk.com.

Applicants/subapplicants should include this information in the Evaluation Section of FEMA GO.

Technical Criterion 6: Application Generated from a Previous FEMA HMA Advance Assistance Award (10 points)

To receive the point allotment for this criterion, a subapplicant must indicate the project was generated from a previous FEMA HMA Advance Assistance award and the award is directly related to the current proposal. HMA Advance Assistance provides Applicants and subapplicants resources to develop mitigation strategies and obtain data to prioritize, select, and develop complete applications in a timely manner.[1]

This type of grant may have been awarded through the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), or Pre-Disaster Mitigation (PDM) grant program at any time since HMA's Advance Assistance award inception.

Applicants/subapplicants should include this information in the Evaluation Section of FEMA GO.

Technical Criterion 7: Increased Non-Federal Cost Share (5 points)

To receive the point allotment for this criterion, a subapplicant must indicate the non-federal cost share exceeds 25 percent.

Applicants/subapplicants should include this information in the Budget Section of FEMA GO.

Technical Criterion 8: Designation as a Small Impoverished Community (5 points)

To receive the point allotment for this criterion, local government subapplicants must document their status as a small impoverished community (a community of 3,000 or fewer individuals identified by the applicant that is economically disadvantaged, with residents having an average per capita annual income not exceeding 80 percent of the national per capita income, based on best available data[2]). A state, territory, or Indian tribal government (federally recognized) serving as a subapplicant must document the small impoverished status of the community in which the project is planned to receive the point allotment for this criterion.

Population information can be found through the U.S. Census website. For the most current information on the national income, see http://www.bea.gov.

Applicants/subapplicants should include this information in the Budget Section in FEMA GO and attach required support documentation.

---

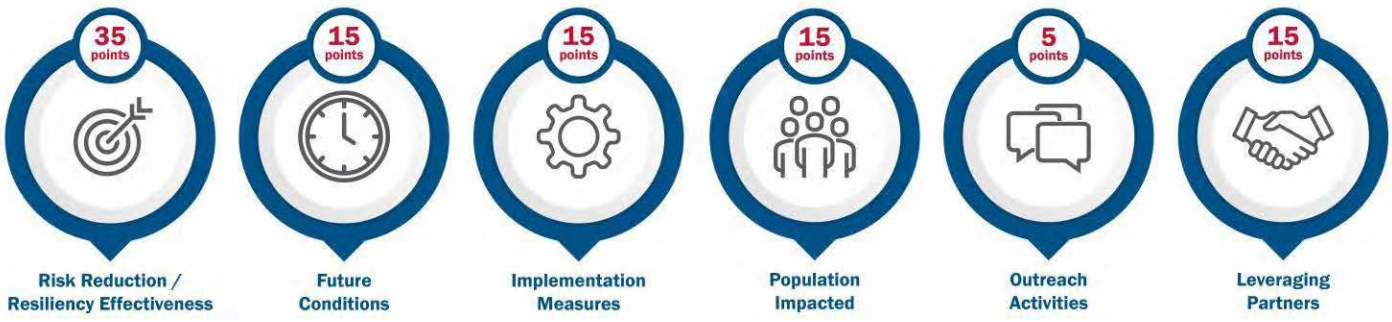
[1] This definition is derived from the Advance Assistance description on page 22 of the Hazard Mitigation Assistance Guidance (HMA Guidance; 2015), which is available at https://www.fema.gov/grants/mitigation/hazard-mitigation-assistance-guidance-and-addendum-fy15.

[2] This definition is derived from the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Recovery Reform Act of 2018.

FEMA PROGRAM SUPPORT MATERIAL

BRIC Qualitative Criteria

This program support material provides detailed information about the six qualitative evaluation criteria that will be used in the Building Resilient Infrastructure and Communities (BRIC) national competition. Information to both guide Applicants and subapplicants in the development of their subapplications and to assist panelists in the qualitative review of projects is described below. Additionally, application instructions are included for each respective criterion to guide information submission in FEMA Grants Outcomes (FEMA GO).



BRIC National Competition Qualitative Criteria and Point Values

Background

As described in Section E.1.a (Application Review Information – Application Evaluation Criteria, Programmatic Criteria) of the BRIC Notice of Funding Opportunity (NOFO), FEMA will convene a National Review Panel to score subapplications submitted to the national competition based on a qualitative review. The BRIC national competition National Review Panel will include FEMA Regional Office and Headquarters staff, as well as representatives from state, local, tribal, and territorial (SLTT) governments and other federal agencies. As referenced in the NOFO:

> *"If needed based on the number of subapplications submitted to the BRIC program, FEMA will use the technical evaluation criteria scoring as a program priority screening tool for the qualitative evaluation review. FEMA will send subapplications valued up to twice the amount of available funding to the BRIC qualitative evaluation panel. FEMA will ensure that at least one eligible subapplication from each Applicant will be sent to the qualitative evaluation panel for review.*
>
> *In order to increase transparency in decision-making while building capability and partnerships, FEMA will convene a National Review Panel (NRP) to score subapplications based on qualitative evaluation criteria. The qualitative criteria are narrative submissions to allow subapplicants the flexibility to fully explain the strengths of the proposed project. Qualitative evaluation criteria have graded scales of point scoring."*

FEMA developed the qualitive evaluation criteria based upon comments received through summer of 2019 stakeholder engagement efforts. For example, comments indicated support for holistic project evaluation beyond economic metrics alone as well as for incentivizing partnerships and high-quality community engagement.

For more information on BRIC and stakeholder engagement efforts, please visit https://www.fema.gov/bric.

Evaluation Process and Scoring

The panelists will leverage their mitigation experience and expertise during the review to assess the degree to which subapplications meet the six BRIC qualitative evaluation criteria (based on the scoring in Table 1). The subapplication's final qualitative score will be calculated by averaging the qualitative scores from each panelist. The six criteria include the following: (1) Risk Reduction/Resiliency Effectiveness, (2) Future Conditions, (3) Implementation Measures, (4) Population Impacted, (5) Outreach Activities, and (6) Leveraging Partners.

Table 1: To what degree does the subapplication meet the criterion?

Scoring Option	Description
Not at all	The subapplication does not address the criterion at all, or minimal references to the criterion are made that include no substantive information.
Minimally	The subapplication addresses the criterion, but information in the subapplication may be confusing, unclear, and/or incorrect. The degree to which the subapplication demonstrates the criterion has been met is weak.
Partially	The subapplication addresses the criterion, but the subapplication may lack clarity and/or strong support, have some minor inconsistencies, or not address all components of the criterion. The degree to which the subapplication demonstrates the criterion has been met is mediocre.
Mostly	Although the subapplication may include a few minor inconsistencies or areas that need more clarity, there is strong support for most components of the criterion. The degree to which the subapplication demonstrates the criterion has been met is acceptable.
Entirely	The subapplication is clear, concise, and complete; provides examples; and is supported by data. It addresses all components of the criterion and may have a particularly compelling narrative. The degree to which the subapplication demonstrates the criterion has been met is excellent.
Exceeds	In addition to addressing all components of the criterion and being clear, concise, complete, and supported by data, the subapplication articulates the transformative impact of the project in catalyzing broader efforts (such as legislative action) as they relate to the criterion. The degree to which the subapplication demonstrates the criterion has been met is beyond excellent.

The National Review Panel will apply the scoring options listed in Table 1 to all six qualitative criteria. However, point values associated with each scoring option vary among criteria, depending on the total possible points for each criterion. The graded scoring and point scales for each criterion are included below.

Application instructions are included below for each respective criterion to guide information submission in FEMA GO. More information on navigating the new FEMA GO system and the full application process can be found at https://www.fema.gov/grants/guidance-tools/fema-go.

Prompts are outlined for each qualitative criterion to serve as a helpful starting point for Applicants and subapplicants. These prompts are designed to clarify terms and provide guiding questions for Applicants and subapplicants to consider as they write the subapplication. This information will be provided to panelists to foster a common frame of reference. Please note that answering every question, while informative, will not necessarily guarantee an "Exceeds" score. Finally, prompts included here are by no means mutually exclusive or exhaustive; any additional information to support the merit of the subapplication is welcome. This information supplements the information regarding qualitative evaluation criteria that can be found in Section E.1.a (Application Review Information – Application Evaluation Criteria, Programmatic Criteria) of the BRIC NOFO.

Qualitative Criterion 1: Risk Reduction/Resiliency Effectiveness (35 possible points)

The subapplication details how the project will effectively reduce risk and increase resilience (including the benefits quantified in the BCA), realize ancillary benefits, and leverage innovation.

Not at all	Minimally	Partially	Mostly	Entirely	Exceeds
0	7	14	21	28	35

Applicants and subapplicants should include Risk Reduction/Resiliency Effectiveness information in the Scope of Work Section of FEMA GO.

Prompts for Risk Reduction/Resiliency Effectiveness Criterion

- Resilience refers to the ability to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruption.[1] How will the proposed project improve resilience? For example, a project designed to retrofit a library to serve as a tornado shelter could include tornado (and other hazards) preparedness, resilience, and mitigation information. This could enhance the community's resilience by educating the public about the natural hazard risks they face, as well as build a culture of preparedness.
- How will the proposed project reduce risk(s) and to what level? For example, a proposed project could be designed to provide 100-year-level flood protection to a neighborhood with 250 people, 135 homes, 15 publicly owned structures that support several Community Lifelines, and a variety of cultural, historic, and environmental resources. Additionally, subapplicants may have high Building Code Effectiveness Grading Schedule (BCEGS) scores that show a commitment to reducing risk through strong building code adoption and enforcement activities.
- Ancillary benefits refer to benefits other than the project's primary risk reduction objective which may be identified in the Hazard Mitigation Plan, Scope of Work, and Benefit-Cost Analysis. These are benefits related

[1] This definition is used by the National Institute of Standards and Technology.

to water/air quality, habitat creation, energy efficiency, economic opportunity, reduced social vulnerability, cultural resources, public health, mental health, etc. What ancillary benefits will the project provide and how? Does the project consider multiple hazards (e.g., wind/storm surge, wildfire/mudslides) to address risks beyond the proposal's primary risk reduction objective?

- Innovation in one community can look very different from innovation in another community. How does the project leverage or demonstrate innovation for your community? What new ideas or approaches is the project incorporating? For example, a proposed project in a rural community that has seen an increase in development and impervious surface might include nature-based solutions that have not previously been used.

Qualitative Criterion 2: Future Conditions (15 possible points)

The subapplication describes how the project will anticipate future conditions (population/demographic/climate changes, sea level rise,[2] etc.) and cites data sources, assumptions, and models.

Not at all	Minimally	Partially	Mostly	Entirely	Exceeds
0	3	6	9	12	15

Applicants and subapplicants should include Future Conditions information in the Evaluation Section of FEMA GO.

Prompts for Future Conditions Criterion

- What anticipated future conditions are relevant for the project? Examples of future conditions include, but are not limited to, the following: expected population growth or shrinkage, land use and development shifts, aging population, shifts in income or employment, changes in housing needs, sea level rise, more intense rainfall events, increasing storm frequency, etc.
- How is the project responsive to any identified anticipated changes? Does the project integrate the consideration of future conditions into design, planning, and operations workflows?
- How was the project informed by, or connected to, plans and planning efforts and their assessment of future conditions? Relevant plans may include Hazard Mitigation Plans, Comprehensive Plans, Climate Adaptation Plans, Long-Range Transportation Plans, Small Area Plans, etc.
- What data sources and assumptions are used to guide the project? For example, when citing a sea level rise projection, what time period and what scenario of sea level rise are assumed?

[2] Applicants and subapplicants may use any valid source that is based on recognized sea level rise estimation methods for sea level rise. Several federal government sources are available for relative sea level rise data along coastal areas. Some of these sources include, but are not limited to, the National Oceanic and Atmospheric Administration Center for Operational Oceanographic Products and Services' Mean Annual SLR Trend Data (https://tidesandcurrents.noaa.gov/sltrends/sltrends.html) and the U.S. Army Corps of Engineers Sea-Level Change Curve Calculator (Version 2019.21) (http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html).

Qualitative Criterion 3: Implementation Measures (15 possible points)

The subapplication adequately describes how the costs and schedule will be managed, how the project will be successfully implemented, and how innovative techniques to facilitate implementation will be incorporated. The project's Scope of Work identifies sufficient technical and managerial staff and resources to successfully implement this project.

Not at all	Minimally	Partially	Mostly	Entirely	Exceeds
0	3	6	9	12	15

Applicants and subapplicants should include Implementation Measures information in the Scope of Work Section of FEMA GO.

Prompts for Implementation Measures Criterion

- Does the application inspire confidence that the project can be completed successfully as designed, given the stated implementation measures?
- What potential implementation challenges and obstacles are identified (e.g., technical, political, financial, public support) and what innovative implementation solutions are proposed? Innovative implementation techniques in one community can look very different from those in another community.
- Are the proposed project costs and schedule realistic? How do project cost estimates and the schedule identify and properly address potential challenges and obstacles?
- What pre- and post-implementation monitoring strategies are proposed for the project? What specific evaluation elements are proposed to measure progress and ensure the project is executed as designed?
- What technical and managerial staff and resources are available to successfully implement the project? How will anticipated staff and resource gaps be filled?
- Are examples of successfully completed projects included to demonstrate effective implementation measures?

Qualitative Criterion 4: Population Impacted (15 possible points)

The project subapplication demonstrates community-wide benefits and identifies the proportion of the population that will be impacted. The application also describes how impacts (positive or negative) to socially vulnerable populations informed project selection and design.

Not at all	Minimally	Partially	Mostly	Entirely	Exceeds
0	3	6	9	12	15

Applicants and subapplicants should include the Population Impacted information in the Scope of Work Section of FEMA GO.

Prompts for Population Impacted Criterion

- Community size, scale, and definition can look very different in different local contexts. What does "community-wide" mean in the context of the proposed project?
- What percent of the population will directly benefit from the project (i.e., experience direct community-wide benefits)? How is this estimate calculated?
- What is the extent of the project's expected direct and indirect impacts? How will the project reduce cascading impacts to Community Lifelines, residents, businesses, public services, infrastructure, and natural systems?
- Who are the most vulnerable members of the community where the project is proposed? How will the project negatively impact vulnerable members of the community? How will the project positively impact vulnerable members of the community? Impacts can be directly related to the risk reduction activity or indirectly related, such as with ancillary impacts (i.e., social, environmental, economic impacts).

Qualitative Criterion 5: Outreach Activities (5 possible points)

The subapplication describes outreach activities appropriate to the project that advance mitigation. The application also outlines the types of community planning processes leveraged during project conception and design and identifies the level of public support obtained during the engagement process.

Not at all	Minimally	Partially	Mostly	Entirely	Exceeds
0	1	2	3	4	5

Applicants and subapplicants should also include information about their Outreach Activities in the Scope of Work Section of FEMA GO.

Prompts for Outreach Activities Criterion

- To what extent did stakeholders and/or stakeholder groups contribute to this project?
- What planning processes were leveraged during the development of the project proposal to advance mitigation? How did the project planning process ensure that the most vulnerable members of the community were involved in the planning and decision-making processes?

- What information (e.g., resiliency goals and outcomes, partnership opportunities, project implementation progress) will be shared with the public? What public outreach and engagement strategies will be used to disseminate project information to and gather feedback from stakeholders and members of the community?
- What support or conflicts emerged through the project planning process? How will conflicts be resolved as the project is implemented?
- What are the linkages between your hazard mitigation plan and local land use requirements and how does the linkage make your community more resilient?

Qualitative Criterion 6: Leveraging Partners (15 possible points)

The project subapplication incorporates state, tribal, private, and local community partnerships that will enhance its outcome and describes the extent of those partnerships such as having an increased non-federal cost share, multi-jurisdictional projects, etc.

Not at all	Minimally	Partially	Mostly	Entirely	Exceeds
0	3	6	9	12	15

Applicants and subapplicants should include information about Leveraging Partners in the Evaluation Section of FEMA GO.

Prompts for Leveraging Partners Criterion

- Partnerships can take many different forms. For example, partners may contribute financially, support and promote the proposed project, help generate community-wide awareness of the risks the proposal is designed to address, etc. What partners were involved in the project design? How did partners contribute to the application? What partners will contribute to the implementation of the project?
- To what extent were non-governmental organizations, universities, private organizations, or other government entities consulted for advice or assistance? How has collaboration with surrounding jurisdictions supported project development?
- To what extent have other federal programs or funding sources been leveraged for the project? To what extent have partners provided funding that increases the non-federal cost share?
- How have partnerships been used to increase community resiliency? What potential exists for partnerships to continue beyond implementation of the project?

FEMA Fact Sheet

FMA Community Flood Mitigation

The Flood Mitigation Assistance (FMA) program makes federal funds available to reduce or eliminate the risk of repetitive flood damage to buildings and structures insured under the National Flood Insurance Program (NFIP). This fact sheet provides detailed information on community flood mitigation projects eligible under the FMA program.

Overview

Community flood mitigation (CFM) projects are one of five FMA program priorities in fiscal year (FY) 2020. CFM projects, under FMA, address community flood risk for the purpose of reducing NFIP flood claim payments. Out of $160 million in total funding for FY 2020, FEMA has set-aside $70 million for the federal cost share of CFM projects.

FEMA will select the highest scored eligible CFM project subapplication(s) based on the FEMA scoring criteria (described below). Each subapplication should not exceed $30 million in federal cost share. Additionally, projects will be evaluated to ensure they will provide benefits to the NFIP in accordance with Title 44 of the Code of Federal Regulations Part 79 and the *Hazard Mitigation Assistance Guidance* (HMA Guidance).

FY20 FMA Funding Priorities

Required Subapplication Elements

All community flood mitigation project subapplications must:

- Use the **Community Flood Control** code/activity type within FEMA's grant application system to be considered,
- Be designated as a community flood mitigation project in the subapplication title, **"Community Flood Mitigation Project,"** and
- Prove that the proposed project benefits NFIP-insured properties by **submitting a benefitting area map** and associated geospatial file(s) (e.g., shapefile, KML/KMZ, geodatabase, or other geographic information system [GIS]-enabled document) delineating:
  - Proposed project footprint boundary,
  - Area benefitting from project, and
  - Active NFIP policies (if data available).

FEMA

For more information on developing a benefitting area map, please consult the *Geospatial File Eligibility Criteria* Job Aide at https://www.fema.gov/sites/default/files/2020-08/fema_geospatial-eligibility-criteria-flood-mitigation-grant-applications.pdf.

Eligible Community Flood Mitigation Projects

The following non-exhaustive list represents some eligible CFM projects. Remember, projects must benefit NFIP-insured properties in order to be deemed eligible under the FMA program. Examples projects include, but are not limited to:

- Localized flood control
- Floodwater storage and diversion
- Floodplain and stream restoration
- Stormwater management
- Wetland restoration/creation

Community Flood Mitigation Projects Scoring Criteria

For FY 2020, CFM subapplications submitted to FMA will be scored and selected based on FEMA scoring criteria. The following table outlines the specific criteria with a brief description of each. More information on eligibility and scoring criteria can be found within the FY 2020 FMA NOFO.

