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MAURICE RIVER TOWNSHIP

Flood Hazard Assessment



Caveats

- The data and maps in this analysis illustrate the scale of potential flooding, not the exact location, and do not account for erosion, subsidence, or future construction. As with all remotely sensed data, all features should be verified with a site visit.
- The data, maps, and information provided here should be used only as a screening-level tool for management decisions and not for navigation, permitting, or other legal purposes.
- The flood modeling does not include the presence of any flood protection structures like berms, levees, dikes, floodwalls, etc.
- For parcel flooding, the building footprint data is not used. Instead, a parcel is considered to be flooded only if the inundation covers at least **60%** of the parcel.
- The land value and improvement value comes from MOD IV data and is for the entire parcel. We do not have data to be able to consider only basement and or first floor flooding.

Content

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- Caveats
- Demographics
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- Land Parcels Vulnerable to Flooding - Various Scenarios
- Hurricane Sandy - TWL
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- Social Vulnerability
- Critical Infrastructure



Introduction

Location and Context

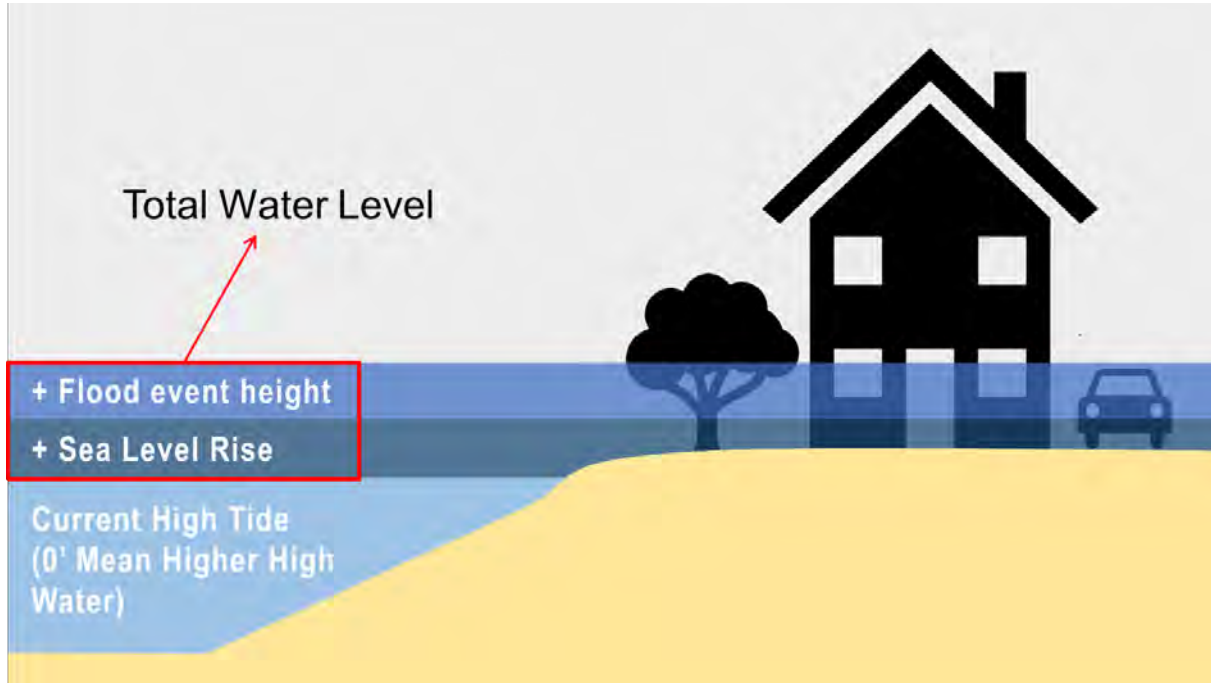
- The county is located on Delaware Bay in the State of New Jersey. The county is part of the South Jersey region.
- Maurice River Township is the easternmost township in Cumberland County, NJ.

Demographics (ACS 2020, 5-year estimates)

Total Population including Institutional Population	6,218
Residential Population	3,184
Residential Population Growth Since 2010	-10.8 %
Institutional Population	3,034
Institutional Population Growth Since 2010	-31.1%
Area	93.17 sq. mile.
Pop. Density	68 / sq. mile
Average HH Size	2.50
Housing Units / Occupied	1,443 / 1,257 (87.1%)
Owner Occupied Units	(82% of all occupied)
Median HH Income	\$73,203
Poverty	9.40%
Unemployment Rate (16 y/o and older)	11.2%
Median Rental Cost	\$1,134 /month
Median House Value	\$169,000
Median Age	39.1 years
White Population (alone)	44.3%
Non-White Population	55.7%
Less than HS Education	22.3%

Total Water Level Approach

Flood Inundation Models



- Mean Higher High Water (MHHW) is a tidal datum developed by the NOAA.
- It is the average higher high-water height of each tidal day observed over the National Tidal Datum Epoch.
- **Seawater that rises past the MHHW line is considered inundation; therefore, water level measurements relative to MHHW can be regarded as proxies for inundation measurements.**
- Total Water Level - The 'still water' inundation above Mean Higher High Water (MHHW).

Sea Level Rise

NJDEP Sea-level rise guidance for NJ, June 2021

Year	Low End	At least a 66% chance between			High End
	Greater than a 95% chance SLR exceeds	Greater than an 83% chance SLR exceeds	~50% chance SLR exceeds	Less than a 17% chance SLR exceeds	Less than a 5% chance SLR exceeds
2000			0		
2010			0.2 ft		
2020	0.1 ft	0.3 ft	0.5 ft	0.7 ft	0.9 ft
2030	0.3 ft	0.5 ft	0.8 ft	1.1 ft	1.3 ft
2040	0.5 ft	0.7 ft	1.1 ft	1.5 ft	1.9 ft
2050	0.7 ft	0.9 ft	1.4 ft	2.1 ft	2.6 ft
2060	0.8 ft	1.2 ft	1.8 ft	2.5 ft	3.1 ft
2070	1.0 ft	1.4 ft	2.2 ft	3.1 ft	3.8 ft
2080	1.1 ft	1.6 ft	2.6 ft	3.8 ft	4.8 ft
2090	1.2 ft	1.8 ft	3.0 ft	4.4 ft	5.8 ft
2100	1.3 ft	2.0 ft	3.3 ft	5.1 ft	6.9 ft
2110	1.6 ft	2.3 ft	3.7 ft	5.7 ft	8.1 ft
2120	1.6 ft	2.4 ft	4.1 ft	6.4 ft	9.4 ft
2130	1.7 ft	2.6 ft	4.5 ft	7.1 ft	10.9 ft
2140	1.9 ft	2.9 ft	4.9 ft	7.7 ft	12.4 ft
2150	2.1 ft	3.1 ft	5.2 ft	8.3 ft	13.8 ft

Notes: All values are 19-year means and are measured with respect to a 1991-2009 baseline. Projections are 19-year

Sea Level Rise (SLR) projections in feet for New Jersey from **2000 to 2150** under a moderate emissions scenario.

The table gives the planning thresholds for the various years. Collectively, the 2ft, 3ft, 5ft, and 7ft levels are **standard state planning benchmarks**.

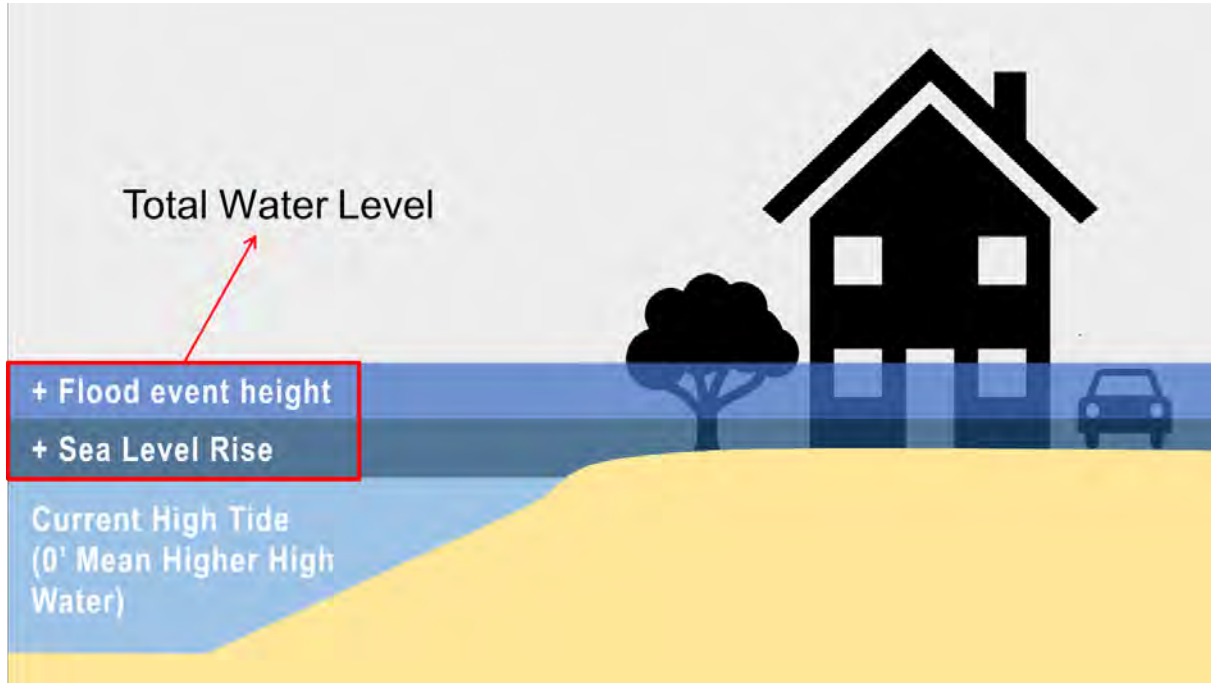
NJDEP SLR Guidance for NJ recommends that planners analyze

- 2ft SLR that is likely unavoidable
- 5.1ft SLR sufficient to plan for most activities in a community, and
- 6.9ft SLR for those **critical activities** for which damages would have debilitating effects on public health and safety.

Additionally, NJOPA's Municipal Plan Endorsement guidelines require that "Communities assess flood risks that at a minimum identifies areas within the municipality that are subject to exposure to 3-, 5-, and 7-foot of sea-level rise and the 1% (100-year) and 0.2% (500- year) storms as part of the Municipal Self-Assessment."

***Activities with less risk tolerance should plan for the upper end of the likely range (<17% Chance SLR exceeds).** These include most activities including single and multi-family residential structures, commercial developments, most energy transmission, and water treatment infrastructure, evacuation routes and bridges, hospitals, and public transit facilities.

Total Water Level Approach



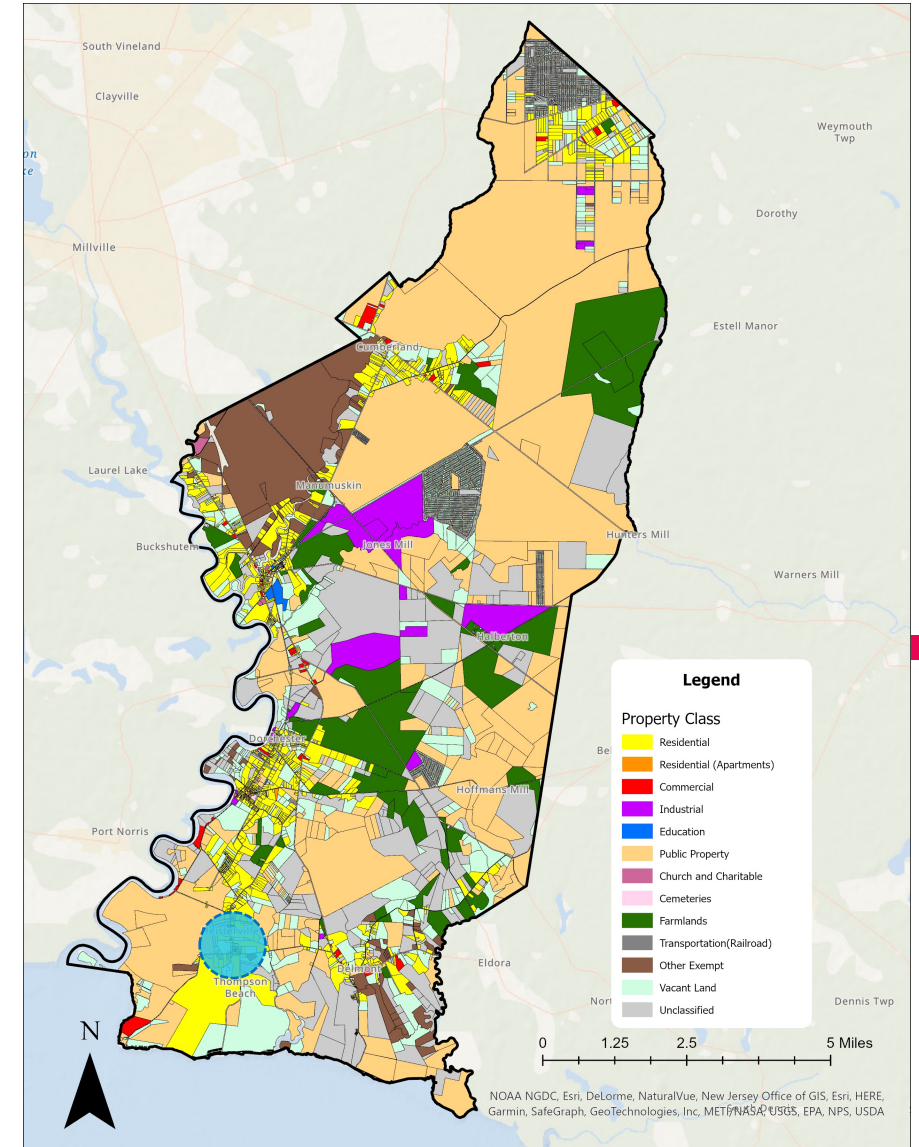
- Total water level (TWL) at the shoreline is **the combination of tides, surge, and wave runup**. A forecast of TWL is an estimate of the elevation where the ocean will meet the coast and can provide guidance on potential coastal erosion and flooding hazards.
- These water levels allow us to visualize the impact of future sea level rise combined with potential flood events up to 20ft of inundation.
- The Total Water Level for the exposure analysis is rounded to the nearest whole foot.

The analysis includes criteria for water levels of 2 feet, 3 feet, 5 feet, and 7 feet

Maurice River Township

Property Class

Property Class	Total Parcels
Residential	1326
Residential (Apartments)	2
Commercial	51
Industrial	24
Education	4
Public Property	668
Church and Charitable	15
Cemeteries	12
Farmlands	57
Transportation	2
Other Exempt	105
Vacant Land	1898
Unclassified Land	3425
Total	7589



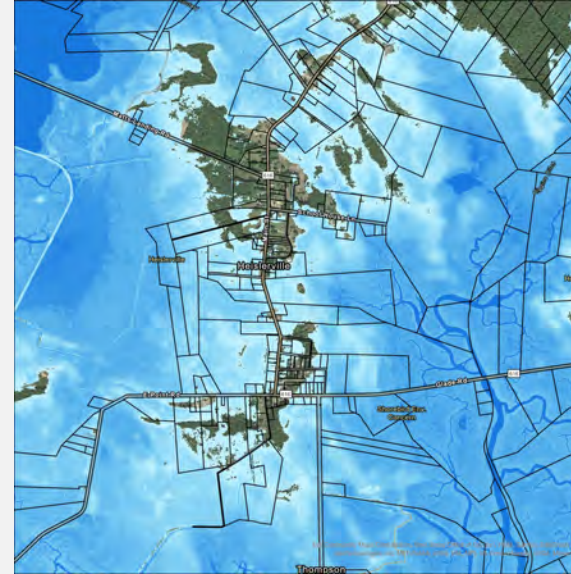
Inundation Analysis Criteria



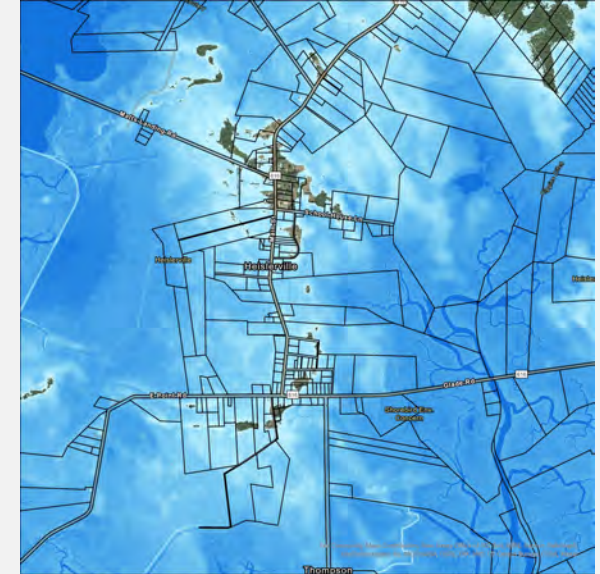
2ft Flood Scenario



3ft Flood Scenario



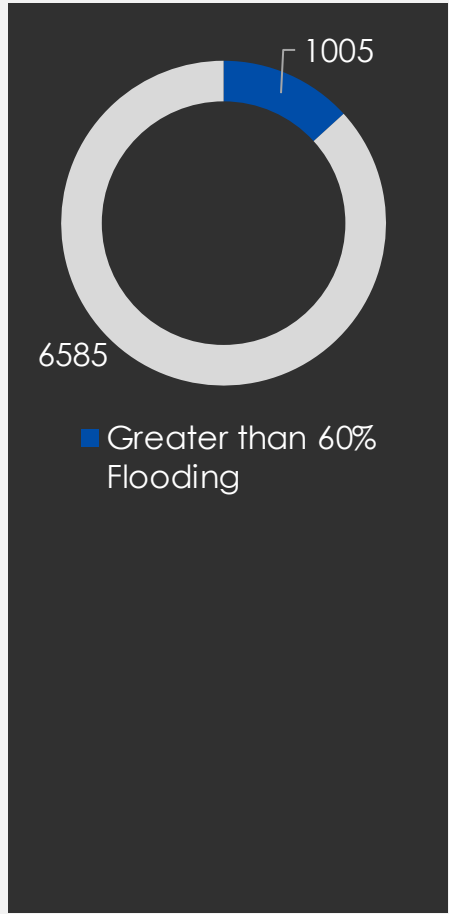
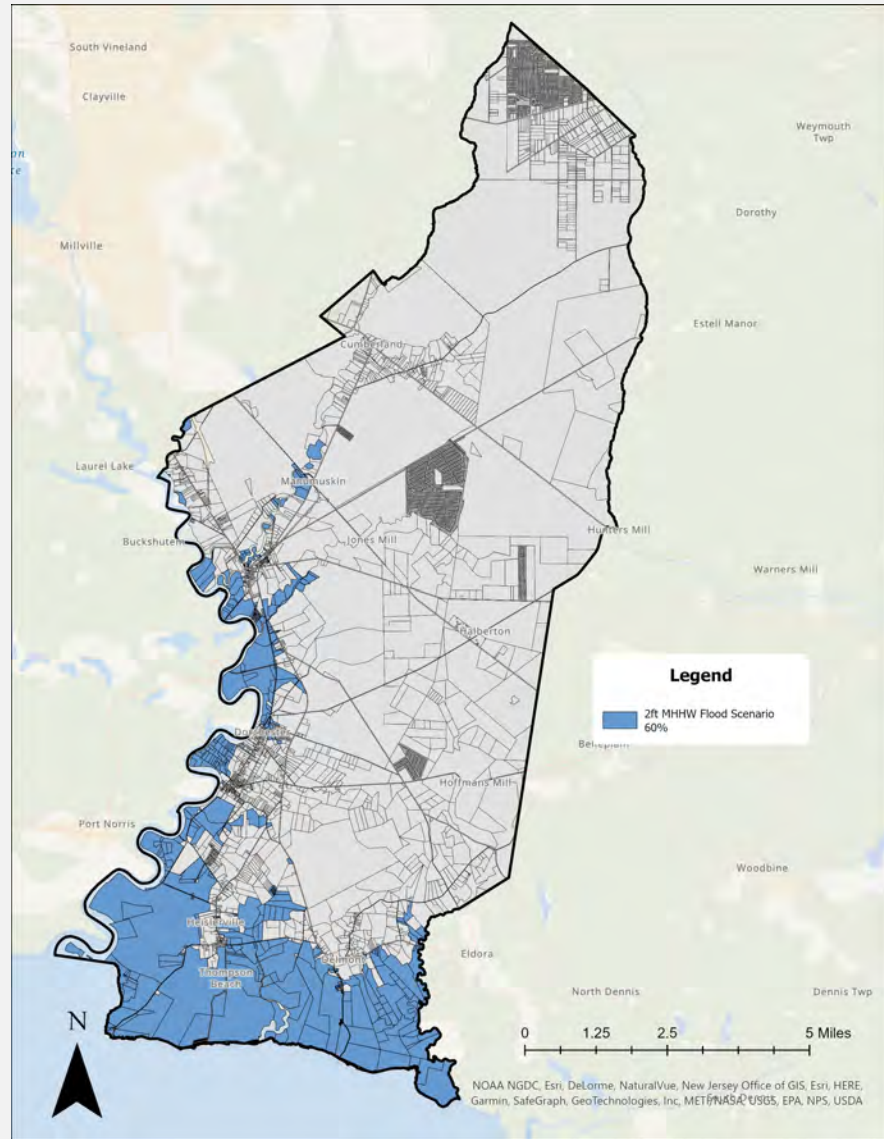
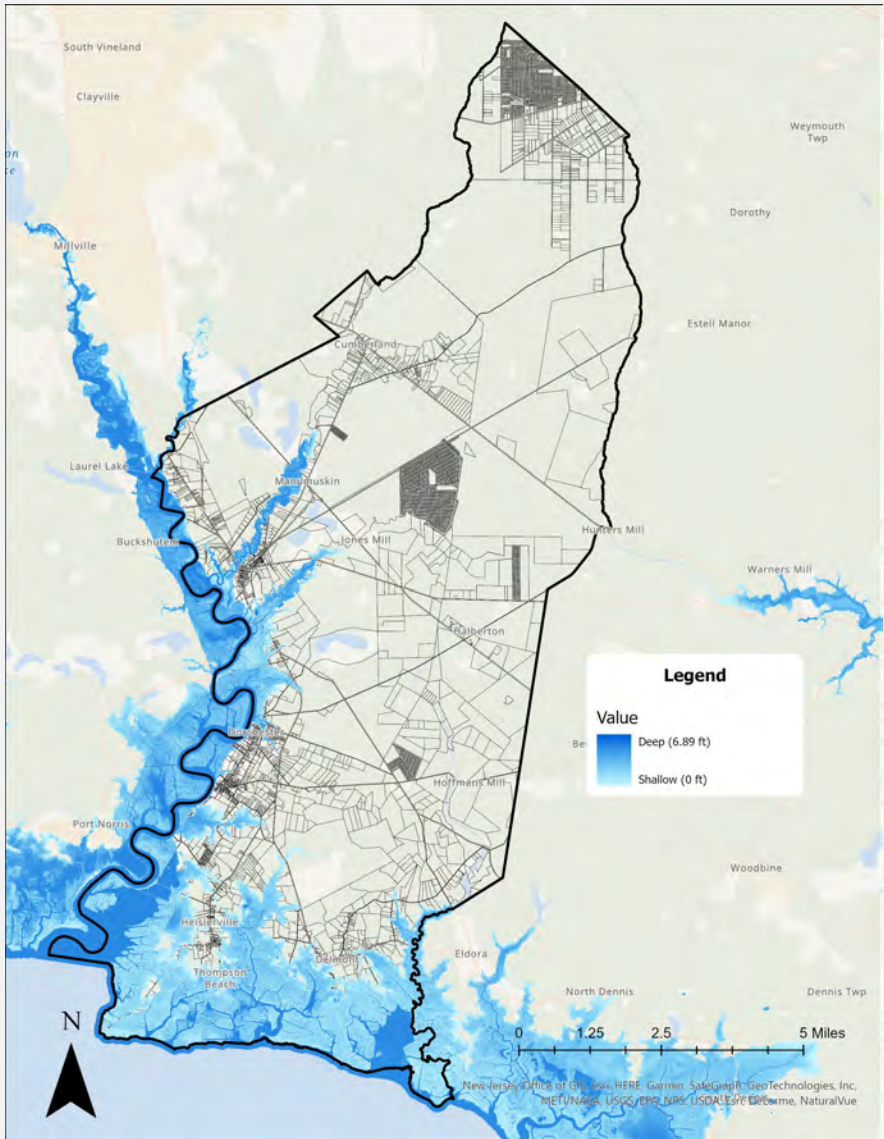
5ft Flood Scenario



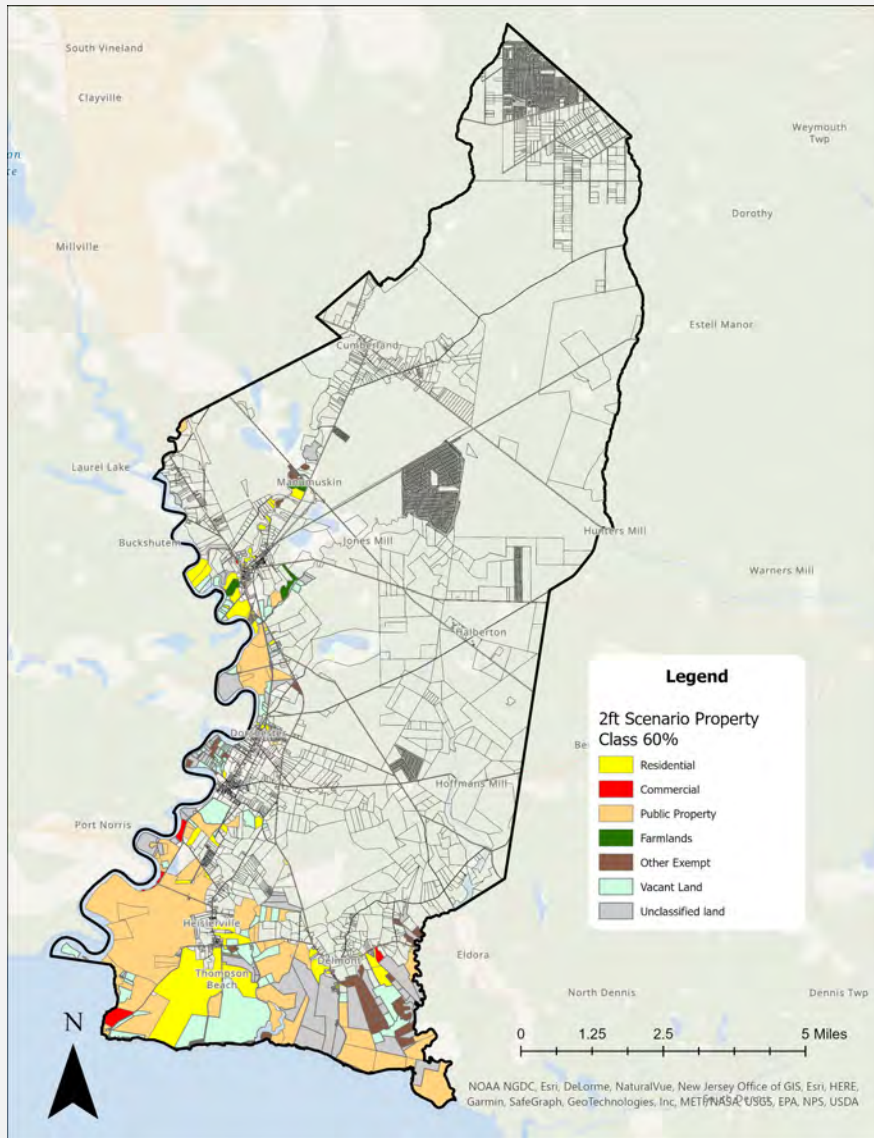
7ft Flood Scenario

- Due to the high variation in parcel sizes, 60% is used as the inundation standard.

