
Coastal Hazards Vulnerability Assessment of Public Infrastructure Down East & Adjacent Communities, Carteret County, North Carolina

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Cover Photo: Down East welcome sign located in Cedar Island, NC. Photo credit: Program for the Study of Developed Shorelines at Western Carolina University.

This Page: Erosion along Lola Road in Cedar Island, NC. Photo credit: Program for the Study of Developed Shorelines at Western Carolina University.

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Executive Summary

Western Carolina University's Program for the Study of Developed Shorelines has completed a **Coastal Hazards Vulnerability Assessment of Public Infrastructure** in Down East Carteret County, including the adjacent communities of South River and Merrimon. This assessment evaluated the vulnerability of infrastructure to coastal flooding, erosion/shoreline proximity, sea-level rise, and storm surge. In total, 67 buildings, 148 state-maintained roads/road segments, and 14 road bridges were analyzed.

Vulnerability is generally defined as the extent to which a resource is susceptible to harm from natural hazard impacts. For infrastructure (assets), vulnerability is most often calculated as a combination of exposure and sensitivity. Exposure refers to the extent or degree to which a natural hazard is likely to affect an asset, and sensitivity refers to how it will fare when exposed to a hazard/impact.

Approximately one-third of all assets analyzed have very high or high exposure to the evaluated coastal hazards, most of which are in the communities of Davis, Merrimon, Otway, Sea Level, Smyrna, Stacy, Straits, and Williston. Over one-third (36%) have moderate exposure, 28% have low exposure, and 2% have minimal exposure (not in any exposure hazard zone). Most of the lower exposure assets are located in Harkers Island or Atlantic. All evaluated bridges have very high exposure. Only 11 buildings have very high or high exposure, and the Original Free Will Baptist Church of Stacy has the highest total exposure indicator (raw) score of any building. Most buildings have either moderate (40%) or low exposure (39%). Three buildings in Atlantic (the Elementary School, United Methodist Church, and Fire Department) have minimal exposure.

Over 50 of the roads analyzed have very high or high exposure, including three roads over five miles in length: Merrimon Road, Cedar Island Road (Old Cedar Island Road to Lola Road), and HWY 70 Stacy. Cedar Creek Road in Sea Level received the highest possible exposure indicator (raw) score and was the only road or building to fall within the high hazard FEMA VE Zone. Over one-third (38%) of roads have moderate exposure and 25% have low exposure. One road, School Drive in Atlantic, has minimal exposure. Roads were only analyzed for exposure, as sensitivity data were not available (and thus vulnerability could not be calculated).

Approximately one-third of all assets analyzed have very high or high sensitivity, while half have moderate sensitivity, and 14% have low sensitivity. Sea Level Free Will Baptist Church is the only asset with very high sensitivity. Twenty-seven buildings have high sensitivity, including 17 churches, three community centers, and four fire departments/stations. Less than half (45%) of the buildings have moderate sensitivity, while 11% have low sensitivity. The buildings with the lowest total indicator (raw) score for sensitivity are Harkers Island Methodist Church, Trinity United Methodist Church, and Eastern Park - Maintenance & Concessions. No bridges have very high or high sensitivity. The majority (71%) of the bridges have moderate sensitivity, and 29% have low sensitivity. The two lowest sensitivity bridges are Earl C. Davis Memorial Bridge and Commissioner Jonathan Robinson Bridge.

Twenty assets analyzed have very high or high vulnerability to the evaluated coastal hazards. Three buildings have very high vulnerability: Gloucester Community Center, Original Free Will Baptist Church of Stacy, and Sea Level Free Will Baptist Church. No bridges have very high vulnerability, but 10 have high vulnerability. NCDOT (2025) estimates the replacement cost for these high vulnerability bridges at almost \$140 million. Nearly half (47%) of the assets have moderate vulnerability, 25% have low vulnerability, and 4% have minimal vulnerability. All but five low vulnerability assets are in Atlantic and Harkers Island, and the only assets with minimal vulnerability are in Atlantic, due to higher elevations. Scores are reported for each individual asset in the Excel results sheets that accompany this report. Final exposure and vulnerability results are also provided as GIS maps and layers.

Introduction & Project Description

Western Carolina University's Program for the Study of Developed Shorelines has completed a **Coastal Hazards Vulnerability Assessment of Public Infrastructure** for Down East, North Carolina, including the adjacent communities of South River and Merrimon (Figure 1). This vulnerability assessment evaluates individual buildings, roads, and bridges, which allows decision makers to develop more detailed adaptation plans and strategies. This project builds on previous vulnerability assessments that focused on evaluating private residences across the region and supports the resilience and adaptation efforts of the Down East Resilience Network (DERN).

Vulnerability has been defined in many ways but can be generally described as the extent to which a species, habitat, or resource is susceptible to harm from natural hazard impacts. For infrastructure, vulnerability is calculated as a combination of two components: exposure and sensitivity.



- **Exposure** refers to the extent or degree to which a natural hazard is likely to affect a resource. Evaluating exposure is primarily an exercise of data gathering and geospatial analysis, as exposure is directly dependent on location and site elevation.
- **Sensitivity** refers to how a resource will fare when exposed to a hazard/impact. Sensitivity is not location dependent, and sensitivity analysis includes the features of an asset (e.g., materials, age, construction, or design elements) that will improve or degrade its performance when exposed to a hazard.

The ability of a resource to adjust or cope with natural hazards (referred to as adaptive capacity) is often included as an additional component of vulnerability, particularly in natural resource and socioeconomic studies. However, this concept is difficult to apply in the built environment (i.e., buildings, roads, bridges). Infrastructure cannot inherently adapt to hazards, while natural resources often can (a salt marsh can adapt to sea-level rise by migrating upland, whereas a building cannot). In this vulnerability assessment, the ability of an asset to adapt to changes is not included in the vulnerability score. This does not mean that understanding the adaptation potential of an asset is not important. Identifying the range of effective adaptations for key vulnerable infrastructure is the logical next step in the planning process. Effective adaptations will reduce exposure and/or sensitivity, which is key to reducing vulnerability. The methods used in this vulnerability assessment were adapted from a National Park Service protocol for evaluating the vulnerability of infrastructure (Peek et al. 2022).

The Down East community in this study is comprised of unincorporated areas of Carteret County east of the North River, including South River and Merrimon (Figure 1). This vulnerability assessment evaluates a subset of public infrastructure (assets), including 67 buildings (churches, post offices, schools, fire departments, community centers, libraries, medical facilities, museums, and park facilities), 148 state-maintained roads/road segments (almost 125 miles), and 14 road bridges. In the appendices and Excel sheets, assets in the communities of Straits, Otway, Merrimon, and South River are grouped and organized within Beaufort (the official mailing address town).



Figure 1. Infrastructure evaluated in the Down East study area (blue shading). Assets (dots and lines) and included communities are shown in white. Infrastructure data were obtained from Carteret County (2017) and NC OneMap (GICC 2025).

Methods

The Coastal Hazards Infrastructure Vulnerability Assessment for Down East has three primary steps: exposure analysis and mapping, sensitivity analysis, and vulnerability calculation. Exposure and sensitivity are evaluated using a set of indicators (i.e., representative proxy factors), while the final vulnerability score is a simple mathematical combination of exposure and sensitivity. A detailed description of the scoring information for buildings, bridges, and roads can also be found in the Excel results sheets that accompany this report.

Exposure Analysis & Mapping

The first step in this assessment was to analyze the exposure of the evaluated infrastructure to coastal hazards. Exposure is whether the area surrounding an asset has experienced, or has the potential to experience, a hazard. Exposure is evaluated in this assessment using the following coastal hazard indicators: 1) FEMA flooding, 2) coastal proximity, 3) sea-level rise, and 4) storm surge (Table 1).

Table 1. Down East exposure hazard indicators and data sources.

Exposure Hazard Indicator	Data Source
FEMA Flooding (1% annual-chance)	Effective VE & AE zones (FEMA 2020; 2025)
Coastal Proximity	WCU shorelines and buffer zones
Sea-Level Rise Inundation	NOAA SLR data (NOAA 2022)
Storm Surge (category 3)	NOAA National Storm Surge Risk Maps, version 4 (Zachry et al. 2015)

The exposure analysis used data imported into Geographical Information Systems (GIS) format, as exposure is directly dependent on location and mapped hazard data. Digital data were gathered for each of the exposure indicators, such as the online georeferenced FEMA flood map layers. Assets located within a particular hazard zone are assigned a higher score than assets located outside of the hazard zone. Specific methods for scoring each exposure indicator are highlighted in Table 2 and described in the following sections.

Table 2. Exposure indicator scoring.

FEMA Flood Zone (BFE; ft) ¹	Coastal Proximity Shoreline Buffer Zone (ft) ²	Sea-Level Rise Inundation Zone (ft)	Storm Surge Cat 3 Height (ft) ³	Indicator Score
None	None	None	None	0
AE (≤ 5)	200	3	≤ 3	1
AE (6)	150	2.5	4 – 6	2
AE (≥ 7)	100	2	7 – 8	3
VE	50	1.5	≥ 9	4

¹ BFE is relative to NAVD88, ² Indicator score reduced by one depending on engineering and bridge channel condition,

³ Max height above ground using higher number in reported range

FEMA Flooding

The FEMA flooding exposure indicator was evaluated for each asset (building, road, or bridge) using a combination of FEMA Flood Zone and Base Flood Elevation (BFE; Table 2). Assets within a VE Zone (coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves) are the most exposed and therefore received the highest possible score of four (Figure 2). Assets within an AE Zone received a score between one and three, depending on the associated BFE (elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year). Assets in an area with a higher BFE received a higher score, and assets within a lower BFE area received a lower score (Figure 2). Assets outside both the FEMA VE and AE Zone (in an X or Shaded X zone) are the least exposed and therefore received the lowest possible score of zero.

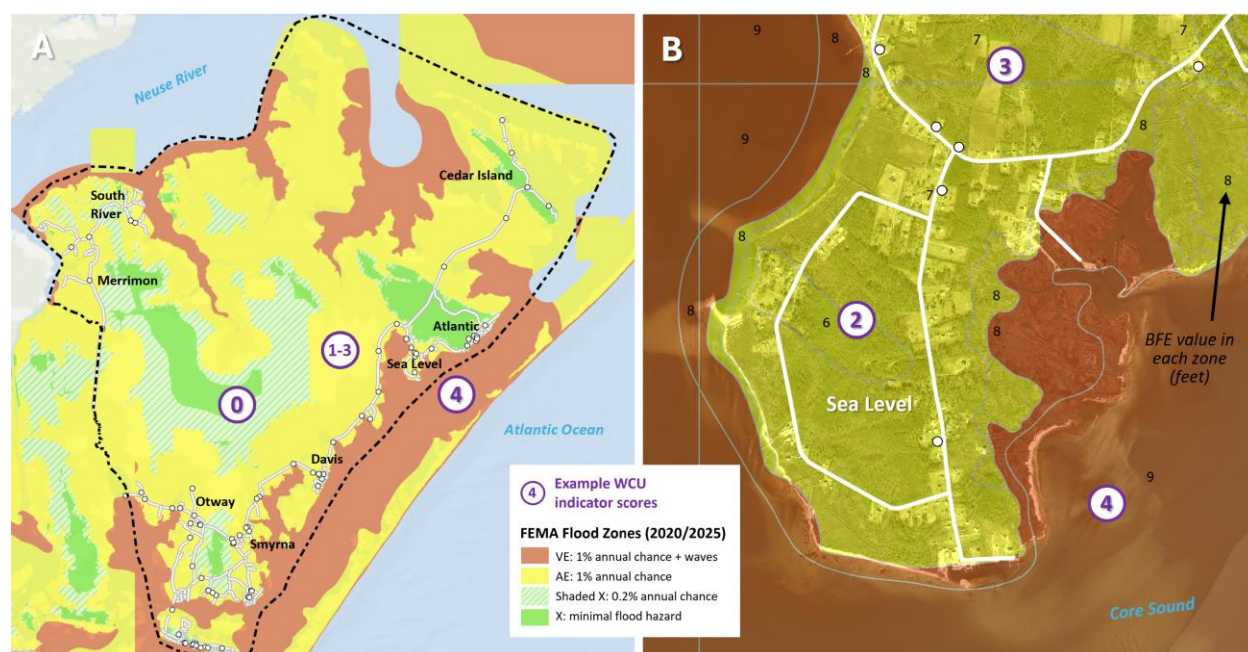


Figure 2. FEMA flooding exposure indicator data, with example indicator scoring. See Table 2 for all scoring ranges. A) FEMA data for the full Down East study area, showing all flood zones with example scoring for each zone. Background is ESRI world ocean base map. B) FEMA VE and AE zones for Sea Level, showing the BFE subzones and associated values. BFE values in the AE zone range from 6 to 8 feet in this area, and therefore assets in these zones received scores ranging from 2 to 3 for the FEMA flooding indicator.

Coastal Proximity

The coastal proximity exposure indicator was evaluated for each asset using four shoreline buffer zones: 50 ft, 100 ft, 150 ft, and 200 ft (Table 2, Figure 3). These shoreline buffer zones represent areas that have higher exposure to erosion and other coastal hazards. To create these buffer zones, shorelines were manually digitized using recent aerial imagery (NGS 2026), and simple buffers were created in ArcGIS Pro based on those shorelines. Assets closest to the shoreline (in the 50 ft buffer) are the most exposed and therefore received the highest possible score of four (Figure 3). Assets outside all shoreline buffer zones are the least exposed and received the lowest possible score of zero. All buffer zones and scores are shown in Table 2.

In some cases, infrastructure is protected from erosion hazards by protective engineering (e.g., bulkheads, seawalls, rip-rap). For buildings and roads with effective protective engineering, the original coastal proximity score was reduced by one. Bridge engineering data were obtained from the NC Department of Transportation (NCDOT 2025). The Federal Highway Administration (FHWA) “Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges” was used to define and interpret the bridge characteristic codes reported by NCDOT (FHWA 1995). The original Coastal Proximity Score was reduced by one for bridges with channels reported to be in good condition, well vegetated, and with stable control devices (code of eight or nine for Item 61: Channel and Channel Protection, as defined in FHWA 1995).