Final Priority Scoring Criteria for Community Flood Mitigation Projects & Project Scoping		
Priority	**Description**	**Total Points**
NFIP Insured Multiple Loss Communities	Communities with 50 or more Repetitive Loss (RL) or Severe Repetitive Loss (SRL) structures and have received NFIP claims in a county that has received an Individual Assistance declaration for flood in the past 10 years.	Up to 200
NFIP Policy Holder	Points will be assessed for every NFIP policy that is active as of the FMA application start date (Section D, Application and Submission Information, Key Dates and Times) and is verified within the benefitting area of the project. (5 per NFIP Policy).	5 x Each NFIP Policy
Severe Repetitive Loss (SRL) and Repetitive Loss (RL) Properties	Points will be assessed for SRL or RL structure that is verified within the benefitting area of the project (5 per RL and 10 per SRL property).	5 x each RL 10 x each SRL
Private-Partnership Cost Share	Cost share taken on by private organizations/businesses emphasizing community participation, collaboration, and investment. Points will be assigned based on percentage of private cost share invested.	150
Community Rating System (CRS) Participation	The CRS recognizes and encourages community floodplain-management activities that exceed the minimum National Flood Insurance Program standards. Depending on the level of participation, flood insurance premium rates for policyholders can be reduced up to 45%. Highest weight will be assigned to class 1 and descending through lower classes. (Graded Scale: 1 = 100, 2 = 90, 3 = 80, 4 = 70, 5 = 60, 5 = 50, 6 = 40, 7 = 30, 8 = 20, 9 = 10)	10-100
Advance Assistance Generated Project (Projects Only)	Application generated from a previous FEMA HMA Advance Assistance Award.	20
Cooperating Technical Partners Program (CTP) Participation	The CTP is a qualified partnership program in which communities commit to collaborate in maintaining up-to-date flood hazard maps and other flood hazard information. Points will be assigned to CTP participating communities.	30

Period of Performance

Under the FMA program, projects typically have a period of performance of 36 months to achieve project completion. However, given the complexity of the CFM projects, the period of performance for CFM projects is 48 months, starting on the date of the Recipient's federal Award.

More information on the period of performance and other programmatic requirements can be found in the FY 2020 FMA Notice of Funding Opportunity (NOFO) or the FMA website at https://www.fema.gov/flood-mitigation-assistance-grant-program.

Community Flood Mitigation Projects within FEMA GO

The new FEMA Grants Outcomes (FEMA GO) grants management system will be used for the FMA program, and is where FMA Applicants and subapplicants will submit, track, and manage all applications. The eGrants system will not be used to process FMA applications or subapplications. This section provides a brief synopsis on how to submit community flood mitigation subapplications in FEMA GO, including information on selecting the correct activity type and an overview of the required narrative questions. For more information on navigating the new FEMA GO system and the full application process, please reference the FEMA GO guide at https://www.fema.gov/grants/guidance-tools/fema-go.

The following section offers tips on selecting and submitting a community flood mitigation subapplication within FEMA GO.

- *"Subapplication Title"*
  - Include "Community Flood Mitigation Project" in the Subapplication title.
- *Choose the "Subapplication Type"*
  - Select the "Project" Subapplication Type within FEMA GO to begin.
- *"Scope of Work" Section*
  - Select the Primary Activity Type "Flood control".
  - Select the sub-activity type "Community flood control".
  - Select a Primary Community Lifeline; if applicable, select secondary and tertiary lifelines as well.
  - *Q: Geographic areas description*
    - In this section describe the project area and the benefitting area to the best of your ability.
    - Note: Ensure you attach your project area and benefitting area maps to your Subapplication.

Additional Resources

The links below provide additional information related to the FMA Program and resources to assist Applicants and subapplicants in their development of FMA projects.

- HMA Guidance: https://www.fema.gov/grants/mitigation/hazard-mitigation-assistance-guidance-and-addendum-fy15
- FMA Program Homepage: https://www.fema.gov/grants/mitigation/floods
- Job Aide: New Geospatial File Eligibility Criteria in Flood Mitigation Grant Applications https://www.fema.gov/sites/default/files/2020-08/fema_geospatial-eligibility-criteria-flood-mitigation-grant-applications.pdf

Appendix C

Construction Project Cost Estimates

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 1: E. Beach Drive @ 74th St**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$17,040.00	$17,040.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	$2,000.00	$2,000.00
3	Furnish and Install Infiltration System (Chambers, 18" Height)	21	EA	$1,000.00	$21,000.00
4	Furnish and Install Infiltration System (Stone with Geotextile)	100	TON	$65.00	$6,500.00
5	Excavate and Remove Soil Excess Material	90	CY	$20.00	$1,800.00
6	Dune Replanting	1	LS	$6,000.00	$6,000.00
7	15" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	160	LF	$110.00	$17,600.00
8	Storm Drain Inlet/Storm Drain Structure @ Inlet to Infiltration System	4	EA	$4,500.00	$18,000.00
9	Permanent Inlet Filter Protection	3	EA	$1,500.00	$4,500.00
10	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$75,000.00	$75,000.00
11	4" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	175	LF	$40.00	$7,000.00
12	Bollards	4	EA	$500.00	$2,000.00
13	Traffic Control	1	LS	$4,000.00	$4,000.00
14	Erosion Control	1	LS	$5,000.00	$5,000.00
				Project Subtotal	$187,440.00
				30% Contingency	$56,232.00

Total Project Cost Estimate = $243,700.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 2: E. Beach Drive @ 76th St**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$22,785.00	$22,785.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	$3,000.00	$3,000.00
3	Furnish and Install Infiltration System (Chambers, 18" Height)	36	EA	$1,000.00	$36,000.00
4	Furnish and Install Infiltration System (Stone with Geotextile)	170	TON	$65.00	$11,050.00
5	Excavate and Remove Soil Excess Material	150	CY	$20.00	$3,000.00
6	Dune Replanting	1	LS	$10,000.00	$10,000.00
7	15" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	290	LF	$110.00	$31,900.00
8	Storm Drain Inlet/Storm Drain Structure @ Inlet to Infiltration System	4	EA	$4,500.00	$18,000.00
9	Permanent Inlet Filter Protection	3	EA	$1,500.00	$4,500.00
10	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$90,000.00	$90,000.00
11	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	120	LF	$70.00	$8,400.00
12	Bollards	4	EA	$500.00	$2,000.00
13	Traffic Control	1	LS	$4,000.00	$4,000.00
14	Erosion Control	1	LS	$6,000.00	$6,000.00
				Project Subtotal	$250,635.00
				30% Contingency	$75,190.50

Total Project Cost Estimate = $325,800.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 3: Ocean Drive @ 79th St**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$26,235.00	$26,235.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	$4,000.00	$4,000.00
3	Furnish and Install Infiltration System (Chambers, 18" Height)	42	EA	$1,000.00	$42,000.00
4	Furnish and Install Infiltration System (Stone with Geotextile)	190	TON	$65.00	$12,350.00
5	Excavate and Remove Soil Excess Material	170	CY	$20.00	$3,400.00
6	Dune Replanting	1	LS	$12,000.00	$12,000.00
7	15"-18" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	360	LF	$120.00	$43,200.00
8	Storm Drain Inlet/Storm Drain Structure @ Inlet to Infiltration System	6	EA	$4,500.00	$27,000.00
9	Permanent Inlet Filter Protection	5	EA	$1,500.00	$7,500.00
10	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$90,000.00	$90,000.00
11	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	70	LF	$70.00	$4,900.00
12	Bollards	4	EA	$500.00	$2,000.00
13	Traffic Control	1	LS	$6,000.00	$6,000.00
14	Erosion Control	1	LS	$8,000.00	$8,000.00
				Project Subtotal	$288,585.00
				30% Contingency	$86,575.50

Total Project Cost Estimate = $375,200.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 4: Ocean Drive @ Barbee Blvd**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$23,860.00	$23,860.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	$2,500.00	$2,500.00
3	Furnish and Install Infiltration System (Chambers, 18" Height)	18	EA	$1,000.00	$18,000.00
4	Furnish and Install Infiltration System (Stone with Geotextile)	80	TON	$65.00	$5,200.00
5	Excavate and Remove Soil Excess Material	70	CY	$20.00	$1,400.00
6	Dune Replanting	1	LS	$8,000.00	$8,000.00
7	15"-18" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	540	LF	$120.00	$64,800.00
8	Storm Drain Inlet/Storm Drain Structure @ Inlet to Infiltration System	5	EA	$4,500.00	$22,500.00
9	Permanent Inlet Filter Protection	4	EA	$1,500.00	$6,000.00
10	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$90,000.00	$90,000.00
11	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	60	LF	$70.00	$4,200.00
12	Bollards	4	EA	$500.00	$2,000.00
13	Traffic Control	1	LS	$6,000.00	$6,000.00
14	Erosion Control	1	LS	$8,000.00	$8,000.00
				Project Subtotal	$262,460.00
				30% Contingency	$78,738.00

Total Project Cost Estimate = $341,200.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 5: E. Pelican Drive R/W @ 77th**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$48,020.00	$48,020.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	$6,000.00	$6,000.00
3	Furnish and Install Infiltration System (Chambers, 18" Height)	102	EA	$1,000.00	$102,000.00
4	Furnish and Install Infiltration System (Stone with Geotextile)	420	TON	$65.00	$27,300.00
5	Excavate and Remove Soil Excess Material	380	CY	$20.00	$7,600.00
6	E. Pelican Drive R/W Site Stabilization with Grass	1	LS	$5,000.00	$5,000.00
7	15"-18" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	850	LF	$120.00	$102,000.00
8	Storm Drain Inlet/Storm Drain Structure @ Inlet to Infiltration System	10	EA	$4,500.00	$45,000.00
9	Permanent Inlet Filter Protection	8	EA	$1,500.00	$12,000.00
10	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$100,000.00	$100,000.00
11	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	690	LF	$70.00	$48,300.00
12	Bollards	4	EA	$500.00	$2,000.00
13	Traffic Control	1	LS	$8,000.00	$8,000.00
14	Erosion Control	1	LS	$15,000.00	$15,000.00
				Project Subtotal	$528,220.00
				30% Contingency	$158,466.00

Total Project Cost Estimate = $686,700.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 6: E. Pelican Drive R/W @ 79th**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$38,015.00	$38,015.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	$6,000.00	$6,000.00
3	Furnish and Install Infiltration System (Chambers, 18" Height)	90	EA	$1,000.00	$90,000.00
4	Furnish and Install Infiltration System (Stone with Geotextile)	370	TON	$65.00	$24,050.00
5	Excavate and Remove Soil Excess Material	340	CY	$20.00	$6,800.00
6	E. Pelican Drive R/W Site Stabilization with Grass	1	LS	$5,000.00	$5,000.00
7	15"-18" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	385	LF	$120.00	$46,200.00
8	Storm Drain Inlet/Storm Drain Structure @ Inlet to Infiltration System	6	EA	$4,500.00	$27,000.00
9	Permanent Inlet Filter Protection	5	EA	$1,500.00	$7,500.00
10	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$100,000.00	$100,000.00
11	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	680	LF	$70.00	$47,600.00
12	Bollards	4	EA	$500.00	$2,000.00
13	Traffic Control	1	LS	$8,000.00	$8,000.00
14	Erosion Control	1	LS	$10,000.00	$10,000.00
				Project Subtotal	$418,165.00
				30% Contingency	$125,449.50

Total Project Cost Estimate = $543,600.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 7: Bldg #801 to NCDOT Storm Drainage System**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (10% of Total Cost)	1	LS	$32,860.00	$32,860.00
2	Site Stabilization with Grass	1	LS	$5,000.00	$5,000.00
3	15"-18" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	580	LF	$120.00	$69,600.00
4	Storm Drain Inlet	4	EA	$4,500.00	$18,000.00
5	Permanent Inlet Filter Protection	4	EA	$1,500.00	$6,000.00
6	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	1	LS	$100,000.00	$100,000.00
7	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	1,600	LF	$70.00	$112,000.00
8	Traffic Control	1	LS	$8,000.00	$8,000.00
9	Erosion Control	1	LS	$10,000.00	$10,000.00
				Project Subtotal	$361,460.00
				30% Contingency	$108,438.00

Total Project Cost Estimate = $469,900.00

*Easement and Professional costs are not included within this estimate

Ocean Drive Drainage Study Cost Estimate

Date: 6/22/2021 **Site 8: SWRF 5209 E. Yacht Drive**

ITEM NO.	ITEM DESCRIPTION	SCHEDULED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization (5% of Total Cost)	1	LS	$100,370.00	$100,370.00
2	R/W Site Stabilization with Grass	1	LS	$15,000.00	$15,000.00
3	15"-18" RCP Storm Drain Pipe (Includes Pavement Removal and Replacement where applicable)	1,800	LF	$120.00	$216,000.00
4	Storm Drain Inlet	17	EA	$4,500.00	$76,500.00
5	Permanent Inlet Filter Protection	17	EA	$1,500.00	$25,500.00
6	Pump Station Complete with Wet Well, Control Panel, Pump(s), Check Valve, and Testing	3	LS	$100,000.00	$300,000.00
7	4" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	450	LF	$40.00	$18,000.00
8	6" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	720	LF	$70.00	$50,400.00
9	10" PVC Force Main (Includes Pavement Removal and Replacement where applicable)	11,000	LF	$110.00	$1,210,000.00
10	Bollards	12	EA	$500.00	$6,000.00
11	Traffic Control	1	LS	$15,000.00	$15,000.00
12	Erosion Control	1	LS	$20,000.00	$20,000.00
13	Clean and Remove Sludge from SWRF (Sludge will be removed using exist. sludge force main)	1	LS	$15,000.00	$15,000.00
14	Decommission SWRF (Remove Excess Piping, Excess Pumps to be removed by Town staff) and Convert to Stormwater Treatment	1	LS	$25,000.00	$25,000.00
15	Fine Screen to filter Stormwater and remove remaining sand/debris particles	1	EA	$15,000.00	$15,000.00
				Project Subtotal	$2,107,770.00
				30% Contingency	$632,331.00

Total Project Cost Estimate = $2,740,100.00

*Easement and Professional costs are not included within this estimate

Appendix D

Infiltration System and Pump Calculations

Infiltration System Calculations

Example Calculations using Site 1 – E. Beach Drive @ 74th St

Depth to Seasonally High Water Table (SHWT)
The required depth to the SHWT was determined using the following parameters:

$$d_{SHWT} = d_d + d_{DIS} + d_s - m_d$$

Where:
d_{SHWT} = Required depth to the SHWT (ft) per Geotech report
d_d = Depth of cover (sand/soil material) above top of Infiltration System (ft)
d_{DIS} = Depth of the Infiltration System (including chambers and stone layers) (ft)
d_s = Depth of separation between bottom of stone layer and SHWT (ft)
m_d = Depth of raised mound above Depth of existing dune elevation @ low point (ft)

d_d = 1.0 ft
d_{DIS} = 2.5 ft
d_s = 1.0 ft
m_d = 2.5 ft

$$d_{SHWT} = 1.0\ ft + 2.5\ ft + 1.0\ ft - 2.5\ ft = 2.0\ ft$$

For Site 1 to be a feasible option, the depth to SHWT as found in the Geotech Report (Appendix A) must equal or exceed 2.0 feet.

Number of Potential Chambers
The number of potential chambers within the Infiltration System was determined using the following parameters:

$$n = \frac{(L-2)}{L_c} * R$$

Where:
n = number of chambers
L = length of provided area (ft)
L_c = length of chambers (ft)
R = number of rows

It is assumed each chamber is on average 7.75’ feet long. The number of potential rows of chambers factored in a 3.25-foot width for the selected chamber, 1-foot separation between chambers, and a 1-foot border on all sides.

L = 60 ft
L_c = 7.75 ft
R = 3

$$n = \frac{(60\ ft - 2\ ft)}{7.75\ ft} * 3 = 21\ chambers$$

Maximum Infiltration Capacity and Pump Capacity
The maximum infiltration capacity was determined using the following parameters:

$$q_i = \frac{S_a * K}{u}$$

Where:
q_i = maximum infiltration capacity (cfs)
S_a = Surface Area of Infiltration System (sf)
K = Hydraulic Conductivity (in/hr)
u = unit conversion (43,200 $\frac{in*s}{ft*hr}$)

S_a = 900 sf
K = 26.0 in/hr
u = 43,200 $\frac{in*s}{ft*hr}$

$$q_i = \frac{900\ sf * 26\ in/hr}{43{,}200\ \frac{in * s}{ft * hr}} = 0.54\ cfs = 243\ gpm$$

The capacity at which the pump will be utilized is the ratio of the maximum infiltration capacity and pumps capacity.

$$\%\ capacity = \frac{q_i}{q_p}$$

Where:
q_i = maximum infiltration capacity (gpm)
q_P = maximum pump capacity (gpm)

It is assumed the pump will produce flow equivalent to the maximum infiltration capacity. The provided pump capacity has a maximum flow rate of 398 gallons per minute.

q_i = 243 gpm
q_P = 398 gpm

$$\%\ capacity = \frac{243\ gpm}{398\ gpm} = 61\%$$

Time to No Ponded Water

The time until there is no water ponded within the road was determined using the following parameters:

$$t = \frac{V}{q_i * u}$$

Where:
t = time (hours)
V = volume of ponded water (cf)
q_i = maximum infiltration capacity (cfs)
u = unit conversion (3600 $\frac{s}{hr}$)

V = 6875 cf
q_i = 0.63 cfs

$$t = \frac{6875\ cf}{0.54\ cfs * 3600\ \frac{s}{hr}} = 3.53\ hours = 212\ minutes$$

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 1: E. Beach Drive @ 74th St

Site Specifications		
Provided Surface Area (SA)	900	sf
Provided Length	60	ft
Provided Width	15	ft
Depth of Ex. Ground Elev. to SHWT, assumed per Geotech report	2.00	ft
Depth of Mound Height Above Ex. Dune Elev. at low point	2.50	ft
Boring # from Geotechnical Report	N/A	
Hydraulic Conductivity (K) (Estimated, Lowest Value Borings #7-#11)	26.0	in/hr
Max Ponded Street Water Volume	6,875	cf

Infiltration and Pumping System		
Infiltration Rate (Within Infiltration System Surface Area)	0.54	cfs
	243.12	gpm
Pump Capacity	398.00	gpm
% Capacity of Pump	61%	
Chamber Length	7.75	ft
Chamber Width	3.25	ft
Separation between Rows and Perimeter Border Width	1.00	ft
Depth of Cover over Infiltration System	1.00	ft
Depth of Chamber with stone layers (Infiltration System)	2.50	ft
Depth of Separation between bottom of stone layer and SHWT	1.00	ft
Number of Possible Chambers Per Row	7	
Number of Possible Rows	3	
Total Number of Chambers	21	
Storage Volume Provided of Infiltration System (Approximte)	1,000	cf

Dune Infiltration System			
Required Surface Area	88	sf	Good
Required Depth	4.5		Good
Provided Depth	4.5		
Time to Pump Street free of Water (Rounded & No Factor Safety)	3.6	hours	
	216	minutes	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
5	0	12,500	0	
5.5	0.5	15,000	6,875	6,875

SA = DV / (K/12/FS*T)

Design Volume (DV) = 6,875 cu ft

K = 26.00 in/hr
Factor of Safety (FS) = 2
Max Time Allowed (T) = 72 hrs

Min. Surface Area (SA) = 88 sf
Surface Area Provided = 900 sf
Draw Down Time (Infiltration with FS) = 7.05 hrs

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 2: E. Beach Drive @ 76th St

Site Specifications		
Provided Surface Area (SA)	1,540	sf
Provided Length	55	ft
Provided Width	28	ft
Depth of Ex. Ground Elev. to SHWT per Geotech report	2.00	ft
Depth of Mound Height Above Ex. Dune Elev. at low point	2.50	ft
Boring # from Geotechnical Report	7	
Hydraulic Conductivity (K)	26.0	in/hr
Max Ponded Street Water Volume	28,125	cf

Infiltration and Pumping System		
Infiltration Rate (Within Infiltration System Surface Area)	0.93	cfs
	416.00	gpm
Pump Capacity	590.00	gpm
% Capacity of Pump	71%	
Chamber Length	7.75	ft
Chamber Width	3.25	ft
Separation between Rows and Perimeter Border Width	1.00	ft
Depth of Cover over Infiltration System	1.00	ft
Depth of Chamber with stone layers (Infiltration System)	2.50	ft
Depth of Separation between bottom of stone layer and SHWT	1.00	ft
Number of Possible Chambers Per Row	6	
Number of Possible Rows	6	
Total Number of Chambers	36	
Storage Volume Provided of Infiltration System (Approximte)	1,700	cf