2 FT MHHW Scenario

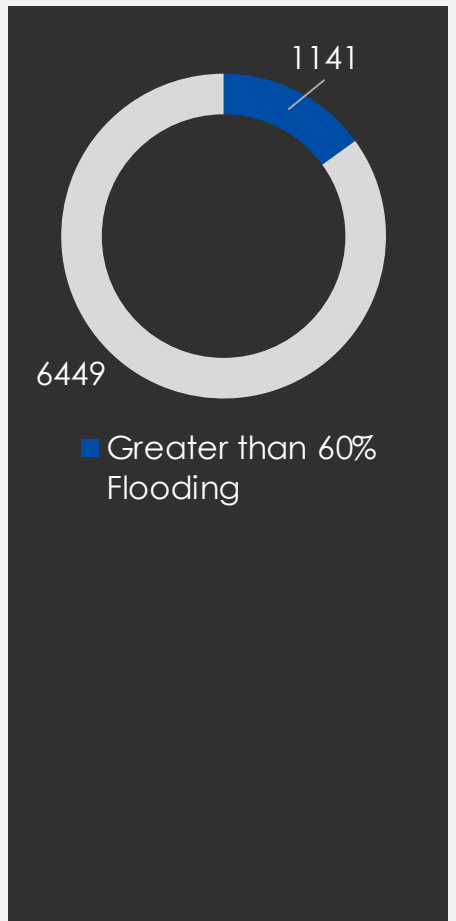
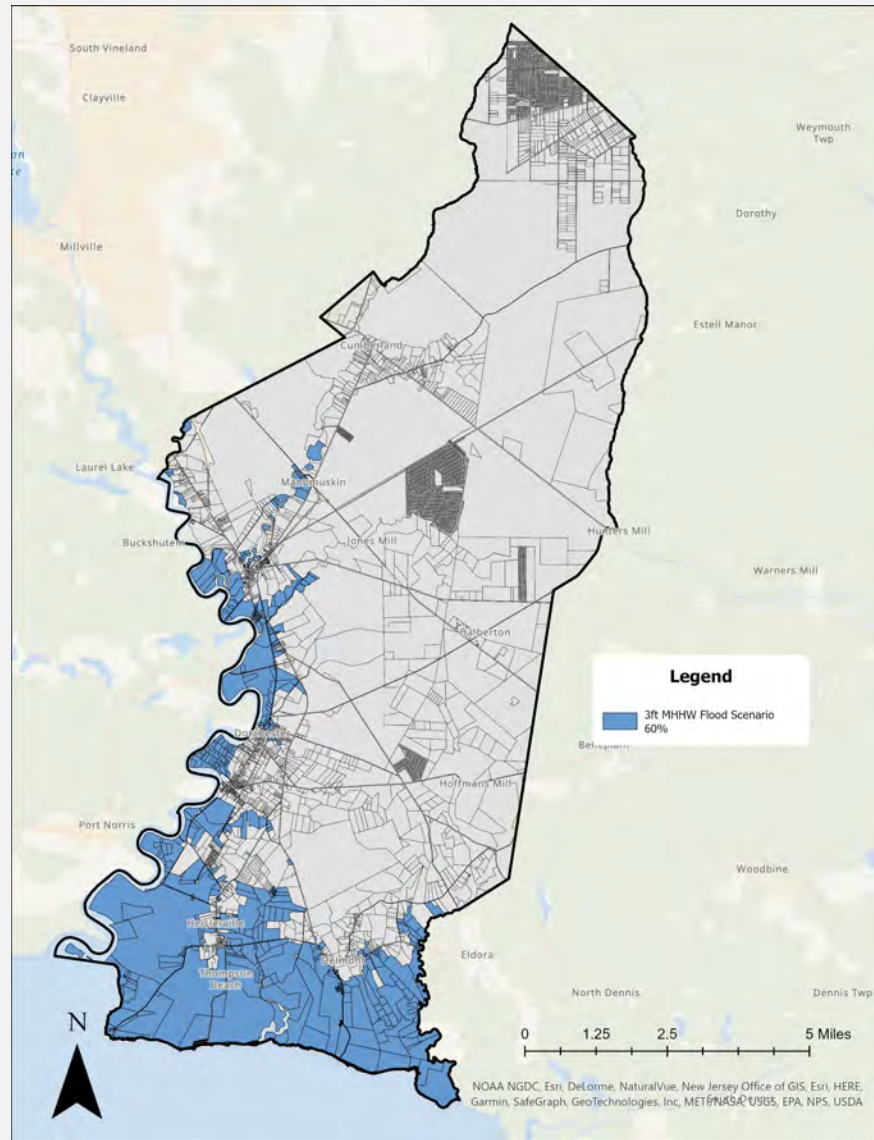
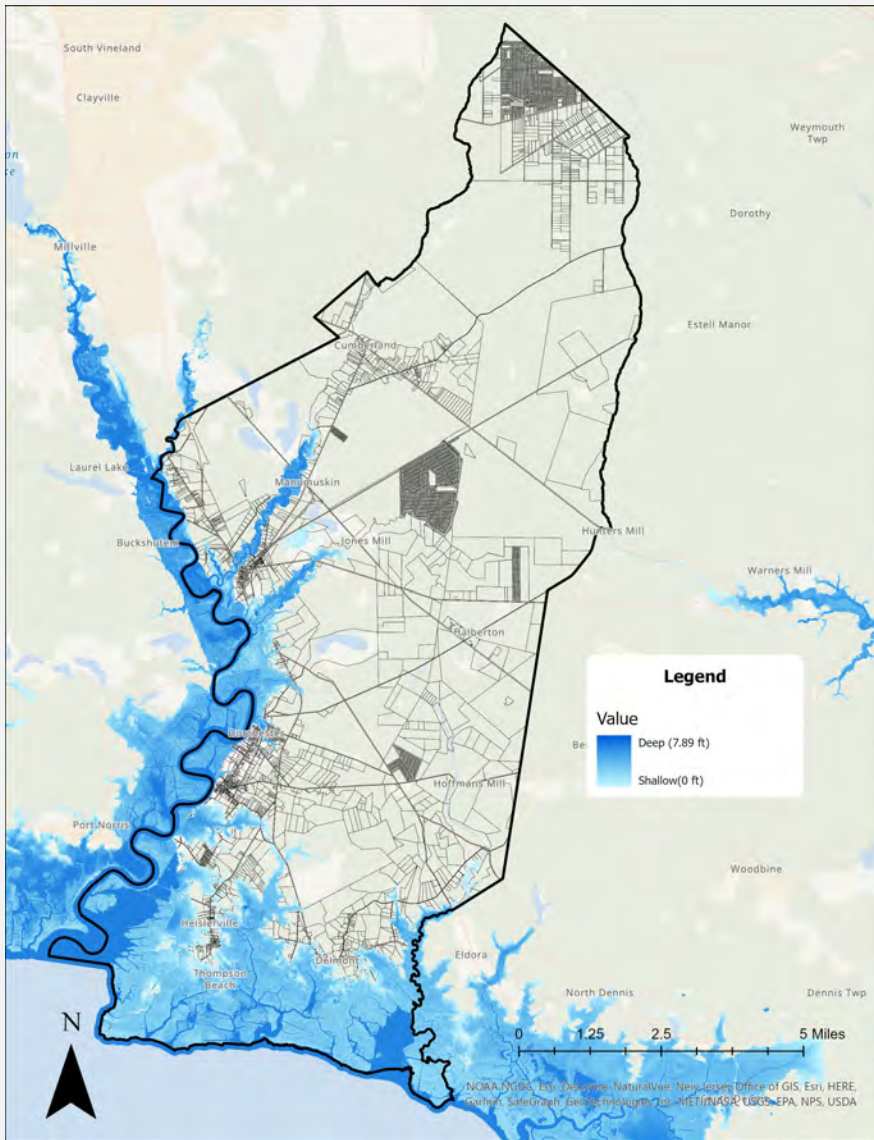


2 FT M H H W Scenario

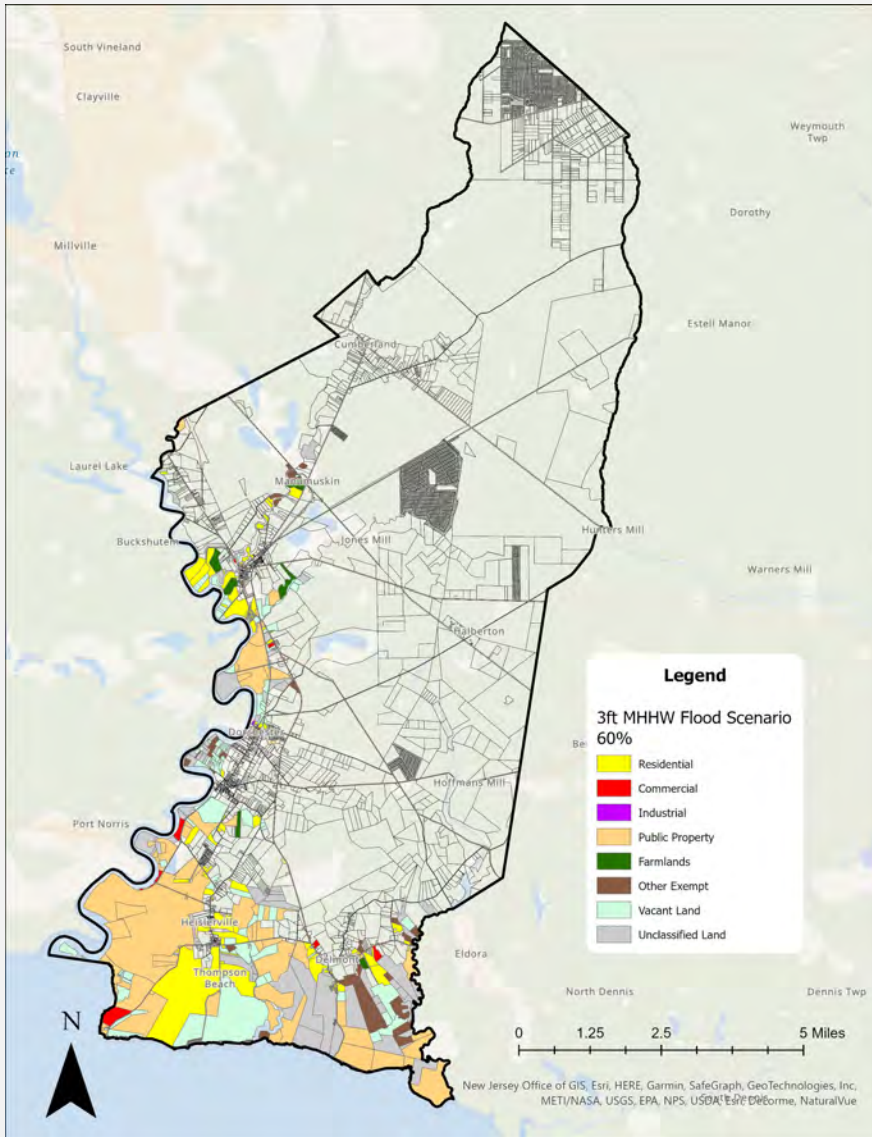


Parcel Class		Flooded parcels	Total Parcel	Percentage	Improvement value	Land value
Residential	2	89	1326	6.71%	\$10,320,800.00	\$ 5,830,200.00
Commercial	4A	9	51	17.65%	\$ 1,355,700.00	\$ 2,016,700.00
Industrial	4B				\$ -	\$ -
Education	15A				\$ -	\$ -
Public Property	15C	106	668	15.87%	\$ 906,100.00	\$ 4,664,300.00
Church and Charitable	15D				\$ -	\$ -
Farmlands	3A & 3B	2	60	3.33%	\$ 203,200.00	\$ 67,300.00
Other Exempt	15F	38	105	36.19%	\$ 9,400.00	\$ 663,200.00
Vacant Land	1	220	1898	11.59%	\$ -	\$ 1,996,000.00
Unclassified Land	0	541	3425	15.80%	\$ -	\$ -
Total					\$12,795,200.00	\$15,237,700.00

3 FT MHHW Scenario

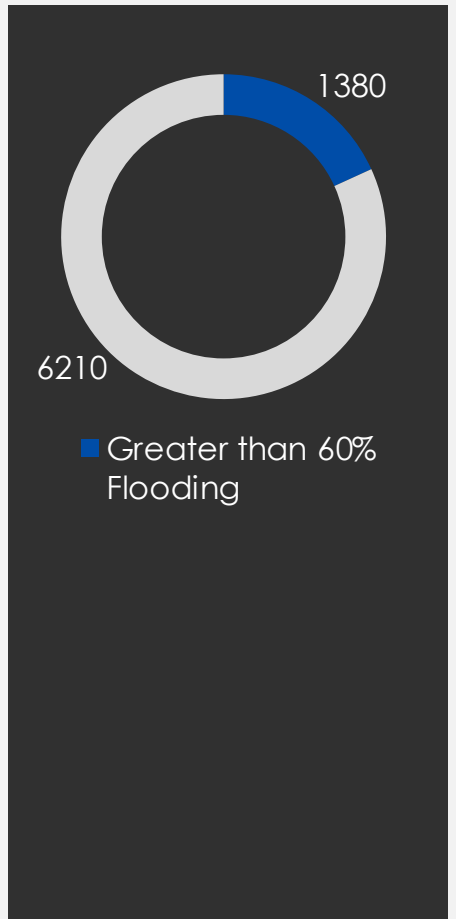
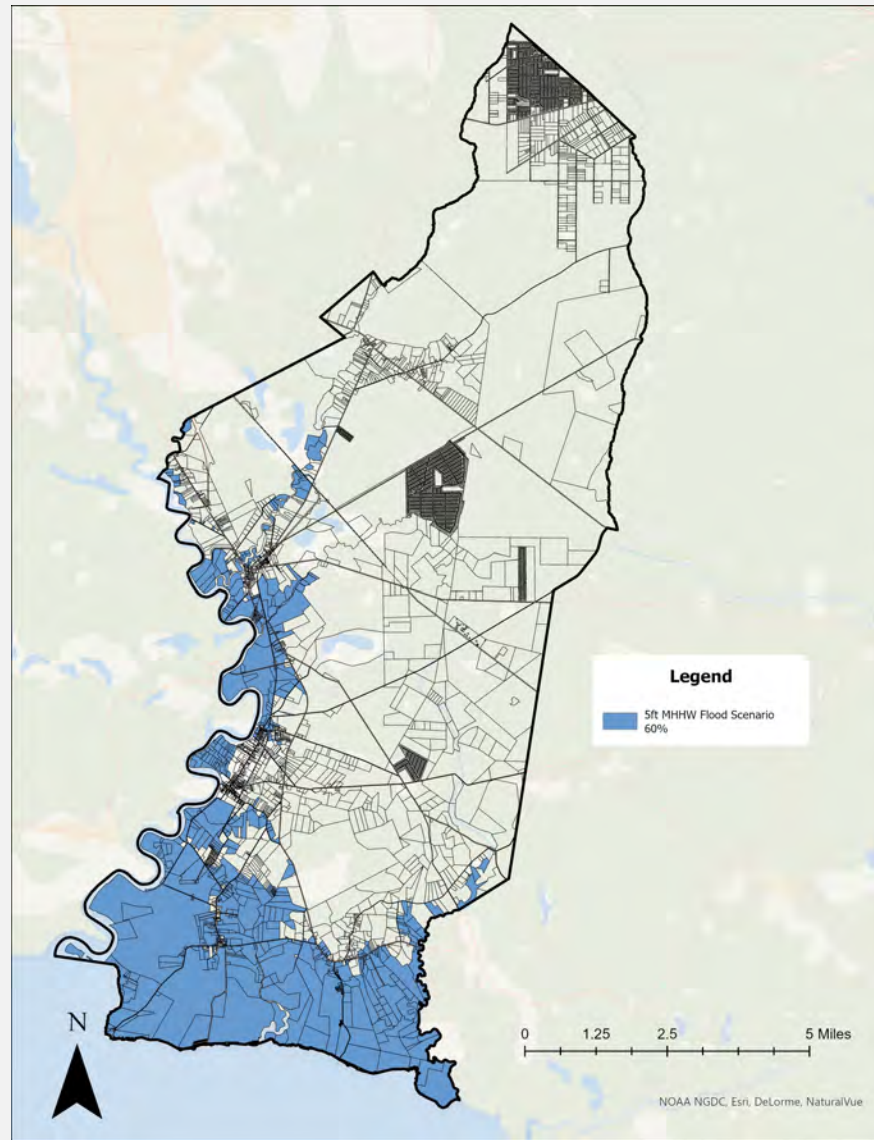
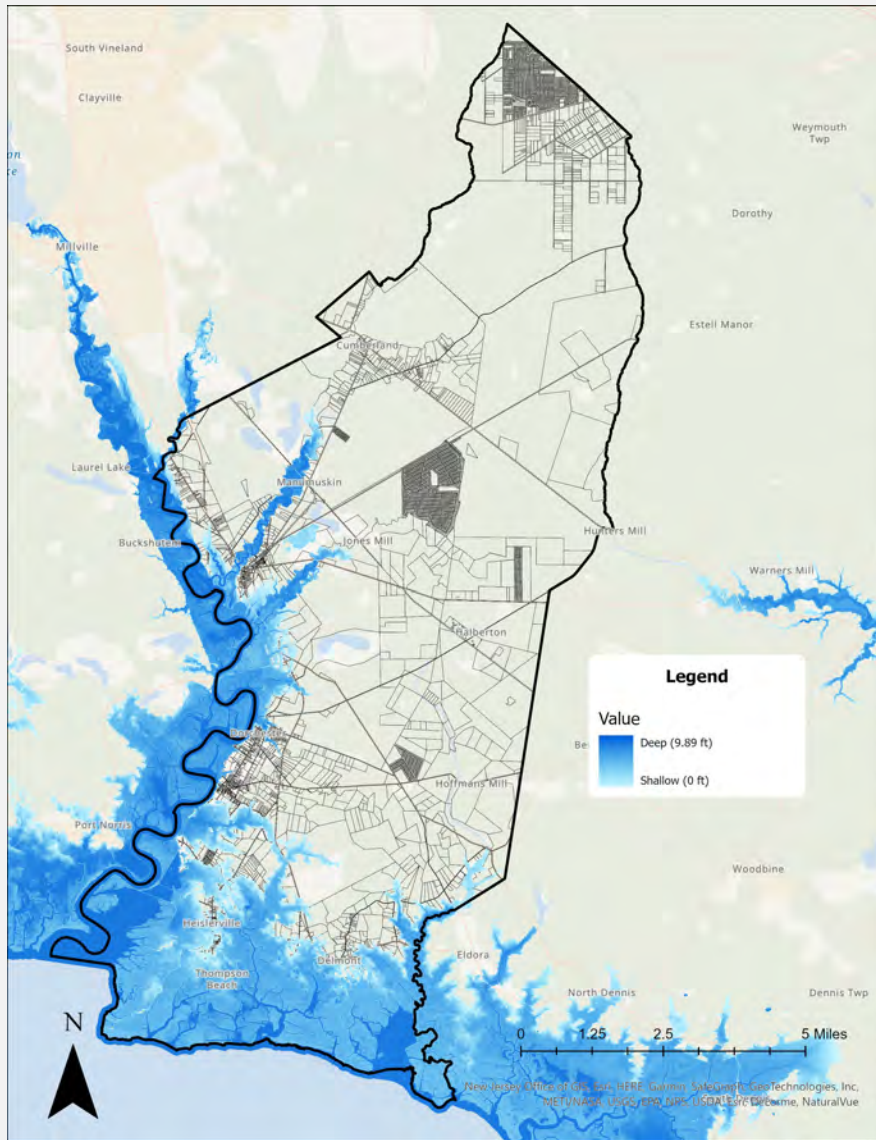


3 FT MHHW Scenario

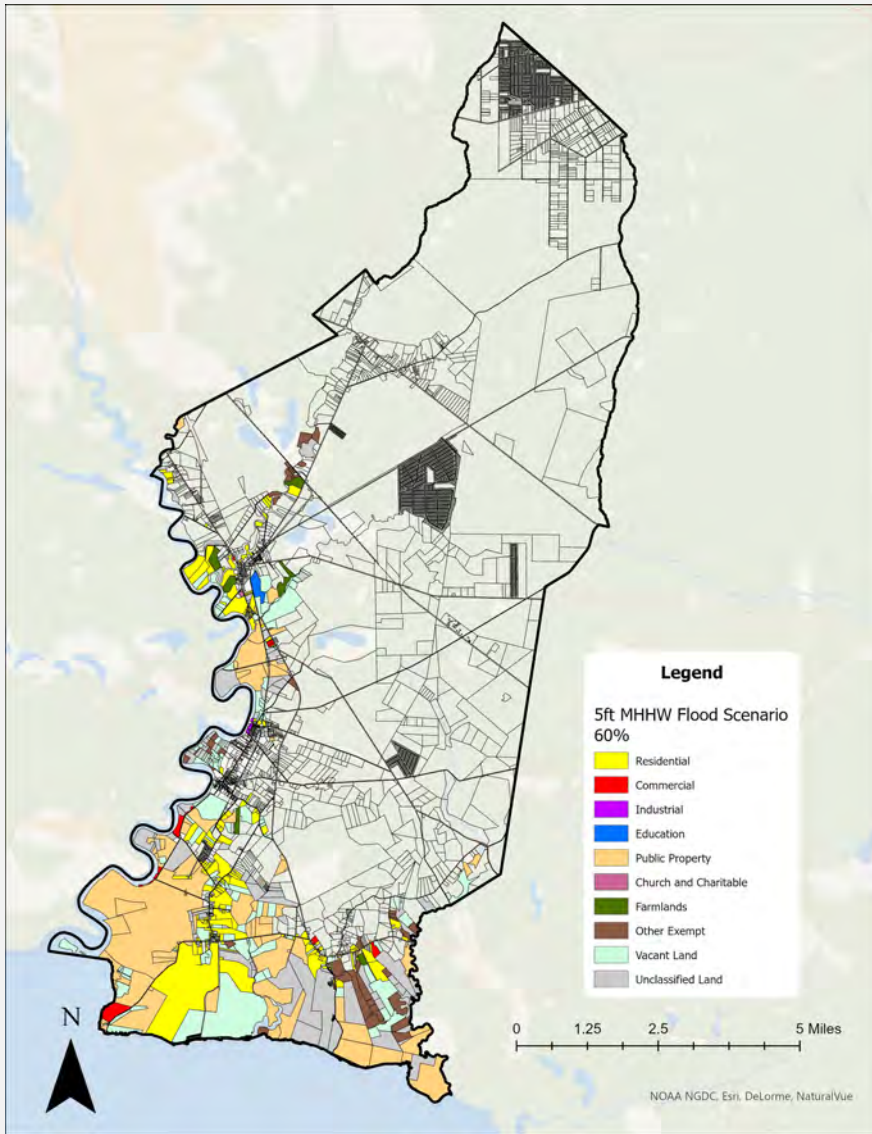


Parcel Class		Flooded parcels	Total Parcel	Percentage	Improvement value	Land value
Residential	2	133	1326	10.03%	\$14,776,800.00	\$ 8,410,100.00
Commercial	4A	11	51	21.57%	\$ 2,182,500.00	\$ 2,231,700.00
Industrial	4B	1	24	4.17%	\$ 103,500.00	\$ 141,300.00
Education	15 A				\$ -	\$ -
Public Property	15 C	115	668	17.22%	\$ 906,100.00	\$ 4,769,200.00
Church and Charitable	15 D				\$ -	\$ -
Farmlands	3A & 3B	5	57	8.77%	\$ 599,500.00	\$ 214,300.00
Other Exempt	15F	41	105	39.05%	\$ 119,800.00	\$ 777,600.00
Vacant Land	1	246	1898	12.96%	\$ -	\$ 2,219,700.00
Unclassified Land	0	589	3425	17.20%	\$ -	\$ -
Total					\$18,688,200.00	\$18,763,900.00

5 FT MHHW Scenario

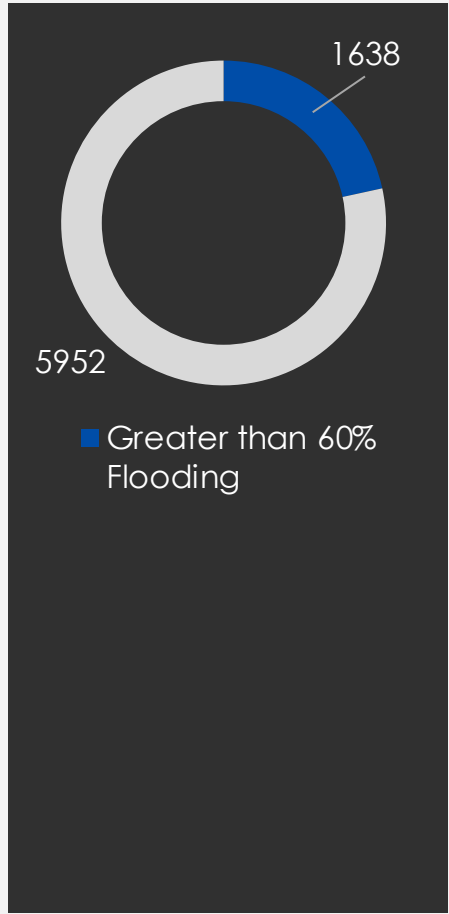
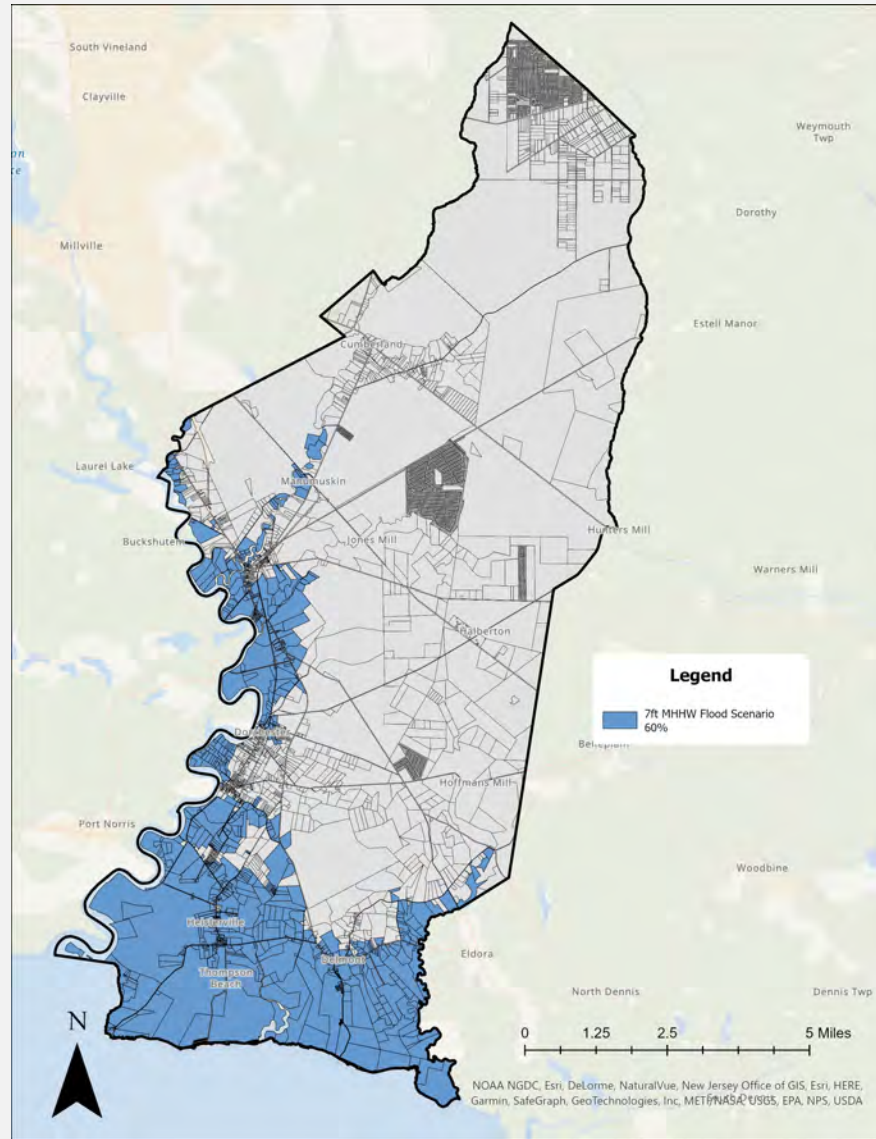
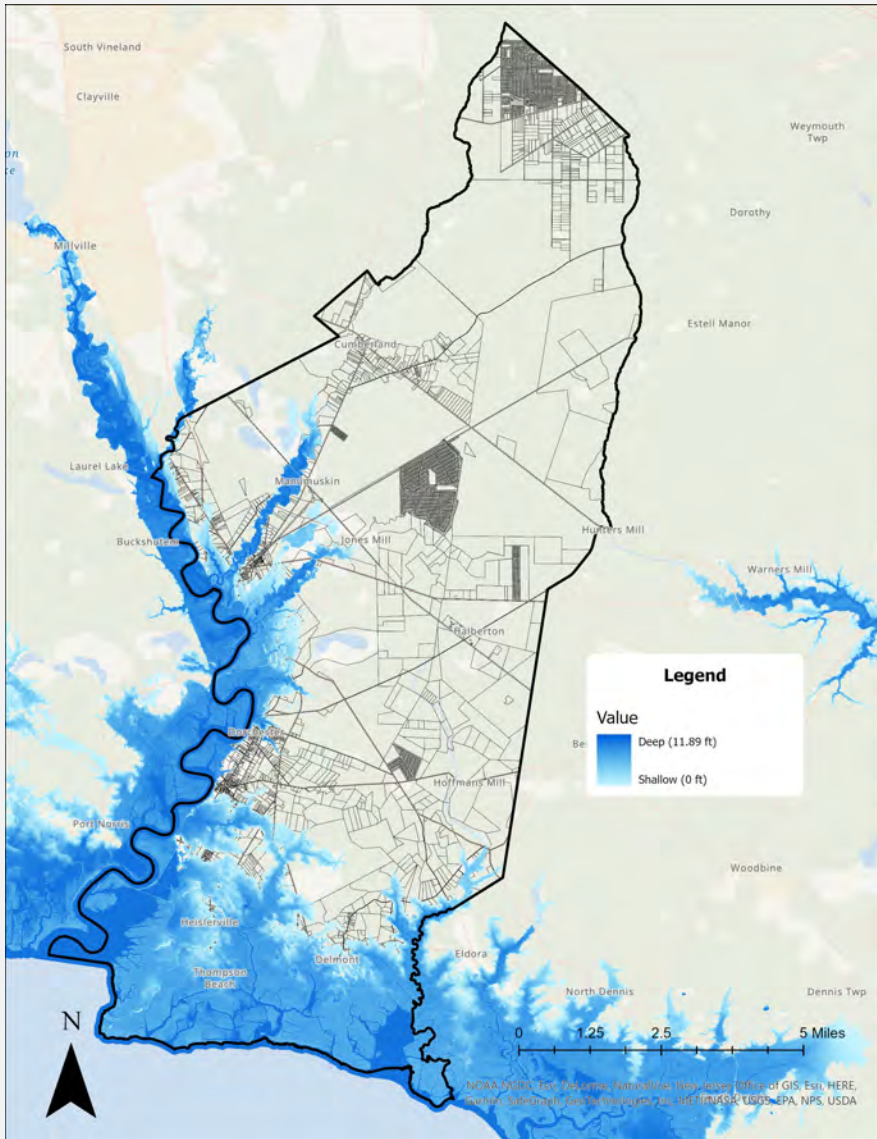