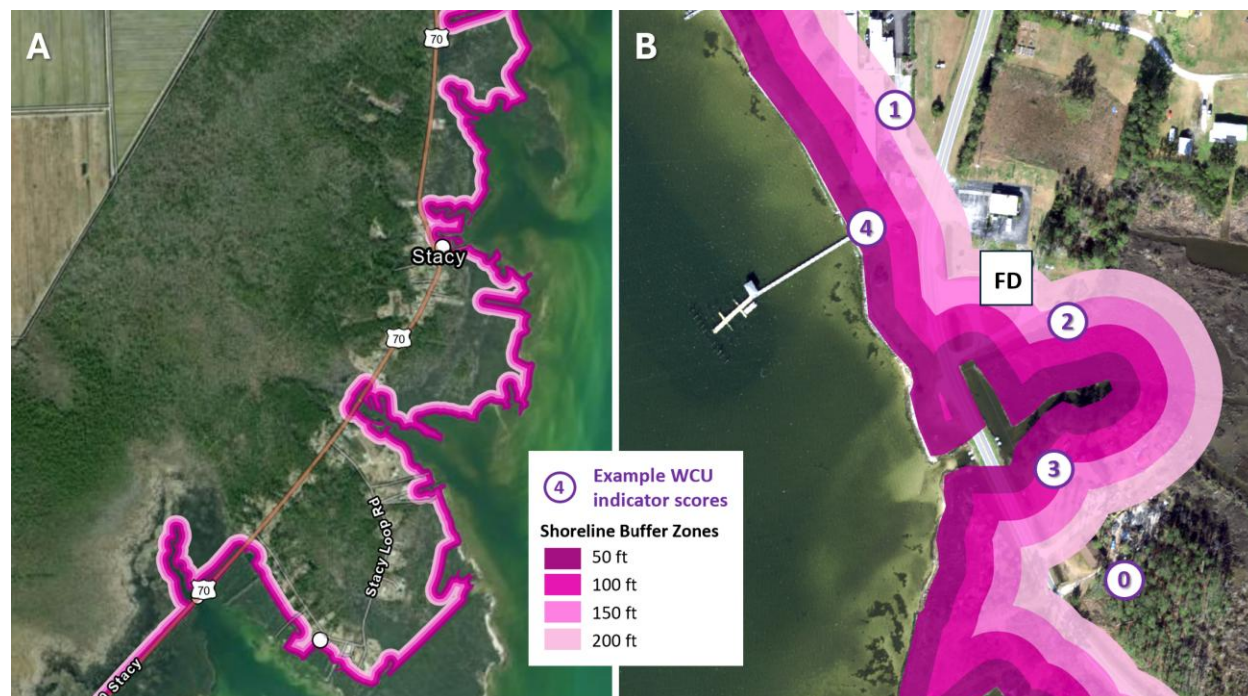


Figure 3. Coastal proximity exposure indicator data example, showing the four shoreline buffer zones. A) Shoreline buffer zones near Stacy. B) Zoomed in view of all four shoreline buffer zones near a fire department (FD). The fire department in this example is partially located within the 150 ft buffer zone and therefore received a score of two for the coastal proximity indicator. See Table 2 for all scoring ranges.

Sea-Level Rise

The sea-level rise (SLR) exposure indicator was evaluated for each asset using four inundation zones: 1.5 ft, 2 ft, 2.5 ft, and 3 ft (Table 2). Assets in the 1.5 ft inundation zone received the highest possible score of four; assets outside all inundation zones received the lowest possible score of zero. Example data and scoring are shown in Figure 4A-B. All inundation zones and SLR scores are shown in Table 2.

Storm Surge

The storm surge exposure indicator was evaluated for each asset using category 3 storm surge height ranges (Table 2). Assets in an area projected to experience a storm surge height of 9 ft or more received the highest possible score of four. Assets in an area projected to experience no storm surge during a category 3 storm received the lowest possible score of zero. Example data and scoring are shown in Figure 4C-D. All storm surge height ranges and scores are shown in Table 2.

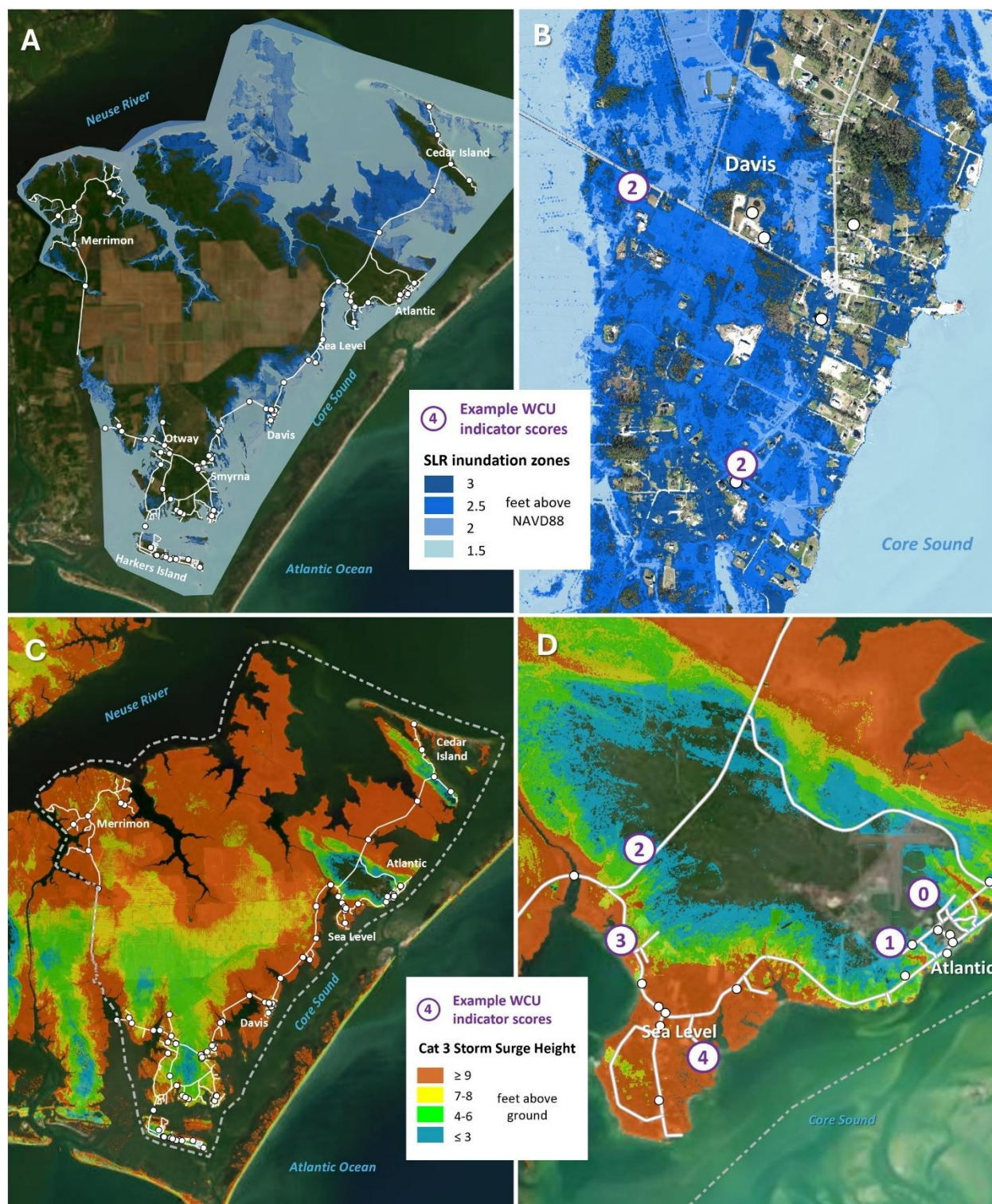


Figure 4. SLR and storm surge exposure indicator data. See Table 2 for full scoring ranges. A) SLR data for the full Down East study area. B) SLR inundation zones in Davis, showing example scoring for two buildings. These buildings are located in the 2.5 ft zone and therefore received a score of two for the SLR indicator. C) Storm surge data for the full Down East study area. D) Storm surge data for Sea Level and Atlantic, showing example scoring in five locations.

Sensitivity Analysis

The second step in this assessment was to analyze the sensitivity of the evaluated infrastructure to coastal hazards. Sensitivity refers to how an asset would fare when exposed to the hazard, which is a function of the inherent properties or characteristics of the asset. Similar to exposure, a set of indicators was determined for asset sensitivity; these indicators (factors) indicate how sensitive an asset is to coastal hazards. Unlike exposure, sensitivity is evaluated independent of geographic location (only exposure is location-dependent). Within this protocol, the sensitivity indicators for buildings and bridges relate to characteristics such as damage potential, condition, storm resistance, and age. Assets with minimal exposure are not evaluated for sensitivity. ***Due to a lack of data, sensitivity was not evaluated for roads.*** The specific methods for scoring the sensitivity of buildings and bridges are described in the following sections.

Buildings

Building sensitivity is evaluated in this assessment using the following indicators: 1) Flood Damage Potential, 2) Overall Condition, and 3) Storm Resistance. Data sources for building sensitivity include LiDAR digital elevation maps, Carteret County tax parcels, and field assessments (Table 3).

Table 3. Down East sensitivity indicators, descriptions, and data sources for buildings.

Sensitivity Indicator	Description	Data Sources
Flood Damage Potential	Base Flood Score & Surge Flood Score	LiDAR digital elevation maps (NGS 2026) Flood maps (FEMA 2020; 2025) National storm surge risk maps (Zachry et al. 2025) Digital imagery & field assessments
Overall Condition	Year built/age & condition	Tax parcel data (Carteret County 2017) Digital Imagery & field assessments
Storm Resistance	Construction type (block, brick, wood, metal)	Tax parcel data (Carteret County 2017) Digital imagery & field assessments

Flood Damage Potential

The flood damage potential sensitivity indicator estimates the likelihood of damage to a building during coastal flood events based on first floor elevation and height above the ground. This indicator is an average of the base flood score (first floor elevation versus base flood elevation) and surge flood score (category 3 maximum surge height versus first floor height).

Base flood scores were determined by comparing the building's first floor elevation (FFE) to the BFE. The FFE of each building was determined using a combination of ground elevation and first floor height. Ground elevations were obtained from recent LiDAR data, and first floor heights were

Table 4. Base flood and surge flood scoring for buildings.

Base Flood FFE versus BFE	Surge Flood First Floor vs Surge	Score
Not in FEMA VE or AE	Not in surge cat 3	n/a
FFE > 2 ft above BFE	FF < 4 ft below surge (or above)	1
FFE = 0 - 2 ft above BFE	FF = 4 - 6 ft below surge	2
FFE = 0 - 2 ft below BFE	FF = 6.1 - 8 ft below surge	3
FFE > 2 ft below BFE	FF > 8 ft below surge	4

estimated using digital imagery and field assessments. BFE data were obtained from FEMA flood maps (Table 3). Buildings with a FFE at or below BFE are more likely to be damaged during floods and therefore receive a higher score (Table 4).

Digital imagery and field assessments were used to estimate FF heights, and category 3 maximum storm surge heights were obtained from NOAA National Storm Surge Risk Maps (Table 3). Buildings that have an FF height more than 8 ft below the predicted surge height received the highest possible score of four. All surge flood ranges and scores are shown in Table 4.

Overall Condition

The overall condition sensitivity indicator estimates the likelihood of damage to a building during coastal hazard events based on age and condition (Table 3). This indicator is an average of the age score and estimated condition score (Table 5). Ages were determined by subtracting the year built (obtained from tax parcel data) from the current year (2026) and scored in 25-year increments. Estimated condition scores were determined based on condition rank (Table 5); these rankings were obtained from tax parcel data or digital imagery/field assessments (Table 3).

Storm Resistance

The storm resistance sensitivity indicator estimates the likelihood of damage to a building during coastal hazard events based on construction type (Table 3). Storm resistance scores are based on the primary type of construction material reported in the tax parcel data or determined from digital imagery/field assessments (Tables 3 & 6).

Table 5. Age and estimated condition scoring for buildings.

Age (years)	Estimated Condition	Score
0 – 25	Very Good or Good	1
26 – 50	Average	2
51 – 75	Fair	3
> 75	Poor	4

Table 6. Storm resistance scoring for buildings.

Construction Type	Score
Block	1
Brick	2
Wood	3
Light Metal	4

Bridges

For bridges, the sensitivity factors are: 1) Flood Damage Potential, 2) Age, 3) Condition, and 4) Scour (Table 7). All bridge sensitivity data were obtained from the NCDOT (2025), using item numbers and code definitions from FWHA (1995).

Table 7. Down East sensitivity indicators, descriptions, and data sources for bridges.

Sensitivity Indicator	Description	Data Sources
Flood Damage Potential	Waterway adequacy	Item 71 (NCDOT 2025; FHWA 1995)
Age	Year built/age	Item 27 (NCDOT 2025; FHWA 1995)
Condition	Deck, superstructure, & substructure	Items 58, 59, 60 (NCDOT 2025; FHWA 1995)
Scour	Scour rating	Item 113 (NCDOT 2025; FHWA 1995)

Flood Damage Potential

The flood damage potential sensitivity indicator estimates the likelihood of damage to a bridge during coastal flood events based on the chance of overtopping deck and roadway approaches (Table 7). Flood damage potential scores are based on FWHA Item 71: Waterway Adequacy (Table 8).

Table 8. Flood damage potential scoring for bridges.

Waterway Adequacy	Description	Score
8 – 9	Chance of overtopping deck is remote, slight chance of overtopping approaches	1
6 – 7	Slight chance of overtopping bridge deck and roadway approaches	2
4 – 5	Bridge deck above roadway approaches, occasional overtopping of roadway approaches	3
2 – 3	Occasional or frequent overtopping of deck and roadway approaches	4

Age

The age sensitivity indicator estimates the likelihood of damage to a bridge during coastal hazard events based on age (Table 7). Ages were determined by subtracting the year built from the current year (2026; Table 9) and scored in 25-year increments.

Condition

The condition sensitivity indicator estimates the likelihood of damage to a bridge during coastal hazard events based on the condition of bridge components (Table 7). This indicator is an average of the deck, superstructure, and substructure condition scores (Table 9). Condition scores were determined based on FHWA Item 58: Deck, Item 59: Superstructure, and Item 60: Substructure (Table 9).

Table 9. Age and condition scoring for bridges.

Age (years)	Condition Code	Score
0 – 25	8 – 9 (very good or excellent)	1
26 – 50	7 (good)	2
51 – 75	5 – 6 (fair or satisfactory)	3
> 75	0 – 4 (poor or worse)	4

Scour

The scour sensitivity indicator estimates the likelihood of damage to a bridge during coastal hazard events based on scour (Table 7). Scour is defined as erosion of streambed or bank material due to flowing water (Arneson et al. 2012). Scour scores are based on FHWA Item 113 (Table 10).

Table 10. Scour scoring for bridges.

Scour Rating	Description	Score
N, 9	Not over water or foundations on dry land well above water	1
8	Stable, scour above top of footing	2
4 – 5, 7	Stable, scour possible near footings/pilings	3
0 – 3	Scour critical	4

Final Scoring & Vulnerability Calculation

Scores for each exposure and sensitivity indicator (see previous sections) are summed into a total indicator (raw) score. Total scores are then grouped (binned) to get a final score. Final exposure scores fall into one of five ranking categories: minimal, low, moderate, high, and very high. Final sensitivity scores fall into one of four ranking categories: low, moderate, high, and very high (Table 11). Examples of the exposure and sensitivity analysis datasheets are shown in Figure 6 (next page).

To obtain a vulnerability score for buildings and bridges (only exposure was evaluated for roads), the exposure and sensitivity scores are summed, and then grouped (binned) into five vulnerability ranking categories. These categories are as follows: minimal, low, moderate, high, and very high vulnerability (Table 11). Figure 5 illustrates the final exposure, sensitivity, and vulnerability scoring for Crissie Wright Lodge in Smyrna.

