VDOT/VIMS Partnership

“This Memorandum of Understanding (MOU) provides for coordination among the Virginia Institute of Marine Science (VIMS), the Chief Resilience Officer of the Commonwealth of Virginia (CRO) and the Virginia Department of Transportation (VDOT) in developing a proactive strategy for understanding and addressing sea level rise, land subsidence and recurrent flooding impacts on existing and planned road infrastructure as well as how that infrastructure will impact natural ecosystems in Virginia’s coastal zone as the climate changes.”
Study Goals

1) Assess climate vulnerability and adaptation of transportation infrastructure

2) Assess ecosystem use conflicts of transportation infrastructure under rising sea levels

3) Assess current policy and regulatory requirements potentially affecting VDOT
Project Details

- MOU between VDOT and Secretary of Natural Resources: signed June 2019
- Official start date: October 2019
- Anticipated completion date: September 2024
- Timeframe covered: 2020 – 2080
- Study Area: Virginia’s Coastal Zone (Tidewater Virginia)
  - 46 localities: 29 counties and 17 cities
- Sea Level Rise Curve: NOAA 2017 Intermediate High
ROAD NETWORK ANALYSIS:
What sea level rise projection should we be using?

Norfolk, VA (Sewells Point)
ROAD NETWORK ANALYSIS:
What sea level rise projection should we be using?

Hypothetically
Related Efforts

- **VDOT**
  - House Bill 1217 – recurrent flooding affecting Planning District 8
  - Atlas 14 Update – update historical rainfall information
  - Intensity, Duration, and Frequency (IDF) Predictive Curve Development
  - OIPI / VTRANS
  - VDOT Resilience Steering Committee
  - CTB Environmental Subcommittee

- **Other**
  - Virginia Coastal Resiliency Master Plan
  - PDC / Locality Efforts
Task 1. Determine Transportation Infrastructure Vulnerability

- Examine all roads with respect to FEMA Flood Hazard Zones
- Analyze road elevations and Return Flood Frequency (RFF) relative to the best available tide gauge data for the area
- Perform Road Network Analysis (RNA) to evaluate vulnerability of major VDOT infrastructure
- Determine most useful method of making data available – both for VDOT and those outside of VDOT
FLOODPLAIN ANALYSIS:
Transportation in FEMA Flood Hazard Zones
FLOODPLAIN ANALYSIS:
Flood Zone Summary Tables

<table>
<thead>
<tr>
<th></th>
<th>Total Road Length (miles)</th>
<th>1% Annual Chance Flood Hazard (all A and V zones) (miles)</th>
<th>0.2% Annual Chance Flood Hazard (miles)</th>
<th>Area of Minimal Flood Hazard (miles)</th>
<th>Area of Undetermined Flood Hazard (zone D)</th>
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<tbody>
<tr>
<td><strong>Summary</strong></td>
<td>All Coastal Roads</td>
<td>58,446</td>
<td>28,48</td>
<td>1,465</td>
<td>58,863</td>
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<tr>
<td><strong>Accomack County</strong></td>
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<tr>
<td>Local Main Arteries</td>
<td>153</td>
<td>21</td>
<td>14</td>
<td>113</td>
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<tr>
<td>Local Secondaries</td>
<td>1,266</td>
<td>349</td>
<td>96</td>
<td>821</td>
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<tr>
<td>Ramp</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>US and VA Primary Highways</td>
<td>92</td>
<td>5</td>
<td>1</td>
<td>88</td>
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<tr>
<td></td>
<td>1,512</td>
<td>375</td>
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<td>1,027</td>
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**Alexandria City**

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Total Road Length (miles)</th>
<th>1% Annual Chance Flood Hazard (all A and V zones) (miles)</th>
<th>0.2% Annual Chance Flood Hazard (miles)</th>
<th>Area of Minimal Flood Hazard (miles)</th>
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<td>Alleys</td>
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<td>HOV Lanes</td>
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<tr>
<td>Limited Access Highway</td>
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<td>3</td>
<td>1</td>
<td>9</td>
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<tr>
<td>Local Main Arteries</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>47</td>
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<tr>
<td>Local Secondaries</td>
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<td>13</td>
<td>18</td>
<td>882</td>
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<td>Other</td>
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<td>Parking Lot Roads</td>
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<td>1</td>
<td>1</td>
<td>26</td>
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<tr>
<td>Ramp</td>
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<td>4</td>
<td>3</td>
<td>12</td>
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<tr>
<td>US and VA Primary Highways</td>
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<td>2</td>
<td>1</td>
<td>41</td>
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<tr>
<td></td>
<td>547</td>
<td>27</td>
<td>27</td>
<td>493</td>
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</table>
ROAD NETWORK ANALYSIS:
Tide gauge water level analysis

Yorktown Tide Gauge, Projected Water Height

Elevation exceeded (NAVD88 ft)

Days/year

2020 2050 2100
ROAD NETWORK ANALYSIS:
What roads are likely to flood in the future?

Average Annual Duration
Flood Duration (hours/year)
- 0
- 0-5
- 5-100
- 100-200
- > 200

Inaccessible
Impassable

Average Annual Flooding: 2050
ROAD NETWORK ANALYSIS:

Average Annual Flooding: 2000-2017

<table>
<thead>
<tr>
<th>Flood Duration (hours/year)</th>
<th>Color</th>
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<tbody>
<tr>
<td>0</td>
<td>Green</td>
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<tr>
<td>0-5</td>
<td>Green</td>
</tr>
<tr>
<td>5-100</td>
<td>Yellow</td>
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<tr>
<td>100-200</td>
<td>Orange</td>
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<tr>
<td>&gt; 200</td>
<td>Red</td>
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</table>

CURRENT WORK
ROAD NETWORK ANALYSIS:

Average Annual Flooding: 2050

Average Annual Duration
Flood Duration (hours/year)
- 0
- 0-5
- 5-100
- 100-200
- > 200
ROAD NETWORK ANALYSIS:

Average Annual Flooding: 2100

Average Annual Duration
Flood Duration (hours/year)
- 0
- 0-5
- 5-100
- 100-200
- > 200
ROAD NETWORK ANALYSIS: Inaccessible roads

Flooding Duration Maps
Projected Flooding Duration 2050
- 0 - 5 hours/year
- 5 - 100 hours/year
- 100 - 200 hours/year
- > 200 hours/year

Peninsula Inaccessible Roads
Road inaccessible at Flooding Level
- <1.6 ft
- 1.7-3.2 ft
- 3.3-4.9 ft
- 5 – 6.5 ft
- 6.6 – 8.2 ft
- 8.3 – 9.8 ft
Task 2. Study Ecosystem Impacts of Transportation Infrastructure

- Modeling current habitat distribution for rare, threatened or endangered (RTE) and migratory bird species
- Forecasting habitat distribution shifts for target species
- Assess the potential conflicts for existing and planned local land use changes and transportation infrastructure
Task 3. Policy and Regulatory Requirements

• Determine how resiliency related policy and regulatory requirements have been handled by other states
  – Example: Chapter 51 of 2021 Acts of Assembly requirement to include resiliency in design standards; no formal definition

• Analyzing legal framework informing duties to maintain and authority to abandon
Additional Tasks Being Considered

• Utilize participatory mapping
  – Make use of local expertise

• Determine method of data approval and governance
  – Who reviews and accepts?
  – What is the timing?
  – Interactive map development

• Determine prioritization and decision making approaches

• Engagement with impacted communities and PDCs