5 FT MHHW Scenario

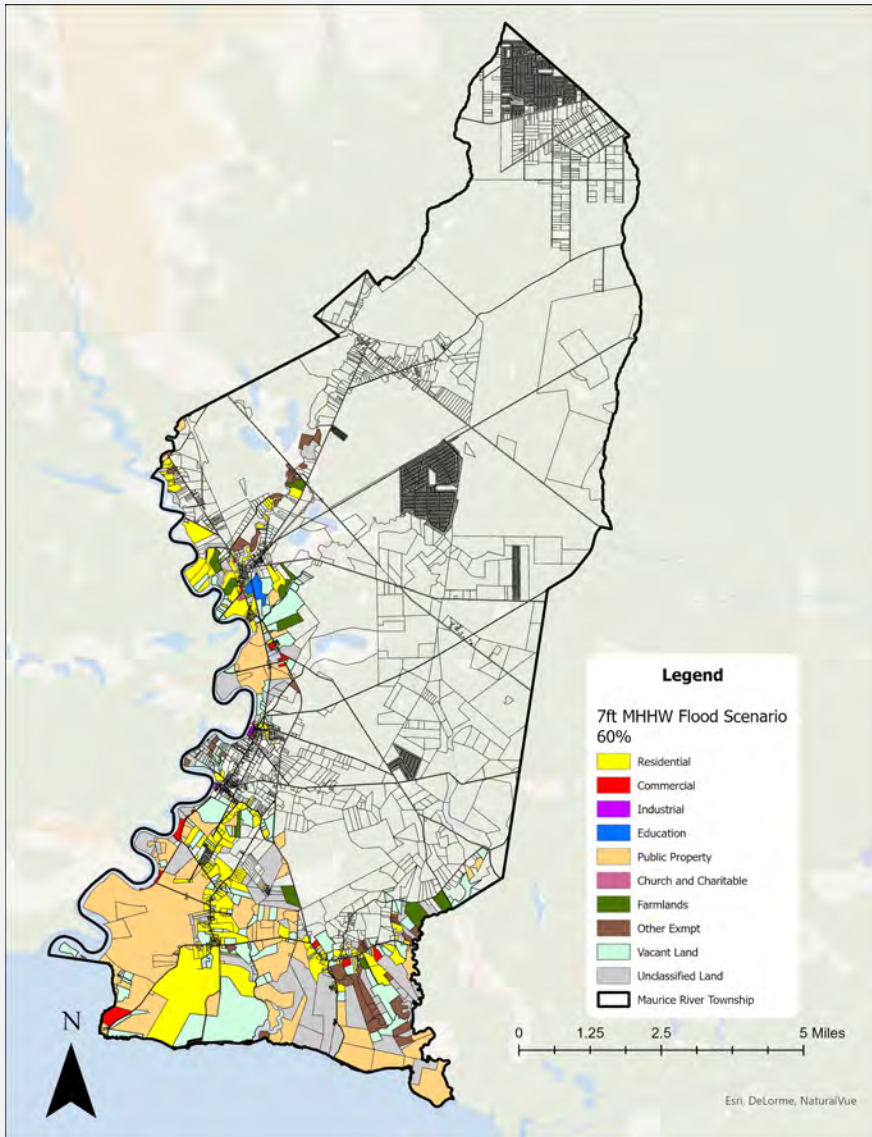


Parcel Class		Flooded parcels	Total Parcel	Percentage	Improvement value	Land value
Residential	2	259	1326	19.53%	\$28,213,800.00	\$15,089,100.00
Commercial	4A	14	51	27.45%	\$ 2,494,900.00	\$ 3,086,700.00
Industrial	4B	3	24	12.50%	\$ 405,200.00	\$ 513,100.00
Education	15A	1	4	25.00%	\$ -	\$ 36,900.00
Public Property	15C	127	668	19.01%	\$ 906,100.00	\$ 5,101,900.00
Church and Charitable	15D	1	15	6.67%	\$ 592,700.00	\$ 50,000.00
Farmlands	3A & 3B	5	57	8.77%	\$ 599,500.00	\$ 214,300.00
Other Exempt	15F	46	105	43.81%	\$ 119,800.00	\$ 875,400.00
Vacant Land	1	287	1898	15.12%	\$ -	\$ 3,078,200.00
Unclassified Land	0	637	3425	18.60%	\$ -	\$ -
Total					\$33,332,000.00	\$28,045,600.00

7 FT MHHW Scenario

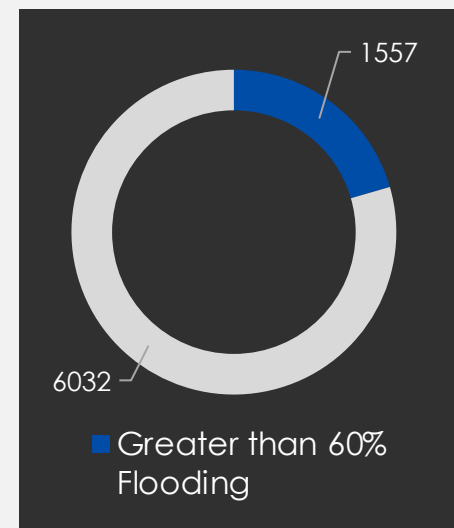
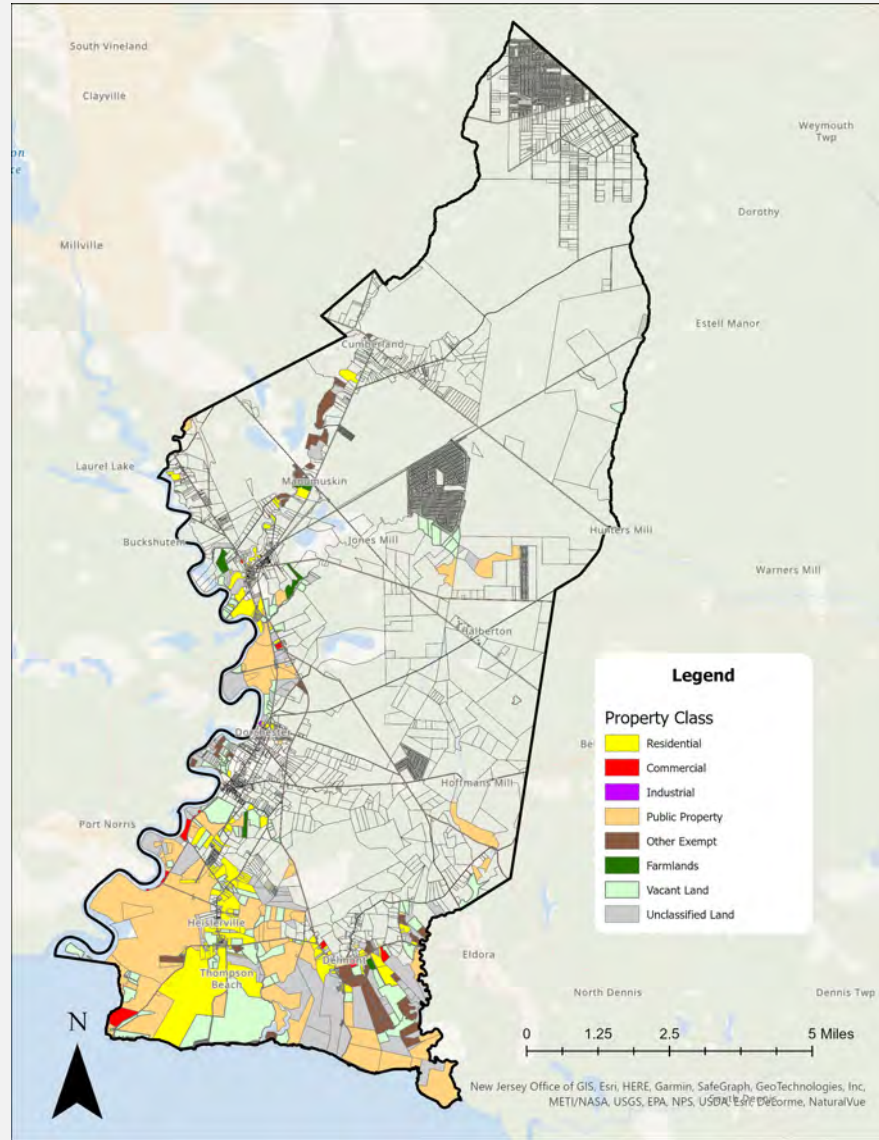
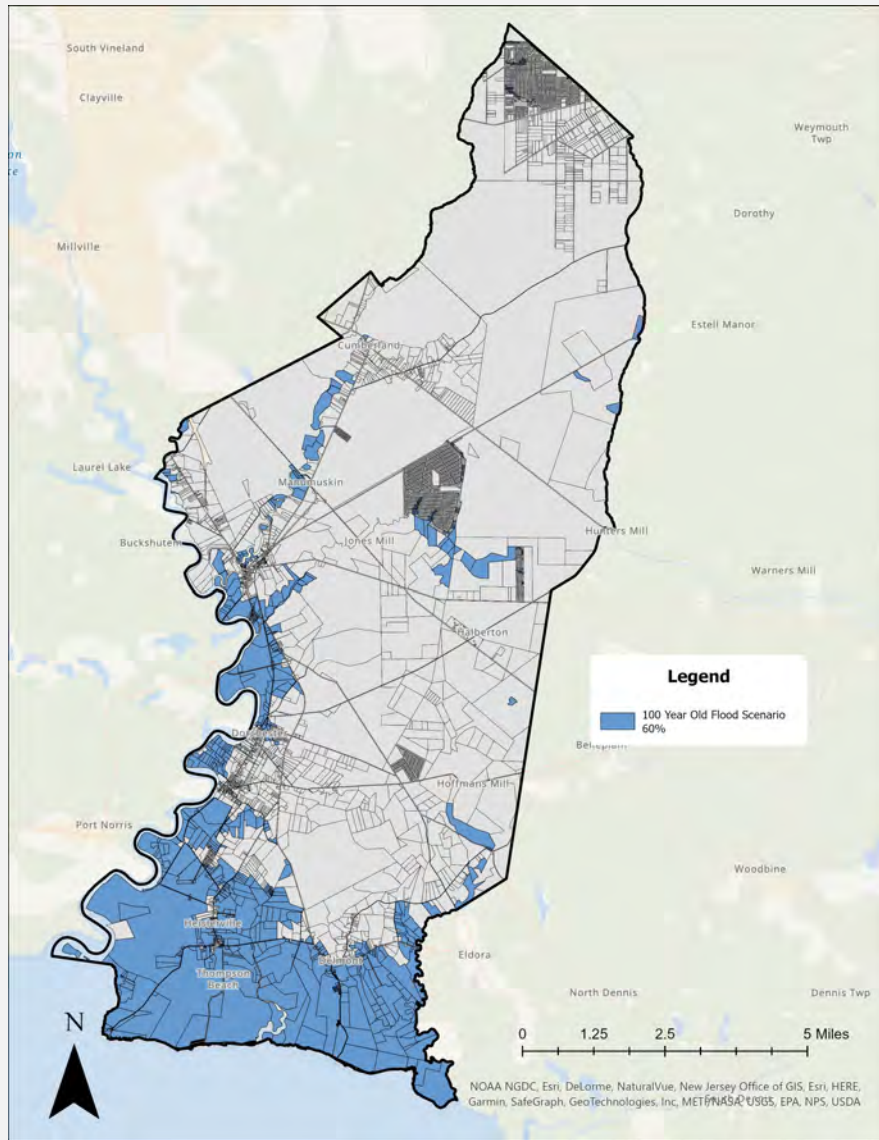


7 FT MHHW Scenario

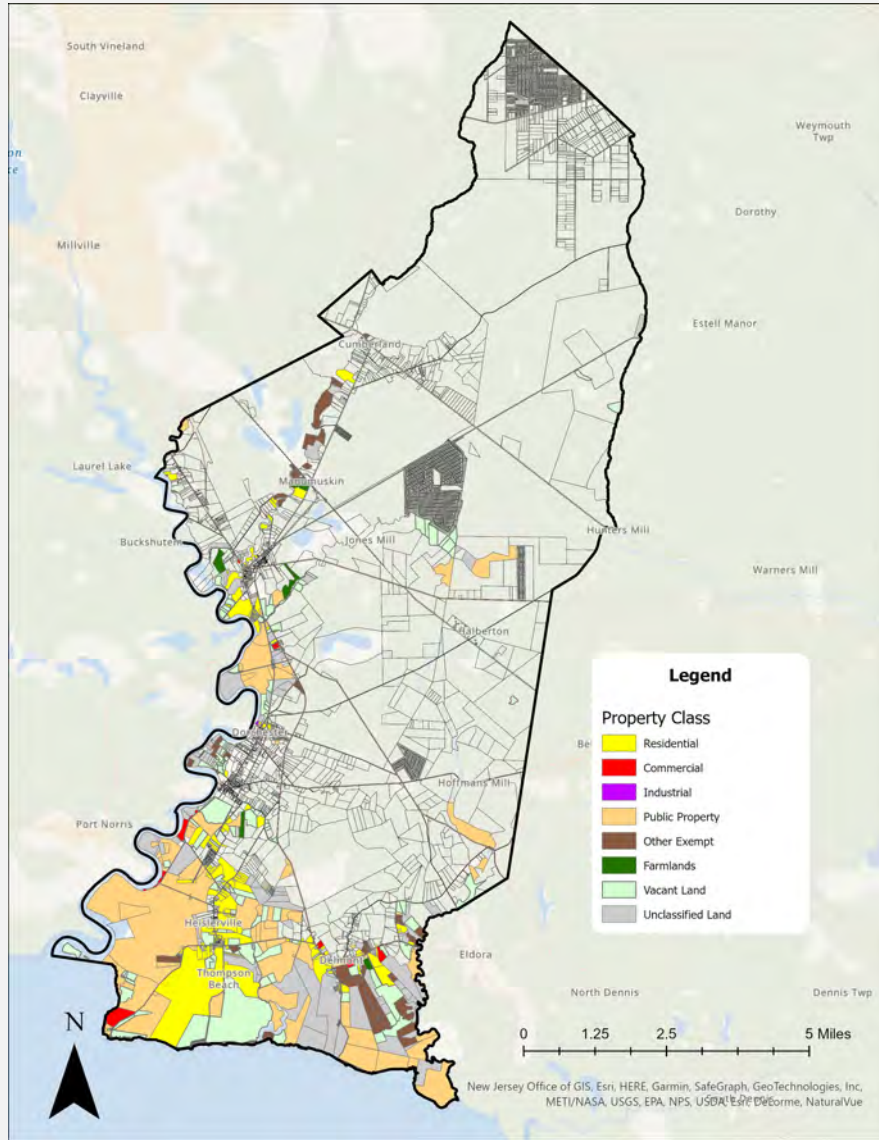


Parcel Class		Flooded parcels	Total Parcel	Percentage	Improvement value	Land value
Residential	2	402	1326	30.32%	\$43,431,000.00	\$21,627,700.00
Commercial	4A	22	51	43.14%	\$ 5,527,400.00	\$ 6,629,300.00
Industrial	4B	4	24	16.67%	\$ 710,000.00	\$ 638,100.00
Education	15A	2	4	50.00%	\$ 8,503,600.00	\$ 236,900.00
Public Property	15C	140	668	20.96%	\$ 980,400.00	\$ 5,274,200.00
Church and Charitable	15D	3	15	20.00%	\$ 916,300.00	\$ 134,300.00
Farmlands	3A & 3B	9	57	15.79%	\$ 806,600.00	\$ 606,200.00
Other Exempt	15F	52	105	49.52%	\$ 446,700.00	\$ 988,800.00
Vacant Land	1	332	1898	17.49%	\$ -	\$ 3,585,800.00
Unclassified Land	0	672	3425	19.62%	\$ 916,300.00	\$ 134,300.00
Total					\$62,238,300.00	\$39,855,600.00

100-Year event scenario - 1% chance

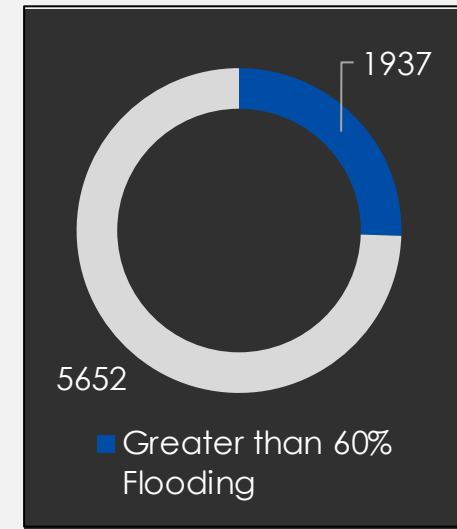
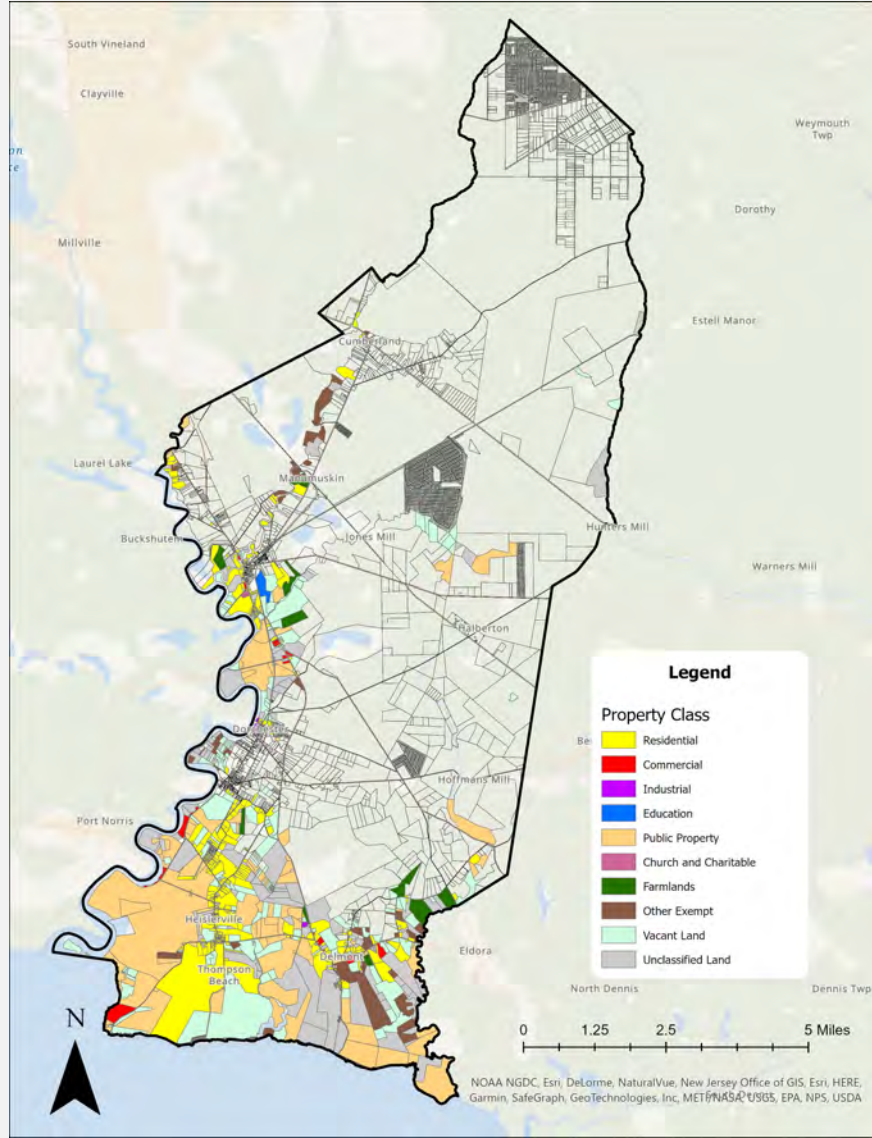
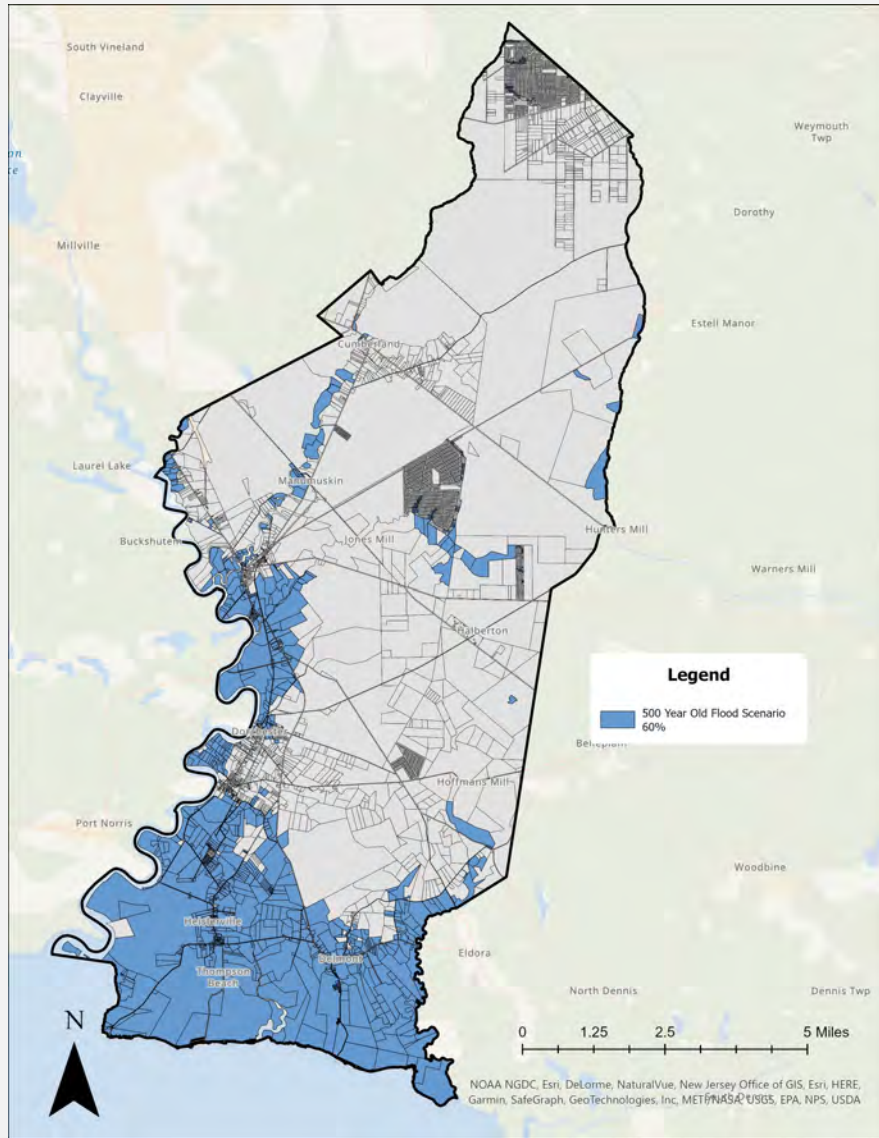


100-Year event scenario - 1% chance

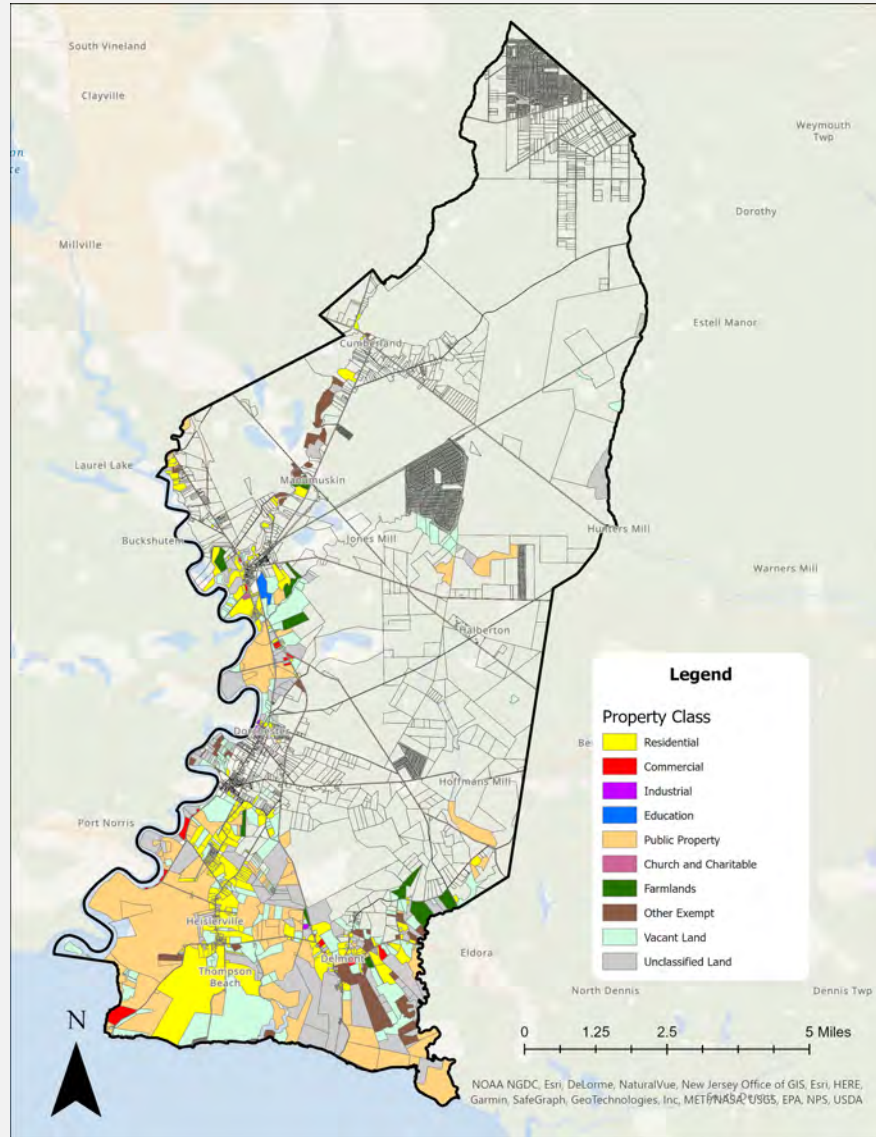


Property Class	Flooded Parcels	Total Parcels	Percentage	Improvement Value	Land Value
Residential	240	1326	18.10%	\$25,349,900.00	\$13,325,300.00
Commercial	15	51	29.41%	\$ 2,583,600.00	\$ 3,146,300.00
Industrial	1	24	4.17%	\$ 103,500.00	\$ 141,300.00
Public Property	148	668	22.16%	\$ 1,125,800.00	\$ 5,756,700.00
Farmlands	5	57	8.77%	\$ 599,500.00	\$ 214,300.00
Other Exempt	50	105	47.62%	\$ 231,700.00	\$ 1,060,400.00
Vacant Land	317	1898	16.70%	\$ -	\$ 3,163,200.00
Unclassified Land	781	3425	22.80%	\$ -	\$ -
Total				\$29,994,000.00	\$26,807,500.00

