

Flooding Dynamic Modeling for Optimized Planning of CORE MPO Transportation Infrastructure Systems

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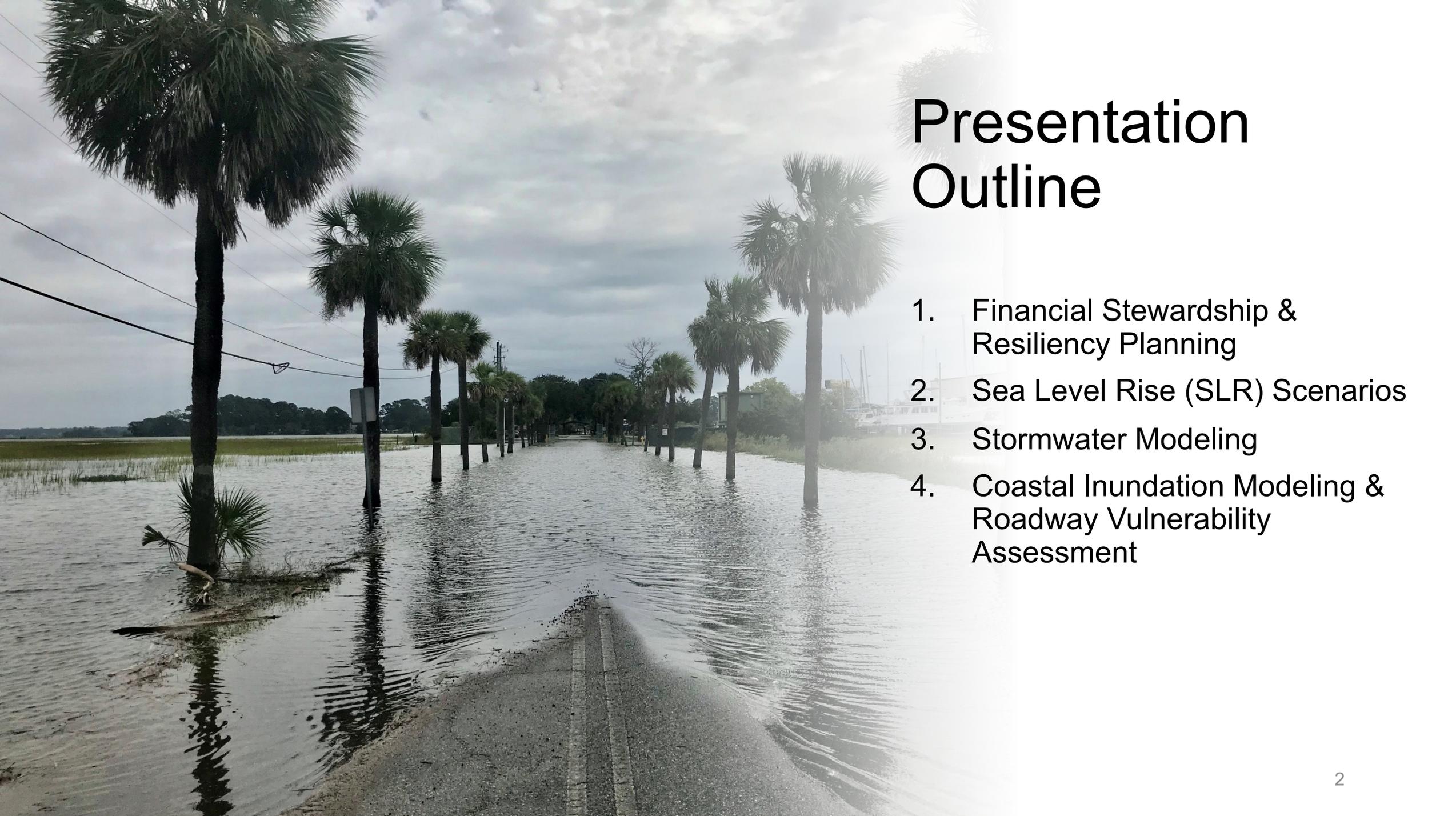
CORE MPO, Board Meeting, Nov. 1, 2023



**UNIVERSITY OF
GEORGIA**

GMC

Goodwyn Mills Cawood

A photograph of a flooded coastal road lined with palm trees under a cloudy sky. The water is murky and reflects the overcast sky. The road is partially submerged, with water reaching up to the trunks of the palm trees. In the background, there are more trees and a building.

Presentation Outline

1. Financial Stewardship & Resiliency Planning
2. Sea Level Rise (SLR) Scenarios
3. Stormwater Modeling
4. Coastal Inundation Modeling & Roadway Vulnerability Assessment

Social Vulnerability

- **What is Social Vulnerability?**
- The characteristics of individuals and populations affects their ability withstand or recover from the negative impacts of natural disaster or other disturbance.

- Poverty, lack of education, limited access to transportation, and other limiting characteristics can make people more vulnerable.



Hurricane Sandy -Breezy Point, NY

Pauline Tran - Photographer

Social Vulnerability Index (SVI)

- Assesses **16 variables** in **4 categories** associated with enhanced vulnerability to environmental threats.
- Based on US Census Bureau data compiled by the Centers for Disease Control (CDC ATSDR).

CDC SoVI variables used. CDC utilizes data from the American Community Survey.

Socioeconomic Status	Below 150% Poverty
	Unemployed
	Housing Cost Burden
	No High School Diploma
	No Health Insurance
Household Characteristics	Aged 65 & Older
	Aged 17 & Younger
	Civilian with a Disability
	Single-Parent Household
	English Language Proficiency
Racial & Ethnic Minority Status	Hispanic or Latino (of any race)
	Black or African American, Not Hispanic or Latino
	Asian, Not Hispanic or Latino
	American Indian or Alaska Native, Not Hispanic or Latino
	Native Hawaiian or Pacific Islander, Not Hispanic or Latino
	Two or More Races, Not Hispanic or Latino
Housing Type & Transportation	Other Races, Not Hispanic or Latino
	Multi-Unit Structures
	Mobile Homes
	Crowding
	No Vehicle
	Group Quarters

Adapted from: https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/pdf/SVI2020Documentation_08.05.22.pdf