Dune Infiltration System			
Required Surface Area	361	sf	Good
Required Depth	4.5		Good
Provided Depth	4.5		
Time to Pump Street free of Water (Rounded & No Factor Safety)	8.5	hours	
	510	minutes	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
5.5	0	35,000	0	
6.25	0.75	40,000	28,125	28,125

SA = DV / (K/12/FS*T)

Design Volume (DV) = 28,125 cu ft

K = 26.00 in/hr

Factor of Safety (FS) = 2

Max Time Allowed (T) = 72 hrs

Min. Surface Area (SA) = 361 sf

Surface Area Provided = 1,540 sf

Draw Down Time (Infiltration with FS) = 16.86 hrs

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 3: Ocean Drive @ 79th St

Site Specifications		
Provided Surface Area (SA)	1,768	sf
Provided Length	52	ft
Provided Width	34	ft
Depth of Ex. Ground Elev. to SHWT per Geotech report	2.00	ft
Depth of Mound Height Above Ex. Dune Elev. at low point	2.50	ft
Boring # from Geotechnical Report	9	
Hydraulic Conductivity (K)	28.3	in/hr
Max Ponded Street Water Volume	31,313	cf

Infiltration and Pumping System		
Infiltration Rate (Within Infiltration System Surface Area)	1.16	cfs
	519.29	gpm
Pump Capacity	590.00	gpm
% Capacity of Pump	88%	
Chamber Length	7.75	ft
Chamber Width	3.25	ft
Separation between Rows and Perimeter Border Width	1.00	ft
Depth of Cover over Infiltration System	1.00	ft
Depth of Chamber with stone layers (Infiltration System)	2.50	ft
Depth of Separation between bottom of stone layer and SHWT	1.00	ft
Number of Possible Chambers Per Row	6	
Number of Possible Rows	7	
Total Number of Chambers	42	
Storage Volume Provided of Infiltration System (Approximte)	2,000	cf

Dune Infiltration System			
Required Surface Area	369	sf	Good
Required Depth	4.5		Good
Provided Depth	4.5		
Time to Pump Street free of Water (Rounded & No Factor Safety)	7.6	hours	
	456	minutes	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
6	0	39,500	0	
6.75	0.75	44,000	31,313	31,313

SA = DV / (K/12/FS*T)

Design Volume (DV) = 31,313 cu ft

K = 28.27 in/hr
Factor of Safety (FS) = 2
Max Time Allowed (T) = 72 hrs

Min. Surface Area (SA) = 369 sf
Surface Area Provided = 1,768 sf
Draw Down Time (Infiltration with FS) = 15.04 hrs

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 4: Ocean Drive @ Barbee Blvd

Site Specifications		
Provided Surface Area (SA)	700	sf
Provided Length	50	ft
Provided Width	14	ft
Depth of Ex. Ground Elev. to SHWT per Geotech report	2.50	ft
Depth of Mound Height Above Ex. Dune Elev. at low point	2.00	ft
Boring # from Geotechnical Report	11	
Hydraulic Conductivity (K)	27.8	in/hr
Max Ponded Street Water Volume	13,500	cf

Infiltration and Pumping System		
Infiltration Rate (Within Infiltration System Surface Area)	0.45	cfs
	202.04	gpm
Pump Capacity	590.00	gpm
% Capacity of Pump	34%	
Chamber Length	7.75	ft
Chamber Width	3.25	ft
Separation between Rows and Perimeter Border Width	1.00	ft
Depth of Cover over Infiltration System	1.00	ft
Depth of Chamber with stone layers (Infiltration System)	2.50	ft
Depth of Separation between bottom of stone layer and SHWT	1.00	ft
Number of Possible Chambers Per Row	6	
Number of Possible Rows	3	
Total Number of Chambers	18	
Storage Volume Provided of Infiltration System (Approximte)	900	cf

Dune Infiltration System			
Required Surface Area	162	sf	Good
Required Depth	4.5		Good
Provided Depth	4.5		
Time to Pump Street free of Water (Rounded & No Factor Safety)	8.4	hours	
	504	minutes	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
6.5	0	25,000	0	
7	0.5	29,000	13,500	13,500

SA = DV / (K/12/FS*T)

Design Volume (DV) =	13,500	cu ft
K =	27.78	in/hr
Factor of Safety (FS) =	2	
Max Time Allowed (T) =	72	hrs
Min. Surface Area (SA) =	162	sf
Surface Area Provided =	700	sf
Draw Down Time (Infiltration with FS) =	16.66	hrs

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 5: E. Pelican Drive R/W @ 77th

Site Specifications		
Provided Surface Area (SA)	4,020	sf
Provided Length	134	ft
Provided Width	30	ft
Depth of Ex. Ground Elev. to SHWT per Geotech report (Estimated)	2.50	ft
Depth of Prop. Mound Height Above Ex. Elev. at low point	2.00	ft
Boring # from Geotechnical Report	3-4	
Hydraulic Conductivity (K) (Estimated Based upon Boring #3-#4)	12.0	in/hr
Max Ponded Street Water Volume	35,000	cf

Infiltration and Pumping System		
Infiltration Rate (Within Infiltration System Surface Area)	1.12	cfs
	501.19	gpm
Pump Capacity	920.00	gpm
% Capacity of Pump	54%	
Chamber Length	7.75	ft
Chamber Width	3.25	ft
Separation between Rows and Perimeter Border Width	1.00	ft
Depth of Cover over Infiltration System	1.00	ft
Depth of Chamber with stone layers (Infiltration System)	2.50	ft
Depth of Separation between bottom of stone layer and SHWT	1.00	ft
Number of Possible Chambers Per Row	17	
Number of Possible Rows	6	
Total Number of Chambers	102	
Storage Volume Provided of Infiltration System (Approximte)	4,700	cf

Infiltration System			
Required Surface Area	972	sf	Good
Required Depth	4.5		Good
Provided Depth	4.5		
Time to Pump Street free of Water (Rounded & No Factor Safety)	8.8	hours	
	528	minutes	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
Ponded Volume from Sites #1-#2				35,000

$$SA = \frac{DV}{(K/12/FS*T)}$$

Design Volume (DV) =	35,000	cu ft
K =	12.00	in/hr
Factor of Safety (FS) =	2	
Max Time Allowed (T) =	72	hrs
Min. Surface Area (SA) =	972	sf
Surface Area Provided =	4,020	sf
Draw Down Time (Infiltration with FS) =	17.41	hrs

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 6: E. Pelican Drive R/W @ 79th

Site Specifications		
Provided Surface Area (SA)	3,600	sf
Provided Length	120	ft
Provided Width	30	ft
Depth of Ex. Ground Elev. to SHWT per Geotech report	3.50	ft
Depth of Prop. Mound Height Above Ex. Elev. at low point	1.00	ft
Boring # from Geotechnical Report	5-6	
Hydraulic Conductivity (K) (Lowest Value of Boring #5-#6)	14.6	in/hr
Max Ponded Street Water Volume	31,313	cf

Infiltration and Pumping System		
Infiltration Rate (Within Infiltration System Surface Area)	1.22	cfs
	546.08	gpm
Pump Capacity	920.00	gpm
% Capacity of Pump	59%	
Chamber Length	7.75	ft
Chamber Width	3.25	ft
Separation between Rows and Perimeter Border Width	1.00	ft
Depth of Cover over Infiltration System	1.00	ft
Depth of Chamber with stone layers (Infiltration System)	2.50	ft
Depth of Separation between bottom of stone layer and SHWT	1.00	ft
Number of Possible Chambers Per Row	15	
Number of Possible Rows	6	
Total Number of Chambers	90	
Storage Volume Provided of Infiltration System (Approximte)	4,200	cf

Infiltration System			
Required Surface Area	715	sf	Good
Required Depth	4.5		Good
Provided Depth	4.5		
Time to Pump Street free of Water (Rounded & No Factor Safety)	7.2	hours	
	432	minutes	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
Ponded Volume from Site #3				31,313

SA = DV / (K/12/FS*T)

Design Volume (DV) =	31,313	cu ft
K =	14.60	in/hr
Factor of Safety (FS) =	2	
Max Time Allowed (T) =	72	hrs
Min. Surface Area (SA) =	715	sf
Surface Area Provided =	3,600	sf
Draw Down Time (Infiltration with FS) =	14.30	hrs

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	2/11/2021

Site 7: Bldg #801 to NCDOT Storm Drainage System

Site Specifications		
Max Ponded Street Water Volume	13,500	cf

Pumping System		
Pump Rate (Assumed)	500.00	gpm
	1.11	cfs
Pump Capacity	610.00	gpm
% Capacity of Pump	82%	
Time to Pump Street free of Water (Rounded & No Factor Safety)	3.4	hours
	204	minutes

Ex. Storm Drain Pipe Capacity (South side of E. Oak Island Drive @ Womble St)				
Ex. Pipe Slope (Assumed)	0.01	ft/ft	1.00	percent
Ex. Pipe Dia.	1.25	feet	15	inches
Ex. Pipe N Value	0.024	CMP		
Ex. Pipe Capacity From Ex. Inlet #1	3.51	cfs		
Ex. Inlet #1 Flow Receives (Approximate)	6.21	cfs	Ex. Pipe Undersized	

Ex. Storm Drain Pipe Capacity (North side of E. Oak Island Drive along Womble St)				
Ex. Pipe Slope (Approximate)	0.005	ft/ft	0.50	percent
Ex. Pipe Dia.	2	feet	24	inches
Ex. Pipe N Value	0.012	HDPE		
Ex. Pipe Capacity From Ex. Inlet #3 to Outlet	17.38	cfs		
Ex. Storm Drain System Flow Receives (Approximate)	149.10	cfs	Ex. Pipe Undersized	

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
Ponded Volume from Site #4				13,500

Project Name:	Ocean Drive Drainage Study
Prepared By:	Jason Sesler
Checked By (PE):	Marc Horstman
Date:	7/14/2021

Site 8: Satellite Water Reclamation Facility (SWRF)

Site Specifications		
Max Ponded Street Water Volume Site #4	13,500	cf
Max Ponded Street Water Volume Site #3 & #4	44,813	cf
Max Ponded Street Water Volume Site #1-#4	79,813	cf

Pumping System from Site 4		
Pump Rate (Assumed)	105.00	gpm
	0.23	cfs
Pump Capacity	280.00	gpm
% Capacity of Pump	38%	
Time to Pump Street free of Water (Rounded & No Factor Safety)	16.1	hours
	966	minutes

Pumping System from Site 3 for Site 3 & 4		
Pump Rate (Assumed)	350.00	gpm
	0.78	cfs
Pump Capacity	480.00	gpm
% Capacity of Pump	73%	
Time to Pump Street free of Water (Rounded & No Factor Safety)	16.0	hours
	960	minutes

Pumping System from Site 2 for Site 1-4		
Pump Rate (Assumed)	550.00	gpm
	1.23	cfs
Pump Capacity	720.00	gpm
% Capacity of Pump	76%	
Time to Pump Street free of Water (Rounded & No Factor Safety)	18.1	hours
	1086	minutes

Ponded Water Stage Storage Calculations				
Elevation	Stage	Area	Volume Inc.	Volume Cu.
ft	ft	sq ft	cf	cf
Ponded Volume from Site 1				6,875
Ponded Volume from Site 2				28,125
Ponded Volume from Site 3				31,313
Ponded Volume from Site 4				13,500

Total Ponded Volume (Site 1-4)	79,813	cf
	597,100	gallons
Available Storage Volume SWRF (Tanks)	321,900	gallons
Available Storage Volume(Infiltration)/day (Basins)	283,300	gallons
Additional Available Storage (Assumed) Above Normal Pool Elevation (Basins)	201,000	gallons
Total Volume Available	605,200	gallons
Total Volume + Additional Volume Available	806,200	gallons
Anoxic Tank (2 @ 10,500 gallons each)	21,000	gallons
Aeration Tank (2 @ 42,000 gallons each)	84,000	gallons
Membrane Tank (2 @ 5,420 gallons each)	10,840	gallons
Effluent Storage Tank	131,000	gallons
Elevated Storage Tank	75,000	gallons

High Rate Infiltration Basin #1	8.45	gpd/sqft
	0.53	acres
	195,083	gpd
	135.47	gpm
Surface Area:	23,087	sqft
Additional Volume (Assumed, Approx.)	15,468	cf
	115,800	gallons
High Rate Infiltration Basin #2	5.19	gpd/sqft
	0.39	acres
	88,170	gpd
	61.23	gpm
Surface Area:	16,988	sqft
Additional Volume (Assumed, Approx.)	11,382	cf
	85,200	gallons

Appendix E

NCSU Extension Publication

Dune Infiltration Systems for Reducing Stormwater Discharge to Coastal Recreational Beaches

NC STATE EXTENSION

Introduction

Before stormwater was recognized as a major contributor to the transport and delivery of pollutants to surface waters, many coastal towns constructed storm sewer systems that discharged runoff without treatment onto the beach or into the ocean. Untreated stormwater often contains high levels of bacteria, which could place swimmers at risk of illness after a rainfall. An innovative Dune Infiltration System (DIS) has been developed

to help prevent the polluted stormwater from reaching the ocean. The DIS reduces out flows from existing stormwater beach discharge pipes by diverting stormwater beneath the sand dunes. As the stormwater in filtrates into the subsurface sand, bacteria are filtered as they move with groundwater beneath the dunes. Three of these systems have been installed in Kure Beach, NC, and have been highly successful in reducing stormwater discharge to the recreational beach areas. The goal of this factsheet is to introduce this technology to coastal towns that want to reduce the potential impact of stormwater discharge to their beaches.

Compared to most states, coastal water quality in North Carolina is relatively high, ranking fourth in the nation according to the 2012 National Resource Defense Council's Testing the Waters report (NRDC, 2012). But as population and tourism continue to increase near our beaches, new development and increased imperviousness generate more stormwater runoff. Houses, hotels, and parking lots are the primary impervious surfaces associated with coastal development (Figure 1), but new or improved highway and bridge systems that enable residents and tourists to reach these popular destinations also produce runoff.

If you have noticed an exposed pipe on the beach, chances are it was there to discharge stormwater (Figure 2). Stormwater management plans for many coastal towns were developed years ago.

Many towns have existing infrastructure that allows the stormwater to flow into sounds or the ocean through stormwater discharge pipes. These pipes can be numerous and vary in size, depending on the watershed area and land-use characteristics. Pipes that discharge to beaches can be fully exposed or covered with sand during various times of the year.

It has been well documented that stormwater carries pollutants that can be detrimental to the aquatic environment and to human health. This places environmental pressure on our coastal water resources and increases health concerns for people who use these waters for recreational

purposes. The main human health concerns come from fecal bacteria that are washed into stormwater systems following storms. Fecal bacteria originating from the intestines of warm-blooded animals (birds, mammals both domesticated and wild, and humans) pose health risks. The NC Recreational Water Quality Program (NC RWQ), which monitors about 240 coastal locations, has shown that after rainfall events, discharge from these pipes often exceeds state and federal bacteria limits considered safe for human contact. Direct human contact with the stormwater or the area that receives the discharge can lead to symptoms of gastrointestinal, respiratory, ear, eye, nose, and skin infections (Griffin et al., 2003). In an effort to protect swimmers, the NC RWQ has an extensive water-quality sampling protocol that allows advisories and alerts to be issued when bacterial limits are exceeded. Beaches commonly have signs posted warning swimmers not to go near these stormwater discharge pipes (Figure 3). Obviously, coastal towns that have frequent advisories could eventually see a downturn in tourism and its associated revenue. Also, despite sign postings and advisories, the warnings are often unheeded (Figure 4), so reducing the frequency of untreated stormwater discharge to beach areas should be a priority.

Figure 1. Development in coastal towns increases stormwater runoff that is often discharged to the ocean.

Figure 2. Stormwater discharge pipes are found in many coastal towns in NC. Note the beach scour that is indicative of out ow from a recent storm event.

Figure 3. A permanent sign warning beachgoers to avoid swimming near this stormwater pipe when it is actively discharging.

Figure 4. Despite warnings, contact with discharging stormwater often still occurs.

A Potential Solution – The Dune Infiltration System

Sand filters have proved to be an effective means to capture bacteria in stormwater (Galli, 1990; Barrett, 2003) and are rated “High” as a stormwater control measure (SCM) for bacteria removal by the North Carolina Division of Water Quality (2007). Many North Carolina beaches have extensive sand dune systems that could be used to filter stormwater in a manner similar to constructed sand filters. Diversion of stormwater from existing pipes and into the dunes was the principle that guided the development of the Dune Infiltration System (DIS).

How does it work?

Before these coastal areas were developed, rainfall easily infiltrated into the sandy soils common to these locations, and portions recharged shallow groundwater. The DIS is designed to recapture this natural process by collecting stormwater runoff and providing an opportunity for infiltration into the sand. To accomplish this, flow from the existing beach discharge pipes is diverted into open-bottomed chambers located beneath the sand dunes. Once it enters the chambers, the stormwater in filtrates into the sand and spreads out laterally beneath the dunes. It mixes with the groundwater, which then moves downslope beneath the surface of the sand towards the ocean. The groundwater mixed with the stormwater then discharges slowly beneath the ocean. Bacteria concentrations in the stormwater are immediately diluted by the groundwater. As it moves with the groundwater, bacteria can then be filtered between particles of sand beneath the surface of the dunes, where they eventually die off due to environmental stresses and predation by other microorganisms (Hathaway and Hunt, 2008). Like other SCMs, it would be impractical to design a DIS large enough to capture all runoff produced from every storm. Therefore, during extremely intense rainfall events, stormwater exceeding the DIS capacity is allowed to bypass the system and discharge to the ocean through the existing discharge pipe.

Is it difficult to design and construct?

The DIS was developed to be a low-cost, low-tech system that could be easily designed by an engineer and implemented by the public works department of any coastal town. Installation of the system is no more difficult than any common stormwater, water distribution, or sewer project that towns frequently construct or repair. The ideal site for the DIS has an elevated dune system with an annual mean water table that is several feet below the surface. Since the system will be located within the dunes (which is in the Ocean Hazard Area of Environmental Concern (AEC)), a Coastal Area Management Act (CAMA) minor development permit must be granted by the NC Division of Environment and Natural Resources Coastal Resources Commission (CRC). This permit must be obtained before the project can begin, and it will authorize the temporary disturbance to the dune system.

A watershed assessment by an engineer must be completed to determine runoff rates that will enter the DIS from a storm of selected rainfall intensity. Since the system relies on in filtration, the ability of the sand to transport water (hydraulic conductivity) must also be determined by direct measurement,

or estimated based on local soil survey data. Values should be high, ideally exceeding 50 inches per hour. Darcy's equation (Haan et al., 1994) can then be used as a simple estimate to determine the area required for in filtration for the targeted storm event. The number of chambers required to provide the area needed for in filtration can then be calculated, but this number can vary depending on the manufacturer and type of chamber chosen. More detailed information on design can be found in Bright et al. (2011), Price (2011), and Price et al. (2012).

To divert stormwater from the beach discharge pipe into the chambers, a diversion can be placed either in a vault buried within the dunes or by retrofitting an existing stormwater drop inlet upslope of the dunes. Once diverted, the stormwater is transported to the chambers through a pipe distribution system, appropriately sized and installed at a proper slope to accommodate calculated peak flow rates. Larger pipe sizes are favored to reduce the potential for clogging, and multiple clean-out pipes should be incorporated in the distribution system to facilitate maintenance. To provide an outlet for the bypass flow, existing beach discharge pipes should be left in place and connected to the downstream end of the diversion structure.

Open-bottomed chambers available on the market are generally constructed of high-density polyethylene (HDPE), which makes them sturdy but lightweight (Figure 5). They can be purchased in various sizes and arranged beneath the dunes in a number of ways. Based on our current experience, however, using larger chambers arranged in a linear fashion parallel to the ocean currently appears to be the most efficient method to disperse the stormwater across the dune (Figure 6). Note the diversion, the distribution pipe, and the two banks of chambers installed at a depth of 5 ft in a linear fashion parallel to the beach.