500-Year event scenario – 0.2% chance

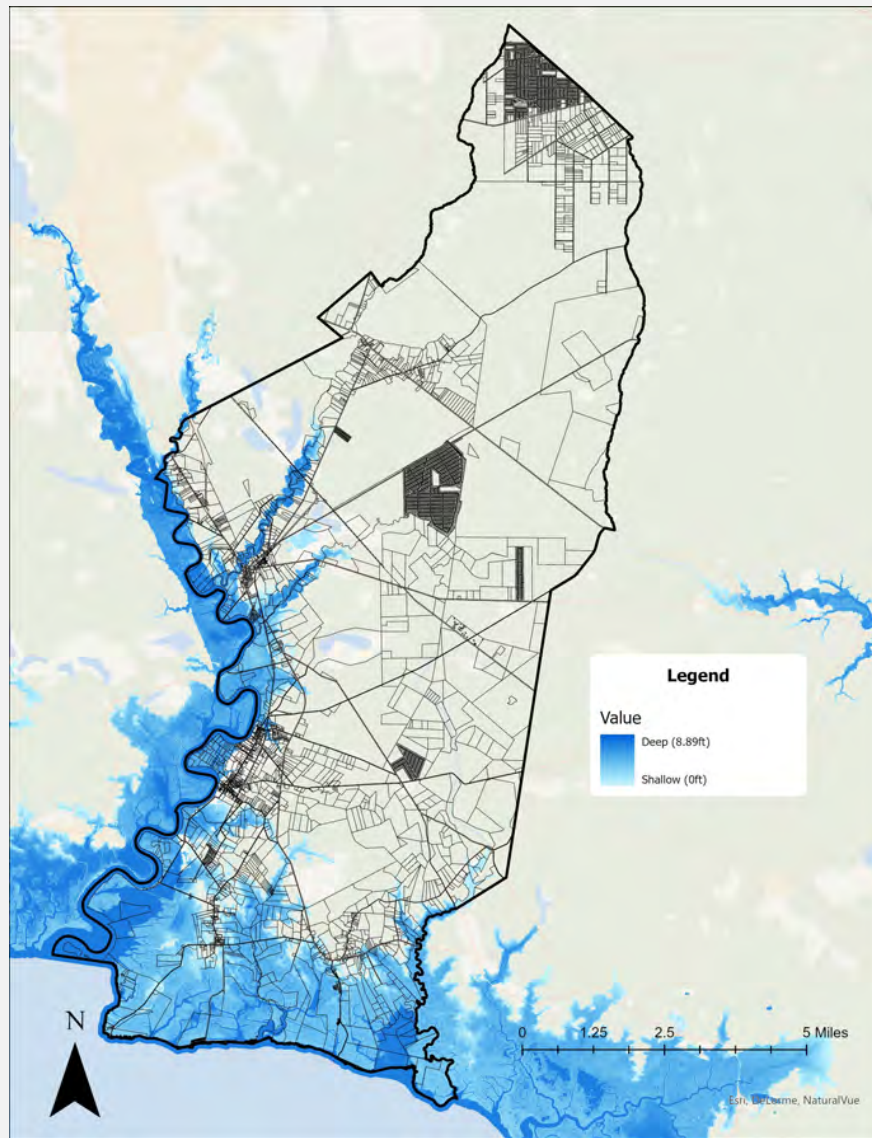
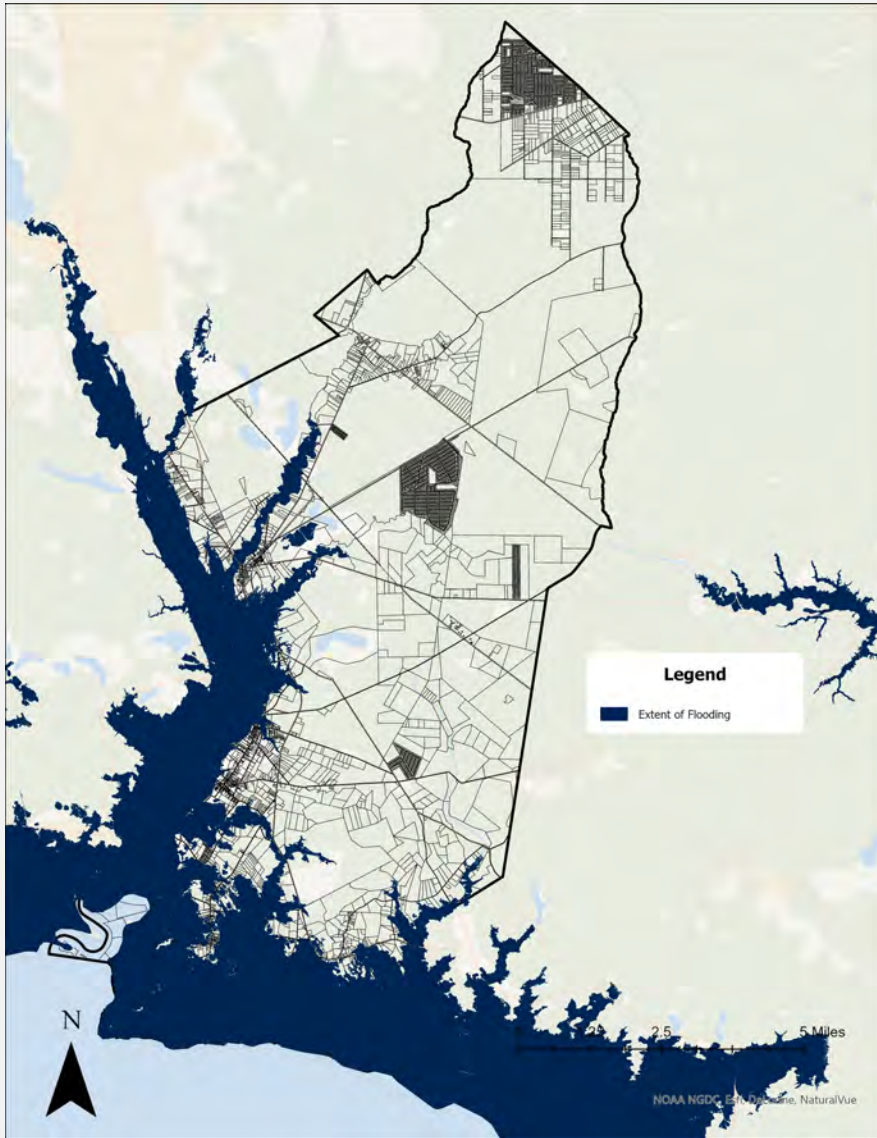


500-Year event scenario – 0.2% chance

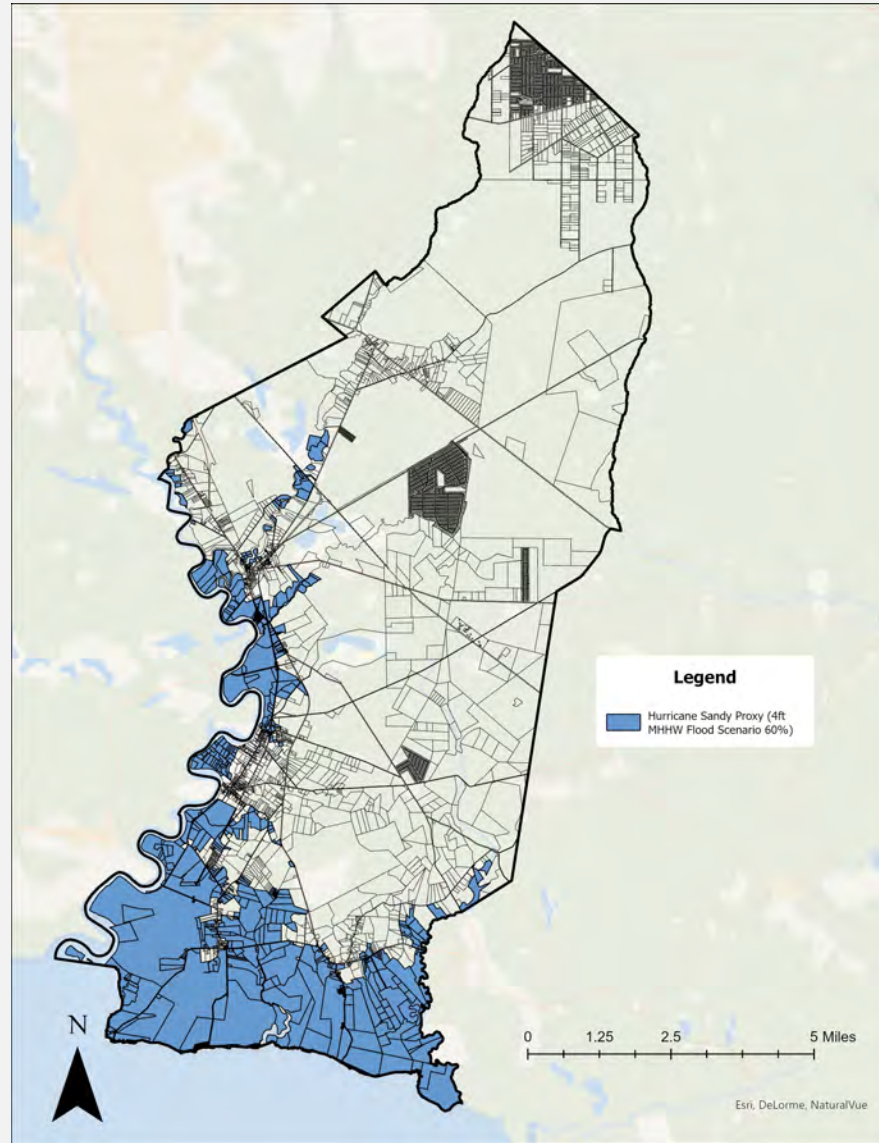
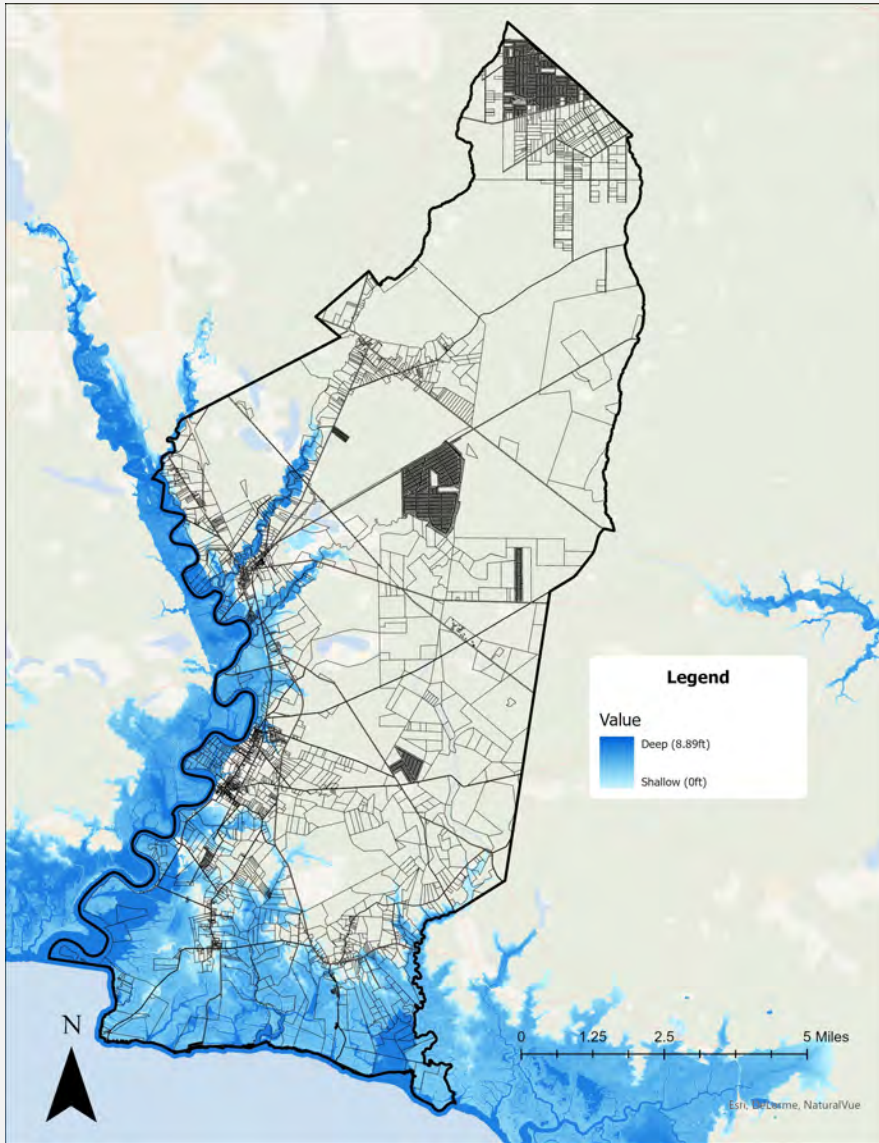


Property Class	Flooded Parcels	Total Parcels	Percentage	Improvement Value	Land Value
Residential	184	1326	33.03%	\$45,873,000.00	\$22,857,000.00
Commercial	23	51	45.10%	\$ 5,549,100.00	\$ 6,679,300.00
Industrial	4	24	16.67%	\$ 467,100.00	\$ 576,100.00
Education	1	4	25.00%	\$ -	\$ 36,900.00
Public Property	172	668	25.75%	\$ 4,043,100.00	\$ 6,185,600.00
Church and Charitable	6	15	40.00%	\$ 1,271,000.00	\$ 236,700.00
Farmlands	11	57	19.30%	\$ 599,500.00	\$ 384,500.00
Other Exempt	59	105	56.19%	\$ 446,700.00	\$ 1,127,900.00
Vacant Land	382	1898	20.13%	\$ -	\$ 4,083,100.00
Unclassified Land	841	3425	24.55%	\$ -	\$ -
Total				\$58,249,500.00	\$42,167,100.00

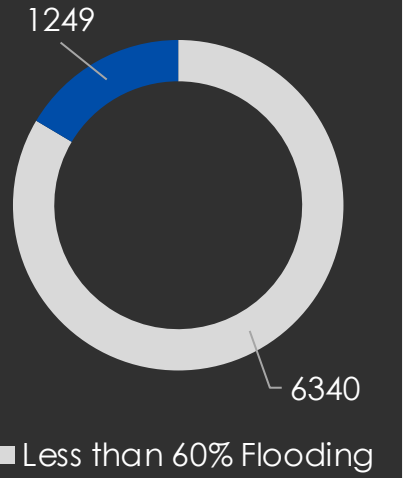
Hurricane Sandy and 4FT TWL Raster



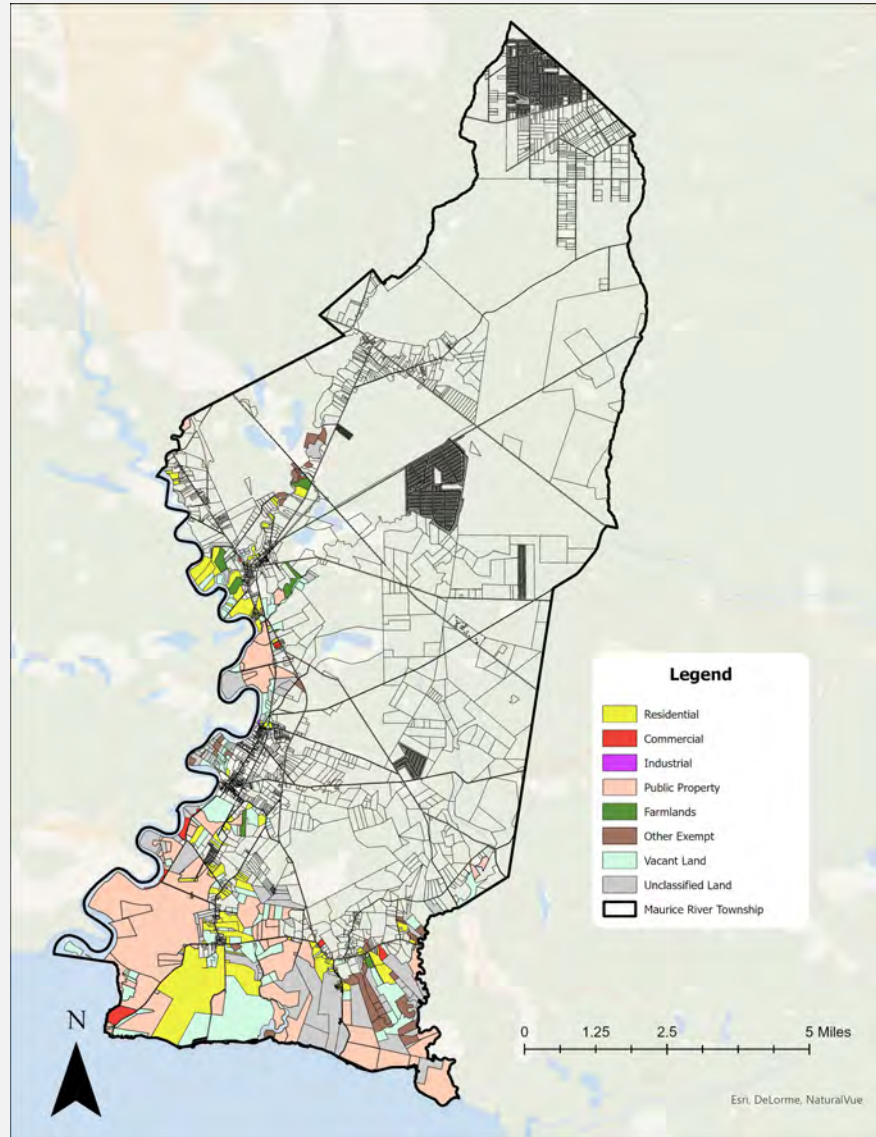
Hurricane Sandy Proxy 4FT TWL Scenario



Number of inundated parcels



Hurricane Sandy Proxy 4FT TWL Scenario



Property Class	Flooded Parcels	Total Parcels	Percentage	Improvement value	Land value
Residential	184	1326	33.03%	\$20,020,200.00	\$11,371,200.00
Commercial	13	51	45.10%	\$ 2,440,900.00	\$ 3,036,700.00
Industrial	1	24	4.16%	\$ 103,500.00	\$ 141,300.00
Public Property	120	668	17.96%	\$ 906,100.00	\$ 4,871,200.00
Farmlands	5	57	15.78%	\$ 599,500.00	\$ 214,300.00
Other Exempt	44	105	41.90%	\$ 119,800.00	\$ 844,900.00
Vacant Land	270	1898	14.22%	\$ -	\$ 2,709,100.00
Unclassified Land	612	3425	17.86%	\$ -	\$ -
Total				\$24,190,000.00	\$23,188,700.00

Social Vulnerability

- Some people are disproportionately impacted by flooding.
- Existing socio-economic factors make it harder to prepare and/or recover.

Factors such as:

Age 

 Socioeconomic status

Race

Health care access

Community underinvestment 

 English-language proficiency

Access to transportation 

Impact capacity to:

Evacuate

Miss work/wages

Comprehend risk
communications

Navigate post-storm
aid

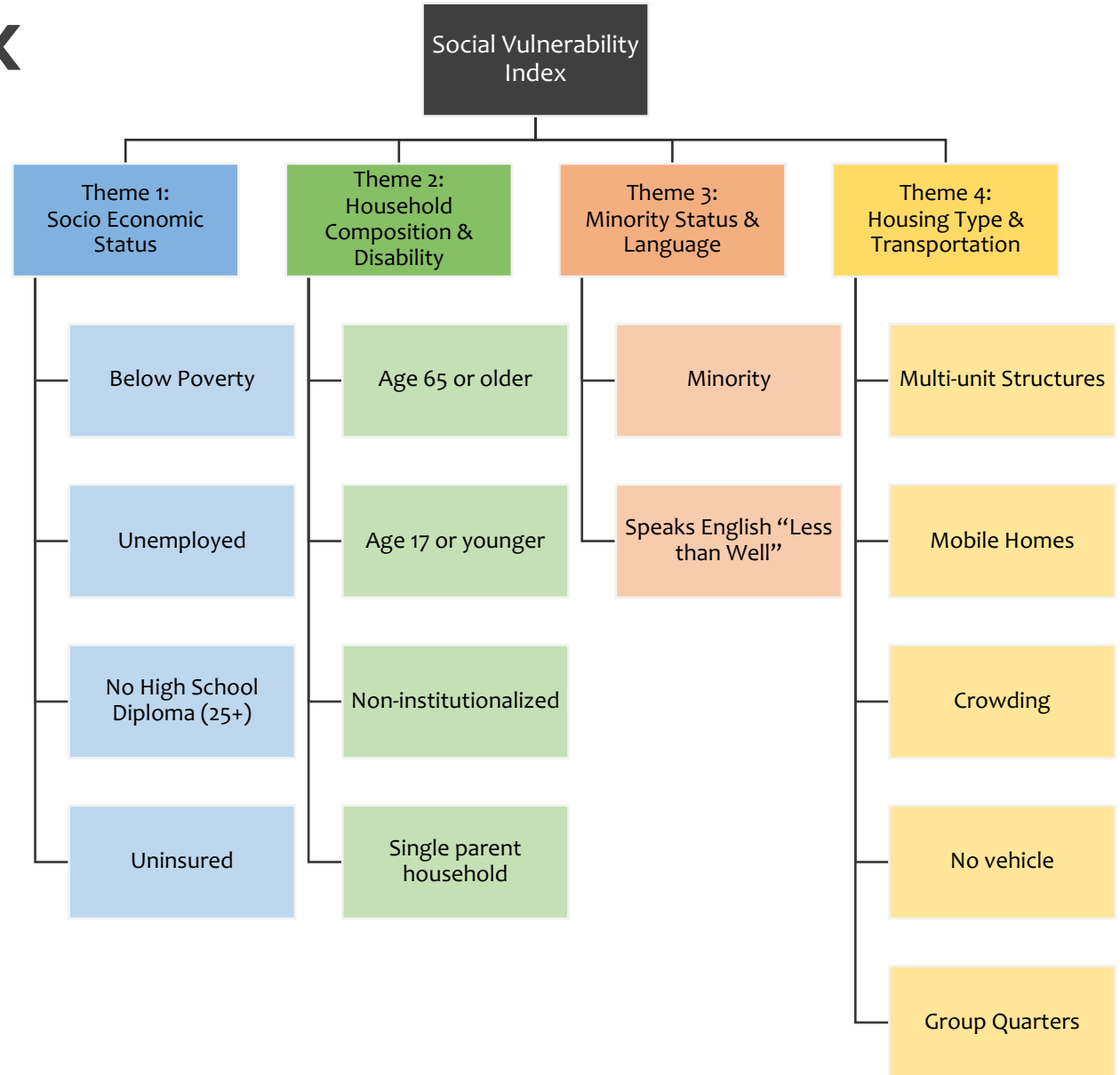
Purchase supplies

Repair housing

Etc...

Social Vulnerability Index

- The Social Vulnerability Index (CDC/ATSDR SVI) is maintained by the **Geospatial Research, Analysis, and Services Program (GRASP)**
- Measures the social vulnerability of US communities to disasters, including natural disasters, disease outbreaks, and public health emergencies.
- The percentile ranking values range from **0 to 1**, with higher values indicating greater vulnerability.
- SVI calculates a single vulnerability score for each community based on demographic, socioeconomic, and household/housing characteristics.
- Each tract receives a separate ranking for each of the four themes.



Social Vulnerability Index of Maurice River Township

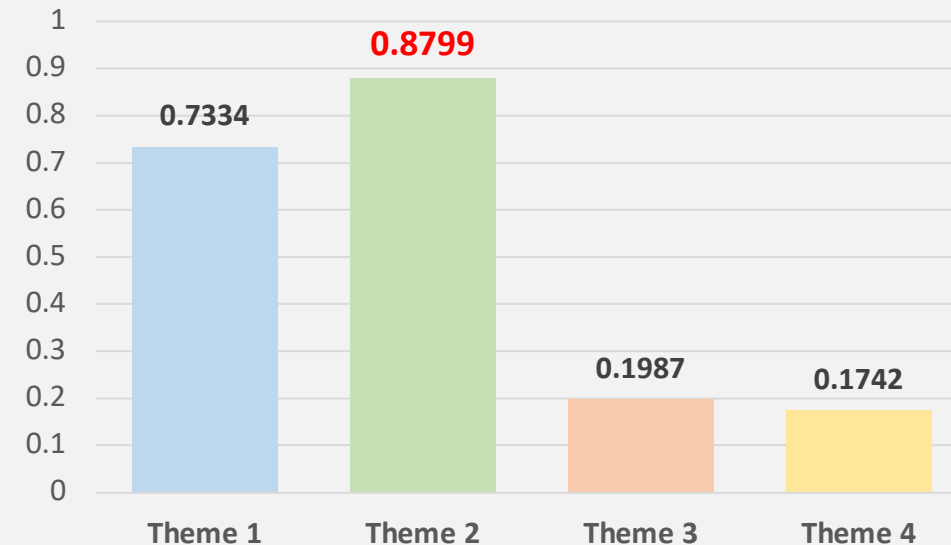
Overall Social Vulnerability (Tract Level)	Themes	15 Variables (Census)	Estimate	Percent	Percentile
	Theme 1: Socioeconomic Status	Below Poverty	472	20.8%	0.7146
		Unemployed	115	11.2%	0.8974
		No High School Diploma (age 25+)	201	12.9%	0.7331
		Uninsured	81	3.6%	0.3517
	Theme 2: Household Composition & Disability	Age 65 or older	442	19.5%	0.745
		Age 17 or younger	608	26.8%	0.8174
		Non-institutionalized disabled	406	17.9%	0.9062
		Single-parent Household	89	9.8%	0.7902
	Theme 3: Minority Status & Language	Minority	374	16.5%	0.1987
Speaks English "Less than Well"		0	0	0	
Theme 4: Housing Type & Transportation	Multi-unit Structures	0	0	0	
	Mobile Homes	64	5.6%	0.9543	
	Crowding	0	0%	0	
	No Vehicle	19	2.1%	0.1992	
	Group Quarters	0	0	0	

- Overall Social Vulnerability Index Score for Maurice River Township tract 34011010101 = 0.5952

(Source: CDC and ACS 5-year estimates 2016 - 20)

- SVI Score = 0.5952** indicates a moderate level of vulnerability in the tract.