Table 11. Final exposure, sensitivity, and vulnerability scoring.

Total Indicator (Raw) Score				Final	
Exposure	Building Sensitivity	Bridge Sensitivity	Vulnerability	Score	Rank
0	n/a	n/a	0	0	minimal
1 – 3	3 – 5	4 – 7	2 – 3	1	low
4 – 7	5.5 – 7	8 – 10	4 – 5	2	moderate
8 – 9	7.5 – 9.5	11 – 13	6	3	high
≥ 10	10 – 12	14 – 16	7 – 8	4	very high



Figure 5. Final exposure, sensitivity, and vulnerability scoring for Crissie Wright Lodge in Smyrna.

A	Exposure Results													
	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3 (Surge)		Total Indicator Score		Exposure Score	Exposure Rank
	Name	Zone	BFE (ft above NAVD88)	FEMA Score	Shoreline Buffer Zone (ft)	Protective Engineering	CP Score	Inundation Zone (ft above NAVD88)	SLR Score	Max Height (ft above ground)	Surge Score	FEMA + CP + SLR + Surge		
Atlantic Elementary School	None	n/a	0	None	n/a	0	None	0	None	0	0	0	0	minimal
Hunting Quarters Baptist Church	None	n/a	0	None	n/a	0	None	0	None	2	1	1	1	low
Atlantic Missionary Baptist Church	None	n/a	0	200	Yes	0	None	0	None	3	1	1	1	low
Atlantic Post Office	None	n/a	0	None	n/a	0	None	0	None	3	1	1	1	low
Hunting Quarters Primitive Baptist Church	None	n/a	0	None	n/a	0	None	0	None	2	1	1	1	low
Atlantic United Methodist Church	None	n/a	0	None	n/a	0	None	0	None	None	0	0	0	minimal
Down East Fire Dept - Station 1	None	n/a	0	None	n/a	0	None	0	None	None	0	0	0	minimal
Down East Branch - Carteret County Public Library	None	n/a	0	None	n/a	0	None	0	None	5	2	2	1	low
East Point Church	None	n/a	0	None	n/a	0	None	0	None	5	2	2	1	low
Edwards Chapel Freewill Baptist Church	None	n/a	0	None	n/a	0	None	0	None	10	4	4	2	moderate
Island Road Baptist Church	None	n/a	0	None	n/a	0	None	0	None	5	2	2	1	low
Merrimon United Methodist Church	AE	6	2	None	n/a	0	None	0	None	10	4	6	2	moderate
Otway Christian Church	AE	8	3	None	n/a	0	None	0	None	7	3	6	2	moderate
Otway Fire & Rescue	AE	8	3	None	n/a	0	None	0	None	8	3	6	2	moderate
Otway Free Will Baptist Church	AE	8	3	None	n/a	0	3	1	None	10	4	8	3	high

B	Sensitivity Results																
	Flood Damage Potential (FDP)						Overall Condition (OC)						Storm Resistance (SR)		Total Indicator Score (FDP + OC + SR)	Sensitivity Score	Sensitivity Rank
	Name	FFE vs BFE (ft)	Base Flood Score	FF Height vs Surge (ft)	Surge Flood Score	FDP Score	Year Built	Age (years)	Score	Estimated Condition	Score	OC Score	Construction	SR Score			
Atlantic Elementary School	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hunting Quarters Baptist Church	n/a	n/a	n/a	-2.0	1	1.0	1977	49	2	Good	1	1.5	Block	1	3.5	1	low
Atlantic Missionary Baptist Church	n/a	n/a	n/a	-3.0	1	1.0	1954	72	3	Good	1	2.0	Brick	2	5	1	low
Atlantic Post Office	n/a	n/a	n/a	-3.0	1	1.0	1975	51	3	Good	1	2.0	Brick	2	5	1	low
Hunting Quarters Primitive Baptist Church	n/a	n/a	n/a	0.0	1	1.0	1940	86	4	Good	1	2.5	Wood	3	6.5	2	moderate
Atlantic United Methodist Church	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Down East Fire Dept - Station 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Down East Branch - Carteret County Public Library	n/a	n/a	n/a	-5.0	2	2.0	2010	16	1	Average	2	1.5	Metal	4	7.5	3	high
East Point Church	n/a	n/a	n/a	-5.0	2	2.0	2010	16	1	Average	2	1.5	Metal	4	7.5	3	high
Edwards Chapel Freewill Baptist Church	n/a	n/a	n/a	-9.0	4	4.0	1960	66	3	Good	1	2.0	Brick	2	8	3	high
Island Road Baptist Church	n/a	n/a	n/a	-5.0	2	2.0	1975	51	3	Average	2	2.5	Brick	2	6.5	2	moderate
Merrimon United Methodist Church	2.2	1	-7.5	3	2.0	2003	23	1	Average	2	1.5	Wood	3	6.5	2	moderate	
Otway Christian Church	-0.3	3	-5.0	2	2.5	2012	14	1	Average	2	1.5	Brick	2	6	2	moderate	
Otway Fire & Rescue	-2.8	4	-8.0	3	3.5	1978	48	2	Average	2	2.0	Block	1	6.5	2	moderate	
Otway Free Will Baptist Church	-3.2	4	-8.5	4	4.0	1965	61	3	Average	2	2.5	Brick	2	8.5	3	high	
Reels Chapel AME Zion Church	1.2	2	-8.5	4	3.0	1970	56	3	Average	2	2.5	Block	1	6.5	2	moderate	

C	Sensitivity Results																	
	Flood Damage Potential (FDP)			Age			Condition						Scour		Total Indicator Score (FDP + Age + FC + Scour)	Sensitivity Score	Sensitivity Rank	
	Name	Waterway Adequacy	FDP Score	Year Built	Age (years)	Age Score	Deck Code	Deck Score	Superstructure Code	Superstructure Score	Substructure Code	Substructure Score	Final Condition (FC) Score	Scour Rating				Scour Score
Back Creek Bridge	7	2	1997	28	2	7	2	7	2	6	3	2	2	8	2	8	2	moderate
Commissioner Jonathan Robinson Bridge (North River)	8	1	2019	6	1	7	2	7	2	7	2	2	2	8	2	6	1	low
Gut to Ward Creek Bridge	7	2	2002	23	1	7	2	7	2	7	2	2	2	8	2	7	1	low
Ward Creek Bridge	7	2	1977	48	2	6	3	6	3	7	2	3	3	8	2	9	2	moderate
Monroe Gaskill Memorial Bridge (Thorofare Bay)	8	1	1995	30	2	6	3	6	3	5	3	3	3	8	2	8	2	moderate
West Bay Channel Bridge	7	2	1991	34	2	6	3	6	3	6	3	3	3	8	2	9	2	moderate
Oyster Creek Bridge	7	2	1977	48	2	6	3	6	3	5	3	3	3	8	2	9	2	moderate
Smyrna Creek Bridge	8	1	1977	48	2	5	3	5	3	5	3	3	3	5	3	9	2	moderate
Earl C. Davis Memorial Bridge	9	1	2023	2	1	9	1	8	1	9	1	1	1	8	2	5	1	low
Cullie Creek Bridge	7	2	1997	28	2	7	2	7	2	6	3	2	8	8	2	8	2	moderate
Daniel E. Taylor Memorial Bridge (Salters Creek)	8	1	1982	43	2	6	3	5	3	6	3	3	3	8	2	8	2	moderate
Maria Creek Bridge	8	1	1976	49	2	6	3	6	3	6	3	3	3	5	3	9	2	moderate
Williston Creek Bridge	8	1	1976	49	2	6	3	6	3	6	3	3	3	8	2	8	2	moderate
North Leopard Creek Bridge	7	2	2002	23	1	7	2	7	2	7	2	2	2	8	2	7	1	low

Figure 6. Example exposure and sensitivity Excel datasheets. A) Exposure results for buildings, B) sensitivity results for buildings, and C) sensitivity results for bridges. See Appendices A-B for full results.

Results

A total of 67 buildings, 148 roads/road segments (almost 125 miles), and 14 road bridges were included in the Down East vulnerability assessment. This includes 40 churches, three community centers, nine fire stations, one library, one medical facility, one museum, one park facility, eight post offices, and three schools. Specific scores are reported for each individual asset in Appendices A-C and the corresponding Excel datasheets. Assets in the communities of Straits, Otway, Merrimon, and South River are grouped and organized within Beaufort (the official mailing address town) in the appendices and excel sheets. Final exposure and vulnerability results are also provided as GIS maps and layers.

Exposure Results

Over one-third (35%) of all assets analyzed have **very high** or **high** exposure to the evaluated coastal hazards (Table 12); most of these assets are in the communities of Davis, Merrimon, Otway, Sea Level, Smyrna, Stacy, Straits, and Williston (Figures 7-12). In addition, 36% have **moderate** exposure, 28% have **low** exposure, and 2% have **minimal** exposure (not in any exposure hazard zone). Most **low** and **minimal** exposure assets are located in Harkers Island and Atlantic (Figures 7 & 10). All exposure results are reported in Appendix A.

Table 12. Summary of Down East exposure results.

Assets	Very High		High		Moderate		Low		Minimal		Total #
	#	%	#	%	#	%	#	%	#	%	
Buildings	2	3%	9	13%	27	40%	26	39%	3	4%	67
Roads	27	18%	27	18%	56	38%	37	25%	1	1%	148
Bridges	14	100%	0	0%	0	0%	0	0%	0	0%	14
All Assets	43	19%	36	16%	83	36%	63	28%	4	2%	229

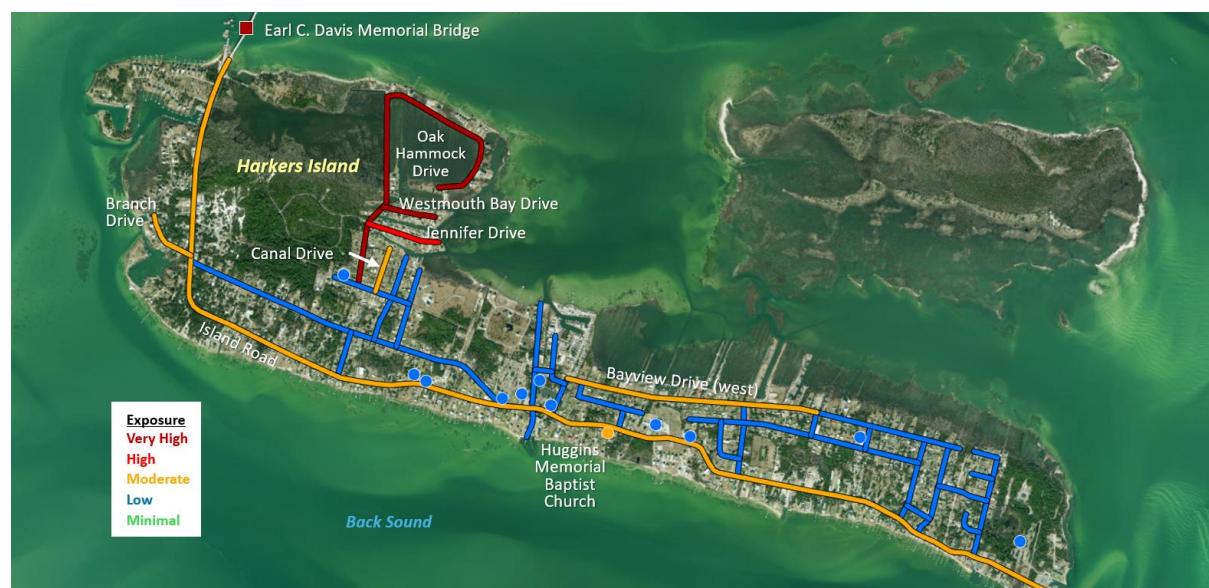


Figure 7. Exposure results for Harkers Island. Buildings are represented by circles, bridges by squares, and roads by lines. Very high, high, and moderate exposure assets are labeled.

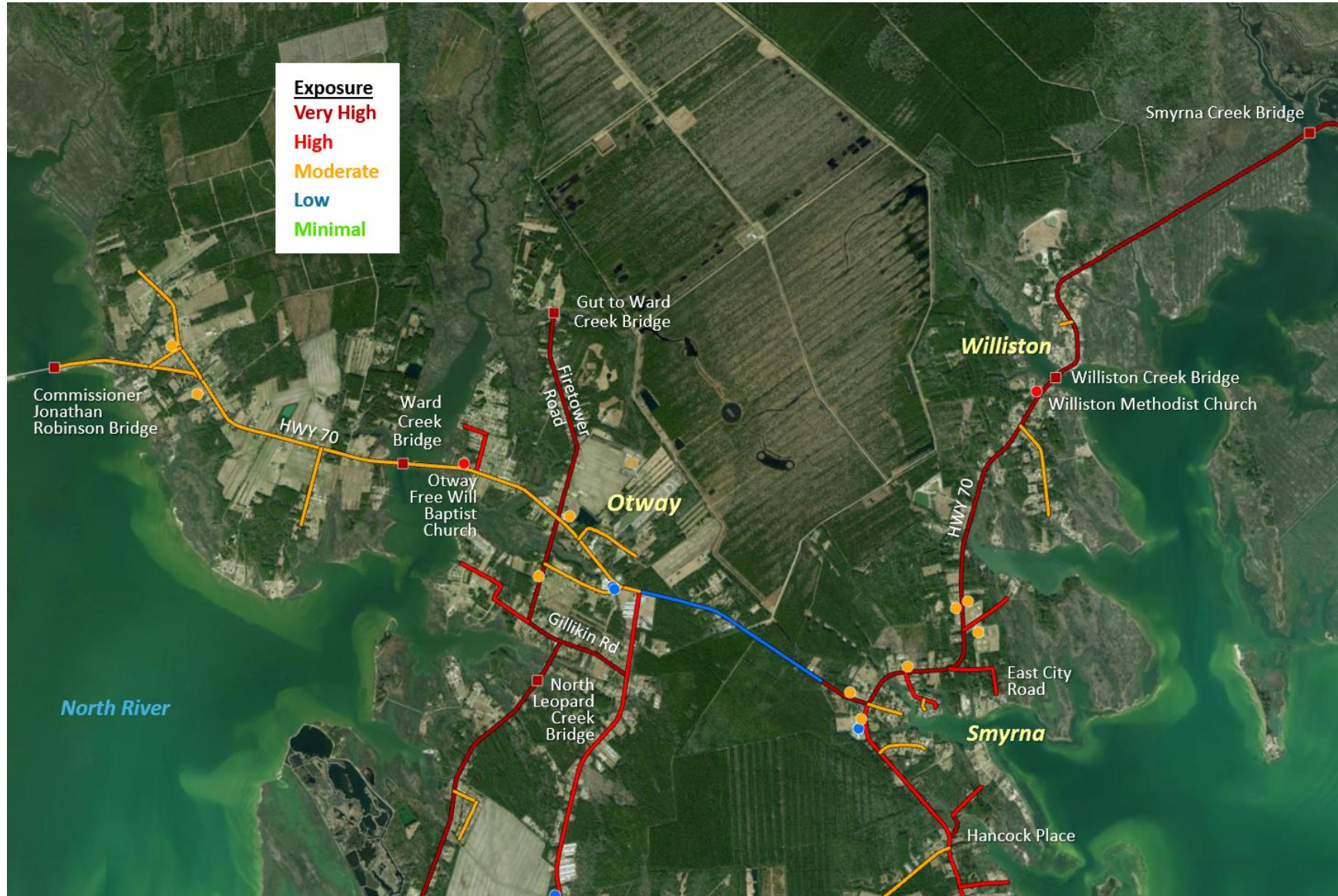


Figure 8. Exposure results for Otway, Williston, and Smyrna. Buildings are represented by circles, bridges by squares, and roads by lines. Select assets are labeled.