To install the chambers, a trench through the dunes must be excavated down to a target elevation, generally dictated by the elevation of the stormwater beach discharge pipe that enters the dunes. As the trench is dug with a backhoe, a 12-in.-deep layer of gravel is poured into the bottom to provide increased in filtration and system stability. The chambers are then placed on top of the stone layer (Figure 7). After all of the chambers are installed and secured, they are covered with a geotextile fabric to reduce sand intrusion around the top and sides. The chambers are then covered with a minimum of 1.5 ft of sand and replanted with native dune vegetation.

With proper planning, these systems can be installed in about one week by a crew that includes five to eight public works staff and a qualified backhoe operator. January through March is the best time to install these systems because it avoids sea-turtle nesting season (between May and October in North Carolina) and is the low season for tourists. Constructing the system in the late winter also minimizes the time that the disturbed dune areas remain unvegetated, as dune vegetation should be replanted in the spring (Rogers and Nash, 2003). Replanting can be accomplished by the public works crew, by volunteers, or by a local company who specializes in dune restoration.

Figure 5. An example of the type of chamber that can be used for the DIS.

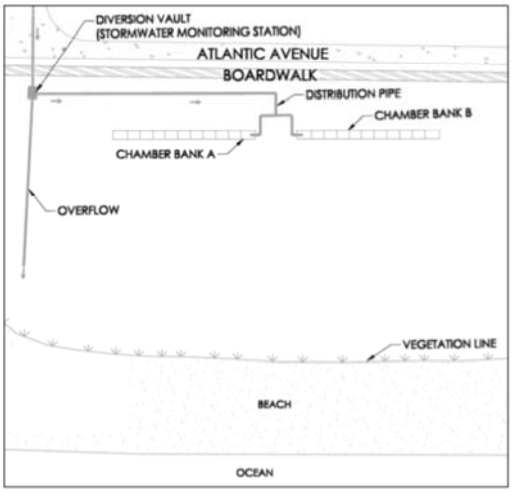


Figure 6. Schematic of DIS installed at L Ave at Kure Beach, NC. Chambers were installed 75 ft upslope of beach/vegetation line and 160 ft from the mean tide line of ocean. Linear distance of dune required for chamber installation at this site was 115 ft.

Figure 7. Installation of a DIS at Kure Beach, NC.

Kure Beach, NC – A Demonstration Study

The Town of Kure Beach was proactive in looking for ways to reduce stormwater entering its beach areas. The town, the NC Department of Transportation, and the NC State University Biological & Agricultural Engineering department began a partnership in 2005 to develop a potential solution, and the result was the Dune Infiltration System. Three DISs have been installed at Kure Beach. The first two, installed in 2006 by the Kure Beach Public Works Department (KBPWD), were located near L and M avenues, and they treated stormwater from two discharge pipes that drained a combined total of 12 acres. Vertical infiltration rates through the sand were measured with a double-ring in filtrometer to be 140 in/hr. (Bright et al., 2011). The systems were designed to in filtrate storms with intensities up to 0.5 in/hr. Each system contained two subsurface independent banks of open-bottomed HDPE chambers (StormChambers, HydroLogic Solutions Inc., Occoquan, Va). Each chamber was 3.5 ft high, 5.0 ft wide, and 8.2 ft long. Site L was constructed with 12 chambers (492 sq. ft. of in filtration area), and Site M had 22 chambers (902 sq. ft. of infiltration area).

Short-term monitoring during the first year of operation indicated that the two systems worked well; they captured and treated about 97 percent of the stormwater generated from 12 acres of watershed and significantly reduced incoming fecal bacteria concentrations through infiltration into the dunes (Bright et al., 2011). But intensified and longer-term data collection and the addition of an experimental control were necessary to verify these initial results before this system could be recommended with confidence for more widespread implementation. The results of three additional years of monitoring (2007-2010) at Site L and M, and one year of monitoring of a third system (Site K – constructed in 2009 also by the KBPWD), are presented in this fact sheet. Findings are summarized in Figure 8 and Table 1.

The DIS installations at sites L and M demonstrated a 100 percent and 96 percent stormwater capture rating during the three-year period, consistent with results observed during the first year of operation (Table 1). This meant nearly all of the runoff generated from these two watersheds was treated in the DISs and not discharged directly to the ocean.

Enterococci were used as an indicator of the presence of fecal bacteria in stormwater and groundwater samples. This is the same indicator used by the NC RWQ in its beach sampling protocol. In general, these bacteria are not hazardous to humans, but their presence has been correlated with the existence of potentially hazardous organisms (Myers et al., 2007). Using fecal indictor bacteria like enterococci also negates the need to test for multiple organisms that may be present in samples. Results are reported in Most Probable Number (MPN) per 100 mL of sample.

Fecal bacteria in the stormwater exceeded North Carolina's single sample maximum for enterococci (104 MPN/100 mL) in more than 70 percent of samples collected. Median concentrations that entered the systems at sites L and M were 185 and 435 MPN/100 mL, respectively. On occasion, concentrations in the stormwater were greater than 1000 MPN/100 mL (Figure 8), but high enterococci values are also common at other locations and are not unique to the Kure Beach site.

More than 200 groundwater samples were collected from wells installed in the dunes downslope from the DISs at sites L and M. More than 120 groundwater samples were collected from a control dune (where no DIS was installed) to compare groundwater quality in areas with and without a DIS. Fecal bacteria concentrations in the groundwater beneath the dunes, which received in filtrated stormwater after it owed into the DISs, were low (5 MPN/100 mL) and similar to those measured in the control dunes at the dune-beach interface (Table 1). Occasional spikes in bacteria concentrations were observed near the DIS, but spikes were also noted in the control, suggesting that some fecal bacteria may be entering the groundwater from other sources. Water table elevations beneath the systems rose as expected following in filtration events, but they returned to pre-storm levels within a few hours to several days. Because water table impacts were temporary, no major differences were observed between the mean groundwater elevation beneath the DISs and in the control dunes that received no direct stormwater input. In addition, the dune elevations did not show any impact from the stormwater in filtration and remained stable. Vegetation that was donated from a nursery at nearby Carolina Beach and planted by volunteers and a public works crew thrived on each site (Figure 9).

The performance observed at sites L and M was far better than expected, suggesting the systems may have been larger than required. A third DIS was designed to test how it treated stormwater from a larger, more impervious watershed that generated a larger fecal bacteria load. Located at K Avenue in Kure Beach, near the downtown area and pier, the Site K system was larger than the two previously installed DISs (26 chambers to capture rainfall events with intensities < 0.5 in/ hr) and was placed deeper in the dunes (and closer to the normal water table) because of the elevations of the existing storm sewer infrastructure. This system collected runoff from three outfalls, near a location that had occasionally received swimming advisories from NC RWQ for high enterococci concentrations.

In the year following construction, the system at Site K achieved an 80 percent stormwater capture rating (Table 1). Stormwater entered this system at a greater volume, was more frequently contaminated with excessive fecal bacteria (94 percent of the samples exceeded 104 MPN/100 mL enterococci), and had a much higher median value of enterococci (977 MPN/100 mL) than at sites L and M (Figure 8). This was attributed to the more urban watershed that drained to the system.

Table 1. Hydrologic and bacteria removal performance of the three Dune Infiltration Systems operating in Kure Beach, NC.

	SITE L	SITE M	SITE K	CONTROL DUNES
Year Installed	2006	2006	2009	—
Watershed Area (acres)	4.2	8.1	8.3	—
Number of Stormwater Discharge Pipes	1	1	3	—
Number of Chambers	12	22	26	—
Infiltration Area (ft^2)	492	902	1066	
DIS Invert Elevation (ft)[1]	9.4	11.4	7.5	—
Total Stormwater Flow (ft^3)	132,642	398,855	934,212	—
Total Overflow (ft^3)	0	15,468	185,756	—
Stormwater Treated (ft^3)	132,642	382,387	748,459	—
% Stormwater Capured	100%	96%	80%	—
Median (Max) Groundwater Enterococci Concentration (MPN/100mL)	185 (89,680)	435 (3,076)	977 (24,196)	—
Median (Max) Groundwater Enterococci Concentration All Wells (MPN/100 mL)	4 (945)	5 (3,063)	16 (4,839)	5 (429)
Median (Max) Groundwater Concentration at Dune/Beach Interface (MPN/100mL)	4 (271)	5 (3,064)	7 (177)	5 (254)

NOTE: Site L, Site M, and control data collected from 2008 to 2010. Site K data collected from 2009 to 2010.
[1] Feet above mean sea level referenced to NGVD88 vertical datum.

More than 130 samples were collected from the groundwater surrounding the Site K DIS, and together they had a relatively low median enterococci concentration of 16 MPN/100 mL. It was noted that near the chambers of the DIS (where in filtration occurred), the geometric mean of the groundwater enterococci (62 MPN/100 mL) was significantly higher than at the same location in the control dunes. However, it appeared that these concentrations effectively decreased as the water moved laterally beneath the dunes, because concentrations of enterococci in the groundwater at the dune-beach interface (7 MPN/100 mL) were similar compared to the control dunes. Water table elevations did not appear to be impacted for long periods of time, and mean elevations were similar to those observed in the control dunes. Because the system was installed deeper in the dunes, the water table rose to the invert elevation of the infiltration chambers more frequently at Site K. However, the total impact to the system was only 33 hours during the first year and did not appear to have a detrimental effect on the performance and stability of the system. As was observed in the older systems at sites L and M, the dune structure remained stable, and vegetation was reestablished on the dunes within the first growing season following construction (Figure 10).

Construction costs associated with these DIS demonstration sites were low in comparison to many other SCMs. It cost $22,000 to install both the systems at sites L and M to treat runoff from 12 acres, or about $1,800 per acre. The system at Site K was more expensive ($24,000 or $2,900 per acre) because it was larger (to treat runoff from a more impervious 8.3 acre watershed) and required additional construction costs to accommodate multiple stormwater discharge pipes. These costs include materials (stone, chambers, pipes, etc.) and backhoe operation, but do not include engineering design or labor costs associated with the Kure Beach public works staff. In addition, the chambers were provided to the demonstration study at a reduced cost. Improved cost estimates will be provided in the future as more of these systems are constructed.

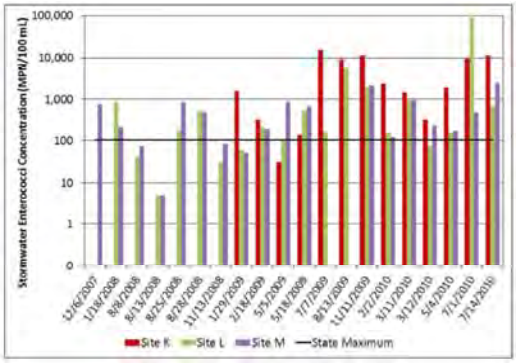


Figure 8. Concentrations of the fecal bacteria indicator enterococci in stormwater samples entering the DISs at Kure Beach. Values indicated on the y-axis are on a logarithmic scale. Samples from the K avenue site were available beginning in 2009.

Figure 9. Replanted vegetation on the dunes will quickly reestablish following installation of a DIS.

Figure 10. View from the Kure Beach Pier of the dunes where the K Avenue DIS was installed. Note the vegetation reestablishment on the landward side of the dune fence. Also in view are signs indicating the location of the over ow discharge pipes.

Figure 11. Sign describing project.

Summary

Based on these results, Dune Infiltration Systems are a successful, low-cost, and low-tech solution for diminishing stormwater discharge and associated fecal bacteria loads to recreational beaches. During our study, all stormwater flow associated with Site L's watershed was captured and treated by the DIS. Stormwater flows at Site M were reduced by 96 percent and by 80 percent at Site K. Overall, each system performed better than or as expected in reducing untreated stormwater discharge onto the beach. Indicator bacteria concentrations were reduced by 98 percent between the influent stormwater and the groundwater at the dune-beach interface. Median groundwater

enterococci concentrations were similar at the dune-beach interface to those measured beneath a control dune that did not have a DIS. Removal of bacteria from the infiltrated stormwater was thought to be due to adsorption and entrapment around sand particles, followed by natural die-off, desiccation, and predation by other microbes.

These systems appear to have no negative effects on dune stability or groundwater systems when used to treat runoff from smaller watersheds (<10-15 acres). They can also provide excellent opportunities for environmental outreach in these high-visibility areas, and coastal towns that incorporate these systems may receive positive media coverage that boosts tourism.

References

Barrett, M . 2003. Performance, Cost, and Maintenance Requirements of Austin Sand Filters. Journal of Water Resources Planning and Management, 129(3), 234-242.

Bright, T., M. Burchell, W. Hunt, and W.D. Price. 2011. Feasibility of a Dune Infiltration System to Protect North Carolina Beaches from Fecal Bacteria Contaminated Storm Water. Journal of Environmental Engineering, 137(10), 968-979.

Galli, F. 1990. Peat-sand filters: A proposed stormwater management practice for urban areas. Metropolitan Washington Council of Governments.

Grif n D. W., K.A. Donaldson, J.H. Paul, and J.B. Rose. 2003. Pathogenic human viruses in coastal waters. Clinical Microbiology Reviews, 16(1), 129.

Hann, C.T., B.J. Bar eld, and J.C. Hayes. 1994. Design hydrology and sedimentology for small catchments. Academic Press. Boston, MA.

Hathaway, J.M. and W.F. Hunt. 2008. Removal of pathogens in stormwater. North Carolina Cooperative Extension Service. AG 588-16.

Myers, D., D. Stoeckel, R. Bushon, D. Francy, and A. Brady. 2007. Fecal Indicator Bacteria. U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Chapter A7, Section 7.1 (Version 2.0).

Price, W. D. 2011. Dune Infiltration Systems for Treating Coastal Stormwater Runoff. M.S. thesis, North Carolina State University, Raleigh, N.C.

Price, W.D., M.R. Burchell, W.F. Hunt, and G. M. Chescheir. 2012. Long-Term Study of Dune Infiltration Systems to Treat Coastal Stormwater Runoff for Fecal Bacteria. Submitted to Ecological Engineering.

North Carolina Division of Water Quality. 2007. Best Management Practices Manual. N.C. Division of Water Quality, N.C. Department of Environment and Natural Resources. Raleigh, N.C.

National Resource Defense Council. 2012. Testing the Waters – A guide to water quality at vacation beaches. Accessed 6/2012.

Rogers, S. and D. Nash. 2003. The Dune Book. UNC-SG-03-30. North Carolina Sea Grant.

Additional Resources

- A Sandy Solution – NC State University College of Agriculture and Life Sciences Perspectives Magazine 2007
- A Buried Treasure – NC State University Results Magazine – Winter 2011
- NC Recreational Water Quality (NCRWQ) Program - find out more about sites sampled around North Carolina, how sampling occurs, and how to avoid illnesses when swimming in natural bodies of water.
- NCRWQ Stormwater Drainpipe Signage Factsheet
- National Resource Defense Council Testing the Waters 2012 Report
- National Resource Defense Council Testing the Waters 2011 Report – North Carolina (references the Dune Infiltration System)
- Dune planting guidance – The Dune Book by Spencer Rogers and David Nash (2003)
- Information on Sea Turtle Nesting Season – US Fish and Wildlife Service
- NC State University - Stormwater website

Authors

Mike Burchell
Associate Professor and Extension Specialist Biological & Agricultural Engineering

Bill Hunt
Professor, Extension Specialist, & University Faculty Scholar Biological & Agricultural Engineering

William Price

Publication date: Nov. 1, 2013
AG-781

This publication printed on: Jan. 07, 2021
URL of this page

Appendix F

Site Photos

Typical Dune Elevation/Configuration Example

Photo 1: View of Typical Dune configuration looking North-East.

Photo 2: View of Typical Dune configuration looking North-East.

Sites 1-2: 74th St. and 76th St @ E. Beach Drive

Photo 3: Site 1 @ 74th St. View of potential site looking South-West.

Photo 4: Site 2 @ 76th St. View of potential site looking South.

Sites 3-4: 79th St. and Barbee Blvd @ Ocean Drive

Photo 5: Site 3 @ 79th St. View of potential site looking North-East.

Photo 6: Site 4 @ Barbee Blvd. View of potential site looking South-West.

Sites 5 & 7: E. Pelican Drive R/W and Bldg #801

Photo 7: Site 5 @ E. Pelican Drive R/W and 77th St. View of potential site looking East.

Photo 8: Site 7 @ Bldg # 801 @ Womble St. View of site looking South-East.

Site 7: NCDOT Storm Drain System along Womble St.

Photo 9: Ex. Inlet @ E. Oak Island Drive and Womble St. View looking North-West.

Photo 10: Ex. Outlet @ Womble St. and Elizabeth Dr. View looking North-East.

Site 8: Satellite Water Reclamation Facility (SWRF)

Photo 11: Pumps and Piping inside SWRF.

Photo 12: Membrane tank inside SWRF.

Site 8: High-Rate Infiltration System

Photo 13: Ex. Infiltration Basin @ golf course for reclaimed water from SWRF.

Photo 14: Ex. Infiltration Basin @ golf course for reclaimed water from SWRF.

Examples of Ponding Stormwater

Photo 15: Site 2 area @ 76th St. and E. Beach Drive. View of ponding looking South-East.

Photo 16: Site 3 area @ 79th St. and Ocean Drive. View of ponding looking South-East.

Examples of Ponding Stormwater

Photo 17: Site 3 area @ Crowell St. and Ocean Dr. View of ponding looking North-West.

Photo 18: Site 4 area @ Barbee Blvd. and Ocean Dr. View of ponding looking North-West.

STORM WATER SOLUTIONS

MARC HORSTMAN | SEP 24, 2021 (/#FACEBOOK) (/#TWITTER) (/#LINKEDIN)

ADDRESSING INCREASING COASTAL FLOODING WITH DUNE INFILTRATION

Coastal flooding is more than a mere nuisance; it can be a safety hazard to communities, but DISs are low-impact solutions to diminishing storm water discharges

Most of the time, when a road floods, it's just a minor inconvenience leading people to find another way around the flooded area. However, when the road is a primary thoroughfare, it can become a significant issue that can disrupt critical access and cause a potential safety hazard. Over the past few decades, portions of

Caswell Beach Road in Caswell Beach, North Carolina, had become impassible to passenger vehicles after moderate rainfall events, and it was not unusual for the road to remain impassable for more than eight hours. The road is the only ingress/egress for approximately 240 residents, the Duke Energy Progress Nuclear Pumping Station, the United States Coast Guard Station on Oak Island and the North Carolina Baptist Assembly grounds at Fort Caswell. A solution for this hazardous flooding issue (https://www.estormwater.com/flood-control-0) was needed to allow safe passage and adequate response to emergencies during and immediately after storms.

To aid the town of Caswell Beach in solving this flooding and access problem, WK Dickson evaluated the feasibility of implementing a new and innovative system known as a Dune Infiltration System (DIS). Originally developed in 2005 as a pilot project for the Town of Kure Beach through a partnership between the Town of Kure Beach, the North Carolina Department of Transportation, and the North Carolina State University Biological & Agricultural Engineering Department, this application was initially applied to address water quality issues.

However, the uniqueness of the Caswell Beach project was its use in addressing localized flooding and public safety beyond its initial application as a water quality practice. For Caswell Beach, the new system allows the town to collect and pump water out of low-lying areas along Caswell Beach Road through storm water piping into a series of infiltration chambers embedded within the dunes that utilize the existing beach sand as infiltration media. The DIS system was optimized to reduce street flooding to a level safe for vehicular traffic within two to four hours following storm events. The DIS at Caswell Beach is only the second location in North Carolina to put a DIS into action.