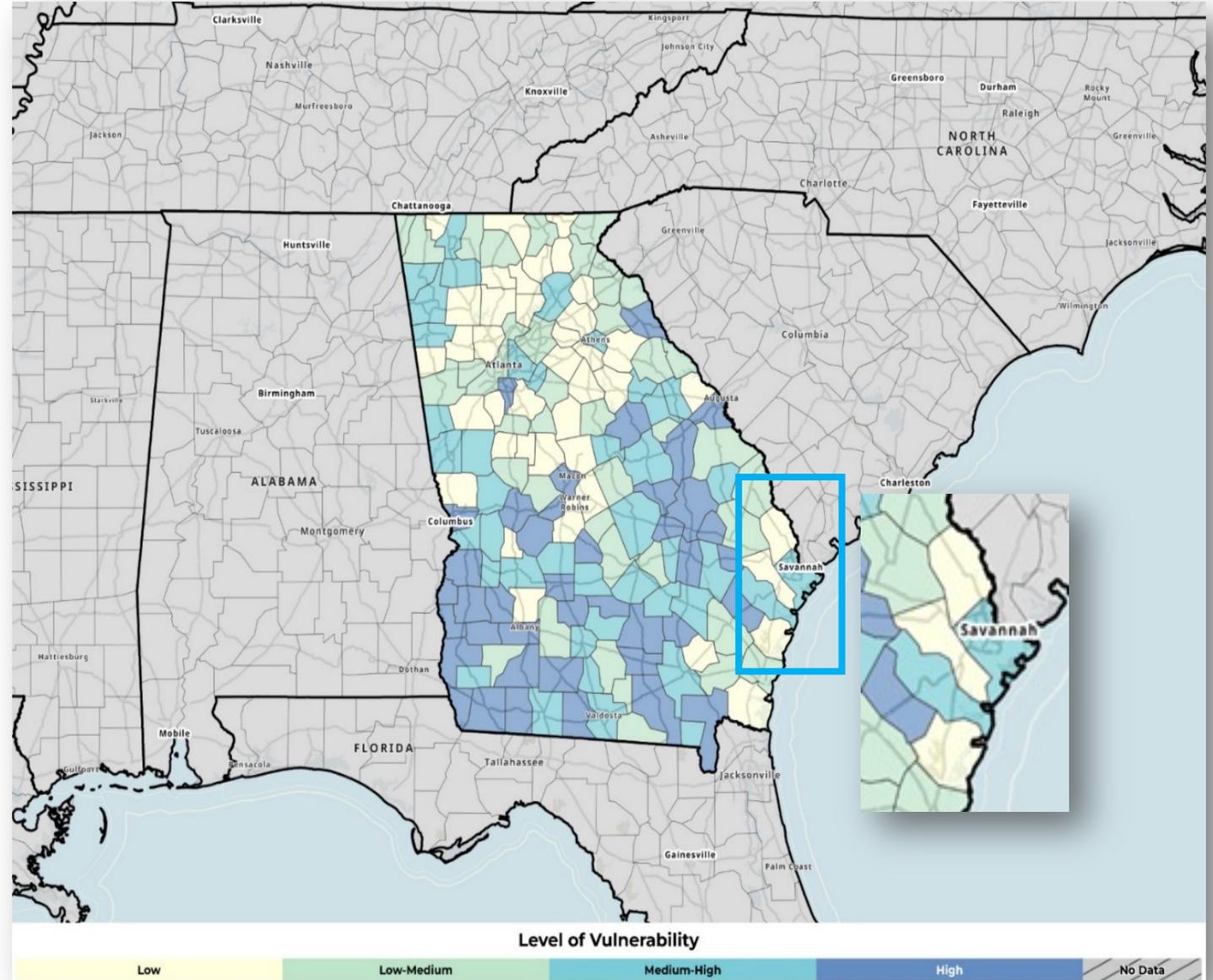


Geospatial Research, Analysis & Services Program (GRASP)
Office of Innovation and Analytics
Agency for Toxic Substances and Disease Registry (ATSDR)



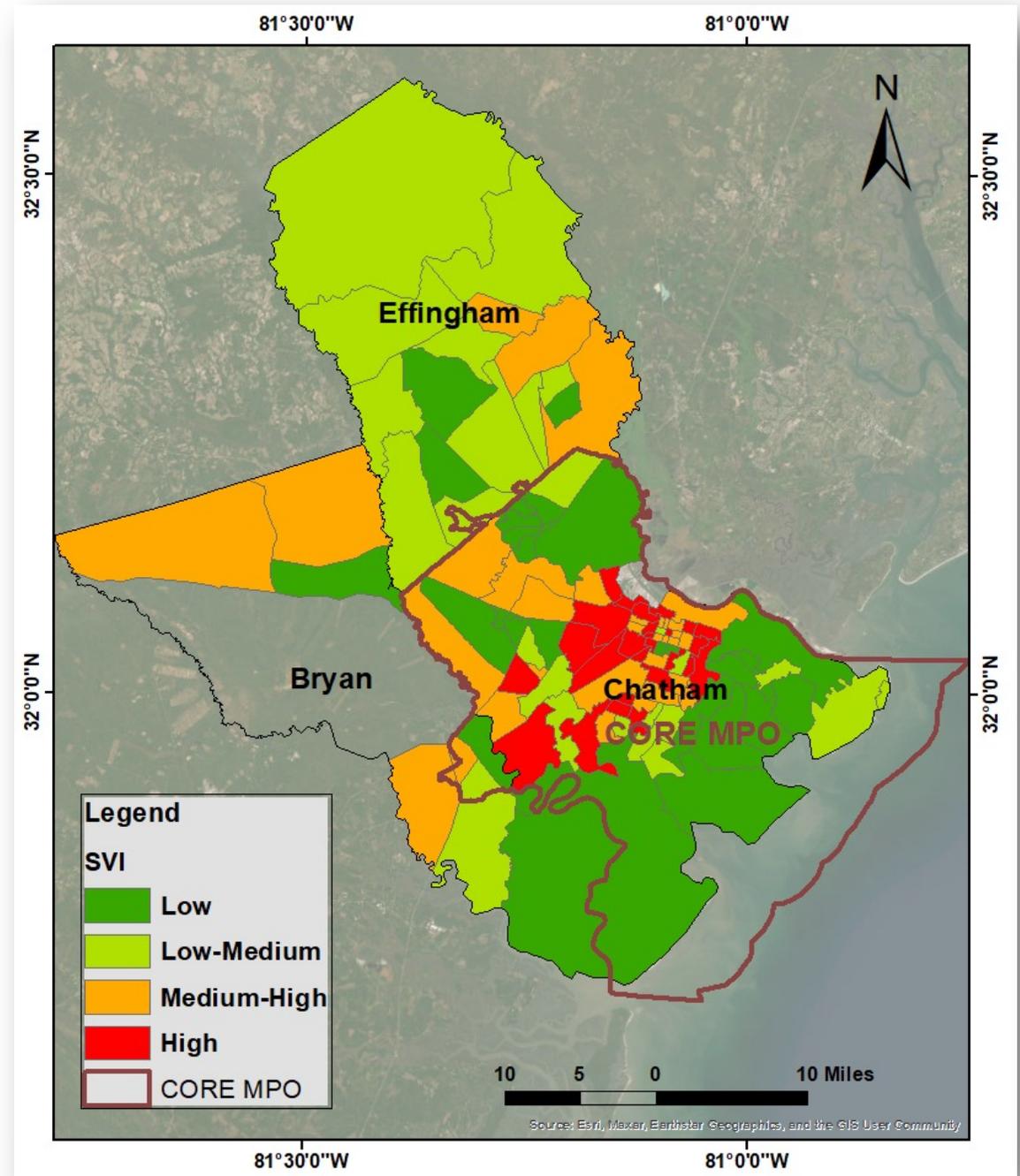
State-Level SVI Analysis

Highlights increased vulnerability of more densely developed area.