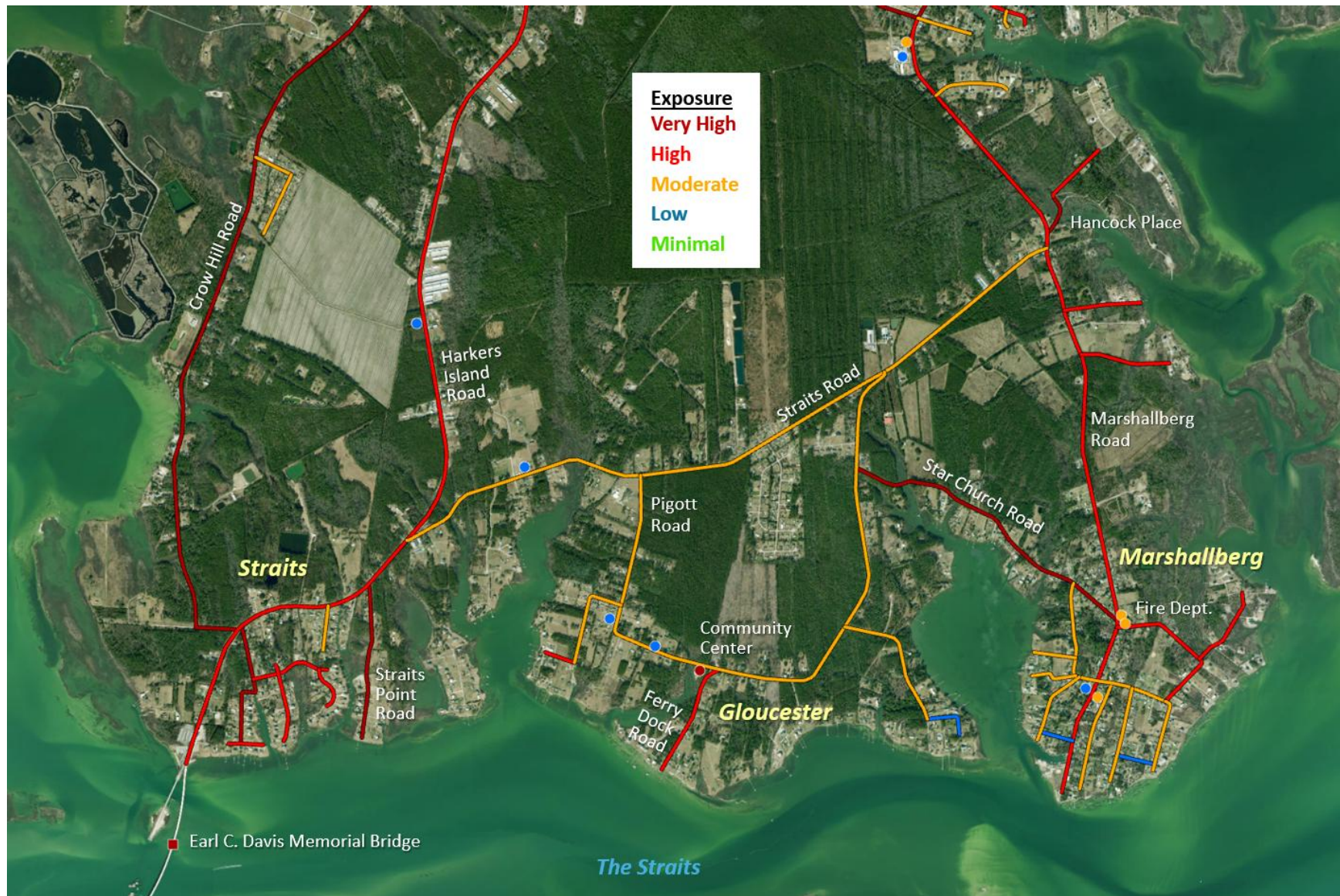


Figure 9. Exposure results for Straits, Gloucester, and Marshallberg. Buildings are represented by circles, bridges by squares, and roads by lines. Select assets are labeled.

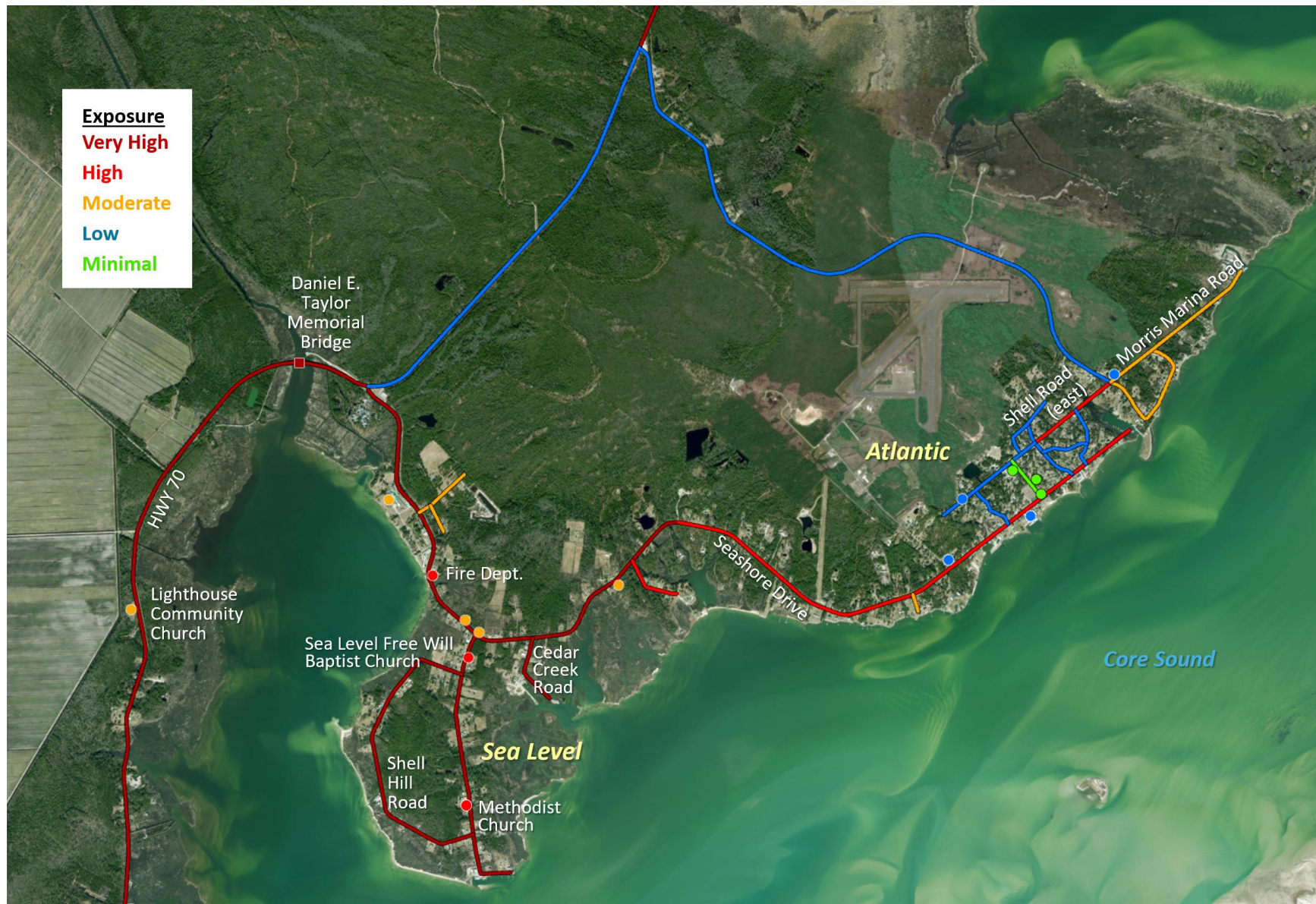


Figure 10. Exposure results for Sea Level and Atlantic. Buildings are represented by circles, bridges by squares, and roads by lines. Select assets are labeled.

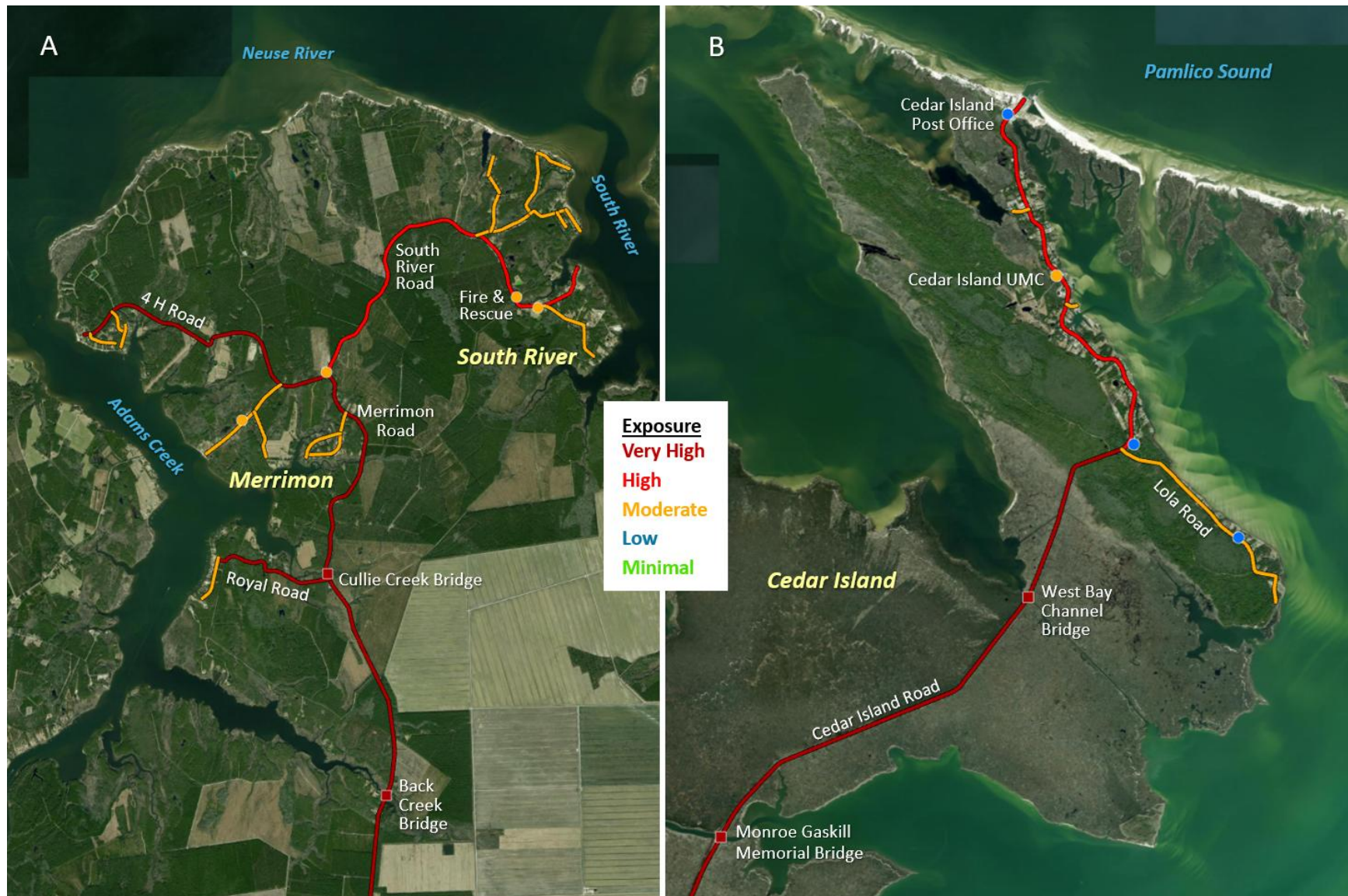


Figure 11. Exposure results for A) Merrimon and South River and B) Cedar Island. Buildings are represented by circles, bridges by squares, and roads by lines. Select assets are labeled.



Figure 12. Exposure results for Davis and Stacy. Buildings are represented by circles, bridges by squares, and roads by lines. Select assets are labeled.

Buildings are the least exposed of all the asset types analyzed, with only 11 buildings (16%) having **very high** or **high** exposure (Tables 12-13). All these assets have the highest possible storm surge category 3 score, with a predicted flood height of 9-10 ft above the ground. None of the buildings evaluated received the highest possible total exposure indicator (raw) score of 16. However, the Original Free Will Baptist Church of Stacy has the highest total indicator score of any building (Table 13), due to unfavorable ratings for all exposure indicators, including the worst possible score for coastal proximity (within 50 ft of the shoreline).

The majority of buildings have either **moderate** (40%) or **low** (39%) exposure. Three buildings (all in Atlantic) have **minimal** exposure, as they were outside all evaluated hazard zones: Atlantic Elementary School, Atlantic United Methodist Church, and Down East Fire Dept - Station 1. See Appendix tables A1-A4 for all Down East building exposure results.

Table 13. Down East buildings with very high or high exposure, sorted by total indicator score.

Name	Community	Total Indicator (Raw) Score	Final Exposure
Original Free Will Baptist Church of Stacy	Stacy	12	very high
Gloucester Community Center	Gloucester	11	very high
Davis Free Will Baptist Church	Davis	9	high
Stacy Methodist Church	Stacy	9	high
Otway Free Will Baptist Church	Otway	8	high
Davis First Baptist Church	Davis	8	high
Davis Original Free Will Baptist Church	Davis	8	high
Down East Fire Dept - Station 2	Sea Level	8	high
Sea Level Free Will Baptist Church	Sea Level	8	high
Sea Level Methodist Church	Sea Level	8	high
Williston Methodist Church	Williston	8	high

Bridges are the most exposed of all the asset types analyzed; all bridges have **very high** exposure to the evaluated coastal hazards (Table 12). With the exception of elevated overpasses, bridges are inherently more exposed, as the foundation and substructure of these assets are built directly within (or adjacent to) the water body. Four bridges evaluated received the highest possible total exposure indicator (raw) score of 16: Commissioner Jonathan Robinson Bridge and Ward Creek Bridge in Otway; and Oyster Creek Bridge and Smyrna Creek Bridge in Davis (Figures 8 & 12). See Appendix table A5 for all Down East bridge exposure results.