The initial concept involved pumping floodwaters from four critical flooding areas to four local DISs. A conceptual design report identified potential system locations and routes for storm water

(https://www.estormwater.com/storm-water-management-20) pipe alignments, dune irrigation system suitability and layout, required easements, required permitting, and planning level construction cost estimates. This conceptual analysis determined several design constraints that narrowed the four potential sites to one ideal location on town-owned property near a highly visible public beach access point.

In addition to providing water quantity benefits, a DIS provides secondary water quality improvements. When it rains, water flows across impervious surfaces and picks up pollutants. Elevated bacterial levels in these pollutants (https://www.estormwater.com/pollution-control) can lead to beach closings or swimming advisories, impacting the local tourism-based economy. Additionally, if these elevated bacterial levels are not addressed, they can degrade the beaches' natural setting, destroy wildlife and endanger public health. However, a DIS uses the sand's natural filtering ability to remove rainfall runoff pollutants. After the runoff is diverted into the DIS, the storm water infiltrates into the sand and strips the pollutants and pathogens using natural sorption and bacterial desiccation. The filtered groundwater then migrates to the ocean flowing underneath the dunes and beach sand. Studies show these systems remove between 75% and 95% of pollutants, including pathogens, hydrocarbons, and excess nutrients.

Once design and permitting were approved, the project was bid, and construction began in January 2021. The exact timing of construction was an essential component of this project. For coastal towns, keeping the beaches open during the summer months is critical for economic vitality. Caswell Beach is a thriving vacation destination, so construction needed to be complete before the tourists arrived for the summer. Additionally, construction was timed as not to impact the area's sea turtles during their annual nesting season.

Construction entailed installing polypropylene open-bottom chambers buried beneath the dune, which collect diverted runoff (https://www.estormwater.com/runoff-treatment-0). As this runoff is pumped into the chambers, the water spreads out into a bed of gravel and sand, which filters the runoff before it reaches groundwater. When the runoff is 75 feet down shore, bacteria levels are similar to that found in normal groundwater.

The complexity of this project involved both engineering and non-engineering issues. From an engineering standpoint, site suitability was a primary focus. The ideal site for the DIS has an elevated dune system (typically a site with a primary and secondary dune area) with a seasonal high-water table several feet below the surface. It was important to size the system accurately and ensure the groundwater mounding would not impact adjacent properties. For this project, comprehensive groundwater modeling was performed to ensure that the groundwater mounding underneath the DIS would not affect any adjacent private structures, including building foundations or seepage back onto the road.

Depending on the allowable elevation of the proposed DIS, the storm water runoff can either drain via gravity or be pumped into the DIS chambers. For the Caswell Beach site, the elevation difference between the road's low-lying areas and the proposed chamber required the use of a pump. The town invested in a trailer-mounted pump attached to the fire truck, and special pump ports were installed. This allows the town to target specific low points as needed to ensure a quick response in addressing the flooding issues.

From an environmental standpoint, this project had to be coordinated with the North Carolina Division of Coastal Management to get approval to construct in the secondary dune system, as overall impacts to the dune systems should be minimized. After multiple meetings discussing the benefits provided by the proposed DIS, the submitted request was approved. The permitting request involved a variance to their permit to show the system was the only option to solve the flooding issues and that this project was crucial to protecting public health and safety.

For future projects, easements will most likely need to be acquired for construction and maintenance access. This process can prove to be challenging for oceanfront property. Fortunately, the final site chosen out of the four areas studied happened to be on property the town already owned.

While the original Kure Beach DIS was designed to address water quality (specifically pathogen pollution to prevent beach closures), the Caswell Beach DIS project applied the same concept to address the dangers associated with road flooding. The DIS does double duty; it can be implemented within beachfront communities to address road flooding issues while also providing a water quality benefit. Another significant advantage of these systems is that they can utilize oceanfront property's primary and secondary dune systems that will never be developed, assuming clear access to the site.

Overall, the completion of this DIS project resulted in several important benefits:

- **Flooding**. The project addresses flooding on the only access road. Emergency vehicles and first responders will reach people quicker after storm events, and the road will become passable sooner than previously.
- **Water Quality**. By taking storm water runoff and infiltrating it back into the ground, the project results in a water quality benefit by reducing runoff from the road, stripping pollutants out of the runoff and contributing to the area's groundwater recharge. For beach communities dealing with beach closures due to contaminated storm water from a direct discharge system, a DIS can reduce or eliminate their ocean outfalls and keep their beaches clean and open to the public.
- **Educational**. The proximity of the DIS to a highly visible public beach access provides educational opportunities for visitors and residents to learn about the benefits of infiltration systems and storm water improvements

water improvements.

Coastal flooding is more than a mere nuisance; it can be a significant safety hazard to these communities. DISs are a low-cost, low-impact solution for diminishing storm water discharges to sensitive waterbodies like recreational beaches.

"Being prepared for flooding and the safety of our citizens is a primary concern for the town," the Mayor of Caswell Beach Deborah Ahlers said. "The recently completed dune infiltration system will help in this regard and provide a water quality benefit – a vital component for coastal communities like Caswell Beach. With this project being only the second one of its kind in the state, we are proud to lead the way in how our neighboring communities can deal with increasing coastal flooding."

ABOUT THE AUTHOR

Marc Horstman, PE, PH, CFM is a project manager with WK Dickson's storm water group with an emphasis on municipal storm water infrastructure, including planning and design, hydraulic and hydrologic modeling, innovative and sustainable site design, and storm water SCM design.

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
TANCRED MILLER
Director

NORTH CAROLINA
Environmental Quality

March 4, 2024

Town of Oak Island
c/o Marc Horstman
4601 East Oak Island Drive
Oak Island, NC 28465

RE: DENIAL OF CAMA MINOR DEVELOPMENT
PERMIT APPLICATION NUMBER- OI 13-24
PROJECT ADDRESS: Intersection of Crowell Street and Ocean Drive Beach Access, Oak Island, NC

Dear Mr. Horstman:

After reviewing the application submitted by the Town of Oak Island, which was determined to be complete on February 29, 2024 the **Division of Coastal Management** has determined that no permit may be granted for the proposed development.

The Town of Oak Island has applied to construct a Dune Infiltration System, partially located within the 60 ft. Ocean Hazard Setback adjacent to the Atlantic Ocean. which is inconsistent with the following rules of the N.C. Coastal Resources Commission, and/or the following provisions of the N.C. Coastal Area Management or N.C. Dredge and Fill Act:

15 NCAC 07H .0306(a)(3) GENERAL USE STANDARDS OF OCEAN HAZARD AREAS, which states in part: "***With the exception of those types of development defined in 15A NCAC 07H .0309(a), no development, including any portion of a building or structure, shall extend oceanward of the ocean hazard setback...***"

15 NCAC 07H .0309(a) USE STANDARDS FOR OCEAN HAZARD AREAS: EXCEPTIONS, which states: "***The following types of development shall be permitted seaward of the oceanfront setback requirements of Rule .0306(a) of the Subchapter if all other provisions of this Subchapter and other state and local regulations are met: (1) campsites; (2) driveways and parking areas with clay, packed sand or gravel; (3) elevated decks not exceeding a footprint of 500 square feet; (4) beach accessways consistent with Rule .0308(c) of this Subchapter; (5) unenclosed, uninhabitable gazebos with a footprint of 200 square feet or less; (6) uninhabitable, single-story storage sheds with a foundation of floor consisting of wood, clay, packed sand or gravel, and a footprint of 200 square feet or less; (7) temporary amusement stands; (8) sand fences; (9) swimming pools and 10) fill not associated with dune creation that is obtained from an upland source and is of the same general characteristics as the sand in the area in which it is to be placed".***

15 NCAC 07H .0306(a)(5) USE STANDARDS FOR OCEAN HAZARD AREAS, which states: " ***If no primary dune exists, but a frontal dune does exist in the AEC on or landward of the lot where the development is proposed, the development shall be set landward of the frontal dune or ocean hazard setback, whichever is farthest from the vegetation line, pre-project vegetation line, or measurement line, whichever is applicable.***

15A NCAC 07H.0308 (b) (1) SPECIFIC USE STANDARDS FOR OCEAN HAZARD AREAS, Dune Protection Establishment, Restoration and Stabilization, which states, "***No development shall be permitted that involves the removal or relocation of primary or frontal dune sand or vegetation that would adversely affect the integrity of the dune's function as a protective barrier against flooding and erosion.***

Given the preceding findings, it is necessary that the Town's request for issuance of a CAMA Minor Permit under the Coastal Area Management Act be denied. This denial is made pursuant to N.C.G.S. 113A-120(a)(8), which requires denial for projects inconsistent with the state guidelines for Areas of Environmental Concern or a local land use plan.

If the you wish to appeal this denial, on behalf of the Town of Oak Island, you are entitled to a contested case hearing. The hearing will involve appearing before an Administrative Law Judge who listens to evidence and arguments of both parties before making a final decision on the appeal. The request for a hearing must be in the form of a written petition, complying with the requirements of §150B of the General Statutes of North Carolina, and must be filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714, within twenty (20) days from the date of this denial letter. The requirements for filing a contested case can be found at http://www.oah.state.nc.us/hearings. Although OAH cannot give legal advice, any questions regarding this process should be directed to OAH at 6714 Mail Service Center, Raleigh, NC 27699-6714 or via telephone at 919-431-3000, including questions regarding the filing fee (if a filing fee is required) and/or the details of the filing process.

A copy of the Town's petition filed at OAH must be served on with DEQ's agent for service of process at the following address:

William F. Lane, General Counsel
Dept. of Environmental Quality
1601 Mail Service Center Raleigh, NC 27699-1601

Please also send a copy of the petition to the attention of Tancred Miller, Director, N.C. Division of Coastal Management, 400 Commerce Avenue, Morehead City, NC 28557, so that your petition may be forwarded to the attorney who will be representing the Respondent in the contested case proceeding.

In the alternative, you may petition the N.C. Coastal Resources Commission for a variance to undertake development that is prohibited by the Commission's rules (Note- a Commission variance cannot be granted if the project was denied due to an inconsistency with a CAMA Land Use Plan or other statutory provisions of the CAMA or NC D&F Law). Applying for a variance requires that you first stipulate

that the Division of Coastal Management applied the Rules properly in issuing this denial. Applying for a variance means that you agree that the legal restrictions are valid but request an exception to the restrictions because of hardships resulting from unusual conditions of the property. In seeking a variance, you are requesting that the Commission vary the rules at issue and you must state how you believe your request meets the four criteria found at N.C.G.S. § 113A-120.1. To apply for a variance, you must file a petition for a variance with the Director of the Division of Coastal Management and the State Attorney General's Office on a standard form, which must be accompanied by additional information on the nature of the project and the reasons for requesting a variance. The variance request may be filed at any time but must be filed a minimum of six weeks before a scheduled Commission meeting to be eligible to be heard at that meeting.

You may either appeal the permit decision or seek a variance. These are two separate paths and cannot be pursued simultaneously. If the appeal of the permit decision is denied, you may still seek a variance. However, you may not first seek a variance and if that is denied attempt to challenge the decision to deny the permit. Information about both a permit appeal in the Office of Administrative Hearings and the Variance process may be obtained at https://deq.nc.gov/about/divisions/coastal-management/coastal-management-permits/variances-appeals.

Respectfully yours,

Tara MacPherson
District Manager
NC Division of Coastal Management

Cc: Patrick Amico, Field Representative
Robb Mairs, NC DCM, Minor Permit Coordinator
Rick Patterson, Town of Oak Island
Christy Goebel, NCDEQ-OGC
WiRo Files

Golden LEAF FOUNDATION

Ralph Strayhorn
Chairman of the Board

Scott T. Hamilton
President, Chief Executive Officer

Dear Mr. Kelly,

I am pleased to inform you that the Board of Directors of the Golden LEAF Foundation has approved funding for "Crowell St Dune Infiltration System Project," in the amount of $579,500.00. We trust that this support will further your work to benefit North Carolinians and the long-term economic advancement of our state.

Your Grantee Acknowledgment and Agreement form will be uploaded to the grantee portal shortly. Please log in to the portal to access and download that agreement and for other information about your award.

We require that grantees become acquainted with Golden LEAF's policies governing grants by attending a grant management workshop. This workshop will be held on Wednesday, April 17, 2:30 pm-4:00pm via Zoom. We recommend those who will be directly responsible for the financial and programmatic reporting for this grant to attend. Typically, this is at least two people per organization. Please register for the workshop by April 16, with the names, titles, and e-mail addresses of those who will attend.

Please let me or Brynn (bfann@goldenleaf.org) know if you have any questions regarding your award, its conditions, or reporting requirements. We stand ready to be of assistance to you at any time. Once again, on behalf of our Board, congratulations on receiving this funding.

Sincerely,

Scott T. Hamilton

Scott T. Hamilton
President, Chief Executive Officer

Photo 1: Roadway flooding at Intersection of Crowell St and Ocean Dr.

Photo 2: Flooding under homes at intersection of Crowell St and Ocean Dr.

Photo 3: Flooding of Ocean Dr and homes; standing at Crowell St, looking towards intersection of SE 79th St. (Left side of road)

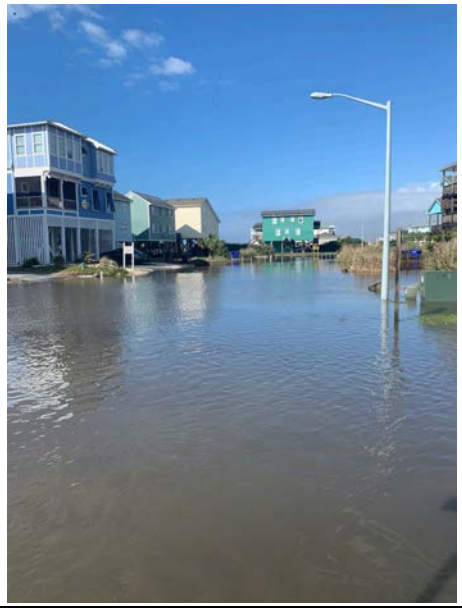


Photo 4: Flooding of Ocean Dr and homes; standing at Crowell St, looking towards intersection of SE 79th St. (Right side of road)

Observations:

Photo 1: Roadway flooding at Intersection of Crowell St and Ocean Dr.

Photo 2: Flooding under homes at intersection of Crowell St and Ocean Dr.

Photo 3: Flooding of Ocean Dr and homes; standing at Crowell St, looking towards intersection of SE 79th St. (Left side of road)

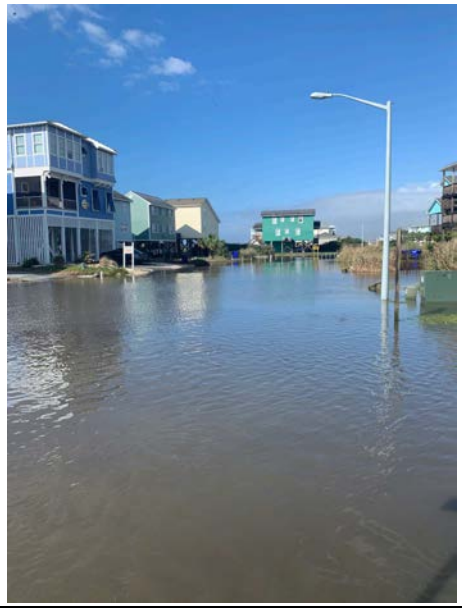


Photo 4: Flooding of Ocean Dr and homes; standing at Crowell St, looking towards intersection of SE 79th St. (Right side of road)

Observations:

Photo 5: Flooding of Ocean Dr; standing at intersection of SE 79th St, looking towards intersection of SE 78th St.

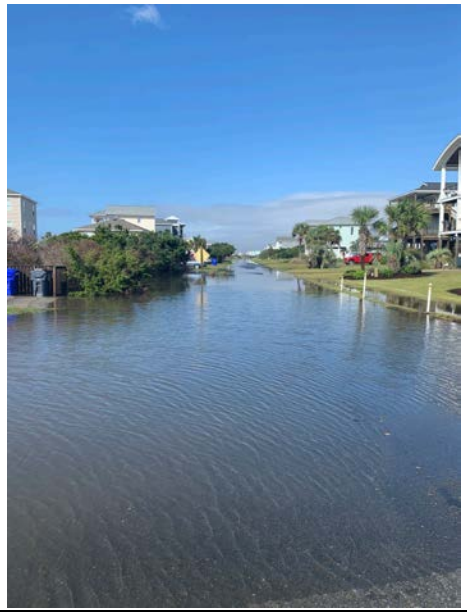


Photo 6: Flooding of Ocean Dr extends east to the intersection of Barbee Blvd.

Photo 7: Flooding of Ocean Dr; Standing at intersection of Barbee Blvd, looking west.

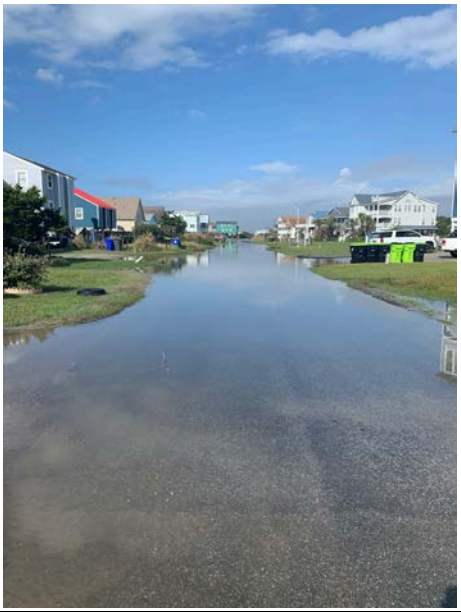
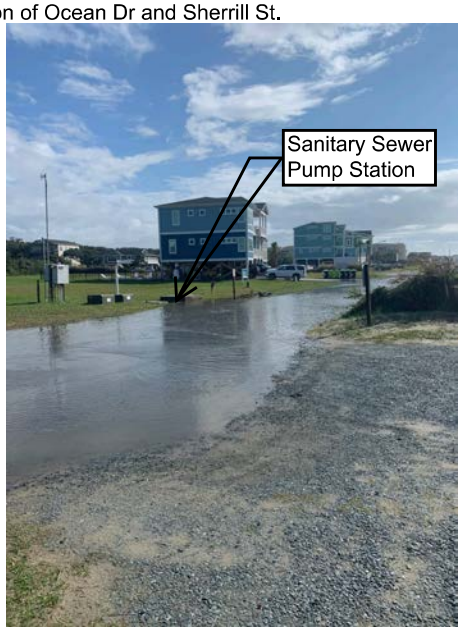


Photo 8: Flooding threatens sanitary sewer pump station located at the intersection of Ocean Dr and Sherrill St.



Observations:

Photo 9: Drone photo showing pumping of flood waters at intersection of Ocean Dr and Crowell St, looking west.

Photo 10: Drone photo showing pumping of flood waters at Crowell St beach access, looking south towards ocean

Photo 11: Pumping of flood waters at Crowell St Beach Access, looking north

Photo 12: Pumping system discharges floodwaters onto beach

Photo 13: Standing at Crowell St and Ocean Dr intersection. Photo shows pumping of flood waters at beach access location. (taken Nov. 20, 2023)

Photo 14: Frequent flooding extends to sanitary sewer pump station at intersection of Ocean Dr and Sherrill St. Note change in development from 2020.

Photo 15: High voltage power supply to sanitary sewer pump station

Photo 16: Erosion is occurring around sanitary sewer pump station lid and excess debris indicates frequent inundation.

Photo 17: Sand deposition indicates flooding extends to utility boxes. Some appear to be in substandard condition.

Observations:

Photo 18: Flooding extends to utility boxes and is causing erosion underneath

Photo 19: Frequent flooding along Ocean Dr has created a defined erosion zone into yards and driveways.