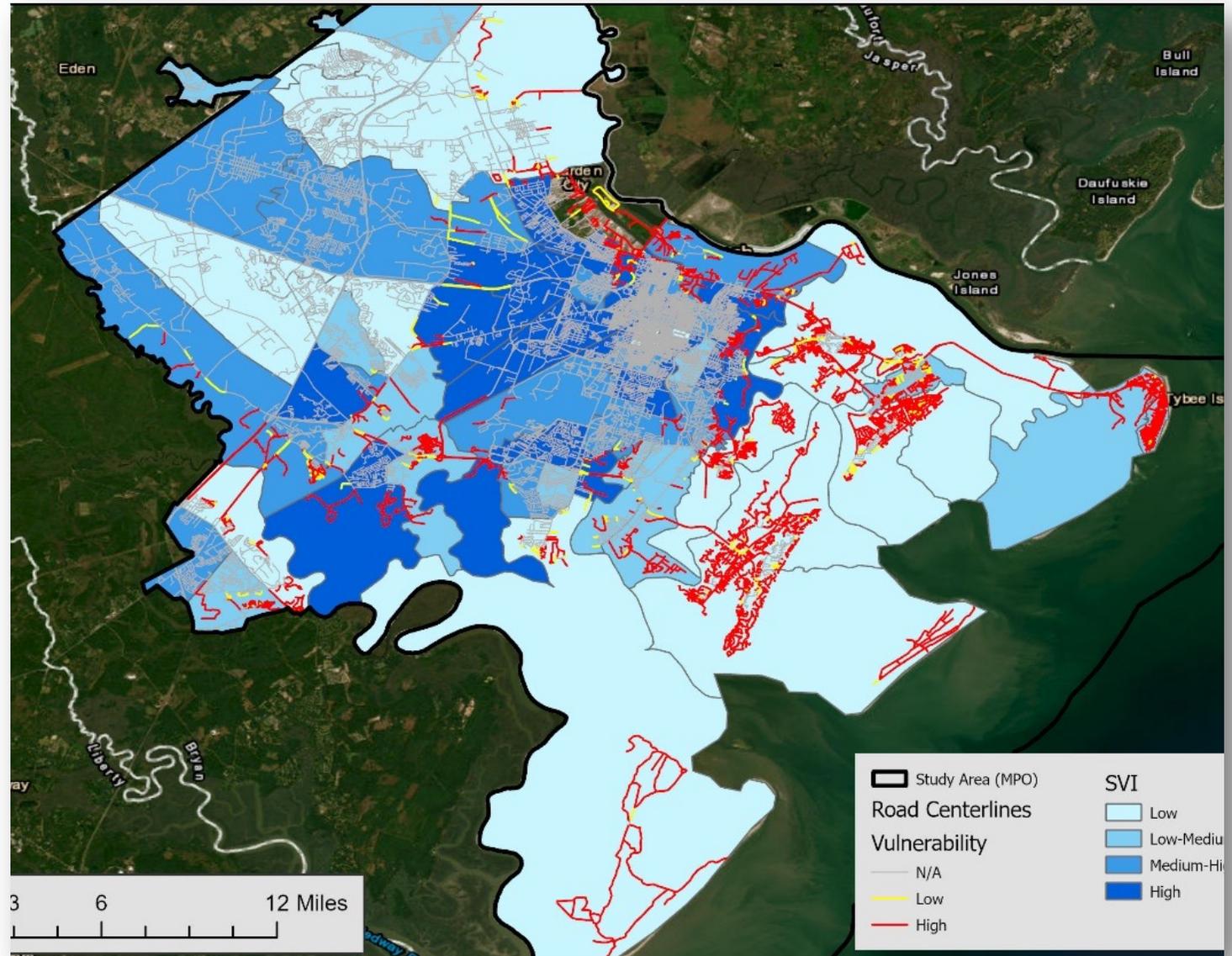
Census Tract-Level SVI Analysis

- At the census tract, the SVI variables highlight more specific areas where local vulnerabilities should be considered.
- SVI variables are unavailable at any finer scale, but this analysis can inform specific demographic inquiries.



Connections between SVI and Road Vulnerability

- Many of the most vulnerable road segments are in the most vulnerable communities.
- Identifies potential opportunities to direct investments where they may most impact public safety.



Resilient Infrastructure Funding

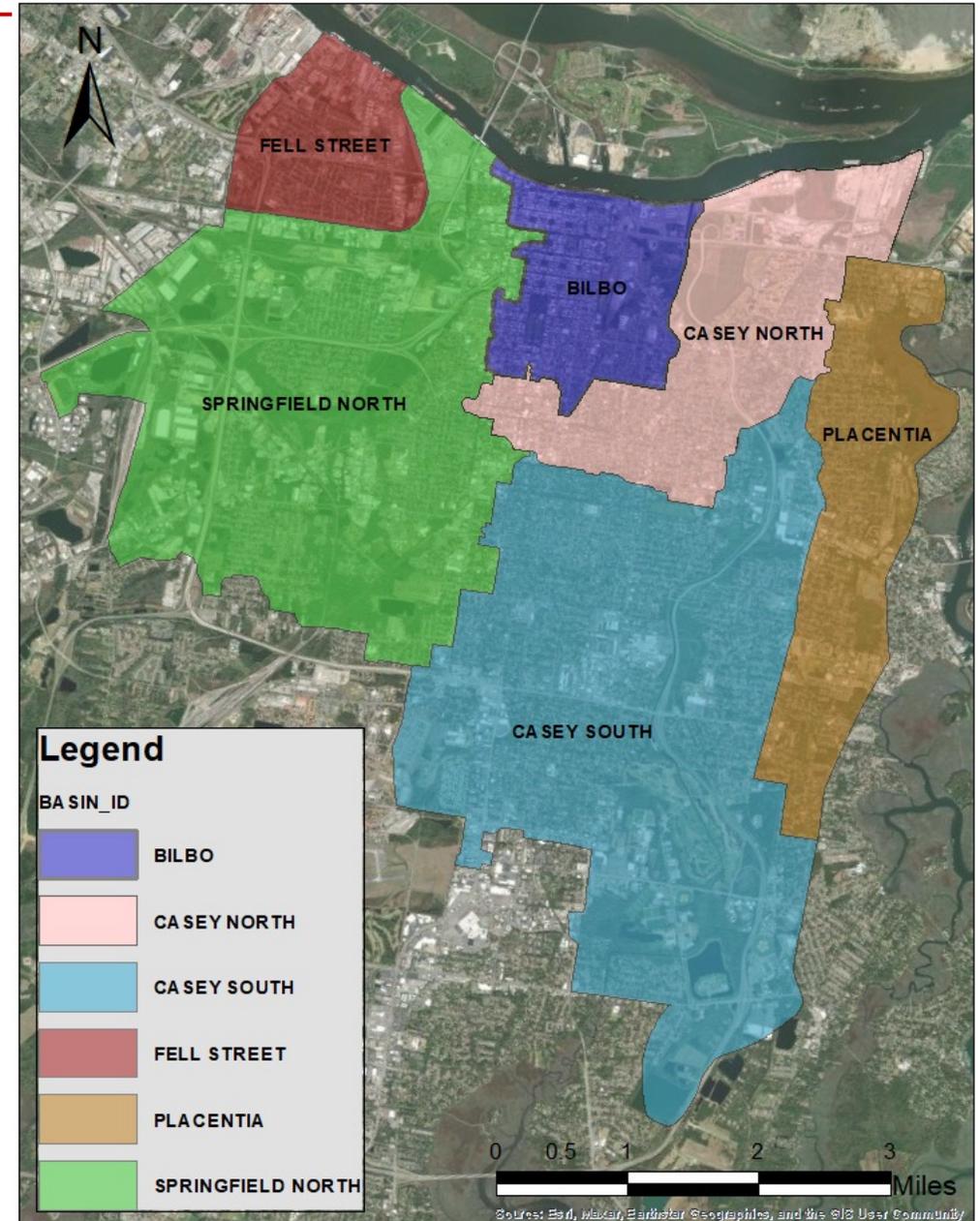
Grant/Program Name	Categories of Funding	Agency	State/Federal	Purpose	Eligibility	Deadline	Additional Comments
Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants	Transportation	US Department of Transportation (USDOT)	Federal	Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants are for surface transportation infrastructure projects that will improve: safety; environmental sustainability; quality of life; mobility and community connectivity; economic competitiveness and opportunity including tourism; state of good repair; partnership and collaboration; and innovation.	States and the District of Columbia; any territory or possession of the United States; a unit of local government; a public agency or publicly chartered authority established by one or more States; a special purpose district or public authority with a transportation function, including a port authority	FY 2023 applications are done, but Raise Grant funds will be dispersed yearly until 2027	
SMART Grants - Justice40	Transportation	USDOT	Federal	Strengthening Mobility and Revolutionizing Transportation (SMART) are awarded to conduct demonstration projects focused on advanced smart city or community technologies and systems to improve transportation efficiency and safety. The purpose of the SMART Equity and Justice40 Initiative is, "to award projects...that will create proportional impacts to all populations in a project area, remove transportation-related disparities to all populations in a project area..."	State, political subdivision of a State, public transit agency or authority, metropolitan planning organization	Sep 29th, 2023	
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Grants Program	Transportation	National Wildlife Federation (NWF)	Federal	PROTECT Discretionary Grants Program funds projects on a competitive basis that address the climate crisis by improving the resilience of the surface transportation system, including highways, public transportation, ports, and intercity passenger rail. Nature-based solutions, such as protective wetland buffers and culverts, are eligible for this program. The Program also seeks to award projects that will increase equitable access to project benefits.	State and local governments, metropolitan planning organizations, special purpose districts or public authorities with a transportation function	\$300M available for FY 2024, NOFO has not been published yet.	