In this assessment, roads were only analyzed for exposure, as sensitivity data were not available. Due to exposure variability and length, four of the evaluated roads were segmented: Cedar Island Road, HWY 12 (three segments); HWY 70 (eight segments); Shell Road (two segments); and Bayview Drive (two segments). Each segment was evaluated individually for exposure.

Over 50 of the roads analyzed (36%) have **very high** or **high** exposure (Table 12, Figures 7-12). Combined, these roads are approximately 75 miles long, representing over 60% of the total length evaluated. Twenty-seven roads have **very high** exposure, including three roads over five miles in length: Merrimon Road, Cedar Island Road (Old Cedar Island Road to Lola Road), and HWY 70 Stacy (Table 14, Figures 11-12). Cedar Creek Road in Sea Level received the highest possible total exposure indicator (raw) score of 16 and was the only road or building to fall within the FEMA VE Zone (1% or greater chance of flooding plus storm waves). Three sections of HWY 70 (Davis, Stacy, and Williston) have the second highest total indicator score of 15.

Over one-third (38%) of roads have **moderate** exposure and 25% have **low** exposure (Table 12). The majority of the **low** exposure roads are located in Harkers Island or Atlantic (Figures 7 & 10). Only one road, School Drive in Atlantic, has **minimal** exposure. See Appendix tables A6-A12 for all Down East road exposure results.

Table 14. Down East roads with very high exposure, sorted by total indicator score.

Name	Community	Total Indicator (Raw) Score	Length (miles)
Cedar Creek Road	Sea Level	16	0.34
HWY 70 Davis	Davis	15	3.02
HWY 70 Stacy	Stacy	15	6.27
HWY 70 Williston	Williston	15	3.33
Oak Hammock Drive	Harkers Island	14	1.37
Crow Hill Road	Straits	13	2.97
Straits Haven Road	Straits	13	0.47
Cedar Island Road, HWY 12 (Old Cedar Island - Lola)	Cedar Island	13	6.24
Murphy Road	Davis	13	0.27
Shell Hill Road	Sea Level	13	1.44
Gillikin Road	Otway	12	1.27
Royal Road	Merrimon	12	1.16
Hancock Place	Smyrna	12	0.15
Firetower Road	Otway	11	1.24
Merrimon Road	Merrimon	11	9.21
Straits Point Road	Straits	11	0.56
Horseshoe Road	Davis	11	0.47
Star Church Road	Marshallberg	11	1.13
HWY 70 Sea Level	Sea Level	11	2.89
Nelson Neck Road	Sea Level	11	1.28
4 H Road	Merrimon	10	1.46
Community Road	Davis	10	0.80
Mollie Lewis Road	Davis	10	0.20
Roys Landing Road	Davis	10	0.08
Westmouth Bay Drive	Harkers Island	10	0.19
HWY 70 Smyrna	Smyrna	10	1.71
Stacy Loop Road	Stacy	10	1.15

Sensitivity Results

Over one-third (36%) of all assets analyzed have **very high** or **high** sensitivity to the evaluated coastal hazards (Table 15). Half have **moderate** sensitivity, and 14% have **low** sensitivity. Three buildings with **minimal** exposure were not analyzed for sensitivity. All sensitivity results are reported in Appendix B.

Table 15. Summary of Down East sensitivity results.

Assets	Very High		High		Moderate		Low		Total Analyzed	Excluded*
	#	%	#	%	#	%	#	%	#	#
Buildings	1	2%	27	42%	29	45%	7	11%	64	3
Bridges	0	0%	0	0%	10	71%	4	29%	14	0
All Assets	1	1%	27	35%	39	50%	11	14%	78	3

*Assets with minimal exposure are not evaluated for sensitivity

Only one asset, Sea Level Free Will Baptist Church, has **very high** sensitivity (Table 15). This church (which was flooded and is now abandoned) has the worst possible score (four) for all sensitivity indicators except construction type (Figure 13). Twenty-seven buildings have **high** sensitivity (Table 15), including 17 churches, three community centers, and four fire departments/stations (Merrimon, Marshallberg, Cedar Island, and Sea Level). Less than half (45%) of the buildings analyzed have **moderate** sensitivity, while 11% have **low** sensitivity. The buildings with the lowest total indicator (raw) score for sensitivity are Hunting Quarters Baptist Church, Lighthouse Chapel Church & School, and Grace Holiness Church. See Appendix tables B1-B4 for all Down East building sensitivity results.

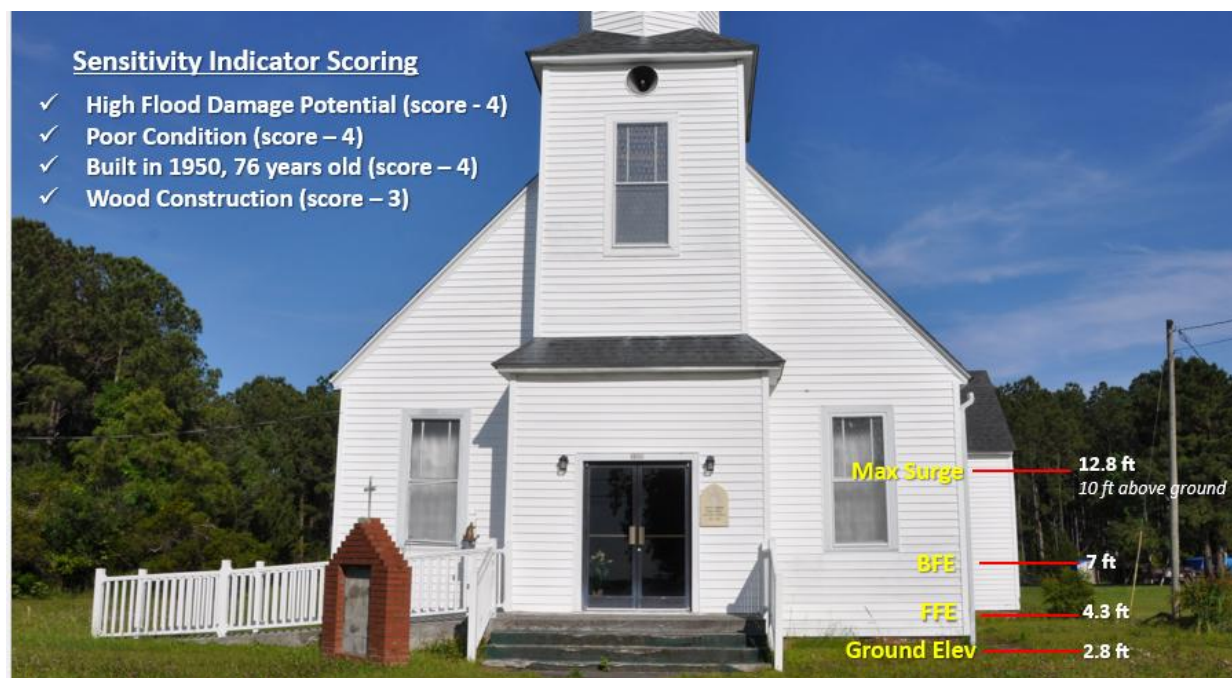


Figure 13. Sensitivity indicator scoring for Sea Level Free Will Baptist Church, the only asset evaluated with very high sensitivity. Also illustrated are the potential flood heights as predicted by the FEMA AE zone and category 3 storm surge. All measurements are in feet above NAVD88 unless otherwise noted. Illustration of flood heights on church exterior are estimates and not to scale.

None of the bridges included in this assessment have **very high** or **high** sensitivity (Table 15). The majority (71%) of the bridges have **moderate** sensitivity, and 29% have **low** sensitivity. Because bridges over water inherently have high exposure, they are commonly built resistant and have a lower sensitivity compared to other asset types. The two lowest sensitivity bridges (Earl C. Davis Memorial Bridge and Commissioner Jonathan Robinson Bridge) have high waterway adequacy (chance of overtopping deck is remote, slight chance of overtopping approaches), are less than 10 years old, are in good or better condition, and are stable relative to scour potential (Photos 1-2). See Appendix table B5 for all Down East bridge sensitivity results.



Vulnerability Results

Twenty assets analyzed (25%) have **very high** or **high** vulnerability to the evaluated coastal hazards (Table 16, Figures 14-19). Three buildings evaluated Down East have **very high** vulnerability. Gloucester Community Center and Original Free Will Baptist Church of Stacy have **very high** exposure (due to low elevation and proximity to the shoreline) and **high** sensitivity (Photos 3-4). Conversely, Sea Level Free Will Baptist Church has **high** exposure and **very high** sensitivity (primarily due to poor condition and age, see Figure 13).

Table 16. Summary of Down East vulnerability results.

Assets	Very High		High		Moderate		Low		Minimal		Total
	#	%	#	%	#	%	#	%	#	%	#
Buildings	3	4%	7	10%	34	51%	20	30%	3	4%	67
Bridges	0	0%	10	71%	4	29%	0	0%	0	0%	14
All Assets	3	4%	17	21%	38	47%	20	25%	3	4%	81



Figure 14. Overview of Down East study area (shaded) vulnerability results. Buildings are represented by circles and bridges by squares.



No bridges have **very high** vulnerability, but 10 of the 14 analyzed have **high** vulnerability, including Ward Creek Bridge, Oyster Creek Bridge, and Smyrna Creek Bridge. NCDOT (2025) estimates the replacement cost for these **high** vulnerability bridges at almost \$140 million (Table 17). The Monroe Gaskill Memorial Bridge (over Thorofare Bay in Cedar Island) and Daniel E. Taylor Memorial Bridge (over Salters Creek in Sea Level) have the highest replacement cost, at \$66 million and \$34 million respectively (Table 17).

Table 17. Down East bridges with high vulnerability, sorted by replacement cost (NCDOT 2025).

Name	Community	Route	Replacement Cost
Monroe Gaskill Memorial Bridge	Cedar Island	NC 12	\$66,311,618
Daniel E. Taylor Memorial Bridge	Sea Level	HWY 70	\$34,300,473
Oyster Creek Bridge	Davis	HWY 70	\$10,123,344
Ward Creek Bridge	Otway	HWY 70	\$10,123,344
Smyrna Creek Bridge	Davis	HWY 70 Williston	\$5,065,855
Williston Creek Bridge	Williston	HWY 70 Williston	\$4,762,208
Maria Creek Bridge	Stacy	HWY 70	\$4,743,749
Back Creek Bridge	Merrimon	Merrimon Road	\$1,880,918
Cullie Creek Bridge	Merrimon	Merrimon Road	\$1,256,904
West Bay Channel Bridge	Cedar Island	NC 12	\$1,255,624

Nearly half (47%) of the assets analyzed have **moderate** vulnerability, 25% have **low** vulnerability, and 4% have **minimal** vulnerability (Table 16, Figure 14-19). All but five **low** vulnerability assets are located in Atlantic and Harkers Island: Island Road Baptist Church in Straits, Cedar Island Pilgrim's Rest Free Will Baptist Church, Gloucester Post Office, Marshallberg Post Office, and Down East Middle School in Smyrna (Figures 16-19). The only assets with **minimal** vulnerability are located in Atlantic: Down East Fire Dept - Station 1, Atlantic Elementary School, and Atlantic United Methodist Church (Figure 19). These buildings are outside all evaluated exposure zones, as this area of Atlantic has relatively high elevations (over 15 feet above NAVD88; Figure 15). All Down East vulnerability results are reported in Appendix C.

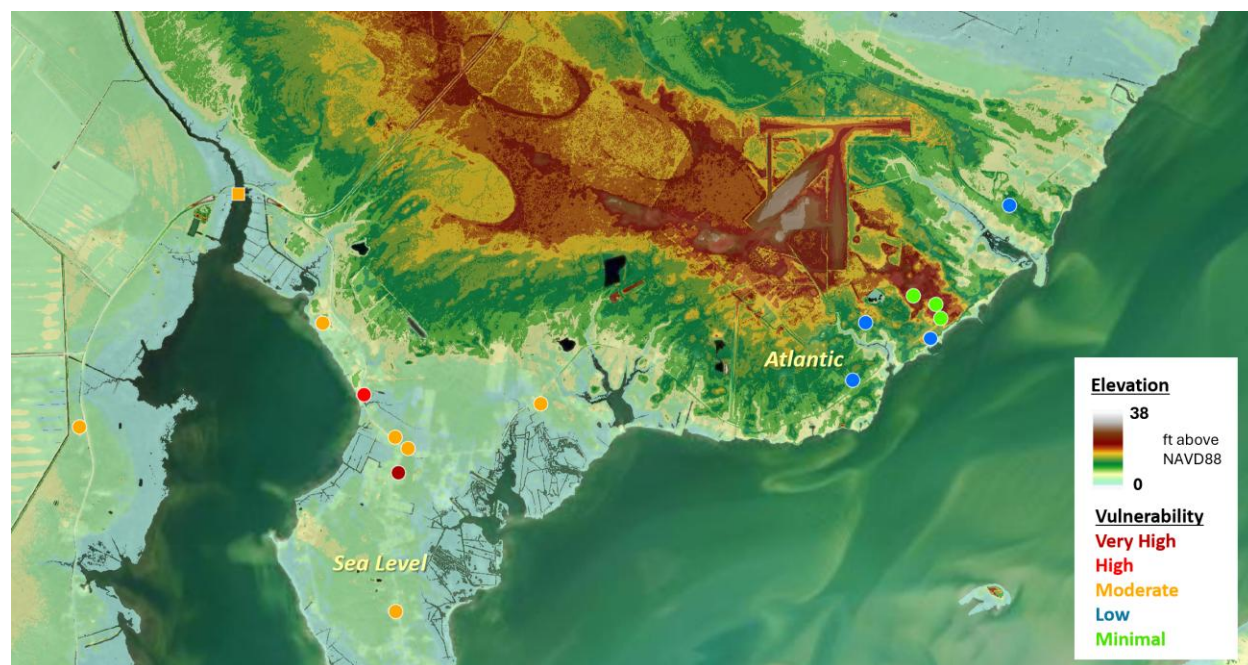


Figure 15. Digital elevation map (NGS 2020) and vulnerability results for Sea Level and Atlantic. Note the location of the three minimal vulnerability assets in the higher elevation portion of Atlantic.



Figure 16. Vulnerability results for Straits, Gloucester, Marshallberg, and Harkers Island. Buildings are represented by circles and bridges by squares. Select assets are labeled.