Photo 20: Flood extent evidenced by sediment deposition and discoloration in driveways and yards on beach side of Ocean Dr

Photo 21: Flooding extends into driveways on land side of Ocean Dr

Observations:

Photo 22: Project site, the Crowell St Beach Access parking lot

Photo 23: Crowell St Beach Access parking and dune ramp to ocean

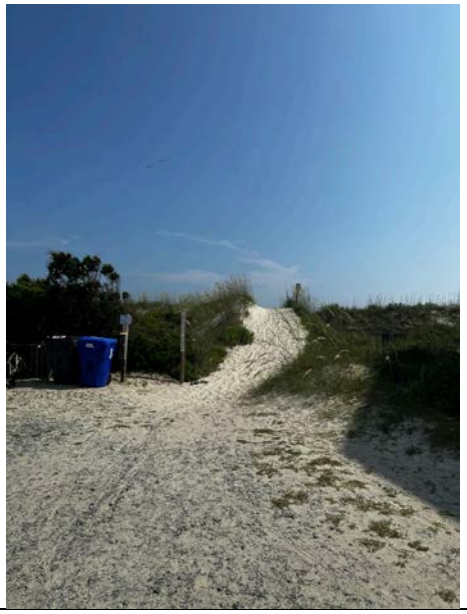


Photo 24: Standing on Crowell St Beach Access top of dune ramp and looking towards Ocean Dr. Dune infiltration system proposed underneath dune ramp.

Photo 25: Looking east at development proximity to dunes adjacent to project area

Observations:

Town of Oak Island
Crowell St Dune Infiltration System Project
Golden Leaf Flood Mitigation Grant Application
Documentation of Flooding Frequency

Documentation of flooding frequency at the project site consists of photos showing the extent of flooding following four separate rainfall events between Oct. 2020 and Nov. 2023 (see Attachment 11). Photos 14-25, taken in the summer of 2023, highlight field indicators of frequent flooding, such as clear vegetation lines (lack of vegetation) and concrete stains/discoloration along the low edge of most driveways, indicative of where frequently ponded water exists. Erosion around utility boxes and a sanitary sewer pump station structure and deposition of sediment and other debris in specific "rack line" patterns are also evidence of frequent flooding. Evidence also includes description of flooding frequency and the annual cost of pumping equipment from Town Stormwater Administrator. A log documenting pumping occurring at the Crowell St location from 2010-2021 and a citizen complaint email from the owner of 1104 Ocean Drive are also provided. According to public works staff, severe flooding, that persists for multiple days on Ocean Drive, occurs 6 times per year during 0.5-inch rainfall events and larger. Pumping equipment is deployed before storm events in preparation at an average of 12 times a year. Flooding frequency is expected to increase as larger and more intense storms are expected to increase in frequency.

Crowell St Dune Infiltration System Project
Golden Leaf Flood Mitigation Grant Application
11/6/23

Prepared By: Rick Patterson-Stormwater Administrator

The National Weather Service in Wilmington NC reported 91 months (2000-2023) received monthly precipitation amounts equal to or greater than 1.5 inches and 44 months had 3.0 inches or greater per month (NWS 2023).

Utilizing this data 39.2% of the months from 2000-2023 had precipitation equal to of greater than 1.5 inches and 23.8% of the months had 3.0 inches or greater precipitation.

Town employees estimated pumping takes place at Crowell Street an average of 6 times per year with our current CAMA permit. Preemptive pump setup in anticipation of storm events takes place on average 12 times per year.

The cost to the Town to actually pump stormwater from these low-lying areas includes:

Pump - ($20,000 new), $1333 (15 yr. life), $222 per I event (avg 6 events/year)

Hoses - ($1000 new), $200 (5 yr. life), $33 per event

Labor - $480 (2 employees/8 hrs.)

1 truck - $100 (8 hrs.)

Total cost = **$835** per 8 hr. pumping session. An estimated total per year for 6 (8-hr.) pumping sessions equals **$5010**.

The cost to set-up to pump based on severe weather forecasts includes:

Labor - $200 (2 employees/3 hrs.)

1 truck: $40 (3 hrs.)

Total of **$240** per pump set-up. An estimated total per year to set up the pump twelve times equals **$2880**.

Our CAMA permit allows pumping to start when stormwater inundates Ocean Dr. at a depth of 18 inches and must be stopped when the level reaches 12 inches. The Town receives a variety of complaints ranging from "*When are you starting the pump*" to "*The Town is damaging the Beach*" when we prepare and/or actually pump stormwater at Crowell Street.

Reference: National Weather Service (NWS), Climate, Wilmington NC. *Monthly Highest Precipitation for Wilmington Area, NC (ThreadEx)*. Web 2023

https://www.weather.gov/wrh/climate?wfo=ilm

Oak Island Pumping Log for years 2010 - 2021

Area Effected	Reason for action	County	Water Body	Started Pumping	Ended Pumping	Days	Precautionary Advisory Date Lifted	
Oak Island-East Beach Drive between Southeast 74th Street and Southeast 79th Street	Floodwater Pumping to Atlantic Ocean	Brunswick	Ocean	8/5/2014	8/7/2014	2	8/15/2014	
Oak Island - 75th Street and Sherrill St	Exessive rain event - pumping to ocean needed	Brunswick	ocean	6/15/2020 (delayed reporting, we were not notified until 6/17)	6/17/2020	3	6/18/2020	
Ocean and Sound side waters	Hurricane Iasias	Brunswick	sound and ocean	No pumping reported - entire island flooded 8/4/2020			8/11/2020	Precautionary Advisory due to Hurricane- no pumping reported.
Oak Island &9th abd Crowell Street	Exessive rain event - pumping to ocean needed	Brunswick	ocean	9/17/2020	9/18/2020	1	9/19/2020	
Oak Island at Crowell Street	rain casued by tropical storm Claudette	Brunswick	Ocean	6/20/2021	6/21/2021	2	6/22/2021	
Oak Island at Crowell Street	rain casued by tropical storm ELSA	Brunswick	Ocean	7/8/2021	7/9/2021	2	7/10/2021	
Oak Island at Crowell Street	rain casued 1/4 inch rain event	Brunswick	Ocean	7/16/2021	7/16/2021	1	7/17/2021	
Oak Island at Crowell Street	rain casued 2 inch rain event	Brunswick	Ocean	7/26/2021	7/26/2021	1	7/27/2021	
Oak Island at Crowell Street	rain casued 4 inch rain event	Brunswick	Ocean	7/28/2021	7/29/2021	2	7/30/2021	
Oak Island at Crowell Street	rain casued 1.2 inch rain event	Brunswick	Ocean	8/2/2021	8/4/2021	2		
Oak Island at Crowell Street	rain casued 3.5 inch rain event	Brunswick	Ocean	9/21/2021	9/23/2021	2	9/24/2021	

President, NC Assn. Municipal Clerks
910-201-8004
lstites@oakislandnc.gov

From: Michael Emory <oki-info@oakislandnc.gov>
Sent: Tuesday, August 16, 2022 3:18 PM
To: Rick Patterson <rpatterson@oakislandnc.gov>; pwdirector <pwdirector@oakislandnc.gov>
Cc: David Kelly <DKelly@oakislandnc.gov>; Lisa Stites <lstites@oakislandnc.gov>; stephen.c.ural@gmail.com; Kennette Tower <ktower@oakislandnc.gov>
Subject: Pumping on Ocean Drive.

All,

I just received a call from Mr. Stephen Ural, who lives at 1104 Ocean Drive, near the corner of SE 79th Street and Ocean Dr.

He is concerned that stormwater pumping is not taking place following yesterday's heavy rain, and is gravely concerned about potential medical access for his wife, who is diabetic. Mr.Ural stated his home is inaccessible from the street due to flooding, and that his vehicle cannot get out of his driveway.

He said he tried to contact the Stormwater Administrator several times today, but calls were not answered or returned.

He would like to know three things:

- Why is there an 18" standing water requirement for pumping to start?
- Is that 18" limit measured in the deepest part of the street?
- (CLERK) Since he is unable to leave his home, is there a way he can remotely provide comment at tonight's Town Council meeting?

At his request, I have copied Mr. Ural to this email for records. Please feel free to "reply all" for direct response, or just send information to me and I will be happy to forward accordingly.

Thanks,
-Mike

From:	Bryan-Millush, Erin
To:	cris.harrelson@brunswickcountync.gov; randell.woodruff@brunswickcountync.gov; David Kelly; Lisa Stites; Michael Emory; sthornall@ci.oak-island.nc.us
Cc:	Cronin, Julie; King, Morella s; Tharrington, Tom; DEQ.DMF.ShellfishSanitation.RWQ
Subject:	Precautionary swimming advisory issued for ocean area in Oak Island where floodwater pumping has occurred
Date:	Friday, May 26, 2023 12:26:10 PM
Attachments:	image002.png

Roy Cooper
Governor

Elizabeth S. Biser
Secretary

Kathy B. Rawls
Division Director

Release: Immediate
Date: May 26, 2023

Contact: Erin Bryan-Millush
Phone: 252-808-8153

Precautionary swimming advisory issued for ocean area in Oak Island where floodwater pumping has occurred

MOREHEAD CITY – State recreational water quality officials today advised beachgoers to be aware of the floodwaters being pumped to the ocean surf in Oak Island. Surfers and swimmers should avoid these sites.

Recent rains caused flooding of streets, yards, and housing in parts of Oak Island and nearby communities. To minimize the flooding damage and to ensure roads are accessible for emergency vehicles, the town has pumped floodwater into the ocean near Crowell Street.

These waters can contain pollutants such as waste from wildlife and pets, oil and gasoline from parking lots and waste from septic systems or sewers.

This notice does not imply that disease-causing organisms are present in the water; it is meant to caution beachgoers of an increased risk of contamination that can cause adverse health effects.

Town officials will place signs at the discharge site along the ocean beach to warn the public of the possible health risk and will remove the signs 24 hours after the pumping stops. State officials will notify the public after the signs are removed.

Officials with the state Recreational Water Quality Program sample 215 sites throughout the coastal region, most of them on a weekly basis, from April to October. Testing continues on a reduced schedule during the rest of the year, when the waters are colder.

For more information on the N.C. Recreational Water Quality Program or to a view a map of testing sites, visit the program's website, and follow the program's Twitter feed.

###

Erin Bryan-Millush
Environmental Program Supervisor
Laboratory QA Officer
Shellfish Sanitation and Recreational Water Quality Section
Division of Marine Fisheries, N.C. Department of Environmental Quality
Office: (252) 808-8153
erin.bryan-millush@ncdenr.gov

WK DICKSON
community infrastructure consultants

July 15, 2024

RE: **Crowell Street DIS Project**
CAMA Minor Permit – Variance Supporting Information
Town of Oak Island, NC
WK Dickson # 20200803.00.RA

In response to your request for additional information, we provide the following supporting information and justification for the Crowell Street DIS site selection.

Implementing a coastal Dune Infiltration System (DIS) aims to address and mitigate the recurrent flooding issues along Ocean Drive. Ocean Drive has experienced chronic inundation, posing a significant threat to public safety, property, and infrastructure. The proposed coastal Dune Infiltration System aims to provide a sustainable and nature-based solution to alleviate the impact of flooding on the affected street. The proposed catch basins will collect stormwater runoff and transport it to a proposed pump station, which will then pump the stormwater into the DIS for infiltration.

The existing stormwater infrastructure is insufficient to manage the increased frequency and intensity of flooding events impacting Ocean Drive's functionality for emergency response vehicles. The proposed system will enhance the area's resilience by utilizing natural dune formations to infiltrate stormwater runoff, reducing the likelihood of flooding. Furthermore, this solution aligns with the community's commitment to sustainable development and environmental stewardship, promoting a holistic approach that addresses the immediate flooding concerns and contributes to the overall ecological health of the coastal environment in Oak Island, North Carolina. Impacts to the primary dune system are necessary to set the DIS at an elevation above the Seasonal High-Water Table (SHWT) to function as an infiltration device most effectively.

The location of the Crowell Street DIS site and associated drainage infrastructure improvements were selected to maximize the use of the existing dune system and the available publicly owned land near known flooding locations. The site's proximity to a public beach access provides educational opportunities for visitors and residents to learn about the benefits of infiltration systems and stormwater improvements. The feasibility of additional DIS sites was investigated as part of the "Ocean Drive Drainage Study" dated August 24th, 2021. This study evaluated eight other sites in the vicinity of areas of known flooding for the following:

720 Corporate Center Drive
Raleigh, NC 27607
Tel. 919.782.0495
www.wkdickson.com

- Feasibility of using the Town's Public Beach accesses to determine if the ponded flood waters can be infiltrated into the Secondary Dune system.
- Feasibility of diverting flood waters to the existing Town Right-of-Way on E. Pelican Drive to determine if the existing Right-of-Way can be converted into an infiltration gallery to infiltrate the ponded flood waters.
- Feasibility of diverting flood waters to the existing Satellite Water Reclamation Facility (SWRF).
- A geotechnical analysis to determine the Seasonally High Water Table (SHWT) and hydraulic conductivity of in-situ soils.
- The available site area ensures proper ground elevation and vertical separation to SHWT and horizontal separation between the infiltration system and surrounding structures, including residential walkways and residential buildings.
- Estimate of the volume of water ponding within the roads.
- Evaluation of the size of the pumps to be comparable to the stormwater infiltration rate based upon the surface area of the proposed infiltration system.
- Evaluation of reducing flooding level (draw-down) in less than twelve hours.

The Crowell Street DIS site was found to be the most feasible site based on the above criteria. Reduced efficacy and increased costs would be assessed if a different method or site was selected to improve flooding along Ocean Drive in the vicinity of the Crowell Street intersection.

Please let us know if you have any further questions regarding this project that we can address.

Thanks,

Marc Horstman, PE, PH, BC.WRE
Project Manager
WK Dickson *(NC License No. F-0374)*
mhorstman@wkdickson.com
919-256-5642

WK DICKSON
community infrastructure consultants

July 15, 2024

Via Certified Mail – Return Receipt Requested

Frank Iii & Kelly Allison
6835 Breyerton Way SE
Owens X Rds, AL 35763-8806

RE: CAMA Variance Request by the Town of Oak Island

Dear Property Owner:

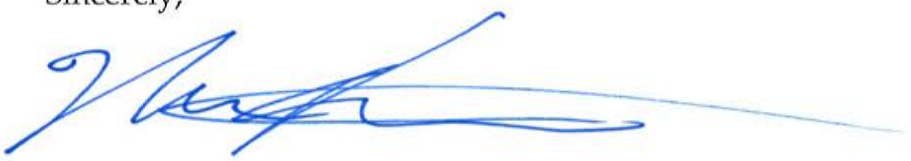
I am writing to notify you that the Town of Oak Island is applying for a variance from the North Carolina Coastal Resources Commission to install a Dune Infiltration System at the Crowell Street Beach Access. This proposed project will reduce flooding near the public beach access at the intersection of Crowell Street and Ocean Drive. This proposed system includes approximately 4 linear feet of 12" RCP (Reinforced Concrete Pipe), 534 linear feet of 18" RCP, 6 (six) standard NCDOT drop inlets, small pump with wet well, a sand separator, 56 linear feet of a 4" PVC force main and a Dune Infiltration System (DIS), located near the Town's public beach access. The Dune Infiltration system will be buried approximately 6-feet into the dune and will provide approximately 1,627 square feet of infiltration area.

The variance for this project will be heard at the August 27-28 Coastal Resource Commission (CRC) Meeting. More information about this meeting location can be found on the NCDEQ website (https://www.deq.nc.gov/about/divisions/coastal-management/coastal-resources-commission/crc-meetings-schedule).

If you would like to receive more information about the variance request, you can contact me. If you would like to provide comments on the variance request, you may direct your comments to the North Carolina Division of Coastal Management, Wilmington District, 127 Cardinal Drive Extension, Wilmington, NC 28405-3845. You may also call the Division of Coastal Management to talk to a representative at (910) 796-7215.

720 Corporate Center Drive
Raleigh, NC 27607
Tel. 919.782.0495
www.wkdickson.com

Sincerely,



Marc Horstman, PE, PH, BC.WRE
Project Manager
WK Dickson
mhorstman@wkdickson.com
919-256-5642

 20200803.00.RA P22

5 Certified Mail - Return Receipt Envelopes

UNITED STATES POSTAL SERVICE.

ACADEMY ST
205 S ACADEMY ST
CARY, NC 27519-9998
(800)275-8777

07/16/2024 11:01 AM

Product	Qty	Unit Price	Price
First-Class Mail® Large Envelope Owens Cross Roads, AL 35763 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309011			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8303 26			$4.10
Total			$10.72
First-Class Mail® Large Envelope Norcross, GA 30071 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317308960			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8303 71			$4.10
Total			$10.72
First-Class Mail® Large Envelope Oak Ridge, NC 27310 Weight: 0 lb 1.10 oz Estimated Delivery Date Thu 07/18/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309080			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8302 58			$4.10
Total			$10.72
First-Class Mail® Large Envelope Raleigh, NC 27615 Weight: 0 lb 1.10 oz Estimated Delivery Date Thu 07/18/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309134			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8302 03			$4.10
Total			$10.72
First-Class Mail® Large Envelope Chapel Hill, NC 27516 Weight: 0 lb 1.10 oz Estimated Delivery Date Thu 07/18/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309141			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8301 97			$4.10
Total			$10.72

Grand Total: $53.60

Credit Card Remit $53.60
Card Name: MasterCard
Account #: XXXXXXXXXXXX0471
Approval #: 068441
Transaction #: 239
AID: A0000000041010 Chip
AL: MASTERCARD
PIN: Verified

Text your tracking number to 28777 (2USPS) to get the latest status. Standard Message and Data rates may apply. You may also visit www.usps.com USPS Tracking or call 1-800-222-1811.

Preview your Mail
Track your Packages
Sign up for FREE @
https://informeddelivery.usps.com

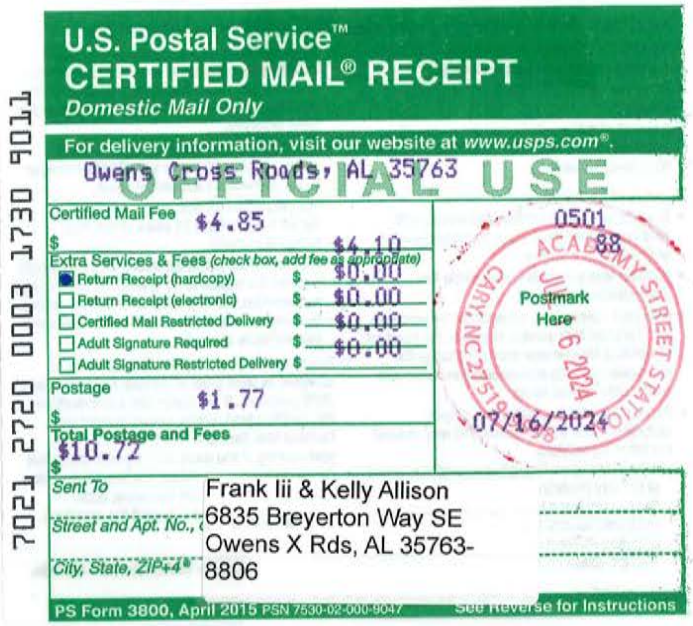
All sales final on stamps and postage.
Refunds for guaranteed services only.
Thank you for your business.

Tell us about your experience.
Go to: https://postalexperience.com/Pos
or scan this code with your mobile device,

or call 1-800-410-7420.