Sea Level Rise Scenarios

Year	CRD Low (ft)	CRD High (ft)
2050	1.23	2.18
2075	2.14	4.08
2100	3.28	6.56

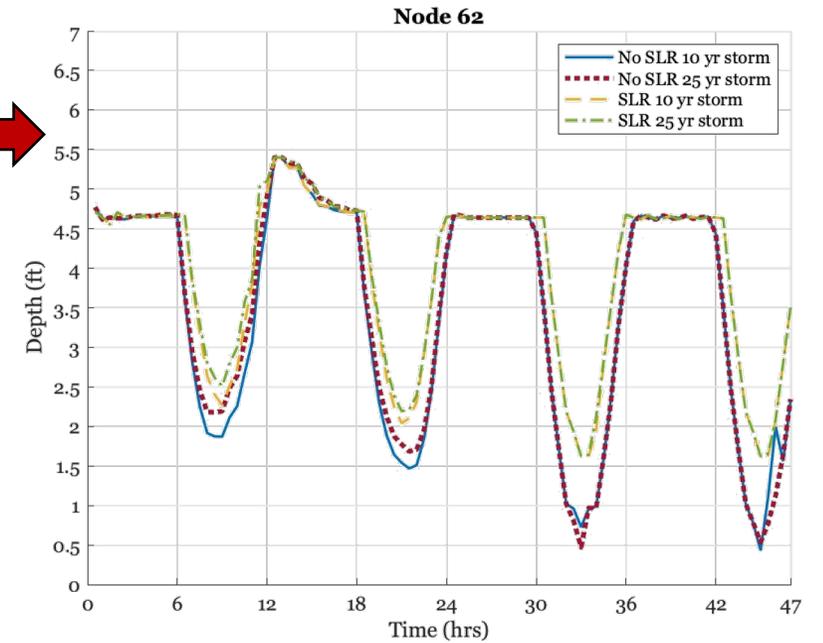
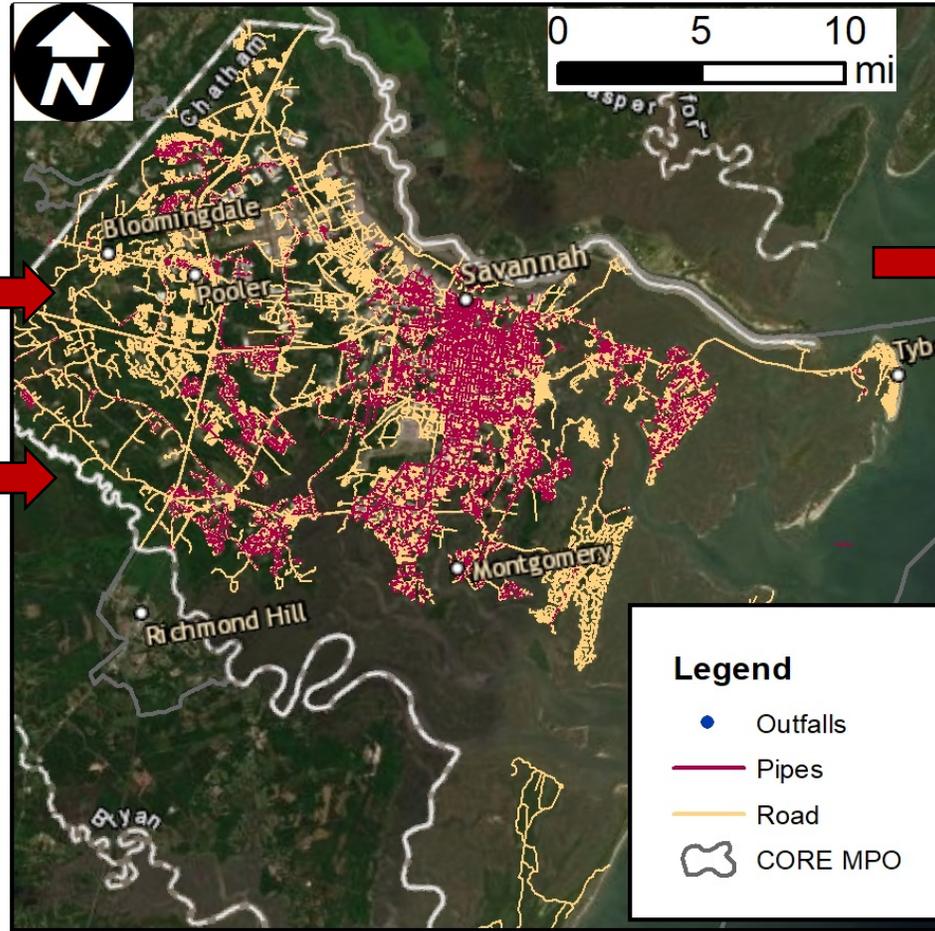
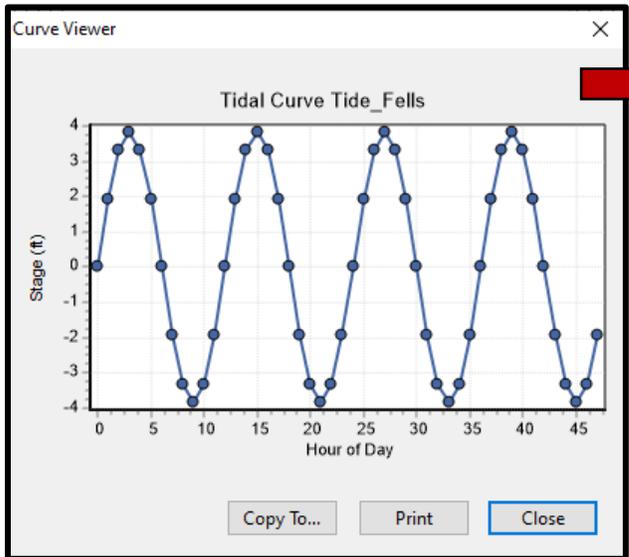
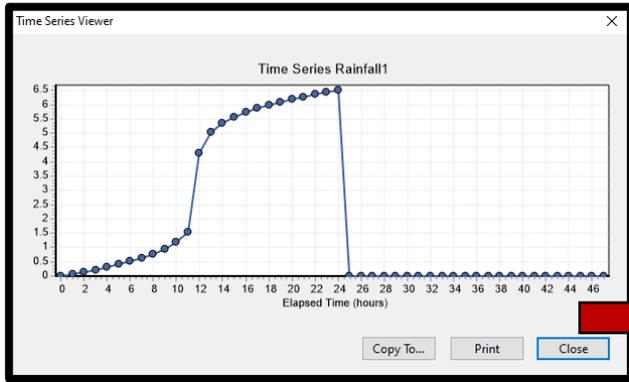
Stormwater Drainage Modeling

- Considerations
 - enough stormwater infrastructure data
 - Direct connection to Savannah River or tidal creek
- Opportunity to expand to the entire county
 - Employ a more robust model