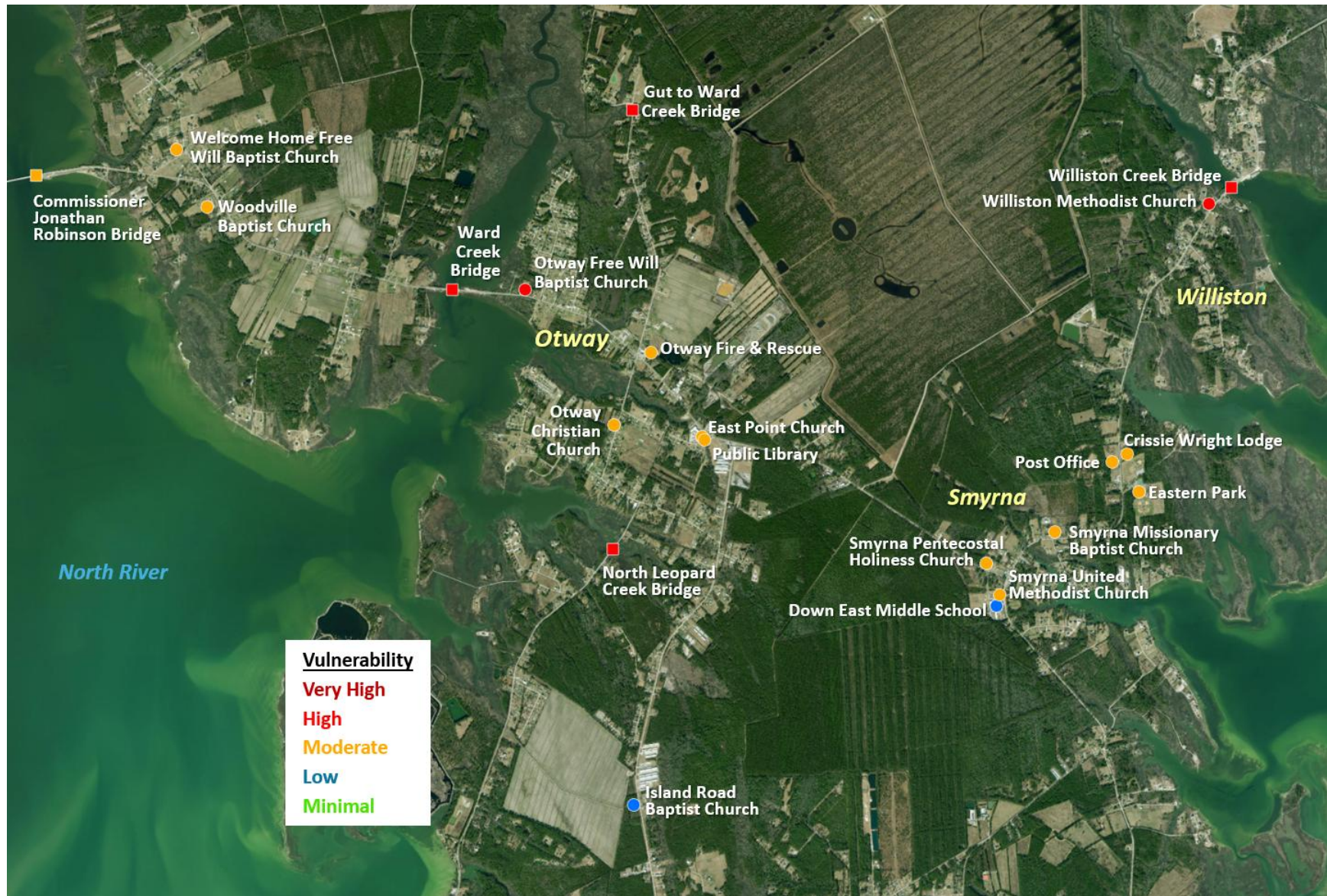


Figure 17. Vulnerability results for Otway, Smyrna, and Williston. Buildings are represented by circles and bridges by squares.



Figure 18. Vulnerability results for A) Davis and Stacy, B) Cedar Island, and C) Merrimon and South River. Buildings are represented by circles and bridges by squares.

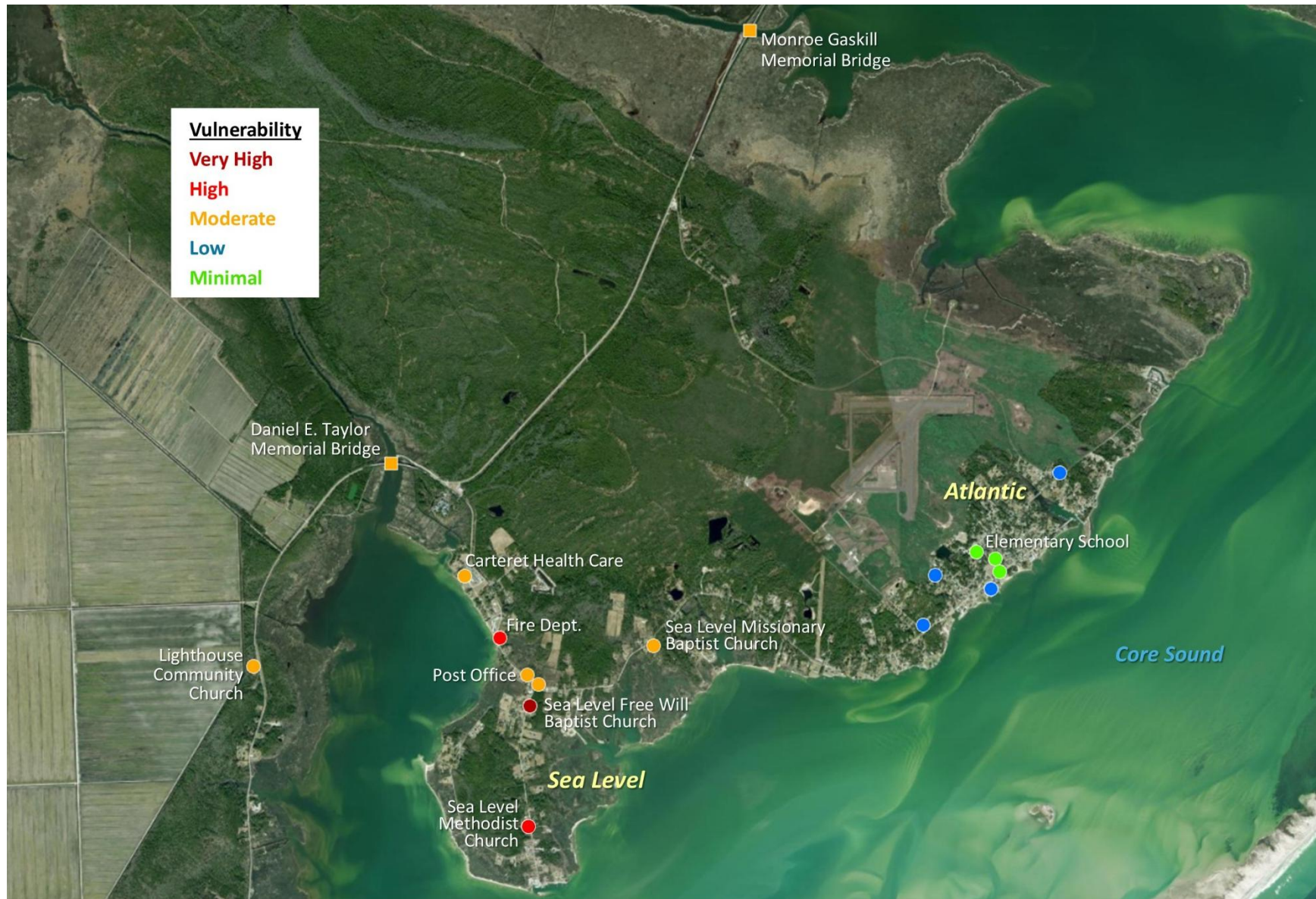


Figure 19. Vulnerability results for Sea Level and Atlantic. Buildings are represented by circles and bridges by squares. Select assets are labeled.

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Appendix A: Down East Exposure Results



Above: Ghost forest on Harkers Island (PSDS Photo)

Appendix Table A1. Down East exposure results for buildings in Atlantic and Beaufort, sorted by total score within each area.

Building Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Hunting Quarters BC	None	n/a	0	None	n/a	0	None	0	2	1	1	1	low
Atlantic Missionary BC	None	n/a	0	200	Yes	0	None	0	3	1	1	1	low
Atlantic Post Office	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Hunting Quart. Prim. BC	None	n/a	0	None	n/a	0	None	0	2	1	1	1	low
Atlantic Elementary	None	n/a	0	None	n/a	0	None	0	None	0	0	0	minimal
Atlantic UMC	None	n/a	0	None	n/a	0	None	0	None	0	0	0	minimal
Down East Fire Station 1	None	n/a	0	None	n/a	0	None	0	None	0	0	0	minimal
Otway Free Will BC	AE	8	3	None	n/a	0	3	1	10	4	8	3	high
Merrimon UMC	AE	6	2	None	n/a	0	None	0	10	4	6	2	moderate
Otway Christian Church	AE	8	3	None	n/a	0	None	0	7	3	6	2	moderate
Otway Fire & Rescue	AE	8	3	None	n/a	0	None	0	8	3	6	2	moderate
Reels Chap AME Zion Ch.	AE	6	2	None	n/a	0	None	0	10	4	6	2	moderate
Welcome Home FW BC	AE	8	3	None	n/a	0	None	0	6	2	5	2	moderate
Woodville Baptist Church	AE	9	3	None	n/a	0	None	0	5	2	5	2	moderate
Edwards Chapel FW BC	None	n/a	0	None	n/a	0	None	0	10	4	4	2	moderate
South River Merrimon Fire	None	n/a	0	None	n/a	0	None	0	10	4	4	2	moderate
Straits UMC	None	n/a	0	None	n/a	0	None	0	7	3	3	1	low
Carteret Co. Public Library	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low
East Point Church	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low
Island Road Baptist Church	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A2. Down East exposure results for buildings in Cedar Island, Davis, Gloucester, and Sea Level, sorted by total score within each area.

Building Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Cedar Island UMC	AE	4	1	None	n/a	0	3	1	8	3	5	2	moderate
Cedar Island Post Office	None	n/a	0	None	n/a	0	None	0	7	3	3	1	low
Cedar Island Fire Dept	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Cedar Is. Pilg. Rest FW BC	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Davis Free Will BC	AE	7	3	None	n/a	0	2.5	2	9	4	9	3	high
Davis First Baptist Church	AE	7	3	None	n/a	0	3	1	9	4	8	3	high
Davis Original Free Will BC	AE	6	2	None	n/a	0	2.5	2	9	4	8	3	high
Davis Post Office	AE	7	3	None	n/a	0	None	0	8	3	6	2	moderate
Down East Fire Station 3	AE	7	3	None	n/a	0	None	0	8	3	6	2	moderate
Down East Scout Center	AE	7	3	None	n/a	0	None	0	6	2	5	2	moderate
Gloucester Comm. Center	AE	7	3	150	No	2	2.5	2	9	4	11	4	very high
Marshallberg Fire Station 2	None	n/a	0	None	n/a	0	None	0	7	3	3	1	low
Gloucester Post Office	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Down East Fire Station 2	AE	7	3	150	Yes	1	None	0	9	4	8	3	high
Sea Level Free Will BC	AE	7	3	None	n/a	0	3	1	10	4	8	3	high
Sea Level Methodist Church	AE	7	3	None	n/a	0	3	1	10	4	8	3	high
Sea Level Missionary BC	AE	7	3	None	n/a	0	None	0	10	4	7	2	moderate
Sea Level Primitive BC	AE	7	3	None	n/a	0	None	0	10	4	7	2	moderate
Carteret Health Care - SL	AE	7	3	None	n/a	0	None	0	7	3	6	2	moderate
Sea Level Post Office	AE	7	3	None	n/a	0	None	0	7	3	6	2	moderate

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A3. Down East exposure results for buildings in Harkers Island, Marshallberg, Stacy, and Williston, sorted by total score within each area.

Building Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Huggins Memorial BC	AE	6	2	None	n/a	0	None	0	8	3	5	2	moderate
Core So. Waterfowl Museum	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Free Grace Wesleyan Church	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Harkers Island Elementary	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low
Harkers Island Fire & Rescue	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Harkers Island MD	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Harkers Is. Pent. Hol. Church	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Harkers Island Post Office	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Refuge Fellow. Church of HI	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low
Grace Holiness Church	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
LH Chapel Church & School	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Church of JC of LDS	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Marshallberg Missionary BC	AE	6	2	None	n/a	0	None	0	7	3	5	2	moderate
Marshallberg Fire Dept	AE	6	2	None	n/a	0	None	0	7	3	5	2	moderate
Trinity UMC	AE	5	1	None	n/a	0	None	0	7	3	4	2	moderate
Marshallberg Post Office	AE	5	1	None	n/a	0	None	0	6	2	3	1	low
Original FW BC of Stacy	AE	7	3	50	Yes	3	2.5	2	10	4	12	4	very high
Stacy Methodist Church	AE	7	3	150	No	2	None	0	9	4	9	3	high
Lighthouse Comm. Church	AE	7	3	None	n/a	0	None	0	8	3	6	2	moderate
Williston Methodist Church	AE	7	3	None	n/a	0	3	1	9	4	8	3	high

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A4. Down East exposure results for buildings in Smyrna, sorted by total score.

Building Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Crissie Wright Lodge	AE	7	3	None	n/a	0	None	0	8	3	6	2	moderate
Eastern Park - Maint. & Conc.	AE	6	2	None	n/a	0	None	0	7	3	5	2	moderate
Smyrna Missionary BC	AE	6	2	None	n/a	0	None	0	8	3	5	2	moderate
Smyrna Pent. Holiness Ch.	AE	6	2	None	n/a	0	None	0	7	3	5	2	moderate
Smyrna UMC	AE	6	2	None	n/a	0	None	0	7	3	5	2	moderate
Smyrna Post Office	AE	6	2	None	n/a	0	None	0	6	2	4	2	moderate
Down East Middle School	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A5. Down East exposure results for bridges, sorted by total score.