Social Vulnerability Index Score (2020)



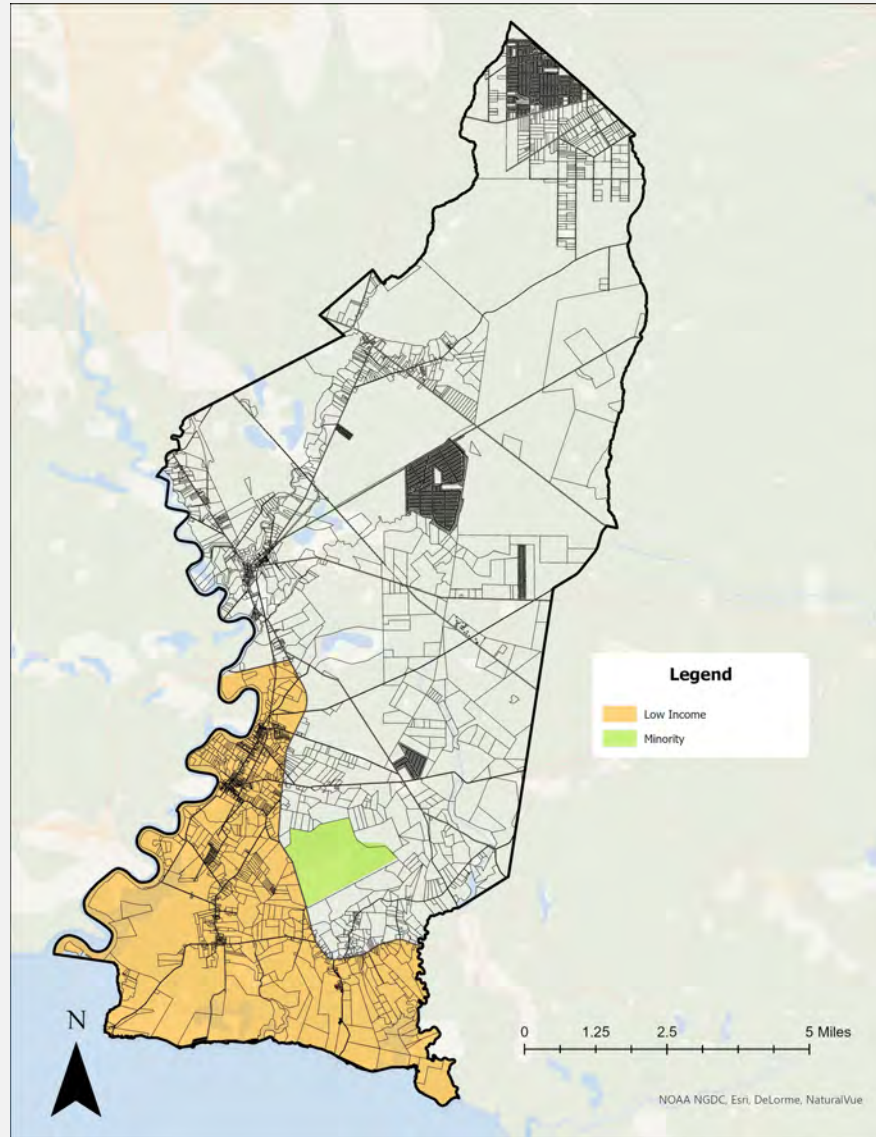
Overburdened communities

An Overburdened Community (OBC), as defined by the law, is any census block group, as determined by the most recent United States Census, in which:

1. **at least 35 percent** of the households qualify as **low-income** households (at or below twice the poverty threshold as determined by the United States Census Bureau);
2. **at least 40 percent** of the residents identify as **minority** or as members of a State recognized tribal community; or
3. **at least 40 percent** of the households have **limited English proficiency** (without an adult that speaks English “very well,” according to the United States Census Bureau).

New Jersey's Environmental Justice Law (N.J.S.A. 13:1D-157) passed on **September 18, 2020**, requires NJDEP **to assess impact of facilities on overburdened communities'** environmental and public health.

Overburdened Communities Maurice River Township



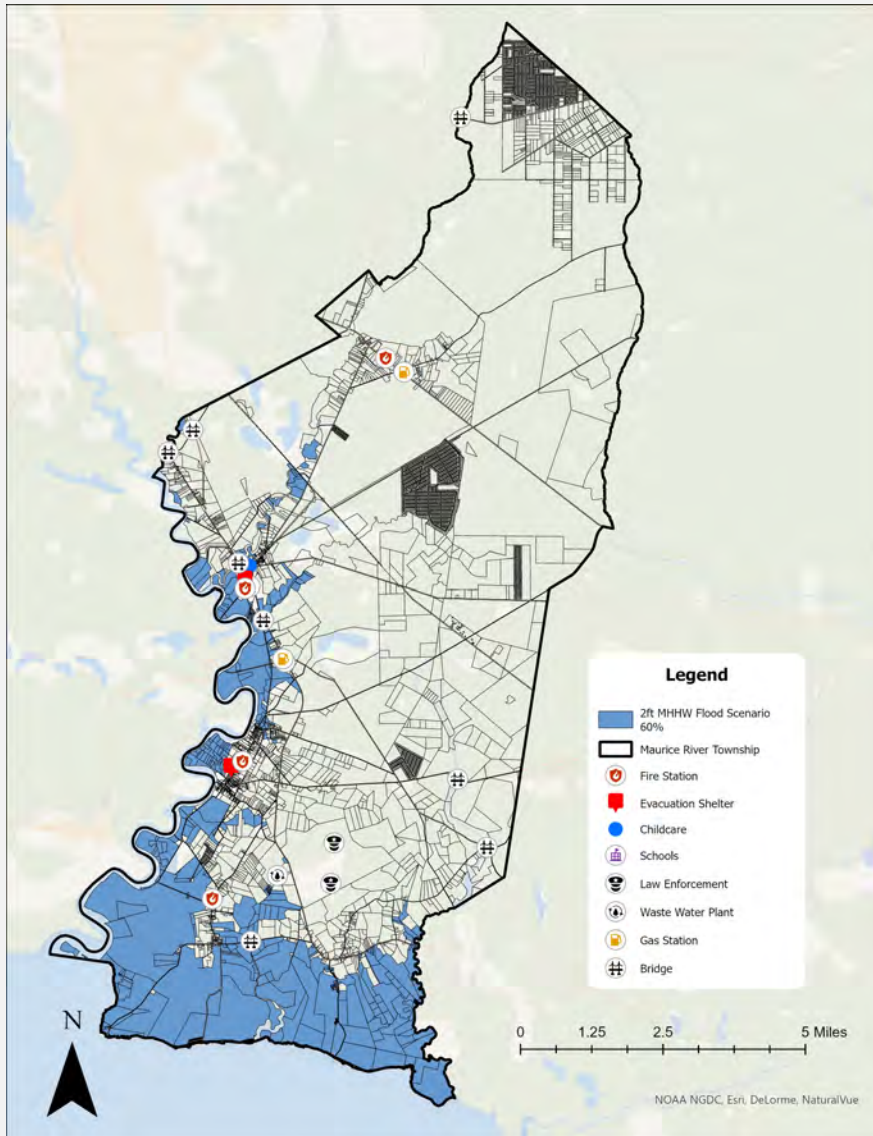
Overburdened Community in Maurice River Township	Block Group Identifier
	340110101011
Total Population	2267
Total Households	445
Low-Income Population	36.68%
Minority Population	27.53%

Overburdened Community in Maurice River Township	Block Group Identifier
	340110101031
Total Population	4890
Minority Population	76.21%

Critical Facilities

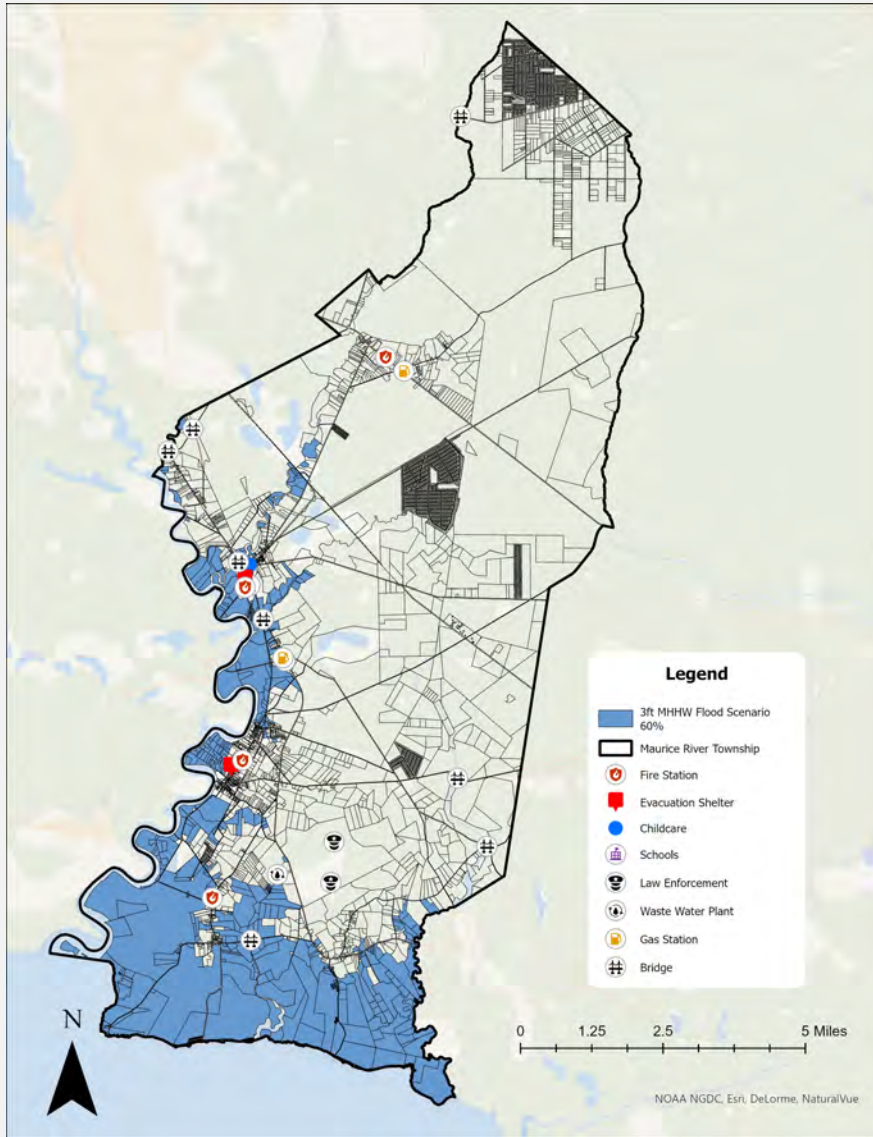
- Critical assets play a crucial role in education, care, and public safety and may be vulnerable to flooding.
- Built infrastructure, such as bridges and evacuation routes, may also be at risk of flooding, and its exposure must be understood to aid in community flood planning.
- Understanding their exposure to flood events and access roads is important for community planning.

Critical Facilities flooding at 2ft TWL



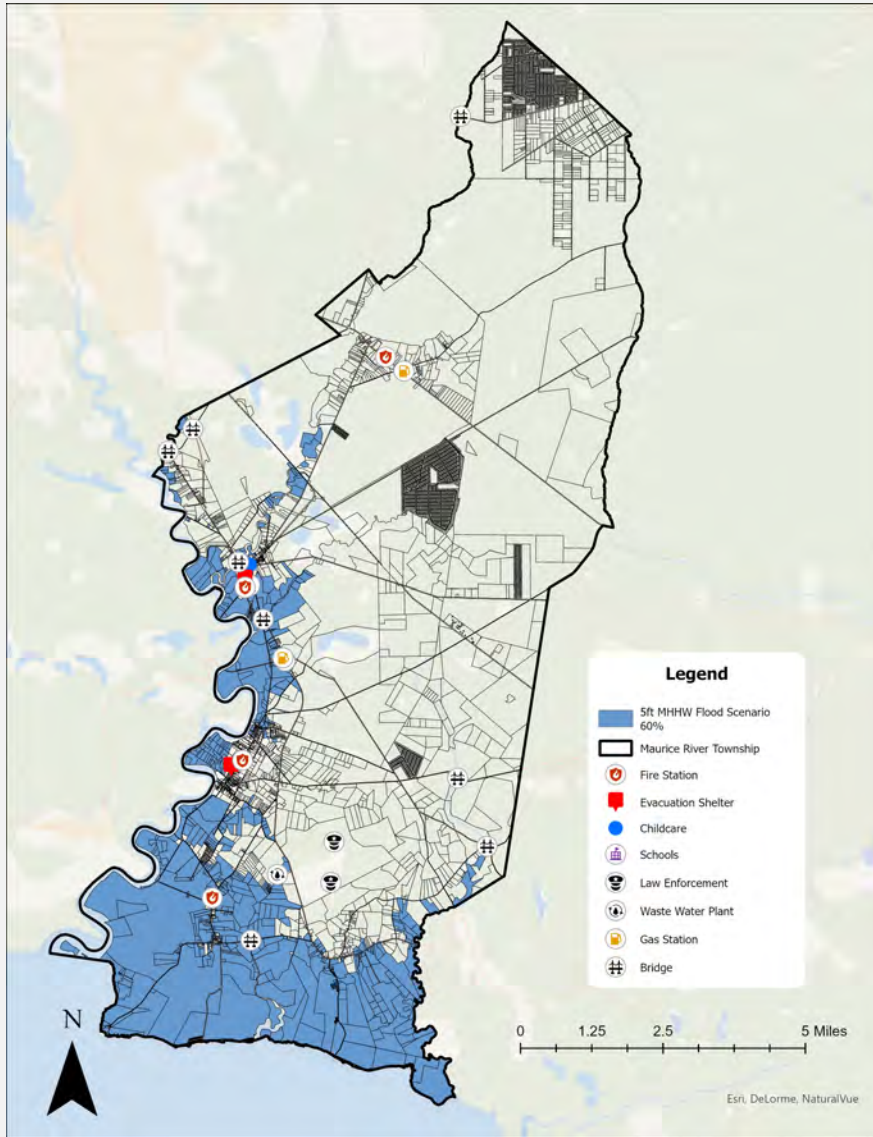
- Permanent inundation by the year 2100 (greater than 83% chance) under a moderate inundation scenario or today's high tide flooding threshold.

Critical Facilities flooding at 3ft TWL



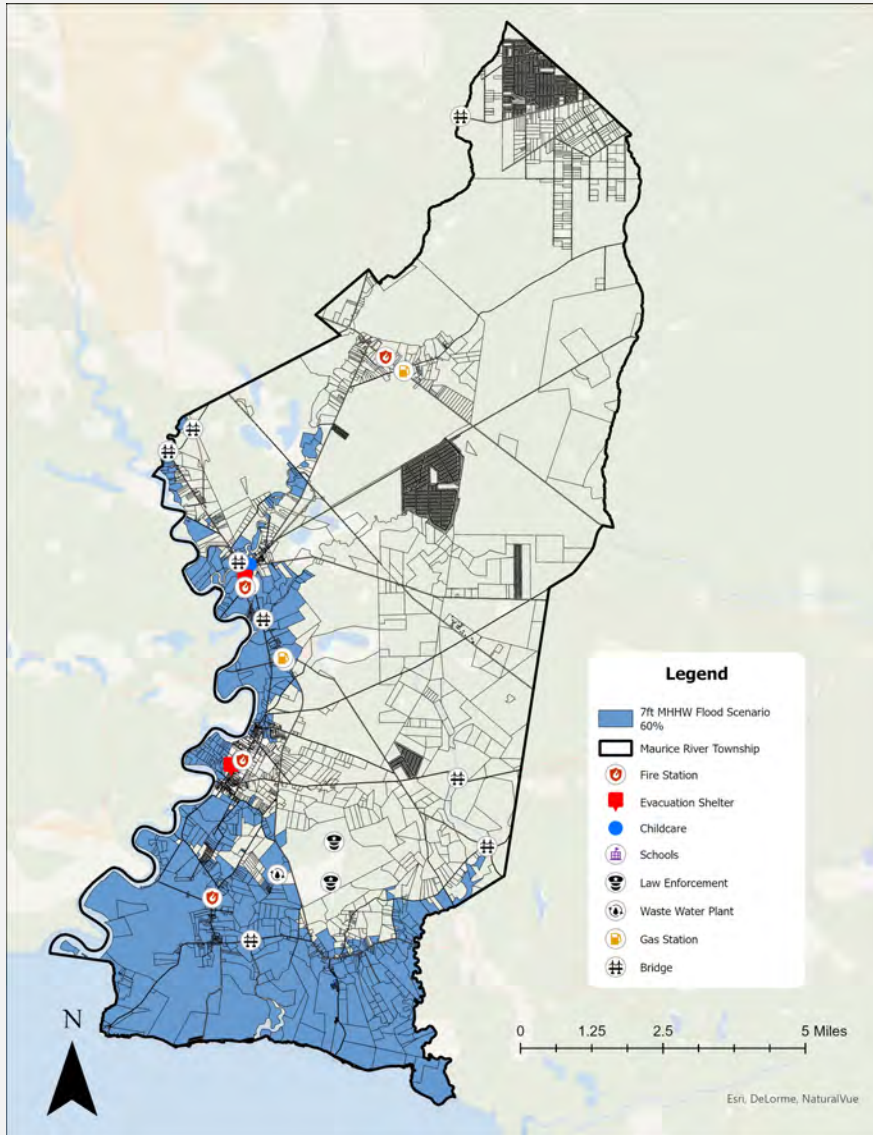
- Permanent inundation by the year 2150 (greater than 83% chance) under a moderate inundation scenario or today's 10-year flood.

Critical Facilities flooding at 5ft TWL



- Permanent inundation by the year 2150 (greater than 50% chance) under a moderate inundation scenario or today's 100-year flood.

Critical Facilities flooding at 7ft TWL



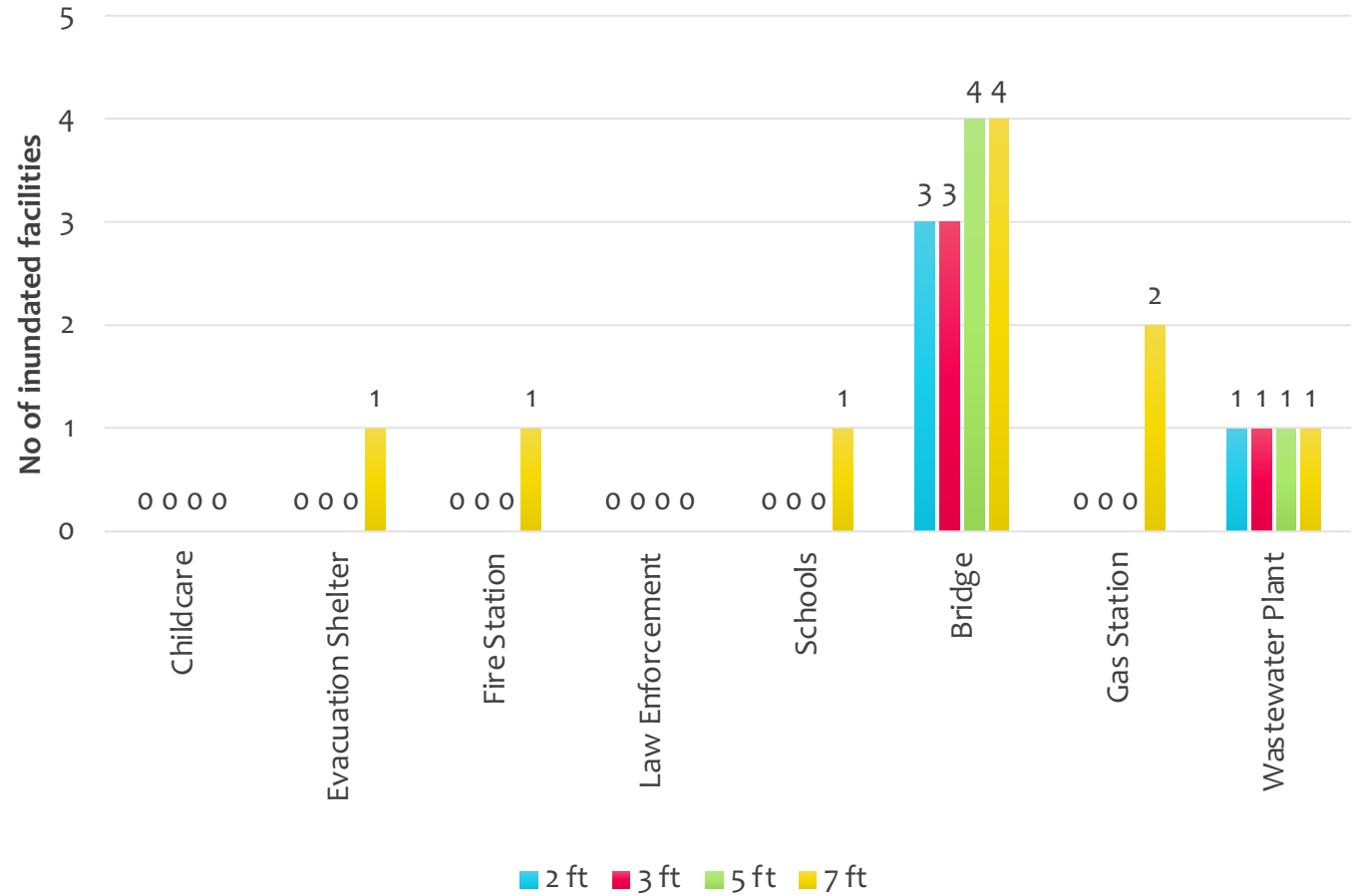
- The sea level rise by 2150 (greater than 50% chance) + today's annual flood or 100-year flood by 2070

Critical Infrastructure

Critical Facilities inundated at various flooding scenarios

Name	2 ft	3 ft	5 ft	7 ft	Total in municipality
Childcare	0	0	0	0	1
Evacuation Shelter	0	0	0	1	2
Fire Station	0	0	0	1	4
Law Enforcement	0	0	0	0	2
Schools	0	0	0	1	1
Bridge	3	3	4	4	8
Gas Station	0	0	0	2	3
Wastewater Plant	1	1	1	1	1

Critical Infrastructure Inundation



Critical Facilities inundated at various flooding scenarios



Thank You

NJ Climate Resilience Corps



FLOOD ASSESSMENT

Maurice River Township, Cumberland County, NJ

Rutgers Climate Corps | March 2023



RUTGERS
New Jersey Climate Change
Resource Center

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Purpose

This Coastal Vulnerability Assessment (CVA) aims to evaluate and summarize the possible consequences of various coastal and tidal flood scenarios in Maurice River Township, New Jersey (MRT). The Rutgers Climate Resilience Corps (hereafter “Rutgers”) has utilized multiple tools and sources to identify the current vulnerabilities affecting housing, the local economy, public assets, natural resources, and other social and physical assets in the area.

In this report, Rutgers provides a flood exposure analysis for neighborhood-level planning and identification of potential flood exposures. The information in this report may be used to support the requirements of the New Jersey Office of Planning Advocacy (NJOPA) Plan Endorsement process, which aims to ensure municipalities comply with state regulations and policies in their planning efforts. The information in this report may also be used to partially support the requirements of the New Jersey Municipal Land Use Law (Section 19 of P.L.1975 c.291 (C.40:55D-28)) for municipalities to incorporate a Climate Change Related Hazard Vulnerability Assessment (CCRHVA) into the land use plan element adopted as part of municipal master plan updates.

The report focuses on flooding scenarios arising from sea level rise, storm surge, and high tides and does not encompass flooding from heavy rainfall/stormwater events. MRT should not depend on this information to determine monetary losses from a specific event on individual properties or parcels. The data used in this CVA is not a substitute for property-specific flood hazard modeling and engineering studies that consider detailed building elevations and hydrodynamic conditions. Instead, the CVA provides a broader understanding of the regional flooding implications for future assessments.

Methodology

Water Levels

Rutgers assessed the impact of **2, 3, 5, and 7 feet of flooding using a Total Water Level (TWL) approach** (Figure 1). TWL represents the “still water” inundation above Mean Higher High Water (MHHW) during a flood event. These water levels allow one to visualize the impact of future sea level rise combined with potential flood events. MHHW is the high-water tidal elevation determined by averaging the higher of each day's two high tides at a particular tide station during a National Tidal Datum Epoch, typically 19-year time period. (NOAA Tides & Currents, n.d.), (The Climate Planning Tool - Flooding Primer, 2022), (New Jersey's Rising Seas And Changing Coastal Storms, 2019)

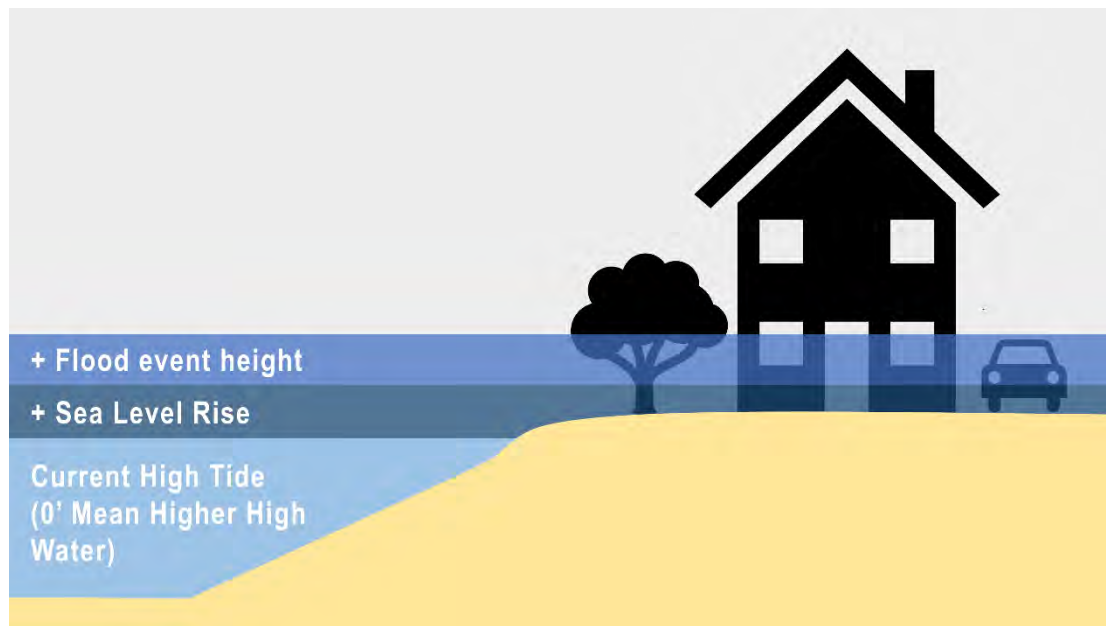


Figure 1: Total Water Level (TWL) approach.

Thus, in this report, a 2-foot flood scenario indicates there are two additional feet of water above the local MHHW level. In other words, a tidal waterbody's surface would be two feet higher than the typical daily high tide.

Water levels above the MHHW can be caused by periodic tidal cycles, short-term storm surge events, gradual phenomena such as sea-level rise, or any of these in combination. In the future, the same water levels that occur during storm surge floods today may appear as high-tide flooding (HTF) during sunny days because of sea-level rise.