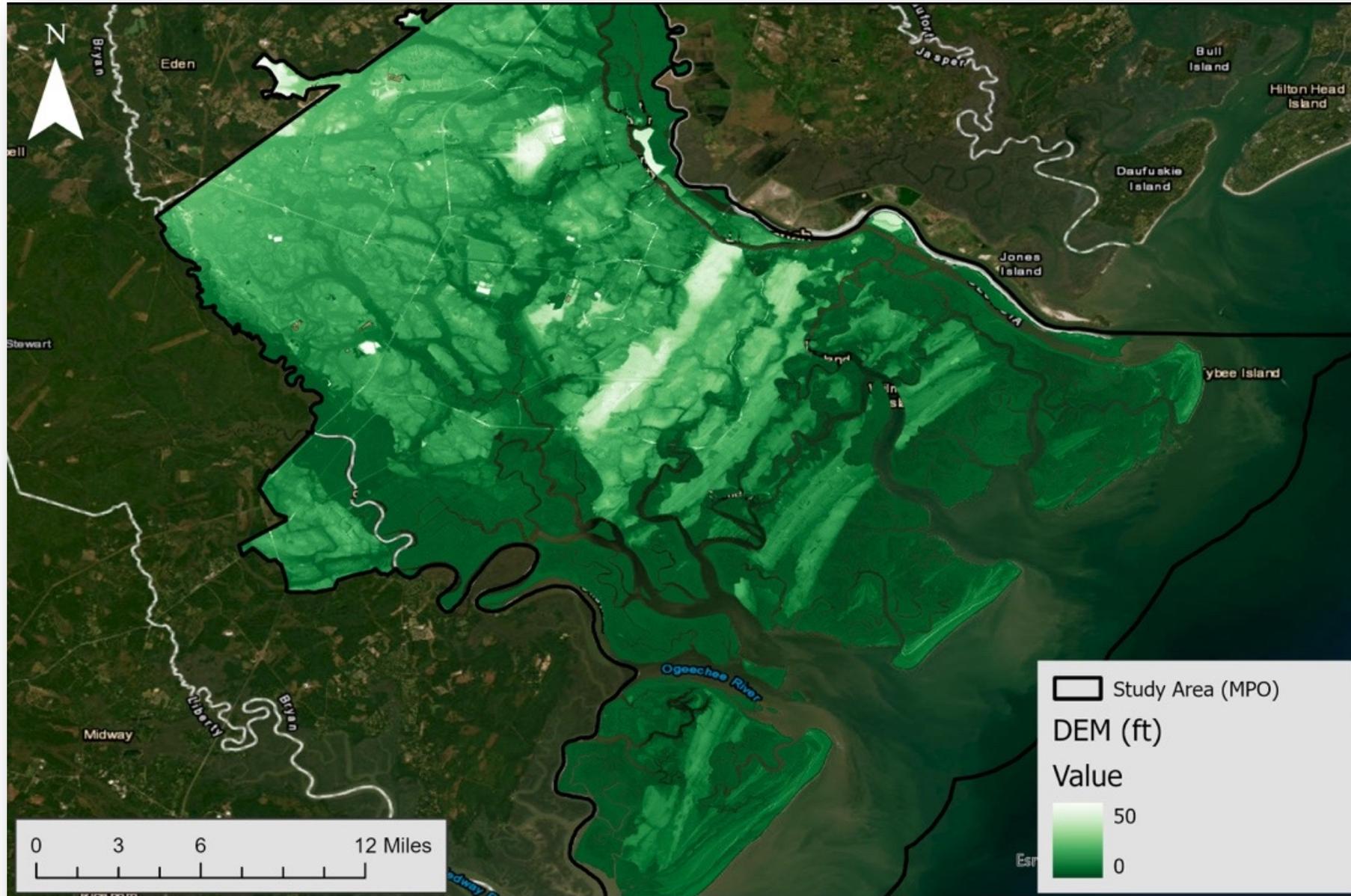


Stormwater Drainage Modeling

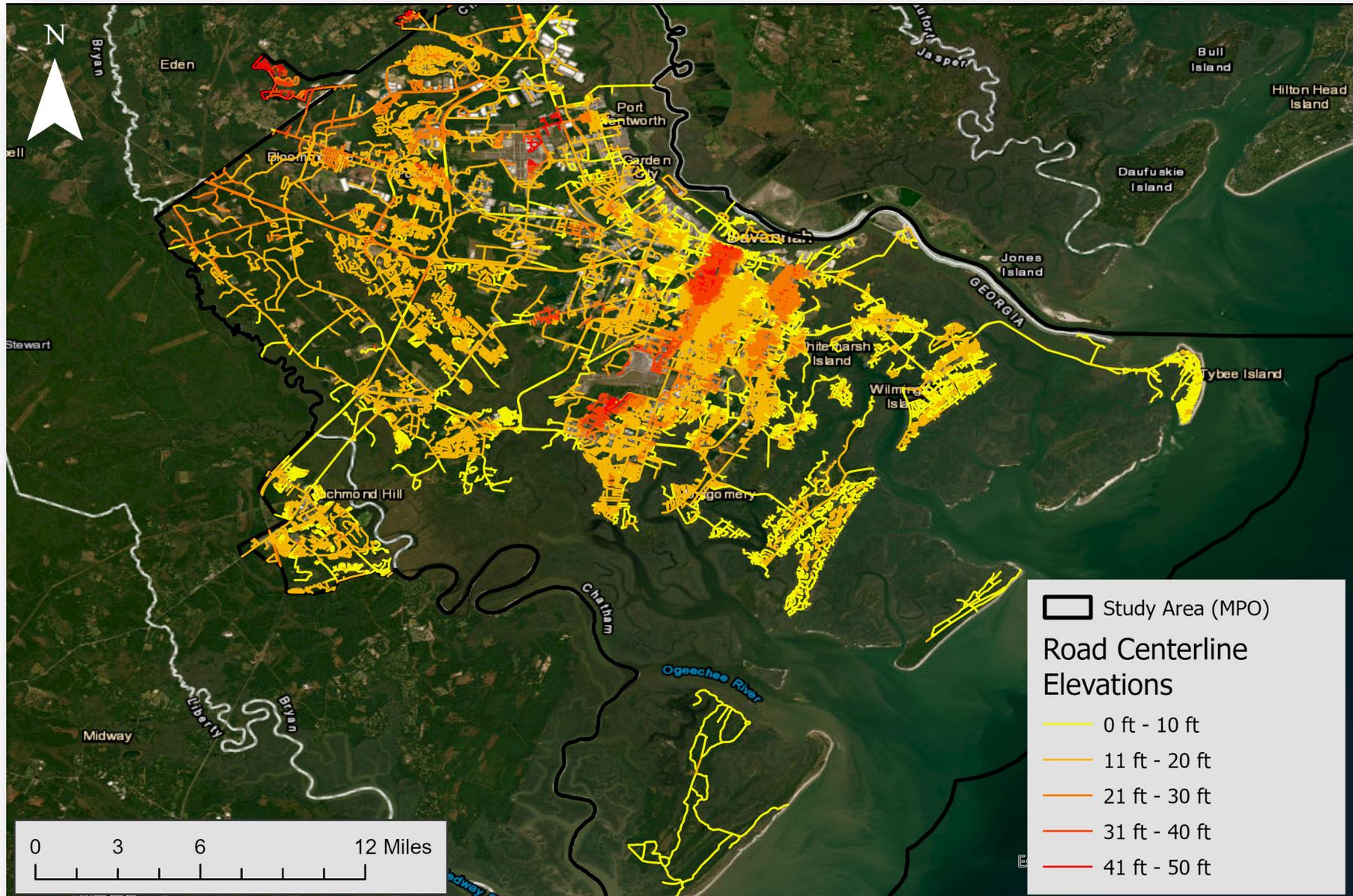
Stormwater Management Model (SWMM)



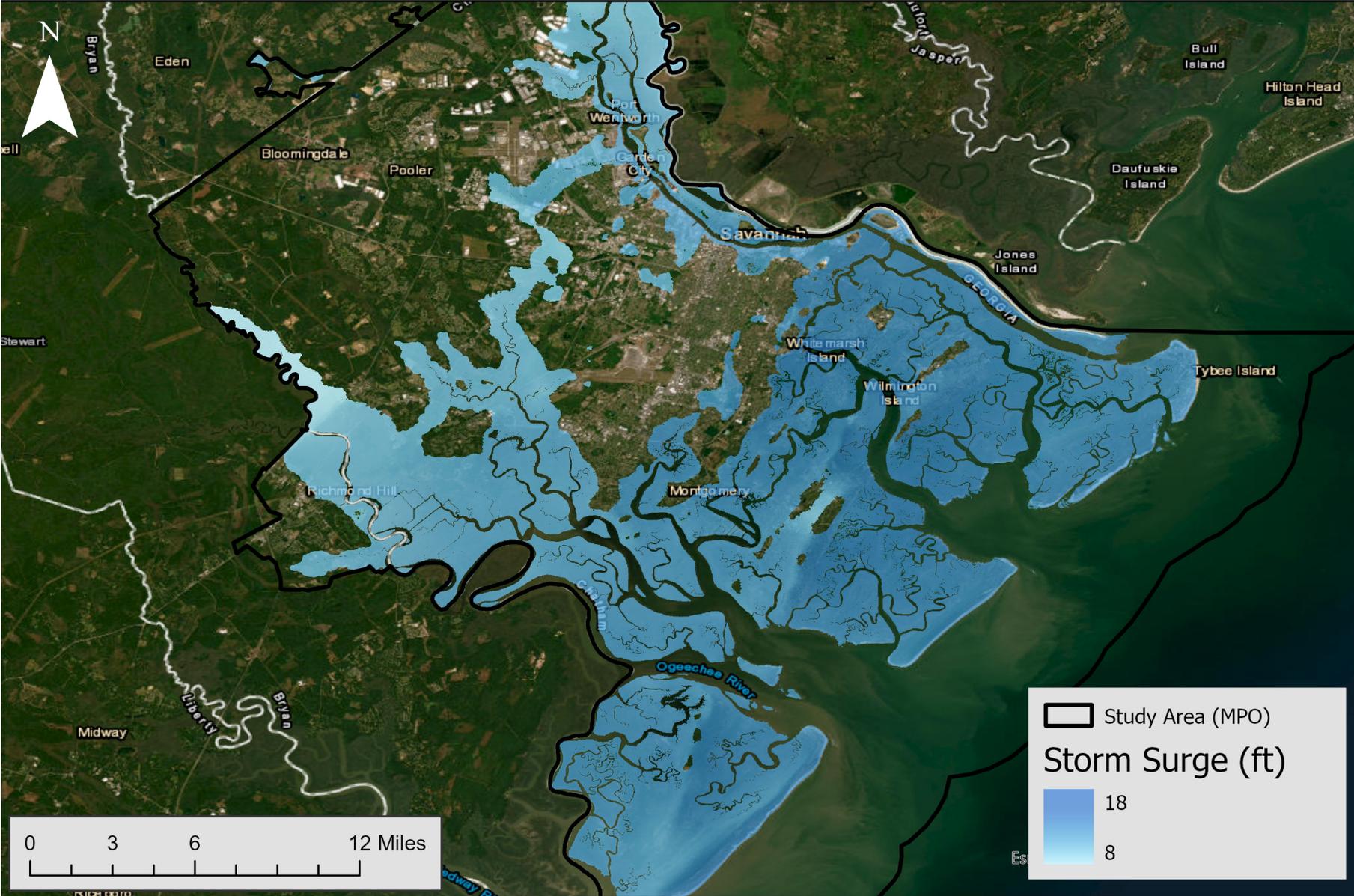
2019 GA Coastal DEM (Elevation NAVD88, ft)