Bridge Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Commissioner Jonathan Robinson Bridge (North River)	VE	11	4	50	7	4	1.5	4	9	4	16	4	very high
Ward Creek Bridge	VE	10	4	50	7	4	1.5	4	9	4	16	4	very high
Oyster Creek Bridge	VE	9	4	50	7	4	1.5	4	9	4	16	4	very high
Smyrna Creek Bridge	VE	8	4	50	7	4	1.5	4	10	4	16	4	very high
Back Creek Bridge	AE	8	3	50	7	4	1.5	4	13	4	15	4	very high
Gut to Ward Creek Bridge	AE	8	3	50	7	4	1.5	4	9	4	15	4	very high
Earl C. Davis Memorial Bridge	VE	8	4	50	9	3	1.5	4	9	4	15	4	very high
Cullie Creek Bridge	AE	7	3	50	7	4	1.5	4	13	4	15	4	very high
Daniel E. Taylor Memorial Bridge (Salters Creek)	AE	7	3	50	7	4	1.5	4	12	4	15	4	very high
Maria Creek Bridge	VE	9	4	50	8	3	1.5	4	10	4	15	4	very high
Williston Creek Bridge	VE	9	4	50	8	3	1.5	4	9	4	15	4	very high
North Leopard Creek Bridge	AE	8	3	50	7	4	1.5	4	9	4	15	4	very high
Monroe Gaskill Memorial Bridge (Thorofare Bay)	AE	5	1	50	7	4	1.5	4	10	4	13	4	very high
West Bay Channel Bridge	AE	5	1	50	7	4	1.5	4	10	4	13	4	very high

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A6. Down East exposure results for roads in Atlantic and Cedar Island, sorted by total score within each area.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Shell Road (east segment)	AE	6	2	50	No	4	3	1	5	2	9	3	high
Seashore Drive	AE	6	2	50	Yes	3	None	0	8	3	8	3	high
Morris Marina Road	AE	5	1	50	Yes	3	None	0	6	2	6	2	moderate
Core Sound Loop Road	None	n/a	0	50	Yes	3	None	0	4	2	5	2	moderate
Houseboat Inn Road	AE	6	2	None	n/a	0	None	0	6	2	4	2	moderate
Morris Drive	AE	5	1	None	n/a	0	None	0	5	2	3	1	low
Cedar Island Road, HWY 12 (HWY 70 - Old Cedar Is. Rd)	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Fulcher Drive	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Lee Daniels Drive	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Old Cedar Island Road	None	n/a	0	None	n/a	0	None	0	2	1	1	1	low
Salter Road	None	n/a	0	None	n/a	0	None	0	1	1	1	1	low
Shell Road (west segment)	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Smith Drive	None	n/a	0	None	n/a	0	None	0	2	1	1	1	low
School Drive	None	n/a	0	None	n/a	0	None	0	None	0	0	0	minimal
Cedar Island Road, HWY 12 (Old Cedar Is Rd - Lola Rd)	AE	5	1	50	No	4	1.5	4	11	4	13	4	very high
Cedar Island Road, HWY 12 (Lola Rd - end)	AE	4	1	100	Yes	2	2.5	2	7	3	8	3	high
Ditch Path Road	AE	4	1	None	n/a	0	2.5	2	9	4	7	2	moderate
Landing Road	AE	4	1	150	No	2	None	0	8	3	6	2	moderate
Lola Road	None	n/a	0	50	Yes	3	None	0	3	1	4	2	moderate

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A7. Down East exposure results for roads in Beaufort (A), sorted by total score.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Crow Hill Road	AE	7	3	50	No	4	2.5	2	10	4	13	4	very high
Straits Haven Road	AE	7	3	50	Yes	3	2	3	9	4	13	4	very high
Gillikin Road	AE	8	3	50	No	4	2.5	2	8	3	12	4	very high
Royal Road	AE	7	3	50	No	4	3	1	13	4	12	4	very high
Firetower Road	AE	8	3	50	No	4	3	1	8	3	11	4	very high
Merrimon Road	AE	7	3	50	No	4	None	0	12	4	11	4	very high
Straits Point Road	AE	7	3	200	No	1	2	3	10	4	11	4	very high
4 H Road	AE	6	2	100	No	3	3	1	12	4	10	4	very high
Ashley Lane	AE	7	3	None	n/a	0	2.5	2	9	4	9	3	high
Harbour Point Road	AE	7	3	200	Yes	0	2.5	2	9	4	9	3	high
Joan Court	AE	7	3	None	n/a	0	2.5	2	9	4	9	3	high
Pelican Harbor Road	AE	8	3	None	n/a	0	2.5	2	9	4	9	3	high
South River Road	AE	6	2	100	No	3	None	0	9	4	9	3	high
Channel Rock Road	AE	8	3	None	n/a	0	3	1	9	4	8	3	high
Harkers Island Road (mainland)	AE	7	3	150	Yes	1	3	1	8	3	8	3	high
Plantation Street	AE	8	3	None	n/a	0	3	1	10	4	8	3	high
Straits Drive	AE	7	3	None	n/a	0	3	1	9	4	8	3	high
Cummings Creek Road	AE	7	3	None	n/a	0	None	0	11	4	7	2	moderate
Hidden Harbor Lane	AE	7	3	None	n/a	0	None	0	12	4	7	2	moderate
HWY 70 Bettie	AE	8	3	200	No	1	None	0	8	3	7	2	moderate
HWY 70 Otway	AE	8	3	200	No	1	None	0	8	3	7	2	moderate
Jonaquins Creek Road	AE	7	3	None	n/a	0	None	0	11	4	7	2	moderate
Jonaquins Drive	AE	7	3	None	n/a	0	None	0	11	4	7	2	moderate

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A8. Down East exposure results for roads in Beaufort (B), sorted by total score.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Sandy Huss Drive	AE	7	3	None	n/a	0	None	0	12	4	7	2	moderate
Straits Road	AE	6	2	None	n/a	0	2.5	2	7	3	7	2	moderate
Thurman Road	AE	7	3	None	n/a	0	None	0	13	4	7	2	moderate
Wackena Way	AE	7	3	None	n/a	0	None	0	12	4	7	2	moderate
Amos Gillikin Road	AE	8	3	None	n/a	0	None	0	8	3	6	2	moderate
Arthur Road	AE	8	3	None	n/a	0	None	0	8	3	6	2	moderate
Big Creek Road	AE	6	2	None	n/a	0	None	0	11	4	6	2	moderate
Golden Farm Road	AE	8	3	None	n/a	0	None	0	7	3	6	2	moderate
Goose Bay Drive	AE	7	3	None	n/a	0	None	0	7	3	6	2	moderate
Gosling Lane	AE	7	3	None	n/a	0	None	0	7	3	6	2	moderate
Harbor Lane	AE	6	2	None	n/a	0	None	0	12	4	6	2	moderate
Old River Road	AE	8	3	None	n/a	0	None	0	7	3	6	2	moderate
Otway Farm Road	AE	8	3	None	n/a	0	None	0	8	3	6	2	moderate
Pamlico Parkway	AE	6	2	200	Yes	0	None	0	10	4	6	2	moderate
Silver Dollar Road	AE	6	2	None	n/a	0	None	0	11	4	6	2	moderate
Sportsman Lane	AE	6	2	None	n/a	0	None	0	12	4	6	2	moderate
Village Drive	AE	6	2	None	n/a	0	None	0	11	4	6	2	moderate
Anchor Road	AE	5	1	None	n/a	0	None	0	9	4	5	2	moderate
South River Drive	AE	5	1	None	n/a	0	None	0	11	4	5	2	moderate
Whitehurst Drive	AE	6	2	200	Yes	0	None	0	8	3	5	2	moderate
Beach Road	AE	5	1	None	n/a	0	None	0	8	3	4	2	moderate
Deer Trail	None	n/a	0	None	n/a	0	None	0	9	4	4	2	moderate
HWY 70 Otway (east of Harkers Island Road)	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A9. Down East exposure results for roads in Davis, Gloucester, Stacy, and Williston, sorted by total score within each area.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
HWY 70 Davis	AE	7	3	50	No	4	1.5	4	10	4	15	4	very high
Murphy Road	AE	6	2	50	No	4	2	3	10	4	13	4	very high
Horseshoe Road	AE	7	3	50	Yes	3	3	1	9	4	11	4	very high
Community Road	AE	7	3	None	n/a	0	2	3	9	4	10	4	very high
Mollie Lewis Road	AE	7	3	None	n/a	0	2	3	10	4	10	4	very high
Roys Landing Road	AE	7	3	200	Yes	0	2	3	10	4	10	4	very high
Croaker Street	AE	7	3	None	n/a	0	2.5	2	9	4	9	3	high
Willis Road	AE	7	3	None	n/a	0	3	1	9	4	8	3	high
Army Camp Road	AE	7	3	None	n/a	0	None	0	8	3	6	2	moderate
Alfred Drive	AE	7	3	None	n/a	0	3	1	9	4	8	3	high
Ferry Dock Road	AE	6	2	100	No	3	None	0	8	3	8	3	high
Pigott Road	AE	5	1	100	Yes	2	3	1	7	3	7	2	moderate
Chadwick Drive	AE	6	2	None	n/a	0	3	1	7	3	6	2	moderate
Sleepy Point Road	AE	5	1	None	n/a	0	None	0	7	3	4	2	moderate
Piper Lane	None	n/a	0	200	No	1	None	0	6	2	3	1	low
HWY 70 Stacy	AE	7	3	50	No	4	1.5	4	11	4	15	4	very high
Stacy Loop Road	AE	7	3	None	n/a	0	2	3	10	4	10	4	very high
HWY 70 Williston	AE	7	3	50	No	4	1.5	4	11	4	15	4	very high
Old Cart Road	AE	7	3	None	n/a	0	None	0	9	4	7	2	moderate
Old Nassau Road	AE	7	3	None	n/a	0	None	0	9	4	7	2	moderate

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A10. Down East exposure results for roads in Harkers Island (A), sorted by total score within each area.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Oak Hammock Drive	AE	7	3	50	Yes	3	1.5	4	10	4	14	4	very high
Westmouth Bay Drive	AE	6	2	150	Yes	1	2	3	9	4	10	4	very high
Jennifer Drive	AE	6	2	150	Yes	1	2.5	2	9	4	9	3	high
Island Road	AE	6	2	100	Yes	2	3	1	6	2	7	2	moderate
Branch Drive	AE	6	2	150	Yes	1	None	0	7	3	6	2	moderate
Bayview Drive - West	AE	5	1	150	Yes	1	None	0	7	3	5	2	moderate
Canal Drive	AE	6	2	None	n/a	0	None	0	5	2	4	2	moderate
Old Ferry Dock Road	AE	5	1	None	n/a	0	None	0	5	2	3	1	low
Bayview Drive - East	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Diamond City Drive	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
East Drive	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Fulford Drive	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low
Guthrie Drive	None	n/a	0	None	n/a	0	None	0	5	2	2	1	low
Johnson Road	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Mary Ella Road	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Middle Street	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Mullens Drive	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Nelson Street	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Pigiott Street	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Shackleford Drive	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Sheldon Drive	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low
Stewart Street	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A11. Down East exposure results for roads in Harkers Island (B) and Marshallberg, sorted by total score within each area.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Yeomans Drive	None	n/a	0	None	n/a	0	None	0	6	2	2	1	low
Barbee Street	None	n/a	0	None	n/a	0	None	0	1	1	1	1	low
Cape Lookout Drive	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Carteret Street	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Clara Crossroads	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Davis Street	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Lewis Street	None	n/a	0	None	n/a	0	None	0	2	1	1	1	low
Porter Crossroads	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Willis Drive	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Willow Street	None	n/a	0	None	n/a	0	None	0	3	1	1	1	low
Star Church Road	AE	6	2	50	No	4	2.5	2	8	3	11	4	very high
Goose Pond Road	AE	6	2	None	n/a	0	2	3	9	4	9	3	high
Marshallberg Road	AE	6	2	100	No	3	None	0	8	3	8	3	high
Through the Woods Road	AE	6	2	None	n/a	0	2.5	2	9	4	8	3	high
Brown Street	AE	6	2	None	n/a	0	2.5	2	7	3	7	2	moderate
Polly Hill Road	AE	6	2	None	n/a	0	2.5	2	8	3	7	2	moderate
Moore Lane	AE	5	1	None	n/a	0	2.5	2	8	3	6	2	moderate
Gillikin Drive	AE	5	1	None	n/a	0	3	1	8	3	5	2	moderate
Ray Davis Road	AE	5	1	None	n/a	0	3	1	8	3	5	2	moderate
Lucille Lewis	AE	5	1	None	n/a	0	None	0	7	3	4	2	moderate
Polly Way Lane	AE	5	1	None	n/a	0	None	0	8	3	4	2	moderate
Harbor Road	AE	5	1	None	n/a	0	None	0	6	2	3	1	low
Second Street	None	n/a	0	None	n/a	0	None	0	4	2	2	1	low

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix Table A12. Down East exposure results for roads in Sea Level and Smyrna, sorted by total score within each area.

Road Name	FEMA Flooding			Coastal Proximity (CP)			Sea-Level Rise (SLR)		Storm Surge Cat 3		Total Score ⁴	Final Exposure	
	Zone	BFE	Score	SB ¹	PE ²	Score	Zone	Score	Max Ht ³	Score		Score	Rank
Cedar Creek Road	VE	8	4	50	No	4	1.5	4	11	4	16	4	very high
Shell Hill Road	AE	7	3	100	No	3	2	3	10	4	13	4	very high
HWY 70 Sea Level	AE	7	3	50	No	4	None	0	10	4	11	4	very high
Nelson Neck Road	AE	7	3	50	Yes	3	3	1	10	4	11	4	very high
Styron Creek Road	AE	7	3	None	n/a	0	3	1	10	4	8	3	high
East Street	AE	7	3	None	n/a	0	None	0	8	3	6	2	moderate
Grigsby Street	AE	6	2	None	n/a	0	None	0	8	3	5	2	moderate
Hancock Place	AE	6	2	50	No	4	2.5	2	9	4	12	4	very high
HWY 70 Smyrna	AE	6	2	50	No	4	3	1	8	3	10	4	very high
Hill Road	AE	7	3	None	n/a	0	2.5	2	9	4	9	3	high
Lige Piner Road	AE	7	3	None	n/a	0	2.5	2	9	4	9	3	high
Old Carteret Road	AE	6	2	None	n/a	0	2	3	9	4	9	3	high
Old Post Office Road / Possum Trot Road	AE	6	2	200	No	1	2.5	2	9	4	9	3	high
Bay Drive	AE	6	2	None	n/a	0	2.5	2	9	4	8	3	high
East City Road	AE	6	2	None	n/a	0	2.5	2	9	4	8	3	high
Jumping Run Court	AE	6	2	None	n/a	0	3	1	9	4	7	2	moderate
Middens Creek Drive	AE	6	2	None	n/a	0	None	0	9	4	6	2	moderate
Whitehurst Road	AE	6	2	None	n/a	0	None	0	7	3	5	2	moderate

¹ Shoreline Buffer Zone (ft), ² Protective Engineering, ³ Max Surge Height (ft), ⁴ FEMA Score + CP Score + SLR Score + Surge Score

Appendix B: Down East Sensitivity Results



Above: Merrimon Methodist Church (PSDS Photo)

Appendix Table B1. Down East sensitivity results for buildings in Atlantic and Beaufort, sorted by total score within each area.