UFN: 361233-0501
Receipt #: 840-52700152-3-7280972-2
Clerk: 88

20200803.00.RA P22



U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Owens Cross Roads, AL 35763

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $ $0.00
- [ ] Certified Mail Restricted Delivery $ $0.00
- [ ] Adult Signature Required $ $0.00
- [ ] Adult Signature Restricted Delivery $

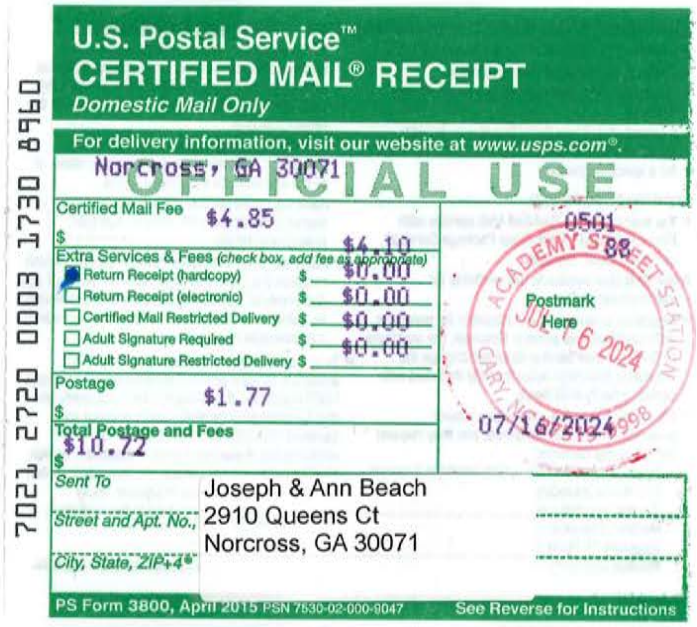
Postage $1.77
Total Postage and Fees $10.72

0501 88
ACADEMY STREET STATION CARY, NC 27519
Postmark Here
JUL 16 2024
07/16/2024

Sent To: Frank Iii & Kelly Allison
Street and Apt. No.: 6835 Breyerton Way SE
City, State, ZIP+4®: Owens X Rds, AL 35763-8806

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9011



U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Norcross, GA 30071

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $ $0.00
- [ ] Certified Mail Restricted Delivery $ $0.00
- [ ] Adult Signature Required $ $0.00
- [ ] Adult Signature Restricted Delivery $

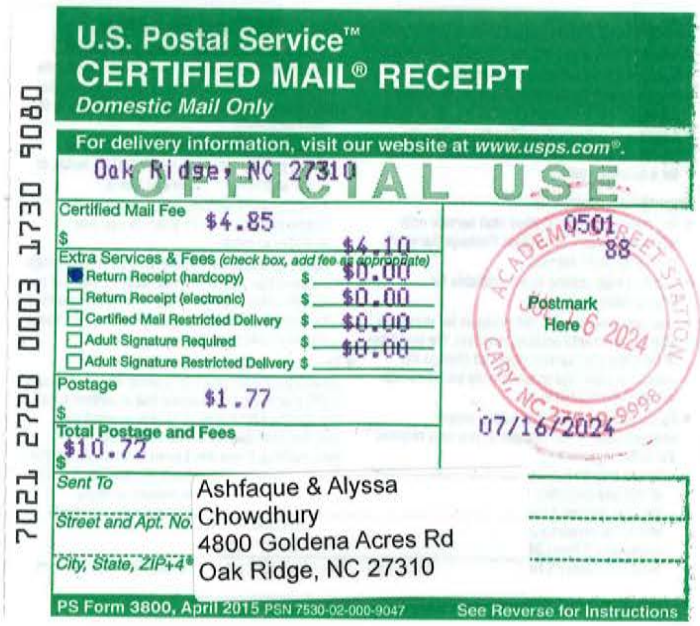
Postage $1.77
Total Postage and Fees $10.72

0501 88
ACADEMY STREET STATION CARY, NC 27519
Postmark Here
JUL 16 2024
07/16/2024

Sent To: Joseph & Ann Beach
Street and Apt. No.: 2910 Queens Ct
City, State, ZIP+4®: Norcross, GA 30071

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8960



U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Oak Ridge, NC 27310

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $ $0.00
- [ ] Certified Mail Restricted Delivery $ $0.00
- [ ] Adult Signature Required $ $0.00
- [ ] Adult Signature Restricted Delivery $

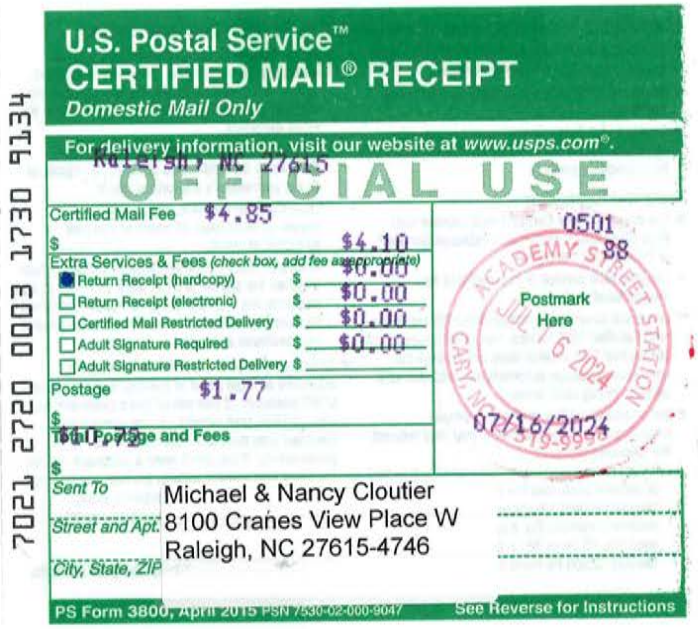
Postage $1.77
Total Postage and Fees $10.72

0501 88
ACADEMY STREET STATION CARY, NC 27519
Postmark Here
JUL 16 2024
07/16/2024

Sent To: Ashfaque & Alyssa Chowdhury
Street and Apt. No.: 4800 Goldena Acres Rd
City, State, ZIP+4®: Oak Ridge, NC 27310

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9080



U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Raleigh, NC 27615

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $ $0.00
- [ ] Certified Mail Restricted Delivery $ $0.00
- [ ] Adult Signature Required $ $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

0501 88
ACADEMY STREET STATION CARY, NC 27519
Postmark Here
JUL 16 2024
07/16/2024

Sent To: Michael & Nancy Cloutier
Street and Apt. No.: 8100 Cranes View Place W
City, State, ZIP+4®: Raleigh, NC 27615-4746

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9134

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Chapel Hill, NC 27516

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $ $0.00
- [ ] Certified Mail Restricted Delivery $ $0.00
- [ ] Adult Signature Required $ $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

0501 88
ACADEMY STREET STATION CARY, NC 27519
Postmark Here
JUL 16 2024
07/16/2024

Sent To: Bryant Dunlap, Jr.
Street and Apt. No.: 250 Culbreth Rd
City, State, ZIP+4®: Chapel Hill, NC 27516

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9141

UNITED STATES POSTAL SERVICE.

CARY
150 WRENN DR
CARY, NC 27511-9998
(800)275-8777

07/16/2024 11:41 AM

Product	Qty	Unit Price	Price
First-Class Mail® Large Envelope Summerfield, NC 27358 Weight: 0 lb 1.10 oz Estimated Delivery Date Thu 07/18/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317308977			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8303 64			$4.10
Total			$10.72
First-Class Mail® Large Envelope Glastonbury, CT 06033 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317308953			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8303 88			$4.10
Total			$10.72
First-Class Mail® Large Envelope Elkin, NC 28621 Weight: 0 lb 1.10 oz Estimated Delivery Date Thu 07/18/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309035			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8303 02			$4.10
Total			$10.72
First-Class Mail® Large Envelope Indian Trail, NC 28079 Weight: 0 lb 1.00 oz Estimated Delivery Date Fri 07/19/2024	1		$1.50
Certified Mail® Tracking #: 70212720000317309110			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8302 27			$4.10
Total			$10.45
First-Class Mail® Large Envelope Fort Mill, SC 29708 Weight: 0 lb 1.00 oz Estimated Delivery Date Fri 07/19/2024	1		$1.50
Certified Mail® Tracking #: 70212720000317309066			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8302 72			$4.10
Total			$10.45
First-Class Mail® Large Envelope Charlotte, NC 28205 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309028			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8303 19			$4.10
Total			$10.72
First-Class Mail® Large Envelope Myrtle Beach, SC 29572 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309165			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8301 73			$4.10
Total			$10.72
First-Class Mail® Large Envelope Raleigh, NC 27606 Weight: 0 lb 1.10 oz Estimated Delivery Date Thu 07/18/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309097			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8302 41			$4.10
Total			$10.72
First-Class Mail® Large Envelope Charlotte, NC 28277 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317309158			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8301 80			$4.10
Total			$10.72
First-Class Mail® Large Envelope Rolesville, NC 27571 Weight: 0 lb 1.00 oz Estimated Delivery Date Thu 07/18/2024	1		$1.50
Certified Mail® Tracking #: 70212720000317309042			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8302 96			$4.10
Total			$10.45
First-Class Mail® Large Envelope Stroudsburg, PA 18360 Weight: 0 lb 1.10 oz Estimated Delivery Date Fri 07/19/2024	1		$1.77
Certified Mail® Tracking #: 70212720000317308939			$4.85
Return Receipt Tracking #: 9590 9402 7110 1251 8304 01			$4.10
Total			$10.72

First-Class Mail® 1 $1.50
Large Envelope
Sutherland, VA 23885
Weight: 0 lb 1.00 oz
Estimated Delivery Date
Fri 07/19/2024
Certified Mail® $4.85
Tracking #:
70212720000317308984
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8303 57
Total $10.45

First-Class Mail® 1 $1.77
Large Envelope
Davidson, NC 28036
Weight: 0 lb 1.10 oz
Estimated Delivery Date
Fri 07/19/2024
Certified Mail® $4.85
Tracking #:
70212720000317309127
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8302 10
Total $10.72

First-Class Mail® 1 $1.50
Large Envelope
Raleigh, NC 27614
Weight: 0 lb 1.00 oz
Estimated Delivery Date
Thu 07/18/2024
Certified Mail® $4.85
Tracking #:
70212720000317309059
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8302 89
Total $10.45

First-Class Mail® 1 $1.50
Large Envelope
Oak Island, NC 28465
Weight: 0 lb 1.00 oz
Estimated Delivery Date
Thu 07/18/2024
Certified Mail® $4.85
Tracking #:
70212720000317308991
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8303 40
Total $10.45

First-Class Mail® 1 $1.50
Large Envelope
Columbia, SC 29204
Weight: 0 lb 1.00 oz
Estimated Delivery Date
Fri 07/19/2024
Certified Mail® $4.85
Tracking #:
70212720000317309103
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8302 34
Total $10.45

First-Class Mail® 1 $1.50
Large Envelope
Greer, SC 29650
Weight: 0 lb 1.00 oz
Estimated Delivery Date
Fri 07/19/2024
Certified Mail® $4.85
Tracking #:
70212720000317309004
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8303 33
Total $10.45

First-Class Mail® 1 $1.77
Large Envelope
Oak Island, NC 28465
Weight: 0 lb 1.10 oz
Estimated Delivery Date
Thu 07/18/2024
Certified Mail® $4.85
Tracking #:
70212720000317309073
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8302 65
Total $10.72

First-Class Mail® 1 $1.77
Large Envelope
Waxhaw, NC 28173
Weight: 0 lb 1.10 oz
Estimated Delivery Date
Fri 07/19/2024
Certified Mail® $4.85
Tracking #:
70212720000317308946
Return Receipt $4.10
Tracking #:
9590 9402 7110 1251 8303 95
Total $10.72

Grand Total: $201.52

Credit Card Remit $201.52
Card Name: MasterCard
Account #: XXXXXXXXXXXX0471
Approval #: 007165
Transaction #: 164
AID: A0000000041010 Chip
AL: MASTERCARD
PIN: Verified

Text your tracking number to 28777 (2USPS) to get the latest status. Standard Message and Data rates may apply. You may also visit www.usps.com USPS Tracking or call 1-800-222-1811.

In a hurry? Self-service kiosks offer quick and easy check-out. Any Retail Associate can show you how.

Preview your Mail
Track your Packages
Sign up for FREE @
https://informeddelivery.usps.com

All sales final on stamps and postage.
Refunds for guaranteed services only.
Thank you for your business.

Tell us about your experience.
Go to: https://postalexperience.com/Pos
or scan this code with your mobile device,

or call 1-800-410-7420.

UFN: 361232-0504
Receipt #: 840-52700148-4-8136044-2
Clerk: 66

7021 2720 0003 1730 8977

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Summerfield, NC 27358

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

CARY POST OFFICE 0504 66
Postmark Here
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Robert & Mary Edmonds
Street and Apt.: 7020 Denison Rd
City, State, ZIP: Summerfield, NC 27358-9235

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9110

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Indian Trail, NC 28079

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $10.45

CARY POST OFFICE 0504 66
JUL 16 Postmark 2024
CARY, NC 27511-9998

Sent To: Charles & Drina Hudson
Street and Apt.: 903 Brief Road West
City, State, ZIP: Indian Trail, NC 28079

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8953

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Glastonbury, CT 06033

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

CARY POST OFFICE 0504 66
Postmark Here
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Richard & Karen Frisk
Street and Apt. No.: 144 Conestoga Way
City, State, ZIP+4®: Glastonbury, CT 06033-3362

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9066

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Fort Mill, SC 29708

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $10.45

CARY POST OFFICE 0504 66
Postmark Here
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Jordan & Tyler Jaeger
Street and Apt. No., or: 409 Hampton Trail Dr
City, State, ZIP+4®: Fort Mill, SC 29708-0184

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9035

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Elkin, NC 28621

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

CARY POST OFFICE 0504 66
Postmark Here
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Wallace Harrelson
Street and Apt. No., or: 523 White Rd
City, State, ZIP+4®: Elkin, NC 28621

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9028

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Charlotte, NC 28205

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10 $0.00
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

CARY POST OFFICE 0504 66
Postmark Here
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Jerri Anne Kallam
Street and Apt. No.: 1338 Rollins Ave
City, State, ZIP+4®: Charlotte, NC 28205

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Myrtle Beach, SC 29572

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77

Total Postage and Fees $10.72

Postmark Here
CARY POST OFFICE
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Mike & Nicole Kaltsas
Street and Apt.: 302 65th Ave N
City, State, ZIP: Myrtle Beach, SC 29572-3343

7021 2720 0003 1730 9165

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Rolesville, NC 27571

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50

Total Postage and Fees $10.45

Postmark Here
CARY POST OFFICE
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Kirby & Terry Pearce
Street and Apt. No.: P O Box 160
City, State, ZIP+4®: Rolesville, NC 27571

7021 2720 0003 1730 9042

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Raleigh, NC 27606

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77

Total Postage and Fees $10.72

Postmark Here
CARY POST OFFICE
JUL 16 2024
CARY, NC 27511-9998

Sent To: Diane McGurl, Etals
Street and Apt.: 124 Singleton St
City, State, ZIP+4: Raleigh, NC 27606-1137

7021 2720 0003 1730 9097

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Stroudsburg, PA 18360

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77

Total Postage and Fees $10.72

Postmark Here
CARY POST OFFICE
JUL 16 2024
CARY, NC 27511-9998

Sent To: Eric & Jennifer Seelza
Street and Apt.: 515 Lindbergh Ave
City, State, ZIP+4: Stroudsburg, PA 18360-2221

7021 2720 0003 1730 8939

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Charlotte, NC 28277

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77

Total Postage and Fees $10.72

Postmark Here
CARY POST OFFICE
JUL 16 2024
CARY, NC 27511-9998

Sent To: Mark & Delaine Mead
Street and Apt. No.: 5410 Callander Ct
City, State, ZIP+4: Charlotte, NC 28277

7021 2720 0003 1730 9158

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Sutherland, VA 23885

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50

Total Postage and Fees $10.45

Postmark Here
CARY POST OFFICE
JUL 16 2024
07/16/2024
CARY, NC 27511-9998

Sent To: Jessee & Janice Shelton, Trustees
Street and Apt. No., or: 18640 Waterford Dr
City, State, ZIP+4®: Sutherland, VA 23885

7021 2720 0003 1730 8984

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9127

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Davidson, NC 28036

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

CARY POST OFFICE 0504 66 Postmark Here JUL 16 2024 07/16/2024 CARY, NC 27511-9998

Sent To: Theresa & Alan Steighner
Street and Apt.: P O Box 1143
City, State, ZIP: Davidson, NC 28036-1143

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9103

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Columbia, SC 29204

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $10.45

CARY POST OFFICE 0504 66 Postmark Here JUL 16 2024 07/16/2024 CARY, NC 27511-9998

Sent To: Roland Odell Trout, Jr.
Street and Apt.: 1311 Wellington Dr
City, State, ZIP: Columbia, SC 29204-2349

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9059

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Raleigh, NC 27614

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $10.45

CARY POST OFFICE 0504 66 Postmark Here JUL 16 2024 07/16/2024 CARY, NC 27511-9998

Sent To: Michael & Susan Stewart
Street and Apt. No.: 1208 Prairie Pond Cir
City, State, ZIP+4: Raleigh, NC 27614-8679

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9004

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Greer, SC 29650

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $10.45

CARY POST OFFICE 0504 66 Postmark Here JUL 16 2024 07/16/2024 CARY, NC 27511-9998

Sent To: Stephen Ural
Street and Apt. No.: 513 Sweet Juliet Way
City, State, ZIP+4: Greer, SC 29650-4555

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8991

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Oak Island, NC 28465

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $10.45

CARY POST OFFICE 0504 66 Postmark Here JUL 16 2024 CARY, NC 27511-9998

Sent To: John Timm, Living Trust
Street and Apt. No.: P O Box 1024
City, State, ZIP+4: Oak Island, NC 28465-6860

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 9073

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Oak Island, NC 28465

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $4.10
- [ ] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77
Total Postage and Fees $10.72

CARY POST OFFICE Postmark Here JUL 16 2024 07/16/2024

Sent To: David & Pamela Wedding
Street and Apt. No.: P O Box 490
City, State, ZIP+4: Oak Island, NC 28465-6854

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Waxhaw, NC 28173

OFFICIAL USE

Certified Mail Fee $4.85

Extra Services & Fees (check box, add fee as appropriate)
- [x] Return Receipt (hardcopy) $0.00
- [ ] Return Receipt (electronic) $
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

Postage $1.77

Total Postage and Fees $10.72

CARY POST OFFICE
JUL 16 2024
Postmark Here
CARY, NC 27511-9998

Sent To Eben & Maggie Wheeler
Street and Apt. 8902 Longview Club Dr
City, State, ZIP+ Waxhaw, NC 28173-6804

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 2720 0003 1730 8946

NC COASTAL RESOURCES COMMISSION MEETING

November 14, 2024

Town Of Oak Island (CRC-VR-24-06) Intersection of Crowell Street and Ocean Drive, Beach Access Oak Island