Road Network (Elevation NAVD88, ft)

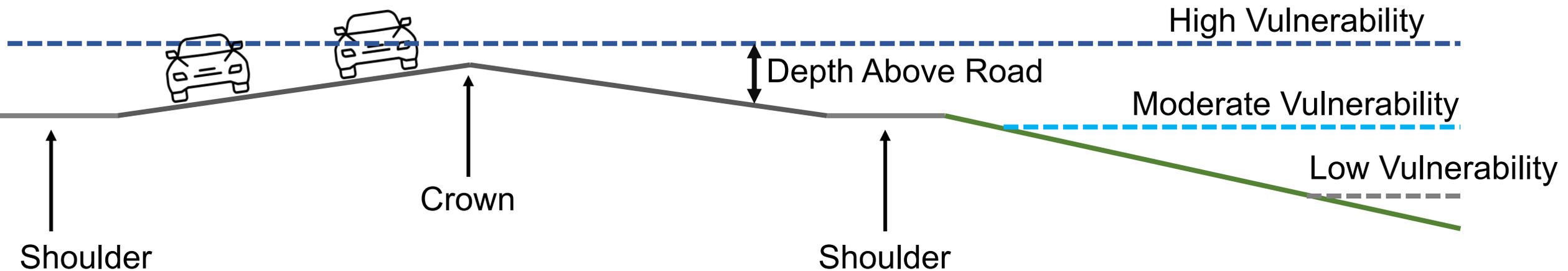


1% AEP Simulated Water Levels (NAVD88, ft)

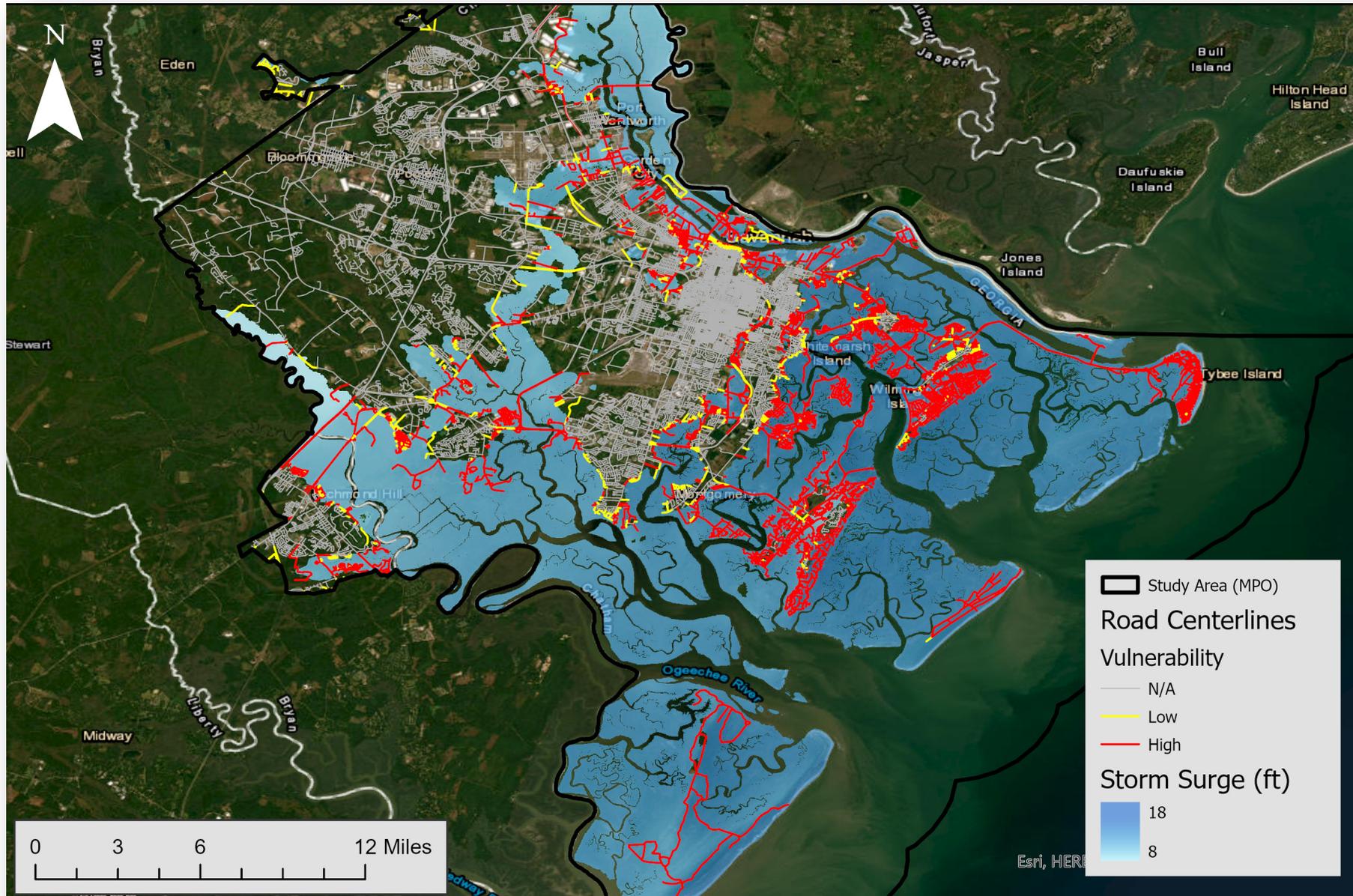


Roadway Vulnerability

- Low: The Depth Above Road was not within 3 feet of the road.
- Moderate: The Depth Above Road was between -3 and 0.
- High: The Depth Above Road exceeded 0.