Building Name	Flood Damage Potential (FDP)			Overall Condition (OC)			Storm Resistance (SR)		Total Score ³	Final Sensitivity	
	BF Score ¹	SF Score ²	Score	Age Score	Cond. Score	Score	Construction	Score		Score	Rank
Hunting Qtrs. Primitive BC	n/a	1	1.0	4	1	2.5	Wood	3	6.5	2	moderate
Atlantic Missionary BC	n/a	1	1.0	3	1	2.0	Brick	2	5	1	low
Atlantic Post Office	n/a	1	1.0	3	1	2.0	Brick	2	5	1	low
Hunting Quarters BC	n/a	1	1.0	2	1	1.5	Block	1	3.5	1	low
Atlantic Elementary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Atlantic UMC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Down East Fire Station 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
S. River Merrimon Fire	n/a	4	4.0	2	1	1.5	Block + Metal	4	9.5	3	high
Otway Free Will BC	4	4	4.0	3	2	2.5	Brick	2	8.5	3	high
Edwards Chapel FW BC	n/a	4	4.0	3	1	2.0	Brick	2	8	3	high
Woodville Baptist Church	3	2	2.5	1	2	1.5	Metal	4	8	3	high
Carteret Co. Public Library	n/a	2	2.0	1	2	1.5	Metal	4	7.5	3	high
East Point Church	n/a	2	2.0	1	2	1.5	Metal	4	7.5	3	high
Straits UMC	n/a	2	2.0	4	1	2.5	Wood	3	7.5	3	high
Island Road BC	n/a	2	2.0	3	2	2.5	Brick	2	6.5	2	moderate
Merrimon UMC	1	3	2.0	1	2	1.5	Wood	3	6.5	2	moderate
Otway Fire & Rescue	4	3	3.5	2	2	2.0	Block	1	6.5	2	moderate
Reels Chapel AME Zion	2	4	3.0	3	2	2.5	Block	1	6.5	2	moderate
Otway Christian Church	3	2	2.5	1	2	1.5	Brick	2	6	2	moderate
Welcome Home FW BC	2	2	2.0	2	2	2.0	Brick	2	6	2	moderate

¹ Base Flood Score, ² Surge Flood Score, ³ FDP Score + OC Score + SR Score

Appendix Table B2. Down East sensitivity results for buildings in Cedar Island, Davis, Gloucester, and Sea Level, sorted by total score within each area.

Building Name	Flood Damage Potential (FDP)			Overall Condition (OC)			Storm Resistance (SR)		Total Score ³	Final Sensitivity	
	BF Score ¹	SF Score ²	Score	Age Score	Cond. Score	Score	Construction	Score		Score	Rank
Cedar Island Post Office	n/a	3	3.0	3	1	2.0	Wood	3	8	3	high
Cedar Island UMC	2	2	2.0	4	2	3.0	Wood	3	8	3	high
Cedar Island Fire Dept	n/a	2	2.0	3	2	2.5	Wood	3	7.5	3	high
Cedar Is. Pilg. Rest FW BC	n/a	1	1.0	4	1	2.5	Wood	3	6.5	2	moderate
Davis Post Office	4	3	3.5	3	4	3.5	Brick	2	9	3	high
Davis Original FW BC	4	3	3.5	3	3	3.0	Brick	2	8.5	3	high
Davis First Baptist Church	3	3	3.0	4	1	2.5	Brick	2	7.5	3	high
Down East Scout Center	3	2	2.5	1	1	1.0	Metal	4	7.5	3	high
Davis Free Will BC	2	2	2.0	4	1	2.5	Brick	2	6.5	2	moderate
Down East Fire Station 3	4	3	3.5	2	2	2.0	Block	1	6.5	2	moderate
Gloucester Comm. Center	4	4	4.0	2	3	2.5	Wood	3	9.5	3	high
Marshallberg Fire Dept 2	n/a	3	3.0	1	2	1.5	Metal	4	8.5	3	high
Gloucester Post Office	n/a	2	2.0	1	2	1.5	Wood	3	6.5	2	moderate
Sea Level Free Will BC	4	4	4.0	4	4	4.0	Wood	3	11	4	very high
Sea Level MC	4	4	4.0	4	2	3.0	Brick	2	9	3	high
Sea Level Primitive BC	4	4	4.0	3	4	3.5	Block	1	8.5	3	high
Down East Fire Station 2	4	4	4.0	2	2	2.0	Brick	2	8	3	high
Sea Level Missionary BC	4	4	4.0	3	2	2.5	Block	1	7.5	3	high
Carteret Health Care - SL	3	3	3.0	2	2	2.0	Brick	2	7	2	moderate
Sea Level Post Office	3	3	3.0	2	2	2.0	Brick	2	7	2	moderate

¹ Base Flood Score, ² Surge Flood Score, ³ FDP Score + OC Score + SR Score

Appendix Table B3. Down East sensitivity results for buildings in Harkers Island, Marshallberg, Stacy, and Williston, sorted by total score within each area.

Building Name	Flood Damage Potential (FDP)			Overall Condition (OC)			Storm Resistance (SR)		Total Score ³	Final Sensitivity	
	BF Score ¹	SF Score ²	Score	Age Score	Cond. Score	Score	Construction	Score		Score	Rank
Free Grace Wesleyan Ch.	n/a	2	2.0	1	1	1.0	Metal	4	7	2	moderate
Harkers Island Post Office	n/a	2	2.0	3	3	3.0	Brick	2	7	2	moderate
Huggins Memorial BC	3	3	3.0	3	1	2.0	Brick	2	7	2	moderate
Harkers Island Elementary	n/a	2	2.0	3	2	2.5	Brick	2	6.5	2	moderate
Harkers Island Fire	n/a	2	2.0	3	2	2.5	Brick	2	6.5	2	moderate
Core So. Waterfowl Mus.	n/a	2	2.0	1	1	1.0	Wood	3	6	2	moderate
Refuge Fellow. Ch. of HI	n/a	2	2.0	3	1	2.0	Brick	2	6	2	moderate
Harkers Island MC	n/a	1	1.0	4	1	2.5	Brick	2	5.5	2	moderate
HI Pentecostal Hol. Ch.	n/a	1	1.0	3	1	2.0	Brick	2	5	1	low
Church of JC of LDS	n/a	1	1.0	3	1	2.0	Brick	2	5	1	low
Grace Holiness Church	n/a	1	1.0	2	1	1.5	Brick	2	4.5	1	low
LH Chapel Ch. & School	n/a	1	1.0	2	2	2.0	Block	1	4	1	low
Marshallberg Miss. BC	3	3	3.0	4	1	2.5	Brick	2	7.5	3	high
Marshallberg Fire Dept	3	3	3.0	2	2	2.0	Brick	2	7	2	moderate
Marshallberg Post Office	1	2	1.5	2	2	2.0	Modular	3	6.5	2	moderate
Trinity UMC	2	2	2.0	2	1	1.5	Brick	2	5.5	2	moderate
Original FW BC of Stacy	4	4	4.0	4	1	2.5	Brick	2	8.5	3	high
Stacy Methodist Church	4	4	4.0	3	1	2.0	Brick	2	8	3	high
Lighthouse Comm. Church	3	3	3.0	2	2	2.0	Block	1	6	2	moderate
Williston Methodist Ch.	3	3	3.0	4	1	2.5	Wood	3	8.5	3	high

¹ Base Flood Score, ² Surge Flood Score, ³ FDP Score + OC Score + SR Score

Appendix Table B4. Down East sensitivity results for buildings in Smyrna, sorted by total score.

Building Name	Flood Damage Potential (FDP)			Overall Condition (OC)			Storm Resistance (SR)		Total Score ³	Final Sensitivity	
	BF Score ¹	SF Score ²	Score	Age Score	Cond. Score	Score	Construction	Score		Score	Rank
Smyrna Missionary BC	2	3	2.5	4	1	2.5	Wood	3	8	3	high
Crissie Wright Lodge	3	3	3.0	2	3	2.5	Brick	2	7.5	3	high
Smyrna UMC	2	2	2.0	4	1	2.5	Wood	3	7.5	3	high
Smyrna Pent. Holi. Church	2	3	2.5	3	1	2.0	Brick	2	6.5	2	moderate
Smyrna Post Office	2	2	2.0	1	2	1.5	Modular	3	6.5	2	moderate
Down East Middle School	n/a	2	2.0	3	1	2.0	Brick	2	6	2	moderate
Eastern Park - Maint. & Concessions	2	3	2.5	1	3	2.0	Block	1	5.5	2	moderate

¹ Base Flood Score, ² Surge Flood Score, ³ FDP Score + OC Score + SR Score

Appendix Table B5. Down East sensitivity results for bridges, sorted by total score.

Bridge Name	Flood Damage Pot (FDP)		Age		Condition				Scour		Total Score ⁵	Final Exposure	
	WWA ¹	Score	Age	Score	Deck	Super ²	Sub ³	Score	#113 ⁴	Score		Score	Rank
West Bay Channel Bridge	7	2	34	2	3	3	3	3	8	2	9	2	moderate
Oyster Creek Bridge	7	2	48	2	3	3	3	3	8	2	9	2	moderate
Smyrna Creek Bridge	8	1	48	2	3	3	3	3	5	3	9	2	moderate
Maria Creek Bridge	8	1	49	2	3	3	3	3	5	3	9	2	moderate
Ward Creek Bridge	7	2	48	2	3	3	2	3	8	2	9	2	moderate
Back Creek Bridge	7	2	28	2	2	2	3	2	8	2	8	2	moderate
Cullie Creek Bridge	7	2	28	2	2	2	3	2	8	2	8	2	moderate
Monroe Gaskill Memorial Bridge (Thorofare Bay)	8	1	30	2	3	3	3	3	8	2	8	2	moderate
Daniel E. Taylor Memorial Bridge (Salters Creek)	8	1	43	2	3	3	3	3	8	2	8	2	moderate
Williston Creek Bridge	8	1	49	2	3	3	3	3	8	2	8	2	moderate
Gut to Ward Creek Bridge	7	2	23	1	2	2	2	2	8	2	7	1	low
North Leopard Creek Bridge	7	2	23	1	2	2	2	2	8	2	7	1	low
Commissioner Jonathan Robinson Bridge (North River)	8	1	6	1	2	2	2	2	8	2	6	1	low
Earl C. Davis Memorial Bridge	9	1	2	1	1	1	1	1	8	2	5	1	low

¹ Waterway Adequacy , ² Superstructure, ⁴ Substructure, ⁴ FWA Item 113, ⁵ FDP Score + Age Score + Condition Score + Scour Score

Appendix C: Down East Vulnerability Results



Above: Core Sound Waterfowl Museum (PSDS Photo)

Appendix Table C1. Down East vulnerability results for buildings in Atlantic, Beaufort, Cedar Island, Davis, and Gloucester, sorted by total score within each area.

Name	Exposure Score	Sensitivity Score	Raw Score	Vulnerability Score	Vulnerability Rank
Hunting Quarters Primitive BC	1	2	3	1	low
Hunting Quarters Baptist Church	1	1	2	1	low
Atlantic Missionary Baptist Church	1	1	2	1	low
Atlantic Post Office	1	1	2	1	low
Atlantic Elementary School	0	n/a	0	0	minimal
Atlantic United Methodist Church	0	n/a	0	0	minimal
Down East Fire Station 1	0	n/a	0	0	minimal
Otway Free Will Baptist Church	3	3	6	3	high
Edwards Chapel Freewill BC	2	3	5	2	moderate
South River Merrimon Fire & Rescue	2	3	5	2	moderate
Woodville Baptist Church	2	3	5	2	moderate
Carteret County Public Library	1	3	4	2	moderate
East Point Church	1	3	4	2	moderate
Merrimon United Methodist Church	2	2	4	2	moderate
Otway Christian Church	2	2	4	2	moderate
Otway Fire & Rescue	2	2	4	2	moderate
Reels Chapel AME Zion Church	2	2	4	2	moderate
Straits United Methodist Church	1	3	4	2	moderate
Welcome Home Free Will BC	2	2	4	2	moderate
Island Road Baptist Church	1	2	3	1	low
Cedar Island United Methodist Church	2	3	5	2	moderate
Cedar Island Fire Dept	1	3	4	2	moderate
Cedar Island Post Office	1	3	4	2	moderate
Cedar Island Pilgrim's Rest FW BC	1	2	3	1	low
Davis First Baptist Church	3	3	6	3	high
Davis Original Free Will Baptist Church	3	3	6	3	high
Davis Free Will Baptist Church	3	2	5	2	moderate
Davis Post Office	2	3	5	2	moderate
Down East Scout Center	2	3	5	2	moderate
Down East Fire Station 3	2	2	4	2	moderate
Gloucester Community Center	4	3	7	4	very high
Marshallberg Fire Dept - 2	1	3	4	2	moderate
Gloucester Post Office	1	2	3	1	low

Appendix Table C2. Down East vulnerability results for buildings in Harkers Island, Marshallberg, Sea Level, Smyrna, Stacy, and Williston, sorted by total score within each area.

Name	Exposure Score	Sensitivity Score	Raw Score	Vulnerability Score	Vulnerability Rank
Huggins Memorial Baptist Church	2	2	4	2	moderate
Core Sound Waterfowl Museum	1	2	3	1	low
Free Grace Wesleyan Church	1	2	3	1	low
Harkers Island Elementary School	1	2	3	1	low
Harkers Island Fire & Rescue	1	2	3	1	low
Harkers Island Methodist Church	1	2	3	1	low
Harkers Island Post Office	1	2	3	1	low
Refuge Fellowship Church of HI	1	2	3	1	low
Grace Holiness Church	1	1	2	1	low
HI Pentecostal Holiness Church	1	1	2	1	low
Lighthouse Chapel Church & School	1	1	2	1	low
The Church of Jesus Christ of LDS	1	1	2	1	low
Marshallberg Missionary BC	2	3	5	2	moderate
Trinity United Methodist Church	2	2	4	2	moderate
Marshallberg Fire Dept	2	2	4	2	moderate
Marshallberg Post Office	1	2	3	1	low
Sea Level Free Will Baptist Church	3	4	7	4	very high
Down East Fire Station 2	3	3	6	3	high
Sea Level Methodist Church	3	3	6	3	high
Sea Level Missionary Baptist Church	2	3	5	2	moderate
Sea Level Primitive Baptist Church	2	3	5	2	moderate
Carteret Health Care - Sea Level	2	2	4	2	moderate
Sea Level Post Office	2	2	4	2	moderate
Crissie Wright Lodge	2	3	5	2	moderate
Smyrna Missionary Baptist Church	2	3	5	2	moderate
Smyrna United Methodist Church	2	3	5	2	moderate
Eastern Park - Maint. & Concessions	2	2	4	2	moderate
Smyrna Pentecostal Holiness Church	2	2	4	2	moderate
Smyrna Post Office	2	2	4	2	moderate
Down East Middle School	1	2	3	1	low
Original Free Will BC of Stacy	4	3	7	4	very high
Stacy Methodist Church	3	3	6	3	high
Lighthouse Community Church	2	2	4	2	moderate
Williston Methodist Church	3	3	6	3	high

Appendix Table C3. Down East vulnerability results for bridges, sorted by raw score.

Name	Exposure Score	Sensitivity Score	Raw Score	Vulnerability Score	Vulnerability Rank
Back Creek Bridge	4	2	6	3	high
Ward Creek Bridge	4	2	6	3	high
Monroe Gaskill Memorial Bridge (Thorofare Bay)	4	2	6	3	high
West Bay Channel Bridge	4	2	6	3	high
Oyster Creek Bridge	4	2	6	3	high
Smyrna Creek Bridge	4	2	6	3	high
Cullie Creek Bridge	4	2	6	3	high
Daniel E. Taylor Memorial Bridge (Salters Creek)	4	2	6	3	high
Maria Creek Bridge	4	2	6	3	high
Williston Creek Bridge	4	2	6	3	high
Commissioner Jonathan Robinson Bridge (North River)	4	1	5	2	moderate
Gut to Ward Creek Bridge	4	1	5	2	moderate
Earl C. Davis Memorial Bridge	4	1	5	2	moderate
North Leopard Creek Bridge	4	1	5	2	moderate