The four flooding scenarios used in this CVA follow the NJDEP's Sea-Level Rise Guidance which recommends utilizing 2100 as a planning horizon. Each of the

flooding scenarios is within the likely range of impacts projected for 2100, meaning that there is at least a 66% chance that sea-level will rise between 2 to 5 feet by 2100. (*NJDEP, Sea-level rise guidance for planning & decision-making, 2021*)

Collectively, these four water levels should be thought of as State planning benchmarks. NJDEP's Sea-Level Rise Guidance for New Jersey recommends that planners analyze: (1) 2 feet of sea-level rise that "is likely unavoidable," (2) 5.1 feet of sea-level rise sufficient to plan for most activities in a community, and (3) a high-end estimate of 6.9 feet for those critical activities for which damages would have "debilitating effects" on public health and safety. (*NJDEP, 2021*)

Data Resources

Rutgers conducted this analysis using publicly available data in ESRI ArcGIS, a GIS software that allows users to work with maps and geographic information. Data used is commonly available as a shapefile (*i.e.*, a series of unique points, lines, or polygons which store information about a given area or object) or raster (*i.e.*, continuous data that can be overlaid on top of a given area). The following resources were used for this CVA and mapped on the "NAD_1983_Stateplane _New_Jersey_FIPS_2900_Feet" coordinate system:

- New Jersey Municipal Boundaries shapefile. (*Municipal Boundaries of NJ, n.d.*)
- Mean Higher-High Water level raster files provided in 2017. These show the extent and depth of flood inundation, for different MHHW levels (2-, 3-, 5-, and 7-feet). (*NJDEP, n.d.*)
- Flood Insurance Rate Map (FIRM) National Flood Hazard Layer shapefile. These show the extents of flood hazard zones. (*FEMA, n.d.*)
- MOD-IV Statewide Parcels shapefile. MOD-IV is the New Jersey Property Tax System, and this dataset provides information regarding where each property is located, the property's class (*e.g.*, whether the property is residential, commercial, etc.), the net value of each property, and other relevant information. Source: The statewide composite of parcels data for New Jersey was developed during the Parcels Normalization Project in 2008-2014 by the NJ Office of Information Technology, Office of GIS. (*NJOGIS, n.d.*)
- New Jersey 2020 Social Vulnerabilities Index shapefile. The Center for Disease Control and Prevention (CDC) Social Vulnerability Index created by the Geospatial Research, Analysis Services Program (GRASP) aimed at helping public health officials and emergency response planners to identify and map the communities that will most

likely need support before, during, and after a hazardous event. 2020 American Community Survey data is mapped onto 2010 Census Tract geographies. Source: CDC.

- US Geological Survey NHDPlus High Resolution. The National Hydrography Dataset depicts flow of water at 1:24,000 scale. Rutgers uses the data to depict floodways and open water.
- Overburdened communities under the New Jersey Environmental Justice Law. As designated by the NJDEP, an “overburdened community” refers to any Census block group in which:
 - at least 35% of the households qualify as low-income households;
 - at least 40% of the residents identify as a minority or as members of a State-recognized tribal community; or
 - at least 40% of the households have limited English proficiency.
- Rutgers Climate Snapshot. This dataset provides location data for exposed critical infrastructure for all New Jersey municipalities.

Interpretation of Maps

Type 1: Spatial Extent of Flooding Scenarios

The first type of map included in this assessment represents the spatial extent of flooding for Total Water Levels at 2 feet, 3 feet, 5 feet, and 7 feet. Each map in this category represents a flooding scenario. Darker shading in any given scenario represents deeper water at that location. The areas that are unshaded in the map indicate that there is no flooding there.

Type 2: Flood Level Exposure of Parcels

The second type of map provides a more detailed version of the first map, identifying parcels whose area is over 60% flooded in a given scenario. Rutgers University opted to analyze flooded parcels using this threshold due to the high concentration of small residential parcels in Maurice River Township. Many parcels, which consist primarily of residential homes, are likely to experience flooding using this threshold. This phenomenon is illustrated in Figure 2.

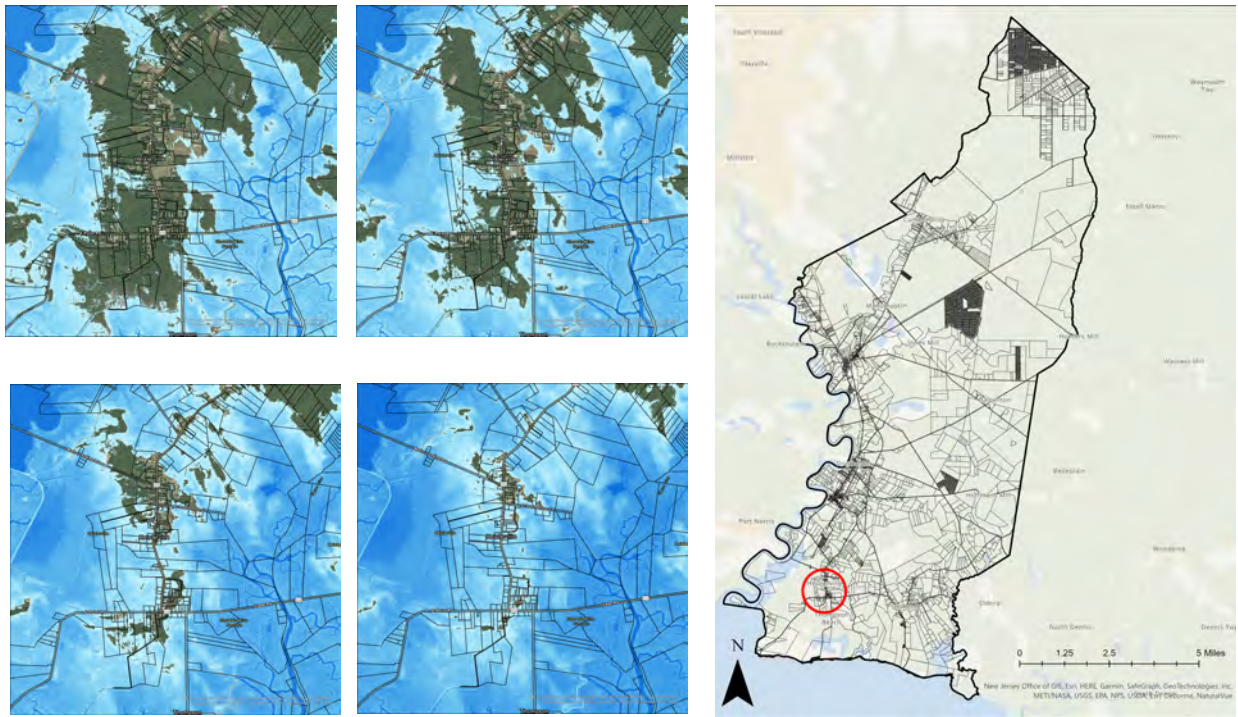


Figure 2: Flood extent of small residential parcels used to select 60% inundation threshold. Map on right indicates inset area.

It should be noted that the 2 feet and 3 feet flood risks, while less severe, are also more likely to occur than the higher water levels analyzed in this study. Conversely, the 5 feet and 7 feet flood scenarios are less likely to occur, but they pose a greater danger when they do.

Type 3: Parcel Class Inundation by Scenario

The third type of map additionally indicates the property classification of the inundated parcels. Parcels are visually represented parcels by property class, using the color-coding scheme within the American Planning Association's Land-Based Classification Scheme standards.

Type 4: FEMA Flood Hazard Zones

The fourth type of map displays the spatial extent of flood zones designated by the Federal Emergency Management Agency (FEMA). FEMA prepares Flood Insurance Rate Maps (FIRMs) illustrating the extent of flood hazards in flood-prone communities for flood insurance and risk assessment purposes. To generate these maps, FEMA conducted engineering studies referred to as Flood Insurance Studies. Collectively, these maps are known as the National Flood Hazard Layer (NFHL).

Using the information gathered in these studies, FEMA engineers and cartographers delineate Special Flood Hazard Areas (SFHAs) on flood maps. SFHAs are subject to inundation by floods that have a 1% or greater chance of being equaled or exceeded during any given year. This type of flood is commonly referred to as the 100-year flood, or the base flood. Areas inundated by these floods are identified on the FIRMs as Zones A, AE, AH, AO, AR, V, VE, B, and C. (An additional identified zone, X, is also mapped but is not part of the SFHA as it has a lower annual chance threshold of only 0.2%.)

While these SFHAs delineate flood insurance carriage requirements, or regulate local, state, and federal management of coastal land development, the engineering studies upon which they are based may not account for climate change-related flood hazards. Therefore, these Flood Hazard Zone maps are meant to complement the maps of Total Water Level Scenarios.

It is important to note a 100-year flood is not a flood that occurs once every 100 years. In fact, the 100-year flood has a 26 percent chance of occurring during a 30-year period. The 100-year flood is a regulatory standard used by Federal agencies and most states to administer floodplain management programs. The 100-year flood is used by the National Flood Insurance Program (NFIP) as the basis for insurance requirements nationwide.

Caveats

The data and maps presented in this flood analysis illustrate the potential scale of flooding but do not provide precise locations. Moreover, the study does not consider factors influencing flooding, such as erosion, subsidence, or future construction. Therefore, when interpreting and utilizing the data and maps, caution must be exercised.

To ensure accuracy, verifying all aspects of remote sensing data with a site visit is crucial. Furthermore, the information provided should only be used for screening and management decisions, not for navigation, permitting, or any other law-related purpose.

It is important to note that the flood modeling used in this analysis does not account for flood protection structures such as berms, levees, dikes, or floodwalls. The potential for flooding is thus not correctly estimated in areas with these structures.

In the case of parcel flooding, it is essential to note that the footprint of the building is not used to determine the extent of flooding. An area of land must be covered with water by at least 60 percent to be considered flooded for the purposes of this analysis. Consequently, some parcels may be deemed flooded despite only a portion of the building being affected.

Lastly, the land and improvement values utilized in the analysis are obtained from MOD IV data and represent the entire parcel. Data is not available to specifically consider basement and first-floor flooding; thus potential economic impacts may be overestimated.

In summary, although the data and maps presented in this flood analysis can assist in screening-level decision-making, it is necessary to weigh the various limitations and caveats of the study. Data and maps should be interpreted and utilized with this limitation in mind when making management decisions.

Introduction: Maurice River Township

Location and Context

Maurice River, situated in Cumberland County, New Jersey, is the largest incorporated municipality in the area, spanning 94.7 square miles (Figure 3). Notably, over 50% of the township's land area is state-owned, enrolled in a conservation program, or publicly owned. Only 9% of the land area is devoted to residential purposes.

The township boasts a natural landscape of four designated Wild and Scenic rivers: the Maurice River, Menantico River, Manumuskin River, and Muskee Creek.

Historically, Maurice River consists of eight historical villages: Milmay, Cumberland, Delmont, Heislerville, Leesburg, Dorchester, Bricksboro, and Port Elizabeth. These villages have roots that date back to the 1600s, and each formed for various reasons related to local commerce and their proximity to the waterways.

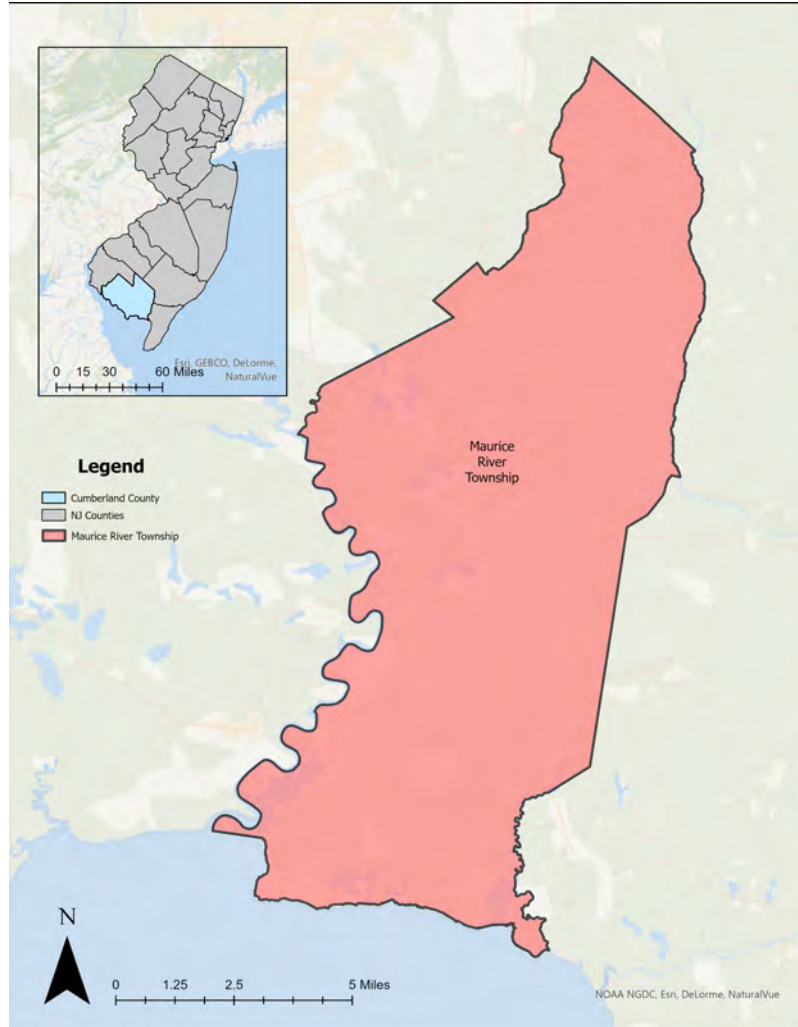


Figure 3: Maurice River Township location

Demographics

According to the American Community Survey (2020) five-year estimates, Maurice River Township has a total population of 6,218, including an institutional population of 3,034. The institutional population includes those living in prison.

The non-institutionalized residential population is 3,184, with a negative 10.80% growth rate since 2010. The institutional population has experienced a negative 31.10% rate since 2010.

The population density of Maurice River Township is 68 persons per square mile. The average household size is 2.5, and there are 1,443 housing units, 1,257 (87.1%) of which are occupied. Approximately 82% of the occupied housing units are owner-occupied, with a median household income of \$73,203. The poverty rate in the township is 9.4%, and the unemployment rate for individuals aged 16 years and older is 11.2%.

The median rental cost in Maurice River Township is \$1,134 per month, while the median house value is \$169,000. The median age of the township's residents is 39.1 years, with 44.3% identifying as white alone and 55.7% identifying as non-white.

Parcels and Property Classes

Table 1 below shows a breakdown of the property class in Maurice River, including the total number of parcels associated with each unique property class. There are 7,589 parcels in the township, each belonging to a property class listed in the table.

The "Residential" property class includes 1,326 parcels, or approximately 18%. Typically, this classification is used for single-family homes, duplexes, and townhouses. The largest property class by far is "Unclassified Land," which includes 3,425 parcels, or just over 45% of the total. There is no specific purpose or use designated for this classification of land. The next largest property class is "Vacant Land," which includes 1,898 parcels, just under 25% of the total. The classification is used for land that has no current use but may be developed or used in the future. The other property classes listed in the table include "Residential (Apartments)," "Commercial," "Industrial," "Education," "Public Property," "Church and Charitable," "Cemeteries," "Farmlands," "Transportation," and "Other Exempt."

Property Class	Total Parcels
Residential	1326
Residential (Apartments)	2
Commercial	51
Industrial	24
Education	4
Public Property	668
Church and Charitable	15
Cemeteries	12
Farmlands	57
Transportation	2
Other Exempt	105
Vacant Land	1898
Unclassified Land	3425
Total	7589

Table 1: Maurice River Township Property Classes Table (Source: Parcels and a mod-IV composite of NJ)

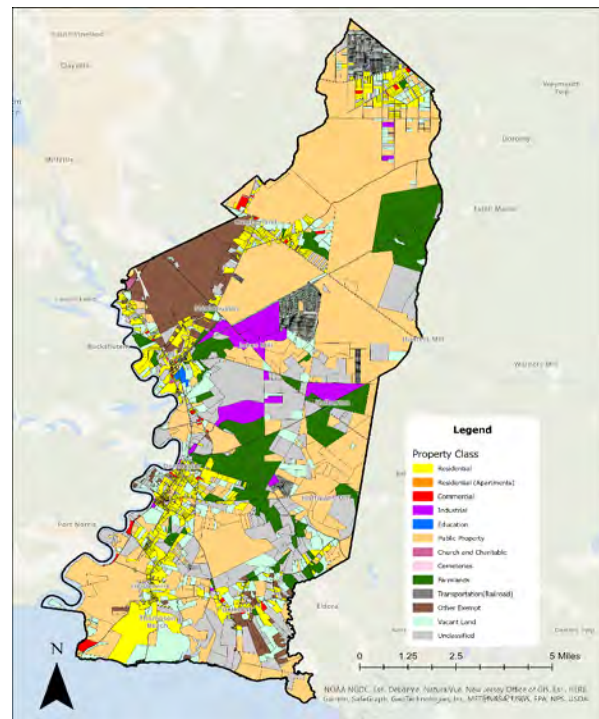


Figure 4: Maurice River Township Property Classes Map (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Flood Assessment

Identified Exposure Summary

This assessment reveals patterns of flooding and its impacts on people and property at municipal and neighborhood scales. At a municipal spatial scale, following underlying patterns were observed:

- Several rivers and creeks in the township, including the Maurice River, the Manumuskin River, and Dividing Creek, are subject to flooding during periods of heavy rainfall or storms. Furthermore, coastal areas like those near Delaware Bay are susceptible to flooding during storm surges and high tides.
- The areas in Maurice River Township most vulnerable to flooding are Bayside locations, including Fortescue and Dividing Creek; low-lying areas close to the Manumuskin River, such as Port Elizabeth and Haleyville; and areas surrounding the Maurice River, particularly in the southern region.

2ft Total Water Level Flooding Scenario

Figure 6 presents a raster layer map illustrating the 2 feet Total Water Level flood scenario for Maurice River. The map indicates that the areas most likely to be flooded are located on the southern and western sides of Maurice Creek, with a total of 1,005 parcels exposed to flooding township-wide (Figure 7).

The NJDEP Sea-Level Rise Guidance provides information on the possibility of sea level rise in the future. It indicates that there is a 5% chance that the sea level will rise by 2 feet between 2040-2050, a 66% chance that the sea level will rise to 2 feet by 2070, and an 83% chance that it will increase by at least 2 feet by 2100. In other words, the sea level will likely rise by at least 2 feet, even under the most optimistic greenhouse gas emissions scenarios, which will have significant implications for coastal communities.

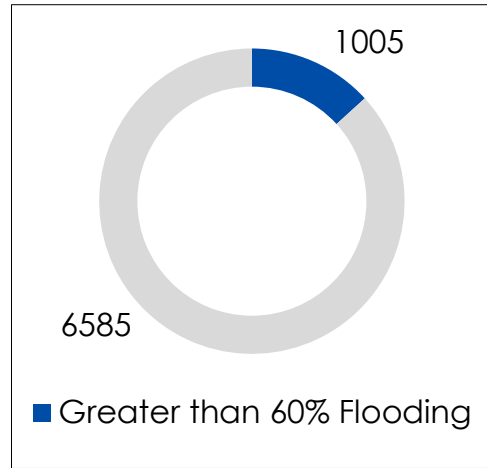


Figure 5: Number of flooded versus non-flooded parcels at 2ft TWL.

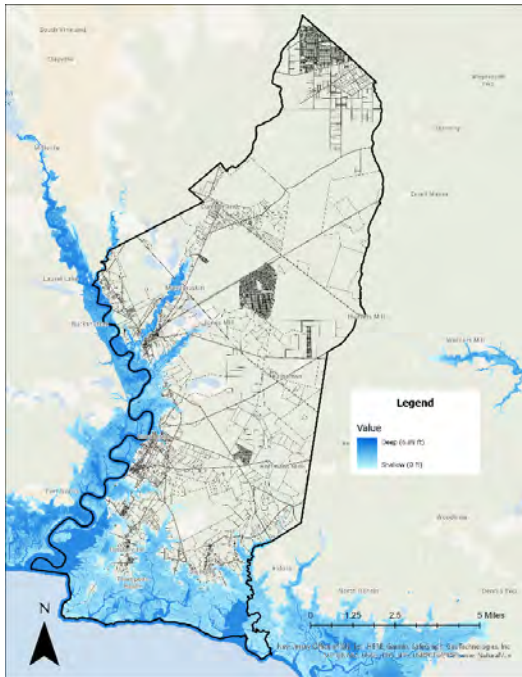


Figure 6: Flood extent at 2ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

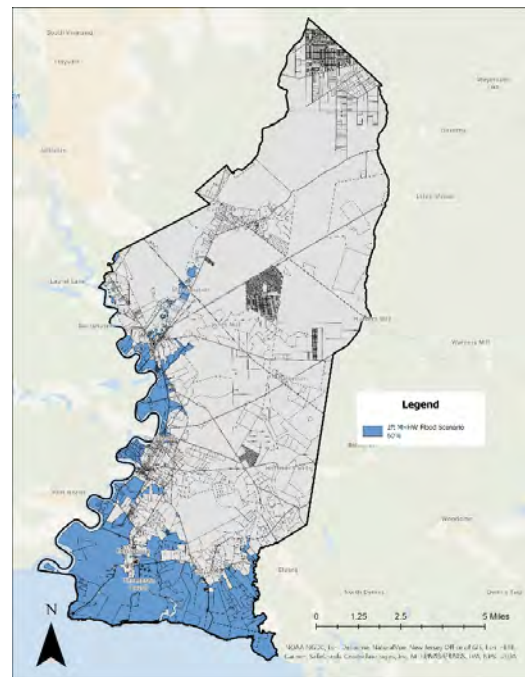


Figure 7: Parcels flooded at 2ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Parcel Class		Flooded parcels	Total parcels	Percentage	Improvement value	Land value
Residential	2	89	1326	6.71%	\$10,320,800.00	\$ 5,830,200.00
Commercial	4A	9	51	17.65%	\$ 1,355,700.00	\$ 2,016,700.00
Public Property	15C	106	668	15.87%	\$ 906,100.00	\$ 4,664,300.00
Farmlands	3A & 3B	2	60	3.33%	\$ 203,200.00	\$ 67,300.00
Other Exempt	15F	38	105	36.19%	\$ 9,400.00	\$ 663,200.00
Vacant Land	1	220	1898	11.59%	\$ -	\$ 1,996,000.00
Unclassified Land	0	541	3425	15.80%	\$ -	\$ -
Total					\$12,795,200.00	\$15,237,700.00

Table 2: Parcel classes exposed to flooding at 2ft TWL.

For each property class, Table 2 presents the number and percentage of flooded parcels and the total value of improvements and land. Improvement values represent the value of physical structures on the property, while land values represent the value of the land.

The property classes with the highest rates of flooded parcels are “Other Exempt” at 36.19%, followed by “Commercial 4A” at 17.65%, “Public Property 15C” at 15.87%, “Vacant Land 1,” at 11.59%, “Residential” at 6.71%, “Farmlands 3A & 3B” at 3.33%, and “Unclassified Land” at 15.80%.

The three most affected property classes based on total improvement value are “Residential” with a value of \$10,320,800, “Commercial 4A” with a value of \$1,355,700, and “Public Property 15C” with a value of \$906,100.

In terms of land value, the three most affected property classes are “Vacant Land 1”, with a value of \$1,996,000, “Public Property 15C,” with a value of \$4,664,300; and “Other Exempt,” with a value of \$663,200.

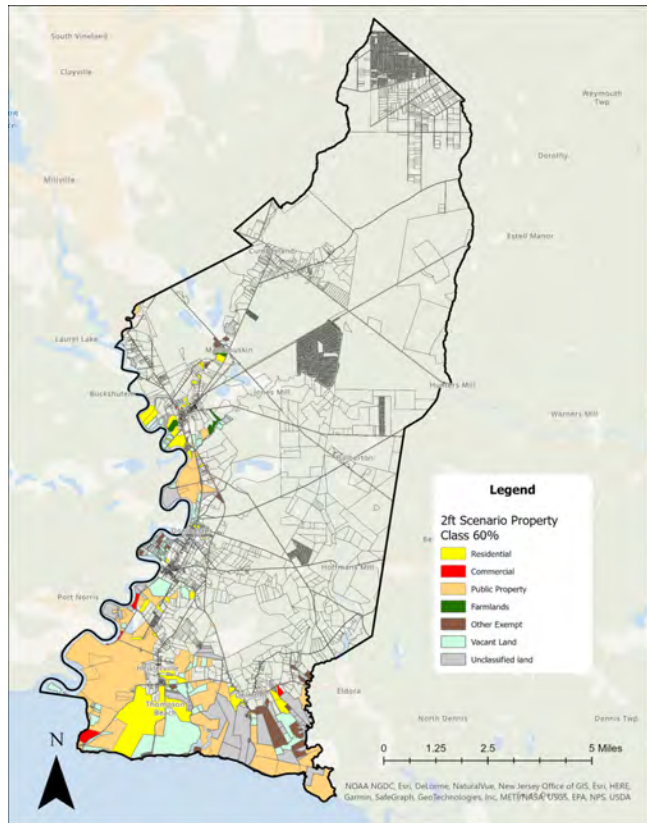


Figure 8: Flooded parcels by property classes at 2ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

3ft Total Water Level Flooding Scenario

Figure 10 presents raster layer map depicting the 3 feet Total Water Level flooding scenario. At 3 feet TWL, the inundated area extends beyond the 2 feet scenario, primarily on the southern and western sides of Maurice Creek.

This flooding scenario threatens 1,141 parcels out of the total 7,589 parcels in the township (Figure 9).

The NJDEP Sea-Level Rise Guidance indicates a 5% probability of 3 feet SLR by 2060 based moderate greenhouse gas emissions, and a 66% probability of 3 feet SLR by 2090 based on high greenhouse gas emissions.

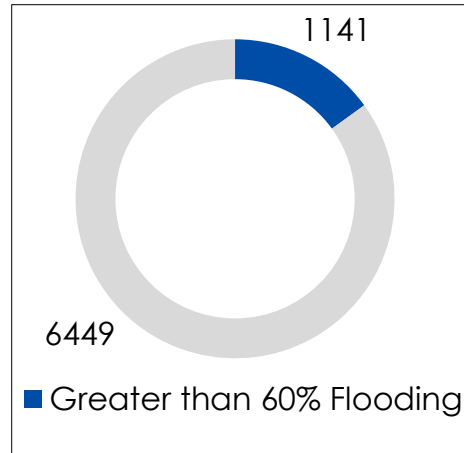


Figure 9: Number of flooded versus non-flooded parcels at 3ft TWL.

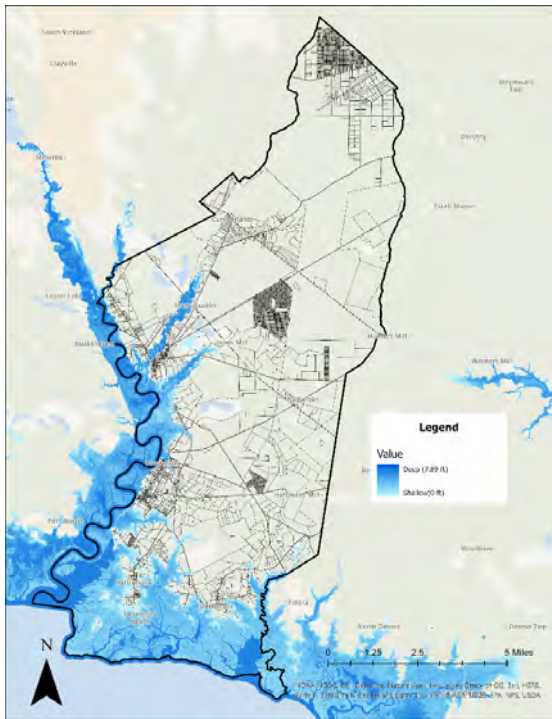


Figure 10: Flood extent at 3ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

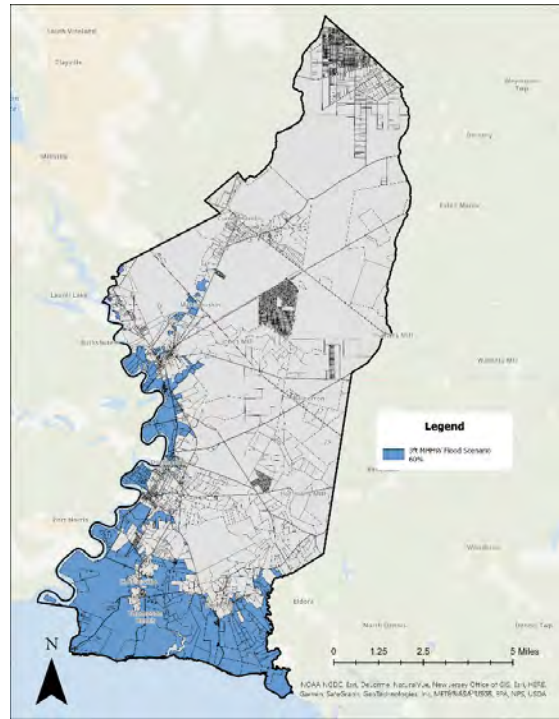


Figure 11: Parcels flooded at 3ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Parcel Class		Flooded parcels	Total parcels	Percentage	Improvement value	Land value
Residential	2	133	1326	10.03%	\$14,776,800.00	\$ 8,410,100.00
Commercial	4A	11	51	21.57%	\$ 2,182,500.00	\$ 2,231,700.00
Industrial	4B	1	24	4.17%	\$ 103,500.00	\$ 141,300.00
Public Property	15C	115	668	17.22%	\$ 906,100.00	\$ 4,769,200.00
Farmlands	3A & 3B	5	57	8.77%	\$ 599,500.00	\$ 214,300.00
Other Exempt	15F	41	105	39.05%	\$ 119,800.00	\$ 777,600.00
Vacant Land	1	246	1898	12.96%	\$ -	\$ 2,219,700.00
Unclassified Land	0	589	3425	17.20%	\$ -	\$ -
Total					\$18,688,200.00	\$18,763,900.00

Table 3: Maurice River Township, Parcels exposed to flooding at 3ft Total Water Level Scenario.