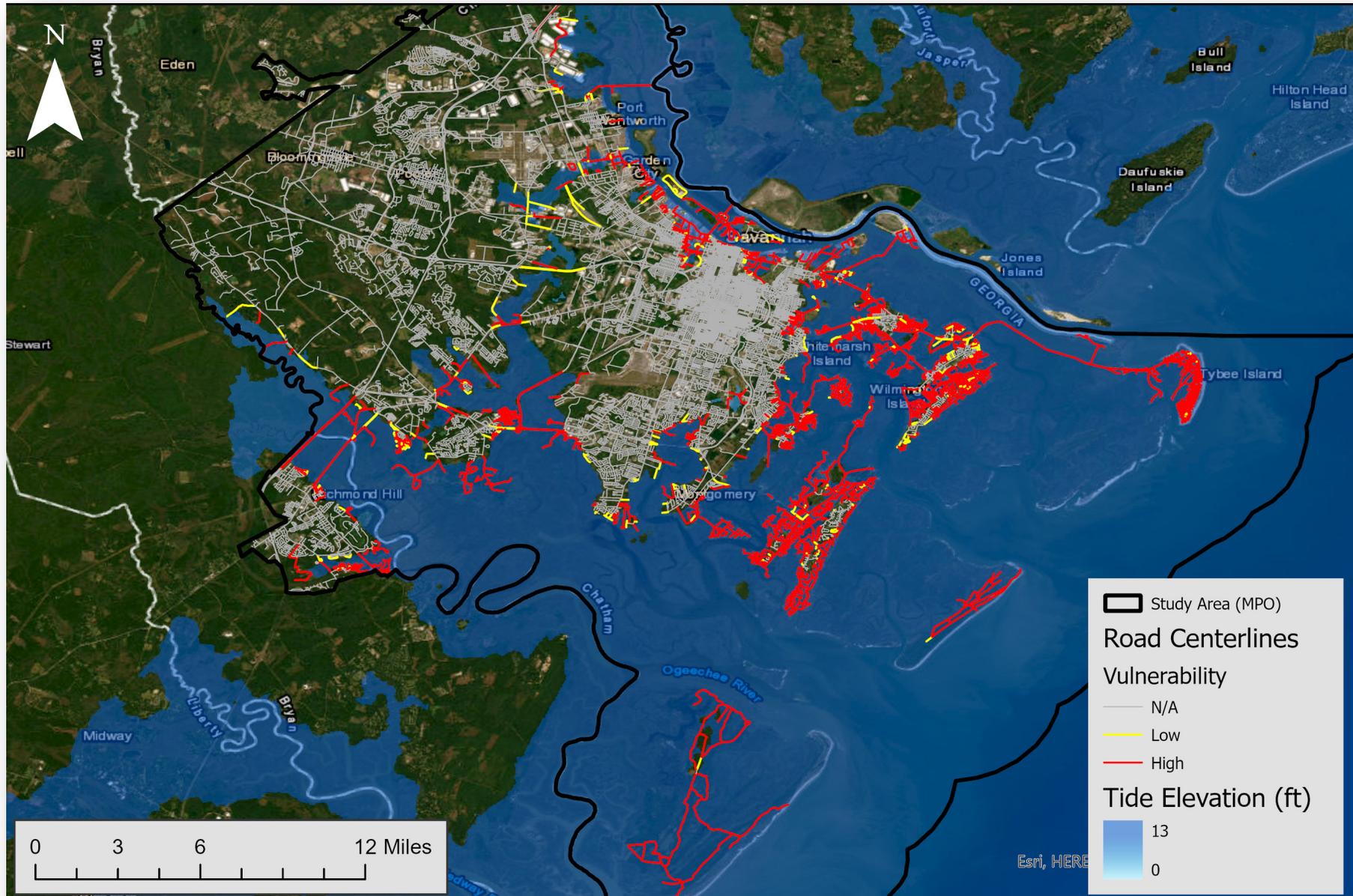
Roadway Vulnerability – 1% AEP (712 miles)



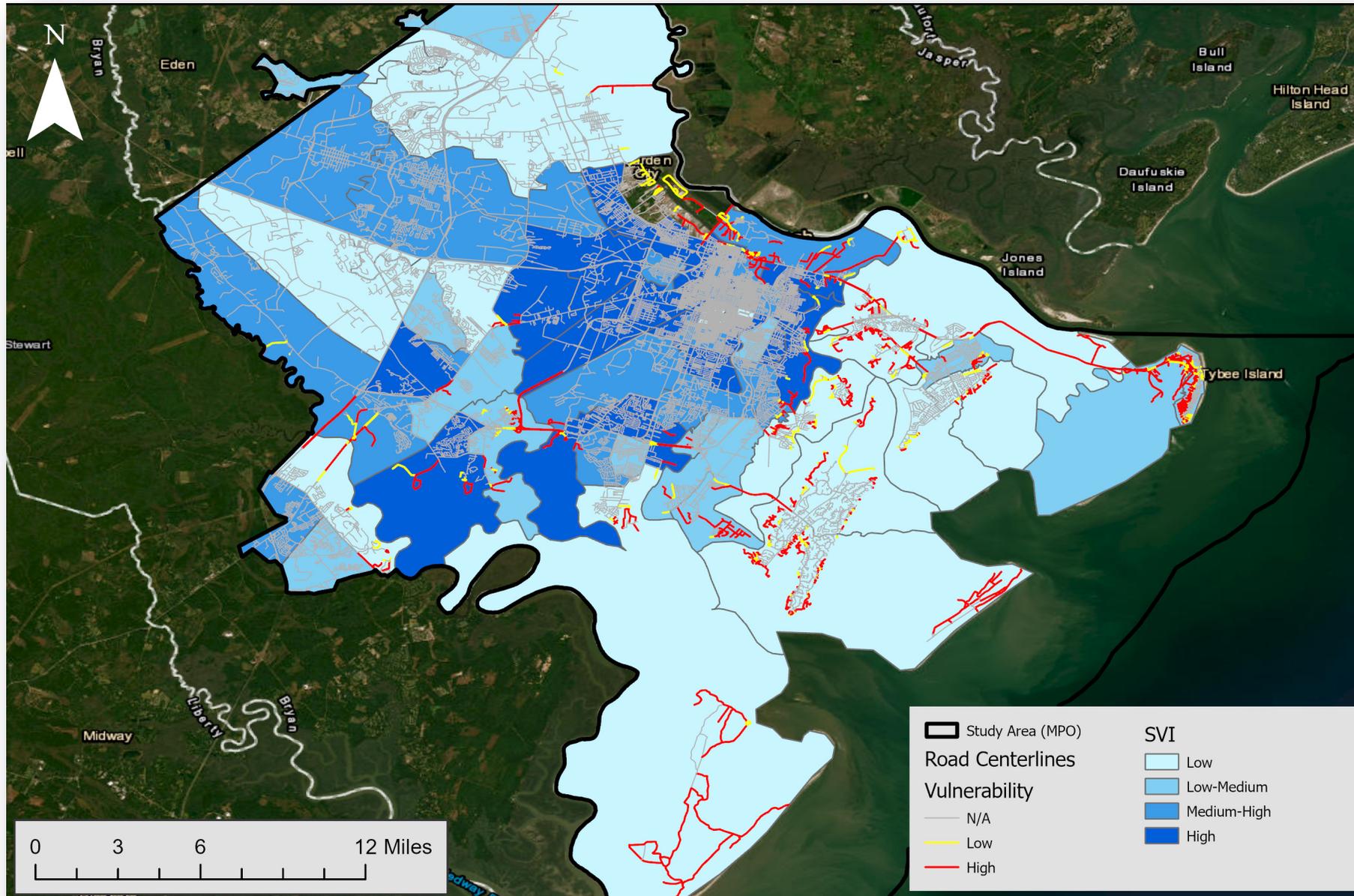
Roadway Vulnerability – Present Tides (142 miles)



Roadway Vulnerability – CRD High 2100 (6.56 ft, 567 miles)



SVI + 2050 High SLR Road Vulnerability



Roadway Vulnerability

Scenario	Moderate Vulnerability (miles)	High Vulnerability (miles)	Total (miles)
Present-Day Tides	50.7	91.0	141.7
Tides 2050 DNR Low (1.23 ft)	47.5	151.0	198.5
Tides 2050 DNR High (2.18 ft)	40.8	202.5	243.3
Tides 2075 DNR Low (2.14 ft)	42.0	199.4	241.4
Tides 2075 DNR High (4.08 ft)	40.3	318.5	358.9
Tides 2100 DNR Low (3.28 ft)	35.2	274.8	309.9
Tides 2100 DNR High (6.56 ft)	44.1	523.5	567.5
0.1% AEP	73.3	638.9	712.2
0.2% AEP	116.2	948.8	1,065.0

ESRI Dashboard DEMO

Roadway Vulnerability Application

Vulnerability Assessment

Select a category
Wilmington Island

Flooding Dynamic Modeling for Optimized Planning of CORE MPO Transportation Infrastructure Systems

The **Vulnerability Assessment Application** was developed to assist with optimizing the planning of new and existing infrastructure to improve reliability and resiliency with additional consideration to economic constraints and social inequities.

The purpose of this application is to provide decision makers and other interested parties the ability to interact with the data in a manner that traditional methods do not offer. The application has been structured to allow data to be viewed over the entire project area and by places of interest.

