

# CAPE CHARLES, VIRGINIA RESILIENCE: CURRENT AND FUTURE CONDITIONS

TOWN COUNCIL WORK SESSION

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**INSTITUTE for  
ENGAGEMENT & NEGOTIATION**

Shaping Our World Together



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**VIRGINIA COASTAL  
POLICY CENTER**



**OLD DOMINION UNIVERSITY**

Resilience Collaborative



**Virginia Coastal Zone**  
MANAGEMENT PROGRAM



Anonymous



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## Acknowledgment of Funders

We thank the following funders for their support in bringing The RAFT to seven localities on Virginia's Eastern Shore.

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**We are also grateful to these funders for supporting other aspects of The RAFT:**

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### **Other institutions that have provided support include:**

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School of Architecture at the University of Virginia  
Virginia Coastal Policy Center at William & Mary Law School  
Virginia Environmental Endowment



**OLD DOMINION UNIVERSITY**

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## WHERE WE'RE GOING ....

- **Quick summary of the RAFT**
- **Current and Future Flooding Conditions for Cape Charles**
- **What Other Localities are Doing**
- **Questions?**



A photograph of a residential street that has been flooded with water. In the background, there are several houses, including a prominent yellow and blue one. A red stop sign is visible on the right side of the street. In the foreground, three orange traffic cones are placed in the water. The sky is overcast and grey.

# The RAFT

**The Resilience Adaptation Feasibility Tool**

# WHAT IS RESILIENCE?

- The capacity of a community to respond to, withstand, recover from, and thrive after both acute and chronic adverse situations.

# The Concept

1. **SCORECARD: Resilience Assessment**
2. **COMMUNITY WORKSHOP: Resilience Action Plan**
3. **IMPLEMENTATION: Ongoing Assistance**



# WHAT DID RAFT SCORECARD MEASURE?

- **1. Policy, Leadership, and Legislation**
- **2. Future Risk and Current Infrastructure Assessment**
- **3. Finance, Budgeting, Funding, and Economics**
- **4. Land Use**
- **5. Community Engagement**
- **6. Community Health and Wellness**
- **7. Ecosystems and Natural Resources**



# PRIORITIZED ACTIONS

## ONE-YEAR CHECKLIST

CATEGORY	RESILIENCE ACTION CHECKLIST	DOT #
COMMUNICATION & EDUCATION	1. Educate council on flooding (and what can be done about it), and coastal resilience	7
	2. Develop council/commission from representatives from planning commission, historic, wetlands, harbor, etc.	6
	3. Develop FAQ on main website on dunes, Commuting Rating System (CRS), and what residents can do	5
COMMUNITY ENGAGEMENT & ACTION	1. Investigate ways to incentivize residents to enhance coastal resilience	2
	2. Education for seasonals (tourism), more signage, "Puppies for the Bay" (include why/importance & poop/scoop for residents)	2
LEGISLATION AND POLICY	1. Zoning/Codes	n/a
	a. Review long-term codes/zoning (incentives, enforcement, open land, setbacks, elevation, etc.)	8
	2. Cross-jurisdiction on resilience topic	5
	a. Discussion with Northhampton County & DEQ for biosolids/E. Coli (drains, setbacks, beach closures, timing of application)	1
	b. Interact more with Accomack-Northampton Planning District Commission (ANPDC)	0
	3. Determine amount of green infrastructure present and develop an open space plan to assist with CRS	5