Table 3 and Figure 12 illustrate the number of parcels that would be flooded in the event of 3 feet TWL.

The Residential class has the highest number of flooded parcels at this scenario, with 133 out of 1326 parcels flooded, representing 10.03% of the total. The total land value impacted is \$8,410,100, and improvement value is \$14,776,800, indicating that this scenario could result in substantial financial loss.

The Public Property class also has a high number of flooded parcels, with 115 out of 668, representing 17.22% of the total, and a significant land value of \$4,769,200.00. The Commercial and Other Exempt classes also have a relatively high percentage of flooded parcels. Vacant Land and Unclassified Land have no improvement value, but they still have a significant land value, which could be negatively affected by flooding.

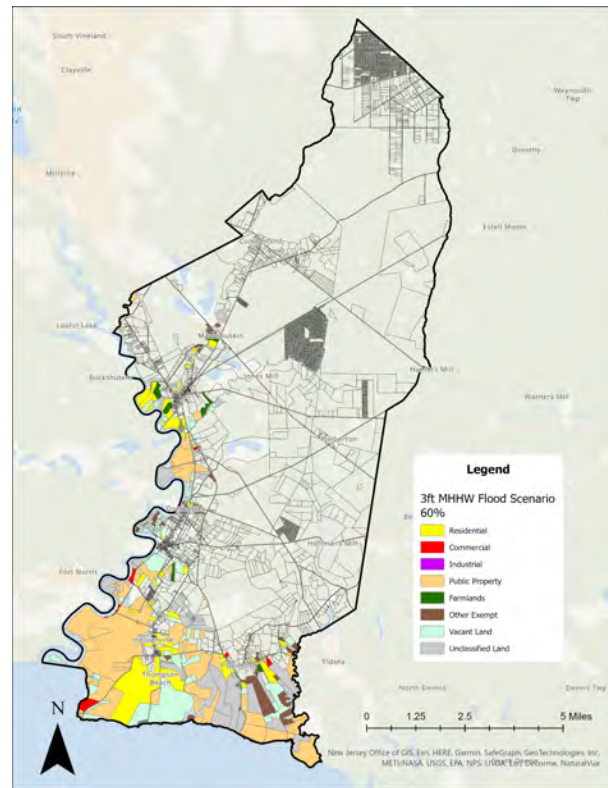


Figure 12: Flooded parcels by property class at 3ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

5ft Total Water Level Flooding Scenario

Figure 14 presents a raster layer map that illustrates the effects of flooding at 5 feet Total Water Level. The map shows an increase in the depth of flooding compared to previous flood scenarios, particularly near the banks of the Maurice and Manumuskin rivers.

This scenario threatens 1,380 parcels (Figure 15).

According to the NJDEP Sea-Level Rise Guidance, under the moderate emissions scenario, there is a 17% chance of sea-level rise exceeding 5 feet by 2100.

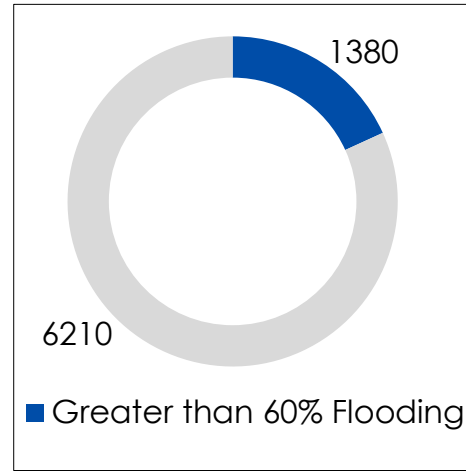


Figure 13: Number of flooded versus non-flooded parcels at 5ft TWL.

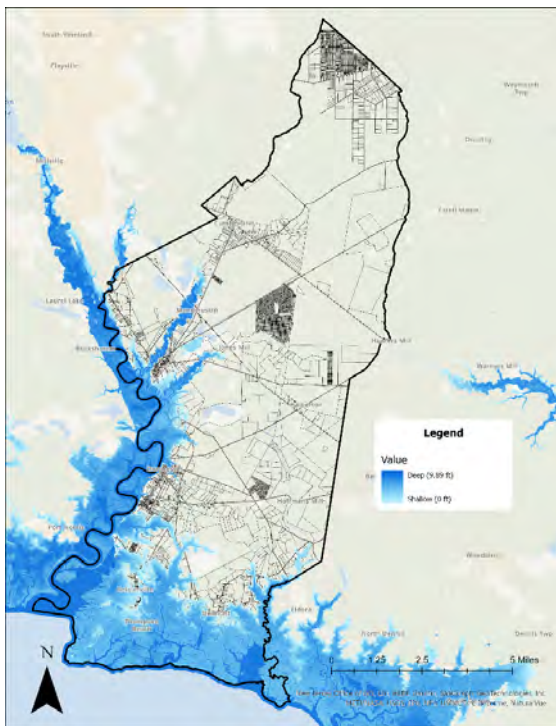


Figure 14: Extent of flooding at 5ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

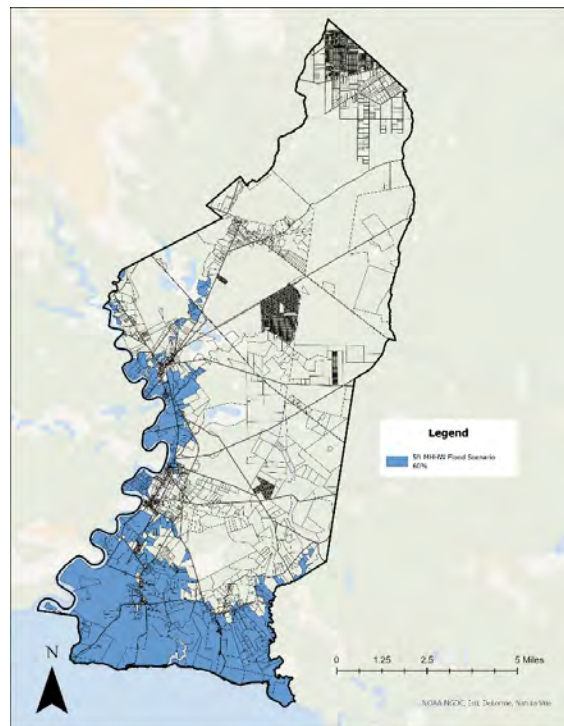


Figure 15: Parcels flooded at 5ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Parcel Class		Flooded parcels	Total parcels	Percentage	Improvement value	Land value
Residential	2	259	1326	19.53%	\$28,213,800.00	\$15,089,100.00
Commercial	4A	14	51	27.45%	\$ 2,494,900.00	\$ 3,086,700.00
Industrial	4B	3	24	12.50%	\$ 405,200.00	\$ 513,100.00
Education	15A	1	4	25.00%	\$ -	\$ 36,900.00
Public Property	15C	127	668	19.01%	\$ 906,100.00	\$ 5,101,900.00
Church and Charitable	15D	1	15	6.67%	\$ 592,700.00	\$ 50,000.00
Farmlands	3A & 3B	5	57	8.77%	\$ 599,500.00	\$ 214,300.00
Other Exempt	15F	46	105	43.81%	\$ 119,800.00	\$ 875,400.00
Vacant Land	1	287	1898	15.12%	\$ -	\$ 3,078,200.00
Unclassified Land	0	637	3425	18.60%	\$ -	\$ -
Total					\$33,332,000.00	\$28,045,600.00

Table 4: Parcels exposed to flooding at 5ft TWL.

Table 4 and Figure 16 indicates that the Residential class has the most flooded parcels (259), impacting 19.53 percent of the residential parcels. The Commercial class also has a relatively high percentage of flooded parcels (27.45%), and the improvement value is also substantial, indicating that flooding could significantly impact the value of these properties.

Flooding in the Public Property class could severely damage government buildings, parks, and other public areas. The Other Exempt parcel class also has a high percentage of flooded parcels (43.81%), indicating that these properties may be particularly vulnerable to flooding.

Observing the total values, the improvement value for all parcel classes is significantly higher than the land value, indicating that many properties have structures that could be damaged by flooding. The total improvement value at risk of inundation is \$33,332,000, and the total value of land value is \$28,045,60.

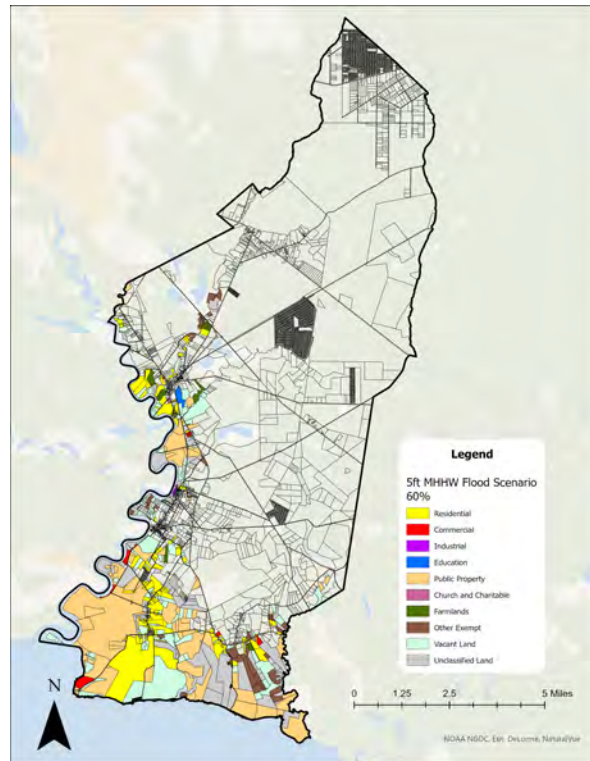


Figure 16: Flooded parcels by property class at 5ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

7ft Total Water Level Flooding Scenario

Figure 18 shows a raster map of the 7 feet Total Water Level scenario. Under this scenario, the flooded area has expanded significantly, particularly around the banks of the Maurice River and Manumuskin River.

This scenario threatens 1,638 parcels (Figure 19) or about 21.6% of the township's parcels. The impact of this flooding could have significant consequences for property owners and the wider community, including potential damage to infrastructure, loss of property value, and disruption to everyday life.

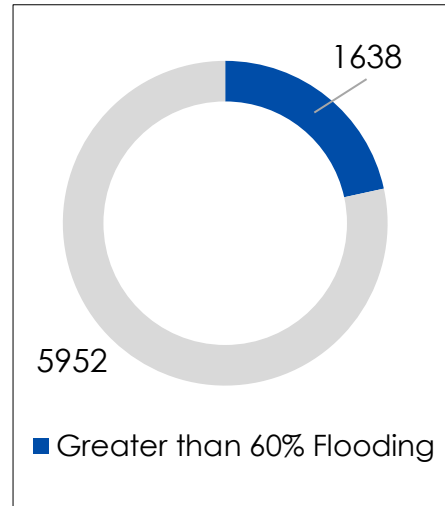


Figure 17: Number of flooded versus non-flooded parcels at 7ft TWL.

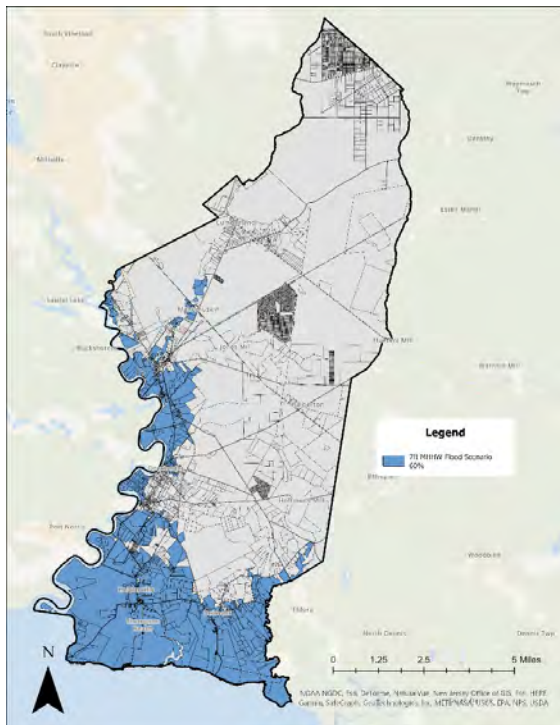


Figure 18: Extent of flooding at 7ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

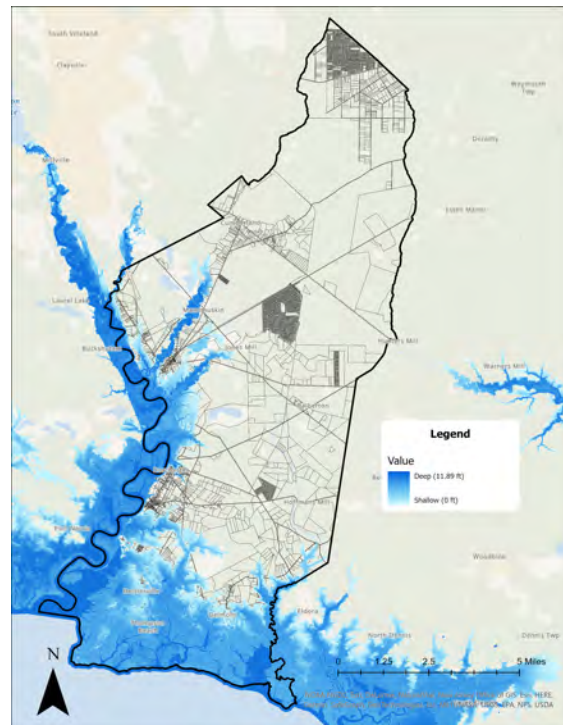


Figure 19: Parcels flooded at 7ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Parcel Class		Flooded parcels	Total parcels	Percentage	Improvement value	Land value
Residential	2	402	1326	30.32%	\$43,431,000.00	\$21,627,700.00
Commercial	4A	22	51	43.14%	\$ 5,527,400.00	\$ 6,629,300.00
Industrial	4B	4	24	16.67%	\$ 710,000.00	\$ 638,100.00
Education	15A	2	4	50.00%	\$ 8,503,600.00	\$ 236,900.00
Public Property	15C	140	668	20.96%	\$ 980,400.00	\$ 5,274,200.00
Church and Charitable	15D	3	15	20.00%	\$ 916,300.00	\$ 134,300.00
Farmlands	3A & 3B	9	57	15.79%	\$ 806,600.00	\$ 606,200.00
Other Exempt	15F	52	105	49.52%	\$ 446,700.00	\$ 988,800.00
Vacant Land	1	332	1898	17.49%	\$ -	\$ 3,585,800.00
Unclassified Land	0	672	3425	19.62%	\$ 916,300.00	\$ 134,300.00
Total					\$62,238,300.00	\$39,855,600.00

Table 5: Parcels exposed to flooding at 7ft TWL

Table 5 illustrates that the Residential class has the highest number of flooded parcels, with 402 parcels, followed by Public Property, with 140 parcels. The improvement value of flooded parcels in the Residential class is the highest at \$43,431,000, followed by Education at \$8,503,600. The land value of flooded parcels in the Vacant Land class is the highest at \$3,585,800, followed by Public Property with \$5,274,200.

Although the Commercial and Industrial classes have a smaller number of flooded parcels, their improvement value is high, with \$5,527,400 and \$710,000, respectively. This indicates that even a small number of flooded parcels in these categories can have a significant economic impact.

It is also worth noting that the Farmlands category has a comparatively small number of flooded parcels, but the Land value of these parcels is substantial at \$606,200. This suggests that the impact of flooding on farmlands can significantly affect the agricultural industry.

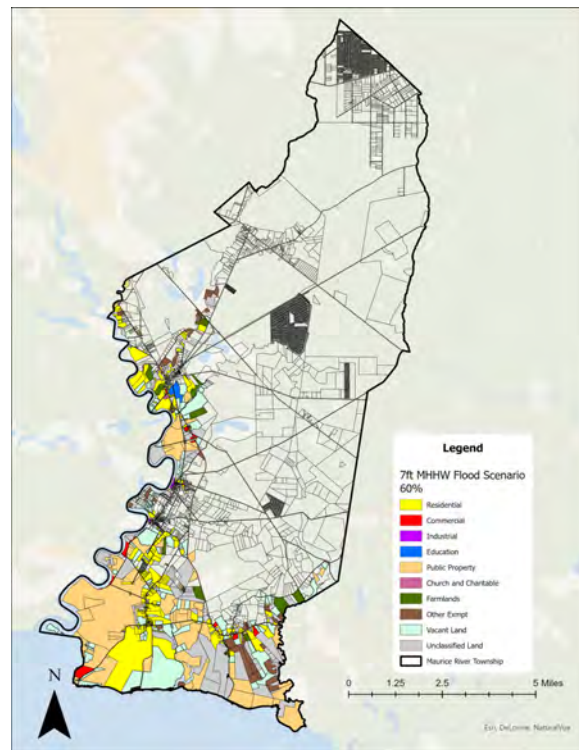


Figure 20: Flooded parcels by property class at 7ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

100-Year Event Scenario - 1% Chance

The FEMA 100-Year event scenario describes a flood event with a 1% chance of occurring in any given year. FEMA uses this scenario to assess the potential risk of flooding in different areas and develop floodplain maps.

The floodplain map for this scenario shows 1,557 parcels as likely to flood in an event that meets the FEMA 100-Year scenario (Figure 22).

The number of parcels exposed to flooding in the FEMA 100-Year event scenario closely aligns with the 5-foot TWL scenario.

Using the FEMA 100-Year event scenario and the corresponding floodplain map is essential for assessing flood risk and developing strategies to mitigate potential damage.

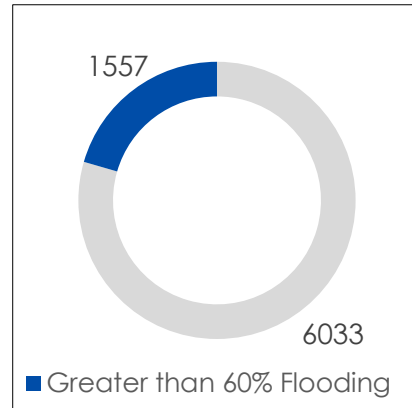


Figure 21: Number of flooded versus non-flooded parcels at 1% chance scenario.

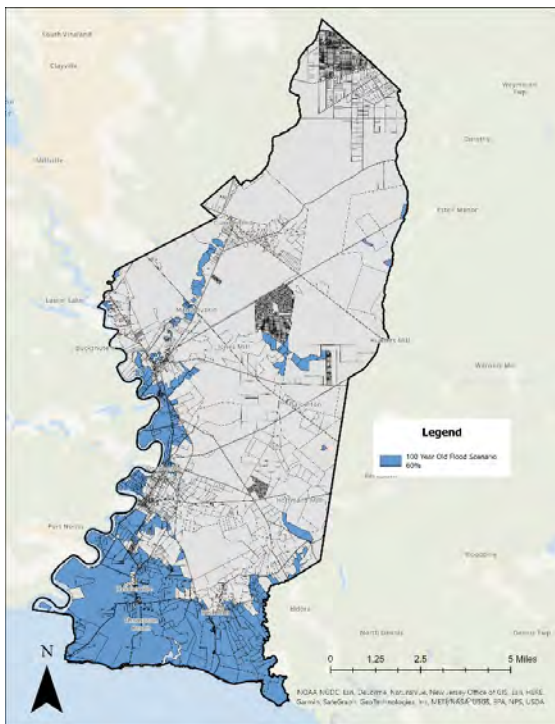


Figure 22: Parcels flooded at 1% chance scenario (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

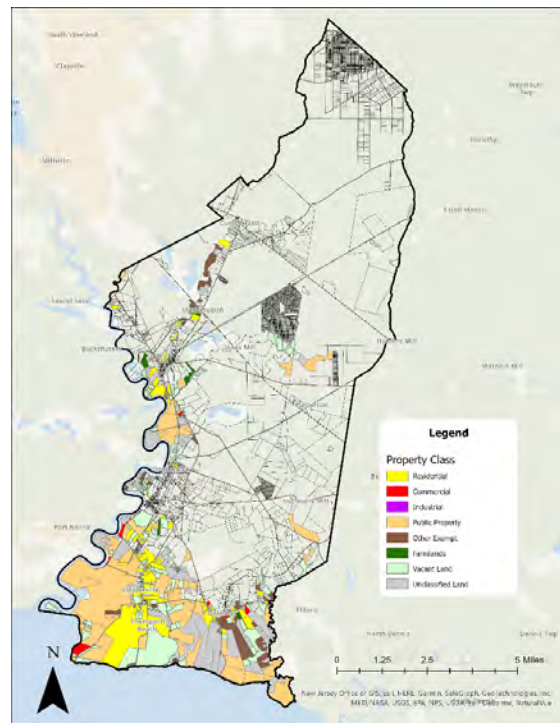


Figure 23: Parcels flooded by property class at 1% chance scenario (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Property Class	Flooded parcels	Total parcels	Percentage	Improvement value	Land Value
Residential	240	1326	18.10%	\$25,349,900.00	\$13,325,300.00
Commercial	15	51	29.41%	\$ 2,583,600.00	\$ 3,146,300.00
Industrial	1	24	4.17%	\$ 103,500.00	\$ 141,300.00
Public Property	148	668	22.16%	\$ 1,125,800.00	\$ 5,756,700.00
Farmlands	5	57	8.77%	\$ 599,500.00	\$ 214,300.00
Other Exempt	50	105	47.62%	\$ 231,700.00	\$ 1,060,400.00
Vacant Land	317	1898	16.70%	\$ -	\$ 3,163,200.00
Unclassified Land	781	3425	22.80%	\$ -	\$ -
Total				\$29,994,000.00	\$26,807,500.00

Table 6: Parcels exposed to flooding at 100-year (1% chance) scenario.

Table 6 indicates that the Residential class has the highest number of flooded parcels, with 240 out of 1,326 total parcels. The improvement value of these properties is \$25,349,900 and the land value is \$13,325,300. This suggests that the impact of flooding could cause significant losses to residential properties.

The Commercial class has the second-highest number of flooded parcels, with 15 out of 51 total parcels. The improvement value of these parcels is lower than the land value, suggesting that the value of these parcels may be primarily based on their location.

The Public Property class, which includes government-owned lands such as parks and schools, have 148 out of 668 total parcels affected by flooding. The total improvement value is \$1,125,800 and the land value is \$5,756,700. The large number of flooded Public parcels highlights the importance of appropriate flood management and prevention measures for these lands.

500-Year Event Scenario – 0.2% Chance

The FEMA 500-Year Scenario describes a flood event that has a 0.2% chance of occurring in any given year. This scenario is more catastrophic than the FEMA 100-Year event scenario, representing a less likely but more severe flood event.

The floodplain map indicates that 1,937 parcels would be flooded in the FEMA 500-Year event scenario (Figure 25).

The flood extent of the FEMA 500-Year event can be compared to the 7-foot TWL scenario.

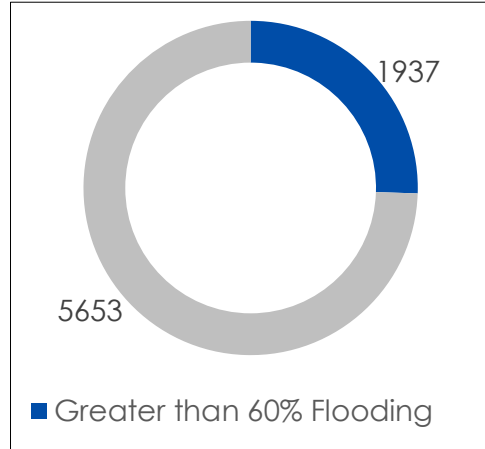


Figure 24: Flooded versus non-flooded parcels at 0.2% chance scenario.

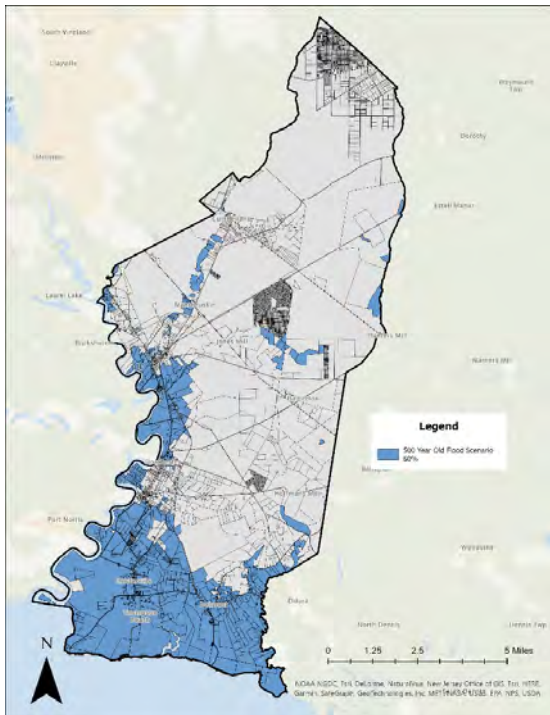


Figure 25: Parcels flooded at 0.2% chance scenario (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

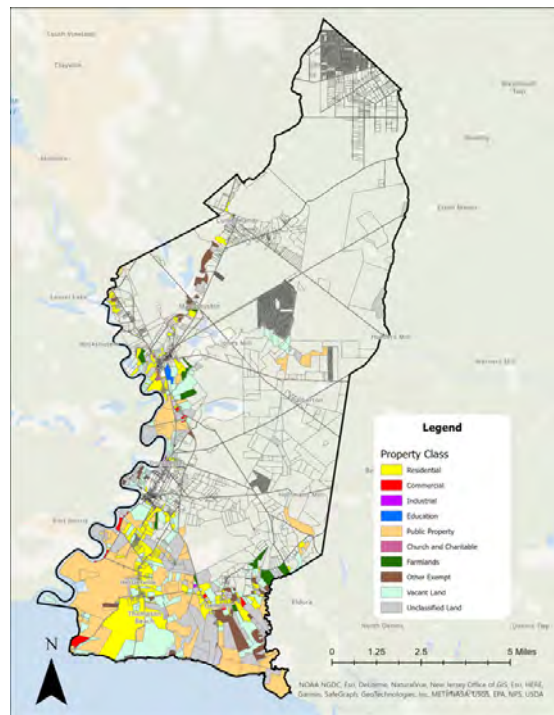


Figure 26: Parcels flooded by property class at 0.2% chance scenario (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Property Class	Flooded Parcels	Total Parcels	Percentage	Improvement Value	Land Value
Residential	184	1326	33.03%	\$45,873,000.00	\$22,857,000.00
Commercial	23	51	45.10%	\$5,549,100.00	\$6,679,300.00
Industrial	4	24	16.67%	\$467,100.00	\$576,100.00
Education	1	4	25.00%	\$ -	\$36,900.00
Public Property	172	668	25.75%	\$4,043,100.00	\$6,185,600.00
Church and Charitable	6	15	40.00%	\$1,271,000.00	\$236,700.00
Farmlands	11	57	19.30%	\$599,500.00	\$384,500.00
Other Exempt	59	105	56.19%	\$446,700.00	\$1,127,900.00
Vacant Land	382	1898	20.13%	\$ -	\$4,083,100.00
Unclassified Land	841	3425	24.55%	\$ -	\$ -
Total				\$58,249,500.00	\$42,167,100.00

Table 7: Parcels exposed to flooding at 0.2% chance scenario.

Table 7 indicates that the Residential class has the greatest impacts at this scenario, with 184 flooded parcels and a total improvement value of \$45,873,000.