Division of Coastal Management

Image Source: Google Earth Imagery Date: 2024

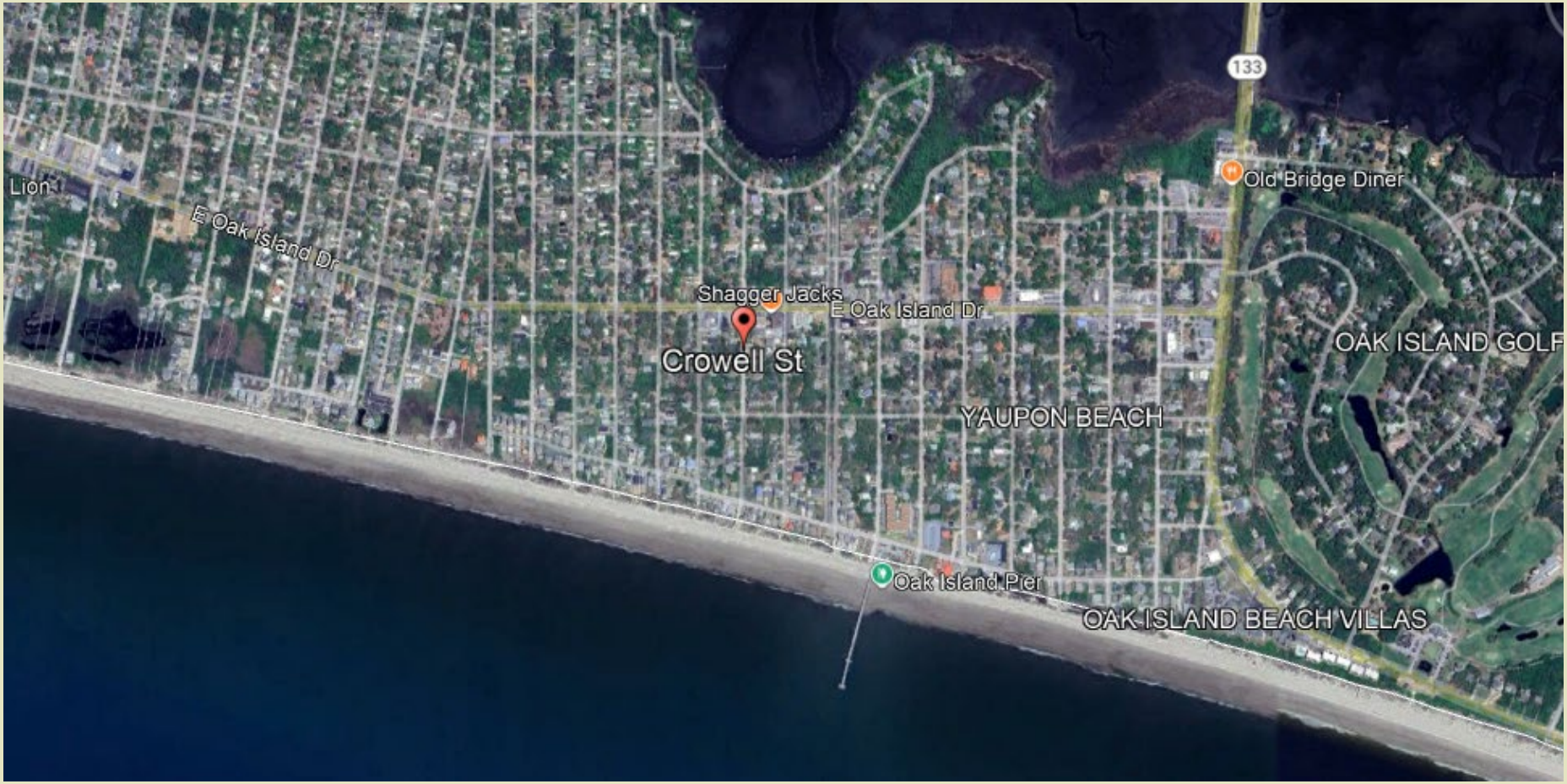


Image Source: Google Earth Imagery Date 2024

Project Area

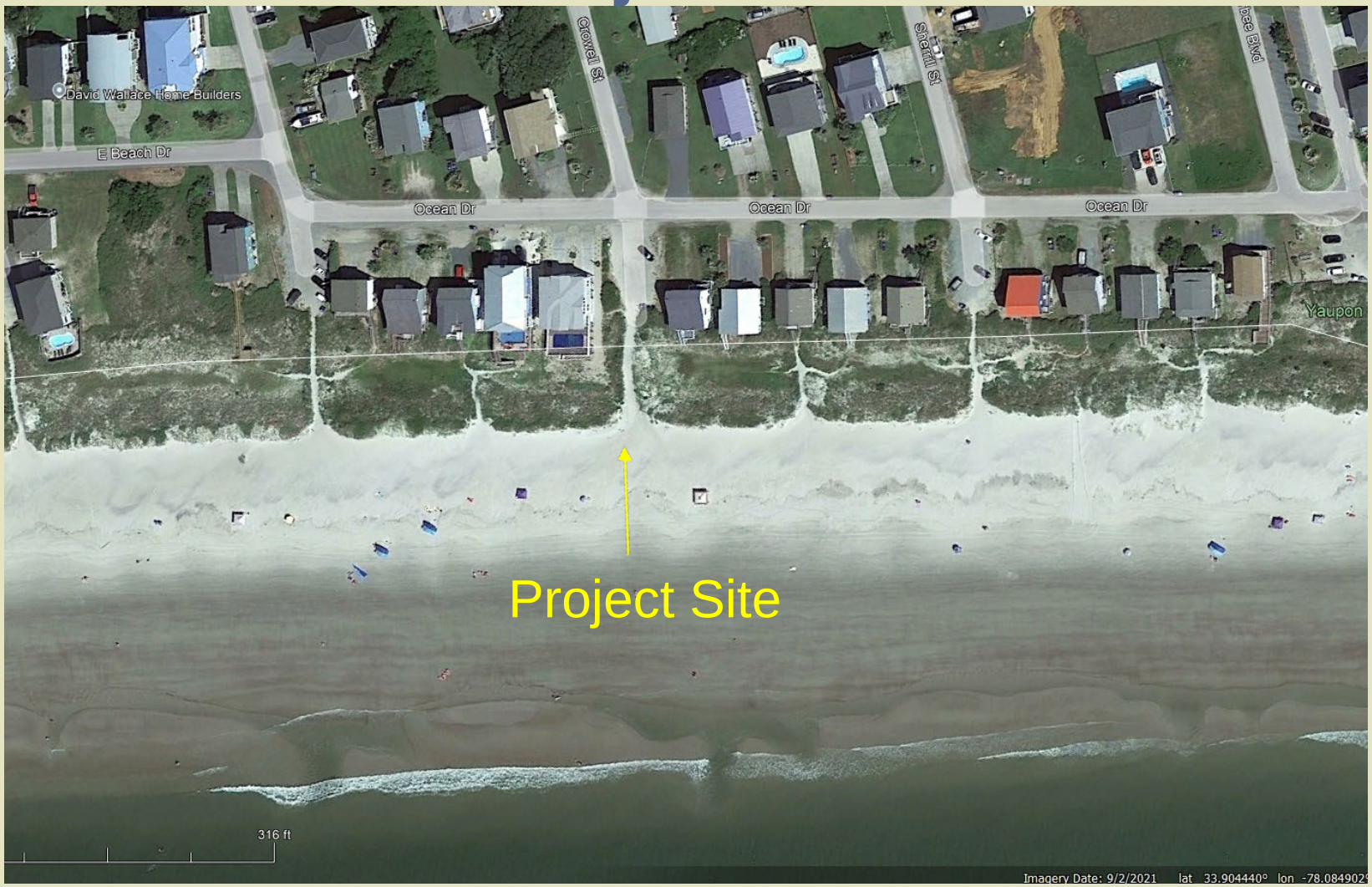


Image Source: Google Earth Image Date 2024

Division of Coastal Management

Project Area

Image Source: Google Earth Image Date: 9/2/21

Project Site Imagery

Image taken on beach near site looking west Source: DCM staff 9/20/23

Image taken on beach near site, looking East Source: DCM staff 9/20/23

Division of Coastal Management

Additional Project Site Imagery

Waterward side of frontal dune, looking East Source: DCM Staff 9/20/23

Landward side of frontal dune, looking South East Source: DCM Staff 9/20/23

Additional Project Site Imagery

Image taken from beach access, looking South Source: DCM Staff 9/20/23

Additional Project Site Imagery

Image taken from beach access, looking West Source: DCM Staff 9/20/23

Division of Coastal Management

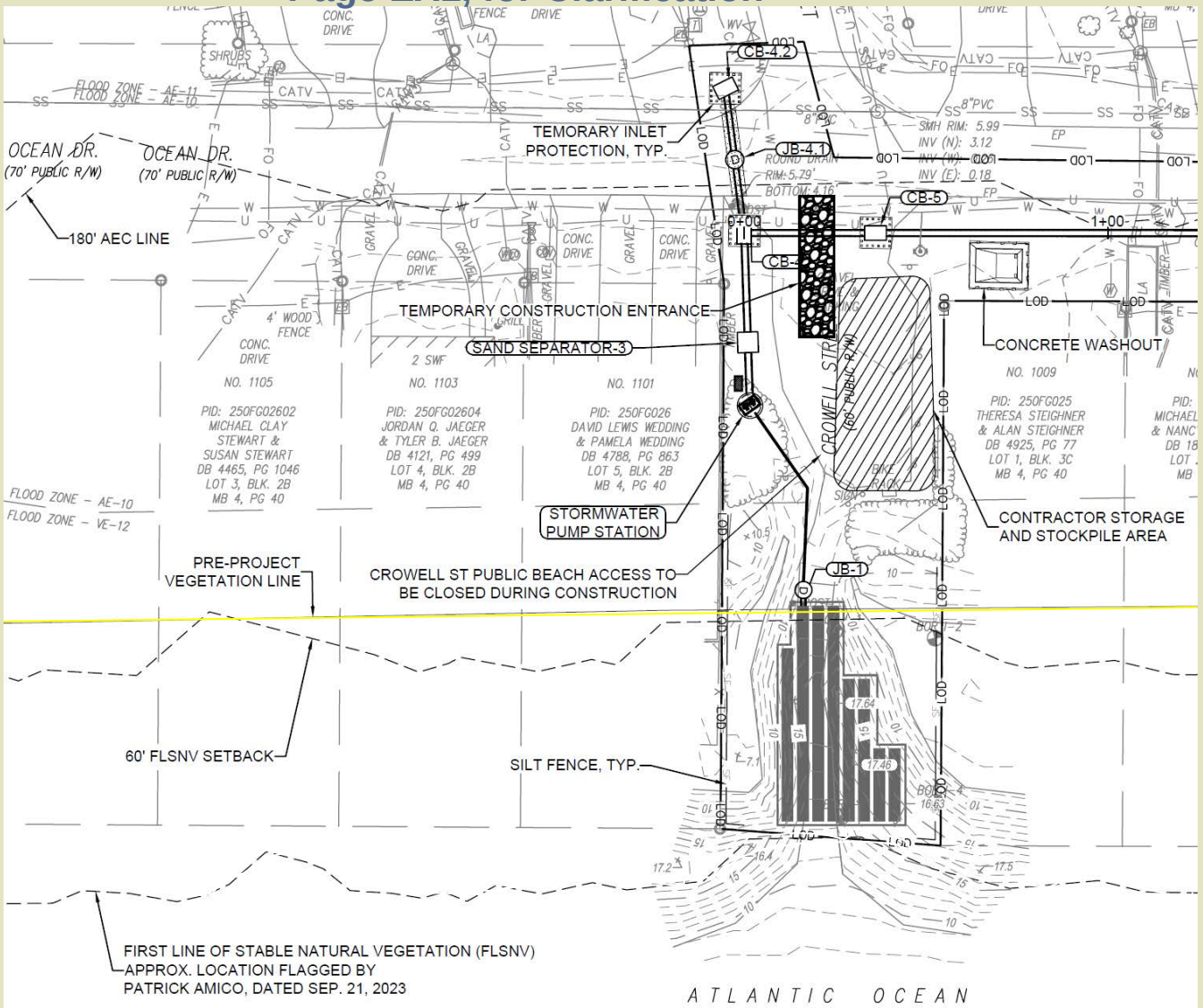
Additional Project Site Imagery

Image taken from beach access, looking East Source: DCM Staff 9/20/23

Division of Coastal Management

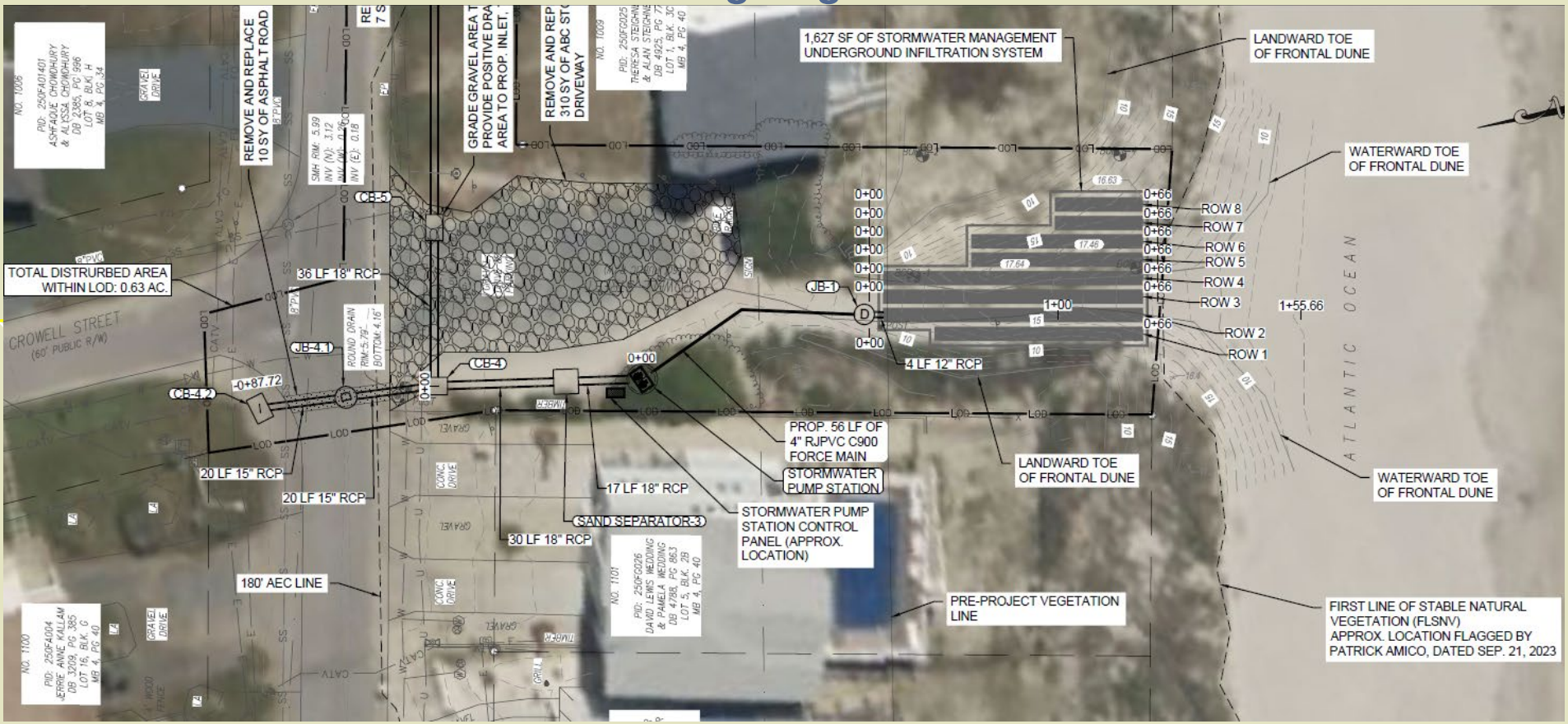
Excerpt from Site Plan Drawing from Minor Permit Application Dated 2/29/24 Page EX1, for Clarification

Note: Colors added to regulatory lines (180 AEC, Pre-Project Vegetation Line, 60' FLSNV setback, and FLSNV) for clarification purposes

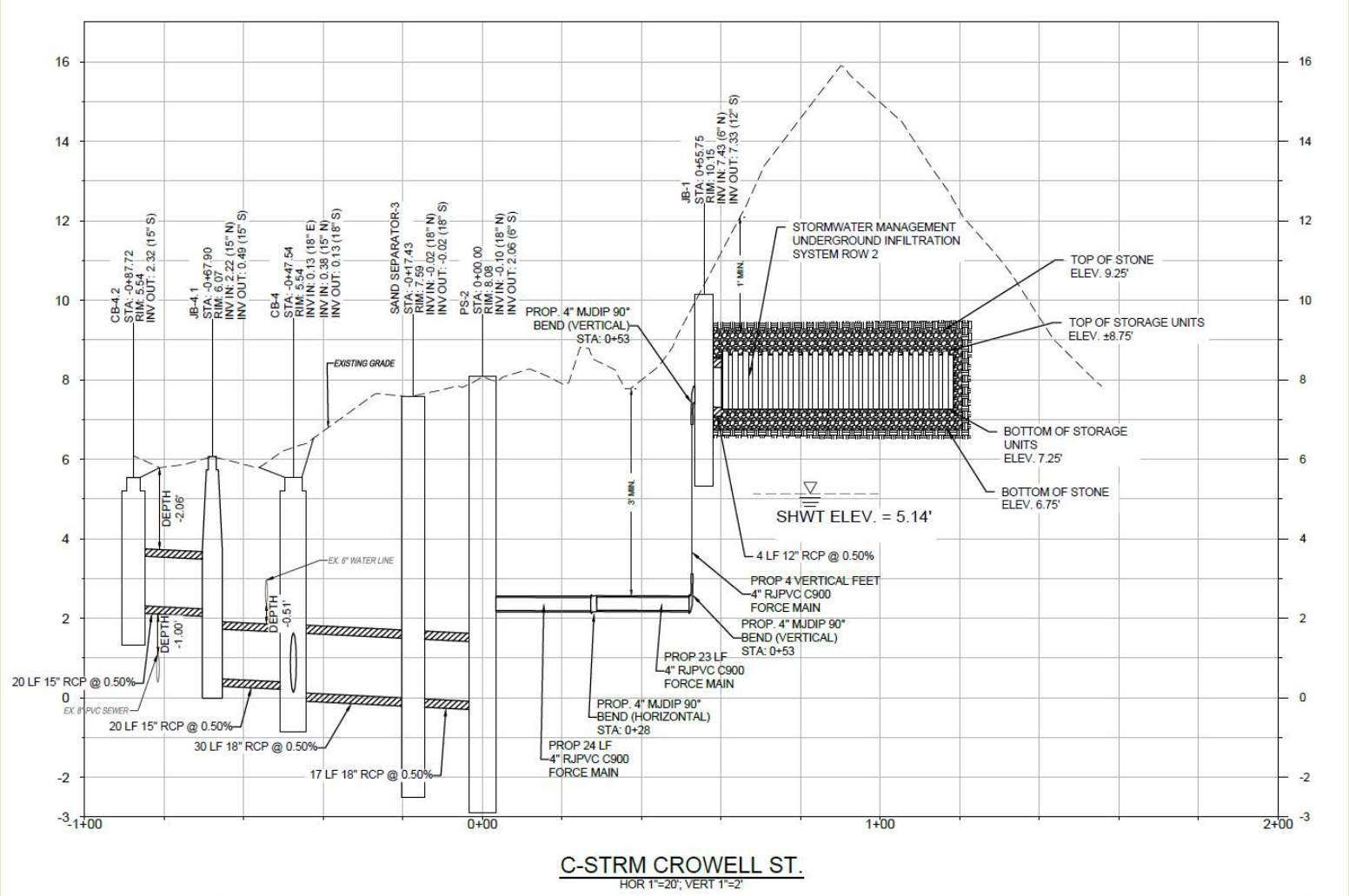


Division of Coastal Management

Site Plan from Minor Permit Application Dated 2/29/24 Drawing Page SD2



Cross Section Drawing from Minor Permit Application dated 2/29/24, Drawing Page # SD 2



C-STRM CROWELL ST.
HOR 1"=20', VERT 1"=2'

VARIANCE CRITERIA G.S. 113A-120.1

(a) Any person may petition the Commission for a variance granting permission to use the person's land in a matter otherwise prohibited by rules or standards prescribed by the Commission, or orders issued by the Commission, pursuant to this Article. To qualify for a variance, the petitioner must show all of the following:

(1) Unnecessary hardships would result from strict application of the development rules, standards, or orders.

(2) The hardships result from conditions that are peculiar to the property, such as the location, size, or topography.

(3) The hardships did not result from actions taken by the petitioner.

(4) The requested variance is consistent with the spirit, purpose and intent of the rules, standards or orders; will secure public safety and welfare; and will preserve substantial justice.

(b) The Commission may impose reasonable and appropriate conditions and safeguards upon any variance it grants.