The information contained in this application are based on the following Sea Level Rise Scenarios from the Georgia Department of Natural Resources:

2050:

- Low = 1.23 feet
- High = 2.18 feet

2075:

- Low = 2.14 feet
- High = 4.08 feet

2100:

- Low = 3.28 feet
- High = 6.56 feet

Depth Above Road (DNR Low)

RUNNER RD
Present Day: -2.28 (ft)
2050: -1.15 (ft)
2075: 0.30 (ft)
2100: 0.75 (ft)
HIGHWATER CT
Present Day: -2.52 (ft)
2050: -1.38 (ft)
2075: -0.54 (ft)
2100: 0.51 (ft)
YARDARM PL
Present Day: -99.00 (ft)
2050: -99.00 (ft)
2075: -99.00 (ft)
2100: 0.21 (ft)
DOGWOOD AVE
Present Day: -99.00 (ft)
2050: -1.56 (ft)
2075: -0.74 (ft)
2100: 0.31 (ft)
SHAD RIVER RD
Present Day: -2.31 (ft)
2050: -1.15 (ft)
2075: -0.29 (ft)
2100: 0.77 (ft)
BREVARD CT
Present Day: -99.00 (ft)
2050: -0.72 (ft)
2075: 0.15 (ft)
2100: 1.22 (ft)
BREVARD POINT RD
Present Day: -99.00 (ft)
2050: -99.00 (ft)
2075: -99.00 (ft)
2100: 0.53 (ft)
PALMETTO BAY RD
Present Day: -99.00 (ft)
2050: -99.00 (ft)
2075: -99.00 (ft)
2100: -99.00 (ft)

◀ DNR Low ▶

Interactive Map

Depth Above Road (DNR Low)

Depth Above Road (DNR High)

Annual Exceedance

Savannah Area GIS, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA

Powered by Esri

Roadway Vulnerability Application

Vulnerability Assessment

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- High = 2.18 feet

2075:

- Low = 2.14 feet
- High = 4.08 feet

2100:

- Low = 3.28 feet
- High = 6.56 feet

Depth Above Road (DNR Low)

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Present Day: -2.28 (ft)
2050: -1.15 (ft)
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DOGWOOD AVE
Present Day: -99.00 (ft)
2050: -1.56 (ft)
2075: -0.74 (ft)
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SHAD RIVER RD
Present Day: -2.31 (ft)
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2100: 0.77 (ft)

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Present Day: -99.00 (ft)
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BREVARD POINT RD
Present Day: -99.00 (ft)
2050: -99.00 (ft)
2075: -99.00 (ft)
2100: 0.53 (ft)

PALMETTO BAY RD
Present Day: -99.00 (ft)
2050: -99.00 (ft)
2075: -99.00 (ft)
2100: -99.00 (ft)

◀ DNR Low ▶

Interactive Map Depth Above Road (DNR Low) Depth Above Road (DNR High) Annual Exceedance

Roadway Vulnerability Application



Roadway Vulnerability Application

Depth Above Road (DNR Low)

Search: Swee

SWEET BAILEY COVE
Present Day: -99.00 (ft)
2050: -0.61 (ft)
2075: 0.25 (ft)
2100: 1.32 (ft)

Depth Above Road

Road Name: SWEET BAILEY COVE

Location: Wilmington Island

Present Day Vulnerability:
Low, -99.00 feet

2050 Vulnerability
Moderate, -0.61 feet | DNR Low
High, 0.29 feet | DNR High

2075 Vulnerability
DNR Low: High, 0.25 feet
DNR High: High, 2.06 feet

2100 Vulnerability
DNR Low: High, 1.32 feet
DNR High: High, 4.4 feet

1% Annual Exceedance
High, 5.62 feet

0.2% Annual Exceedance

Layers

- Places (Outlined)
- MPO Project Area
- Depth Above Road (Present Conditions)
- Scenario (DNR Low)
- Scenario (DNR High)
- Scenario (Storm Exceedance)
- Street Centerline
- Places
- Municipalities

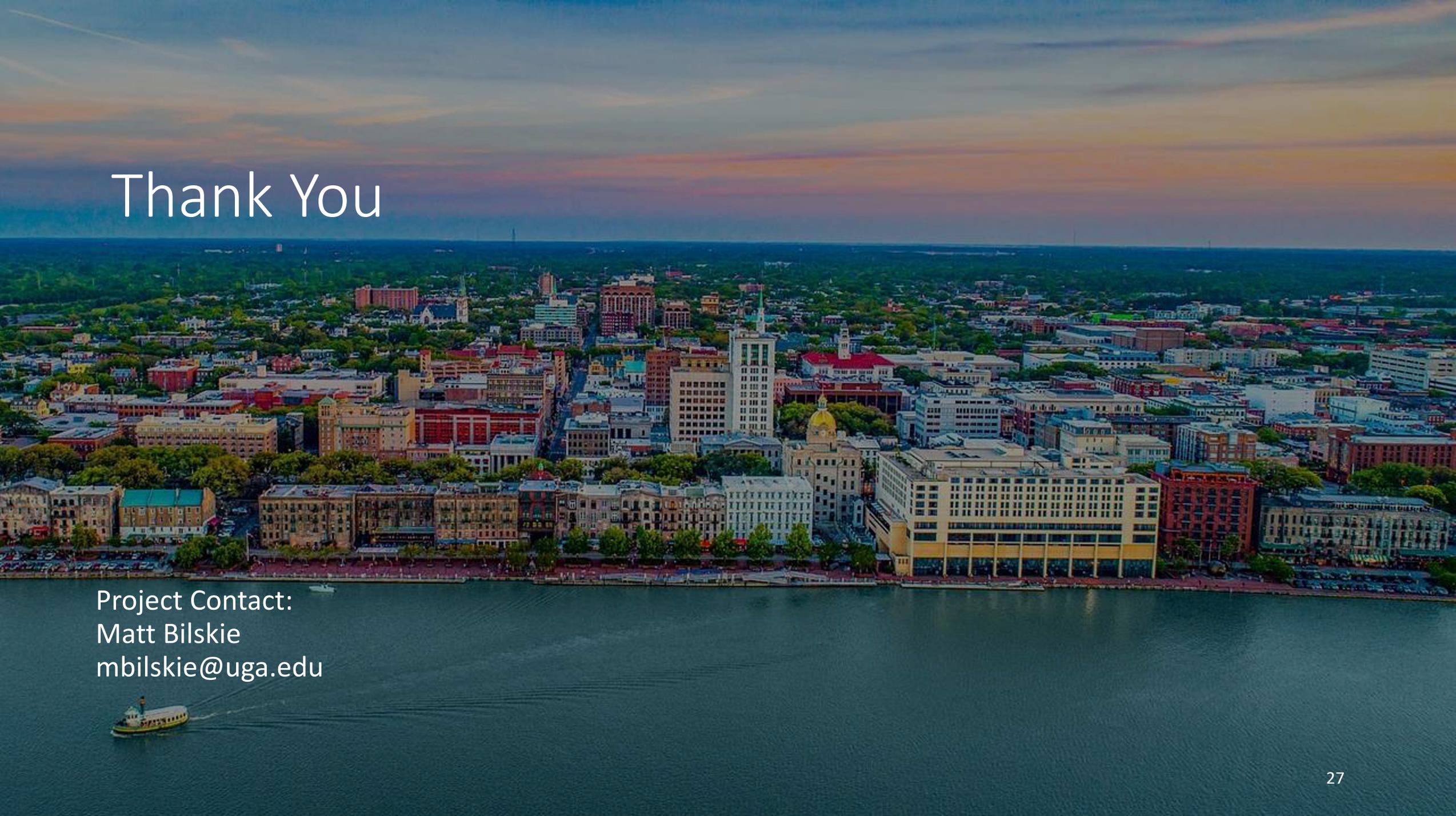
Map navigation: Zoom to, Pan

Map labels: Oemler Loop, Pointe North Dr, Pointe South Dr, Morningside Ct, Sweet Bailey Cv, Shad River Rd

Map footer: Maxar, Microsoft | Esri Community Maps Contributors, Savannah Area GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

Map controls: DNR Low, Interactive Map, Depth Above Road (DNR Low), Depth Above Road (DNR High), Annual Exceedance

Thank You

An aerial photograph of a city, likely Athens, Georgia, taken at sunset. The sky is a mix of orange, pink, and blue. The city is densely packed with buildings of various colors and styles, interspersed with green trees. In the foreground, a wide river flows, with a small yellow and white boat moving across it from left to right, leaving a white wake. The overall scene is peaceful and scenic.

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