The Commercial class has a relatively low number of flooded parcels, but the second-highest land value (\$3,036,700) and improvement value (\$24,40,900.00).

Hurricane Sandy Proxy- 4ft Scenario Total Water Scenario

Figure 29 is a raster layer map showing the areas impacted by the storm surge during Hurricane Sandy. This map was created using USGS field-verified High Water Marks (HWMs) and Storm Surge Sensor data, commonly used to assess flood damage.

The Hurricane Sandy map closely aligns with the 4-foot TWL scenario (Figures 28 and 29). Using the 4-foot TWL scenario as a proxy for Hurricane Sandy, Figure 30 shows a total of 1,249 parcels flooded.

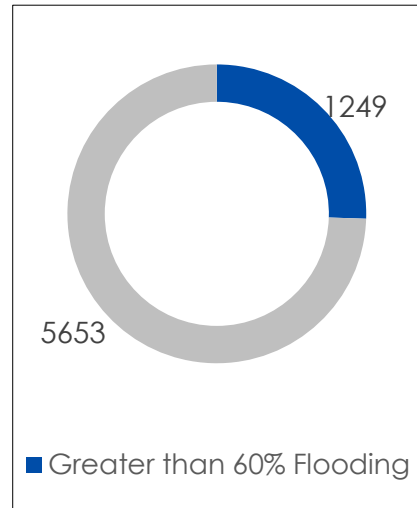


Figure 27: Number of flooded versus non-flooded parcels at 4ft TWL (Hurricane Sandy Proxy).



Figure 28: Hurricane Sandy surge extent (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

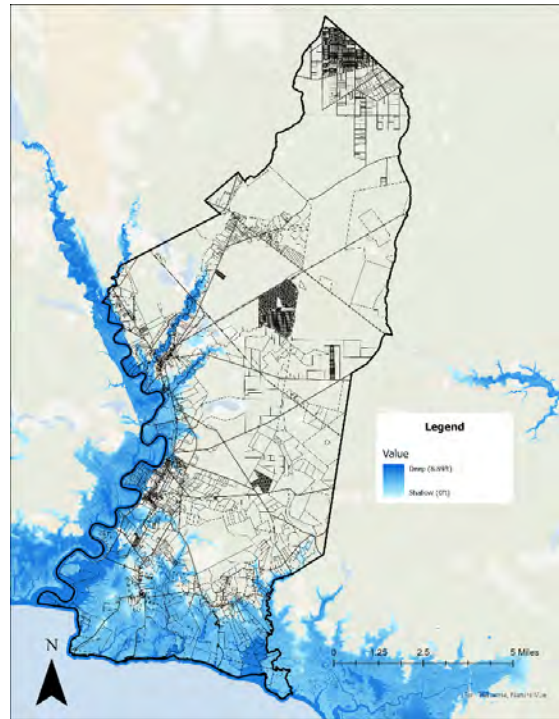


Figure 29: Extent of flooding at 4ft TWL as Hurricane Sandy Proxy (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

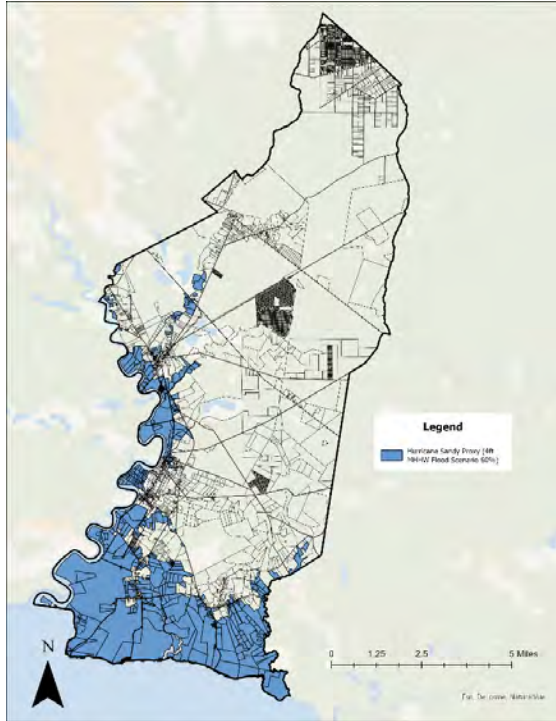


Figure 30: Parcels flooded at 4ft TWL as Hurricane Sandy Proxy (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

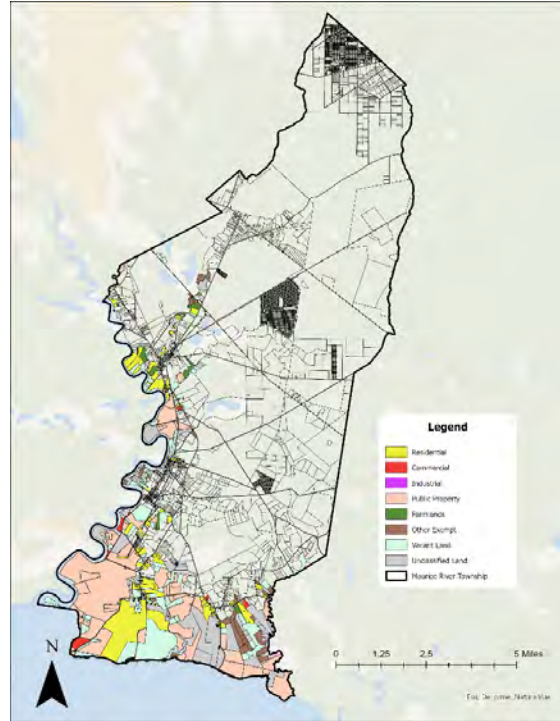


Figure 31: Parcels flooded by property class at 4ft TWL as Hurricane Sandy Proxy (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Property Class	Flooded Parcels	Total Parcels	Percentage	Improvement value	Land value
Residential	184	1326	33.03%	\$20,020,200.00	\$11,371,200.00
Commercial	13	51	45.10%	\$ 2,440,900.00	\$ 3,036,700.00
Industrial	1	24	4.16%	\$ 103,500.00	\$ 141,300.00
Public Property	120	668	17.96%	\$ 906,100.00	\$ 4,871,200.00
Farmlands	5	57	15.78%	\$ 599,500.00	\$ 214,300.00
Other Exempt	44	105	41.90%	\$ 119,800.00	\$ 844,900.00
Vacant Land	270	1898	14.22%	\$ -	\$ 2,709,100.00
Unclassified Land	612	3425	17.86%	\$ -	\$ -
Total				\$24,190,000.00	\$23,188,700.00

Table 8: Parcels exposed to flooding at 4ft TWL as Hurricane Sandy Proxy.

Table 8 illustrates that there are 184 parcels in the Residential category that have been flooded, and the highest improvement value is \$20,020,200.

The Commercial category has a relatively low number of flooded parcels (13) and total parcels (51). However, the third-highest land value (\$3,036,700) and second-highest improvement value \$24,40,900 indicate that the properties in the area are likely to be newer and higher in value.

There are 270 flooded parcels in the Vacant Land category and 1898 total parcels, but the improvement value is zero, suggesting that these parcels are undeveloped.

Overall, improvement values are higher than land values, indicating that the structures built on properties are more valuable than the land. The total value for all properties combined is \$47,378,700, with the improvement value accounting for more than half of \$24,190,000.

Social Vulnerability

Social vulnerability is a critical factor that must be considered in hazard planning, as not all individuals or communities are affected equally when disasters occur. Socially vulnerable populations have compounding challenges, making it more difficult to recover from natural or manmade disasters, disease outbreaks, or other public health emergencies. As a result, officials in various areas, such as disaster preparedness, public health, and emergency response, have increasingly relied on the Social Vulnerability Index (SVI) developed by the Centers for Disease Control and Prevention.

Initially designed to target public health policies to specific communities, the SVI has since been applied to identify communities that may require assistance in preparing for, or recovering from, natural disasters such as storms or flooding. This index considers a wide range of social factors, including income, education, housing, access to transportation, and other factors that can impact a community's ability to cope with and recover from a disaster (Figure 32).

Using the SVI, public officials can more effectively target resources to the communities most in need and help ensure that vulnerable populations are not overlooked or left behind in the wake of a disaster. Ultimately, the use of the SVI is an essential tool for promoting more equitable disaster planning and response and helping to ensure that all community members have the resources and support they need to prepare for, respond to, and recover from disasters.

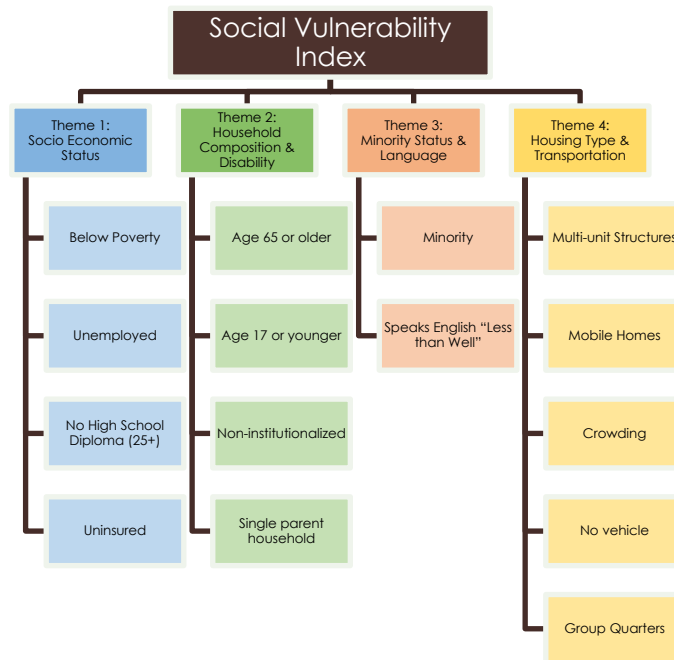


Figure 32: Social Vulnerability Index themes.

The SVI calculates each community's vulnerability score using demographic, socioeconomic, and household/housing characteristics. The percentile ranking values range from 0 to 1, with higher values indicating greater vulnerability. Each tract within a community receives a separate ranking for each of the four themes that the SVI measures. The SVI is a valuable tool for public officials in disaster preparedness, public health, emergency response, and other areas. It helps identify communities that may require additional support and resources based on various demographic and socioeconomic factors.

In the case of Maurice River Township, the data from the CDC and ACS 5-year estimates for 2016-2020 show that the township has an overall Social Vulnerability Index Score of 0.5952, indicating moderate vulnerability. The data highlights three factors contributing to the township's vulnerability: unemployment, non-institutionalized disabled individuals, and mobile homes. This information is part of a detailed assessment of the social vulnerability of the township at the tract level based on 15 variables from the Census (Table 9).

	Themes	15 Variables (Census)	Estimate	Percent	Percentile
Overall Social Vulnerability (Tract Level)	Theme 1: Socioeconomic Status	Below Poverty	472	20.8%	0.7146
		Unemployed	115	11.2%	0.8974
		No High School Diploma (age 25+)	201	12.9%	0.7331
		Uninsured	81	3.6%	0.3517
	Theme 2: Household Composition & Disability	Age 65 or older	442	19.5%	0.745
		Age 17 or younger	608	26.8%	0.8174
		Non-institutionalized disabled	406	17.9%	0.9062
		Single-parent Household	89	9.8%	0.7902
	Theme 3: Minority Status & Language	Minority	374	16.5%	0.1987
		Speaks English "Less than Well"	0	0	0
	Theme 4: Housing Type & Transportation	Multi-unit Structures	0	0	0
		Mobile Homes	64	5.6%	0.9543
		Crowding	0	0%	0
		No Vehicle	19	2.1%	0.1992
		Group Quarters	0	0	0

Table 9: Overall Social Vulnerability by theme for Maurice River Township

The assessment identifies four key themes contributing to social vulnerability: socioeconomic status, household composition, disability, minority status and language, and housing type and transportation. For each theme, the report provides estimates, percentages, and percentile ranks for the relevant variables, contextualizing the estimates by comparing the population in the tract to other tracts in the country.

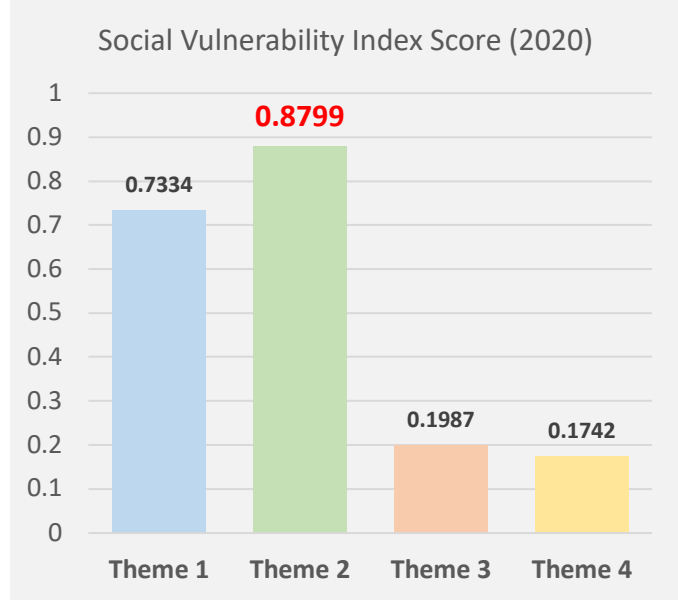


Figure 33: Social Vulnerability Index Score for Maurice River Township

For instance, in table 9 the variable "Unemployed" in Theme 1 (Socioeconomic Status) has a percentage of 11.2% and a high percentile rank of 0.8974, indicating that the population in the tract has a high unemployment rate compared to other areas in the US. Similarly, the variable "Non-institutionalized disabled" in Theme 2 (Household Composition & Disability) has a percentage of 17.9% and a high percentile rank of 0.9062, indicating that the population in the tract has higher rates of disability.

Overall, this begins to provides an understanding of the social vulnerability factors in Maurice River, highlighting areas that may require attention and resources.

Overburdened Communities

Following New Jersey's Environmental Justice Law, the state must consider the effects of facilities on communities' overburdened environmental and public health conditions. An overburdened community is defined as any census block group identified in the most recent United States Census where at least one of three conditions is met.

First, at least 35 percent of households qualify as low-income households, meaning their income is at or below twice the poverty threshold established by the United States Census Bureau. Second, at least 40 percent of the residents identify as a member of a minority group or as members of a State-recognized tribal community.

Finally, at least 40 percent of households in the census block group have limited English proficiency, meaning that no adult speaks English "very well," according to the United States Census Bureau.

The law addresses the disproportionate burden of environmental and public health risks faced by low-income, minority, and non-English speaking communities. Tables 11 and 12 provide information about Overburdened Communities (OBCs) in Maurice River Township, mapped in Figure 34.

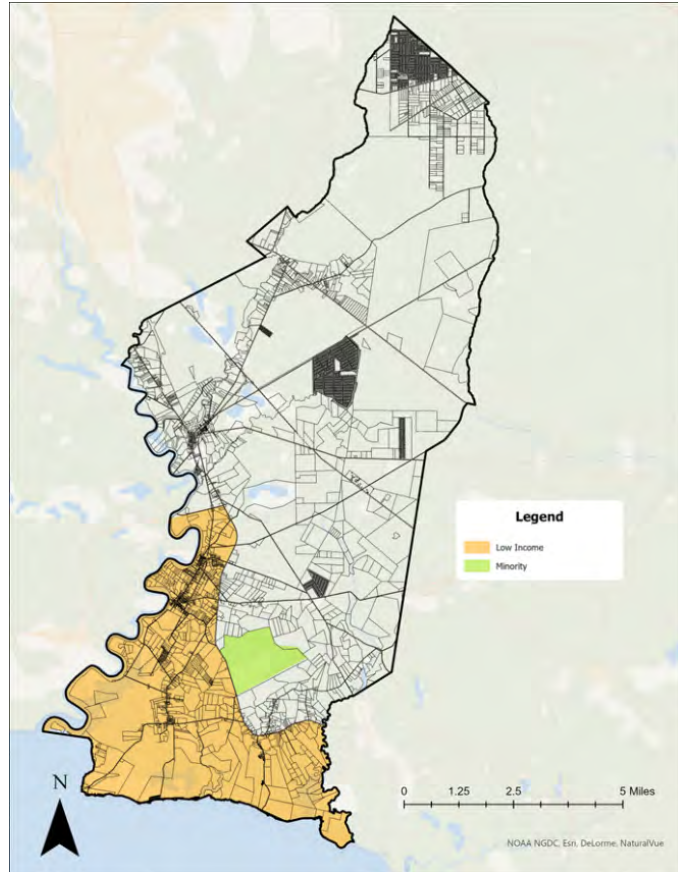


Figure 34: Overburdened Communities in for Maurice River Township (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Overburdened Community in Maurice River Township	Block Group Identifier 340110101011
Total Population	2267
Total Households	445
Low-Income Population	36.68%
Minority Population	27.53%

Table 100: Factors contributing to OBC status for Block Group 340110101011

Overburdened Community in Maurice River Township	Block Group Identifier 340110101031
Total Population	4890
Minority Population	76.21%

Table 11: Factors contributing to OBC status for Block Group 340110101031

Table 10 shows data for block group identifier 340110101011, including the total population, total households, and the percentage of low-income and minority populations. The block group has a total population of 2,267 and 445 households. Approximately 37% of the households in this block group qualify as low-income, while 27.53% of the population identifies as a minority.

Table 11 provides information for block group identifier 340110101031, including the total population and the percentage of the minority population. This block group consists of the prison population, with a total population of 4,890 that identifies as 76.21% minority.

Critical Facilities

Critical assets, including educational institutions, healthcare facilities, and public safety agencies, are essential to communities and their residents, particularly during natural disasters like floods. However, these critical assets may be vulnerable to flooding, which can significantly impact their ability to provide necessary services to the community. It is, therefore, crucial to identify these critical assets and assess their exposure to flood events.

Additionally, built infrastructure, such as bridges and evacuation routes, may be at risk of flooding. These assets are critical in facilitating emergency response and evacuation during flood events. Therefore, understanding their exposure to flood events and potential damages is crucial for effective community flood planning.

This report uses GIS to identify critical assets and assess their vulnerability to flooding events. GIS mapping enables the identification of flood-prone areas and modeling of potential flood scenarios to evaluate the potential impact on these assets. When planning and responding to floods in a community, it is critical to understand the extent to which essential infrastructure and assets are exposed to flooding and their accessibility during emergencies.

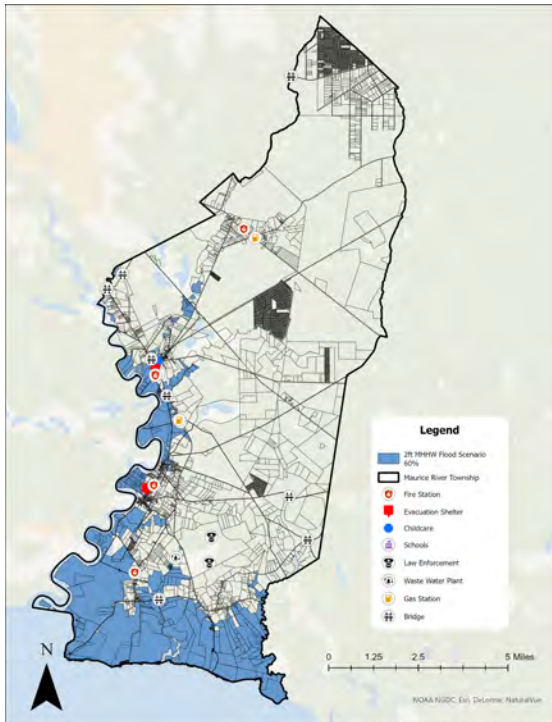


Figure 35: Critical facilities flooded at 2ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

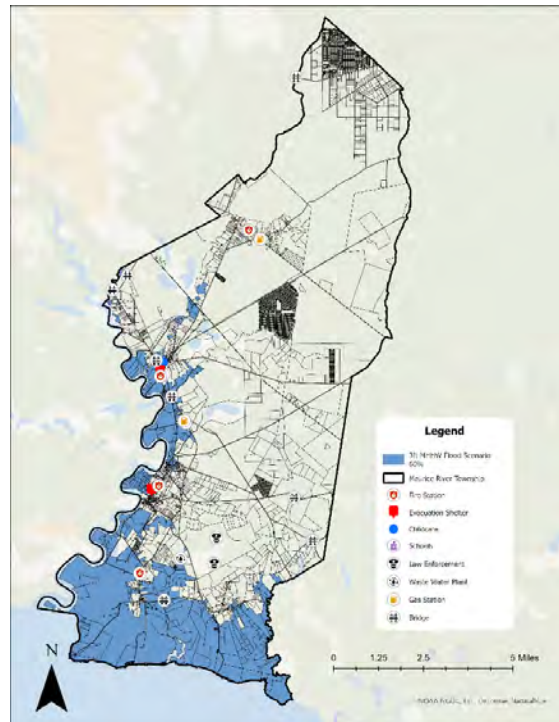


Figure 36: Critical facilities flooded at 3ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

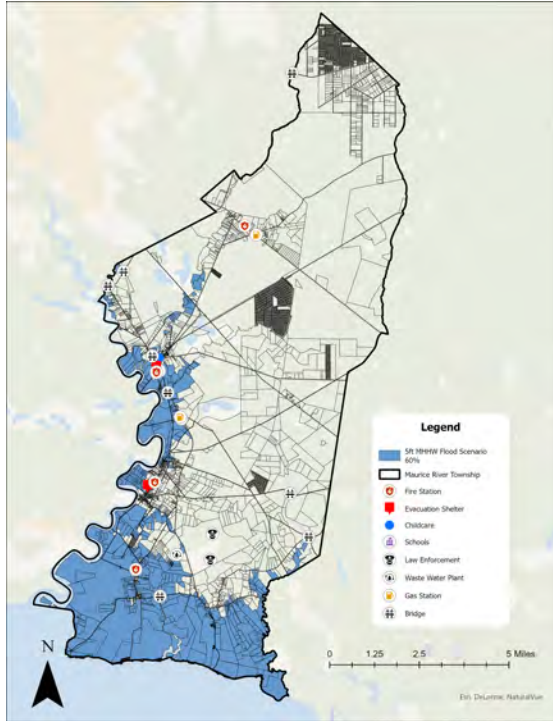


Figure 37: Critical facilities flooded at 5ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

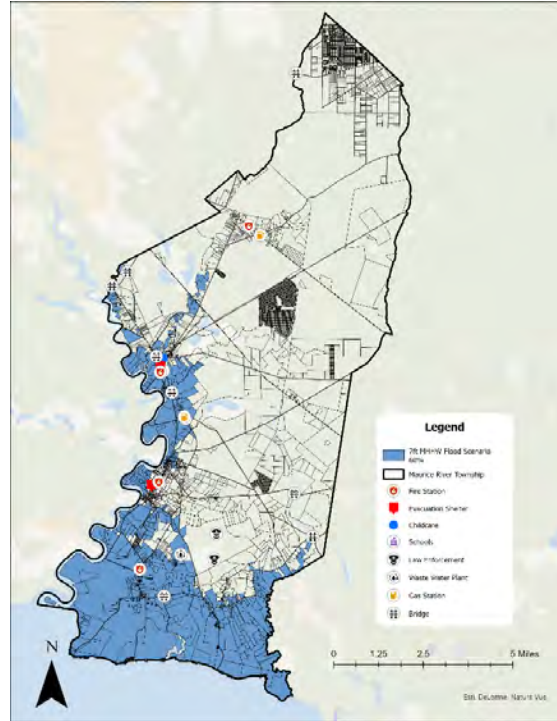


Figure 38: Critical Facilities flooded at 7ft TWL (Source: ArcGIS Pro, Parcels and mod-IV composite of NJ)

Table 12 and Figure 39 show the number of facilities at risk of flooding at various water levels. For instance, at 2 feet TWL, no childcare facilities, evacuation shelters, fire stations, law enforcement facilities, schools, or gas stations are at risk of flooding. However, three bridges and one wastewater plant are at risk.

At 3 feet TWL, the same number of facilities remain at risk of flooding except for the wastewater plant and bridges, which increase to three. At 5 feet TWL, the

Name	2 ft	3 ft	5 ft	7 ft	Total in municipality
Childcare	0	0	0	0	1
Evacuation Shelter	0	0	0	1	2
Fire Station	0	0	0	1	4
Law Enforcement	0	0	0	0	2
Schools	0	0	0	1	1
Bridge	3	3	4	4	8
Gas Station	0	0	0	2	3
Wastewater Plant	1	1	1	1	1

Table 12: Maurice River Township facilities flooded at various flooding scenarios.

number of bridges at risk of flooding increases to four. At 7 feet TWL, all facilities (except the childcare center) are at risk of flooding.

Understanding which facilities are at risk of flooding at different water levels is crucial in developing emergency response plans and taking preventive measures to minimize potential damages. When the water level reaches 7 feet TWL, emergency responders should be aware of the possibility of being unable to access fire stations, law enforcement facilities, and evacuation shelters. There may be a need to relocate or deploy additional resources in these areas.

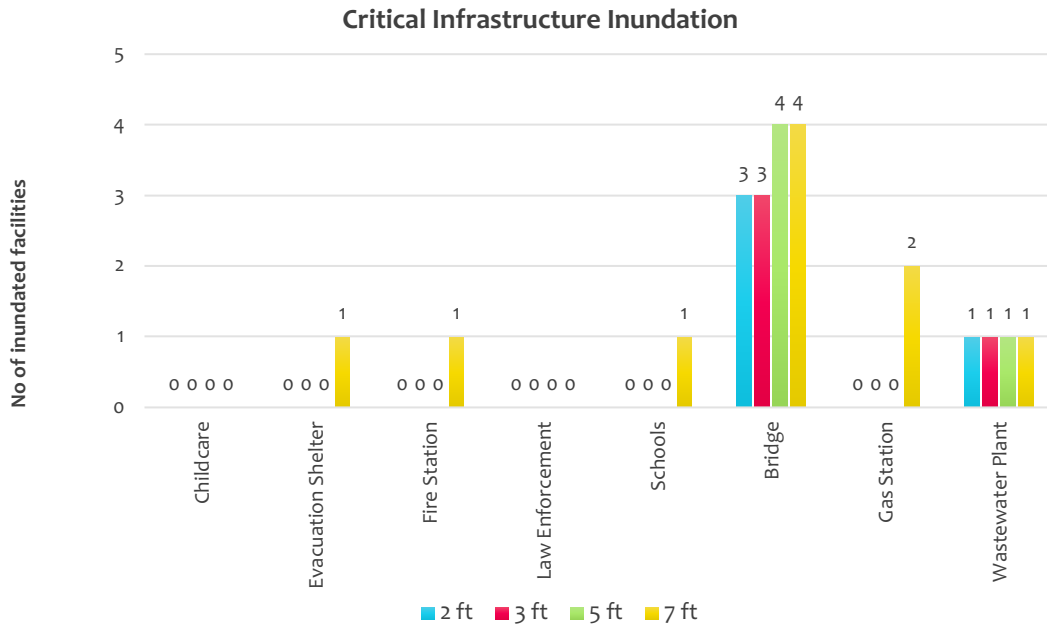


Figure 39: Number of critical facilities at risk at each flood scenario.

Conclusion

The threat of coastal inundation is increasing due to climate change, and planning for potential flooding scenarios is essential. This flood assessment provides critical information regarding the risk of inundation hazards in Maurice River Township, New Jersey. The report incorporates sea level rise guidance from the New Jersey Department of Environmental Protection and the Rutgers University Science and Technology Advisory Panel to identify parcels that may be at risk of flooding at various water levels.

The report highlights the need for equitable mitigation efforts based on quantified social vulnerability data from the CDC. Furthermore, it identifies overburdened communities within the township that are disproportionately affected by flood events, emphasizing the importance of equitable mitigation measures. Several critical infrastructure facilities, including substations, transportation nodes, and water treatment facilities, are identified as at risk of flooding.

The findings of this assessment can be used to inform planning decisions and guide mitigation efforts to reduce the impact of flooding on vulnerable populations and critical infrastructure and minimize effects on people's lives and livelihoods. Analyzing flood risks is the first step in developing effective strategies for reducing the impact of flooding and ensuring our communities are better prepared for the future.

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