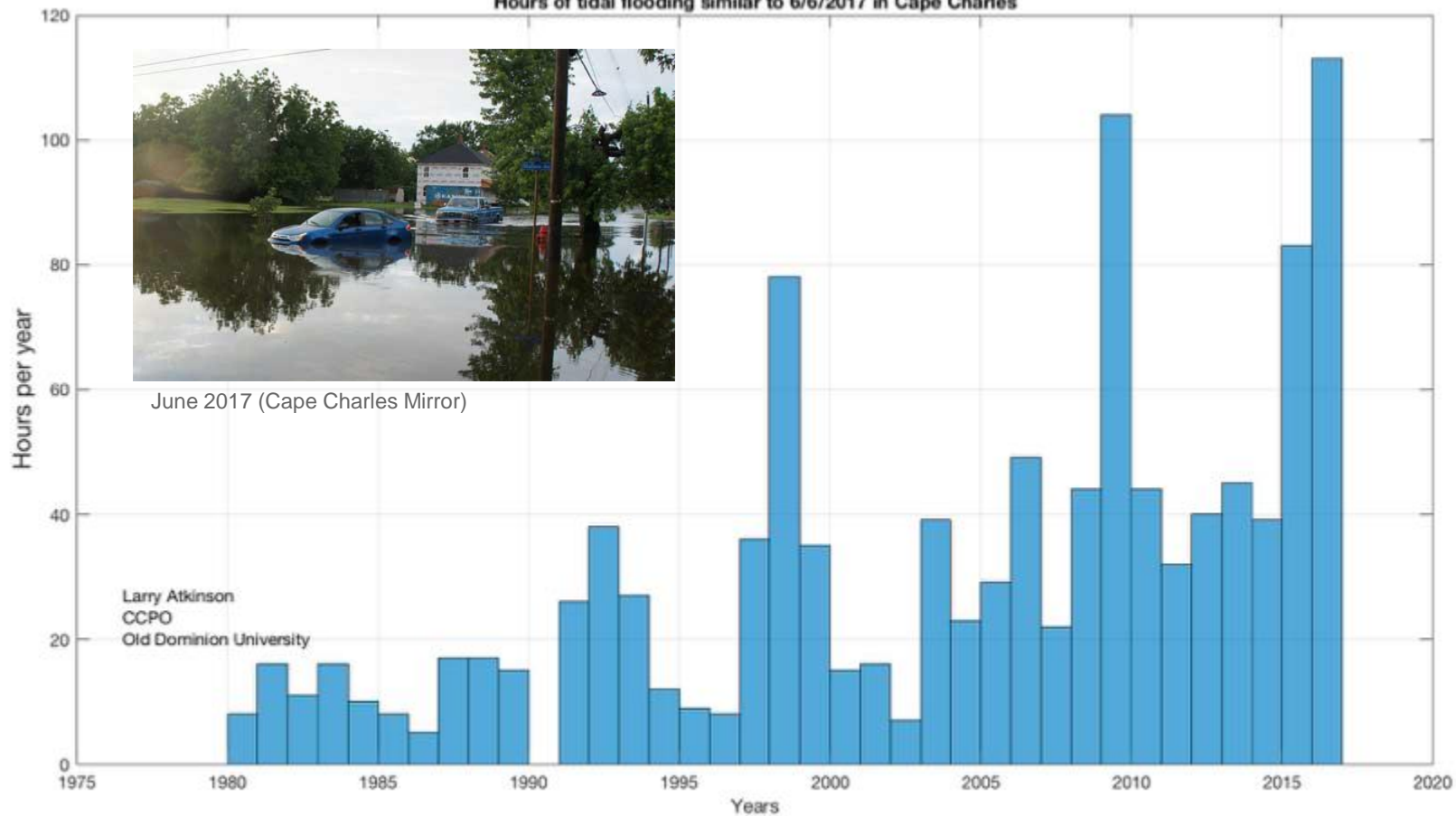
# 8 ITEMS ALREADY ACCOMPLISHED VIA RAFT CHECKLIST

1. **Green infrastructure** potential with the goal of developing an open space plan.
2. Studying **dunes along the town beach** relative to legal status and importance.
3. **Photographic documentation** and scientific data on rising water and recurrent flooding.
4. Active participant in the ANPDC's **Climate Action Working Group (CAWG)**.
5. **Incentivize local residents and businesses to be more resilient** and plan for rising water and recurrent flooding.
6. Studying potential impacts from rising water and recurrent flooding on **residential and commercial tax revenues**.
7. Cape Charles Museum and Welcome Center on last fall's **"Water Ways" exhibit** as part of the Smithsonian Institution's Museum on Main Street program.
8. **Public information update articles** in several editions of the *Gazette*.

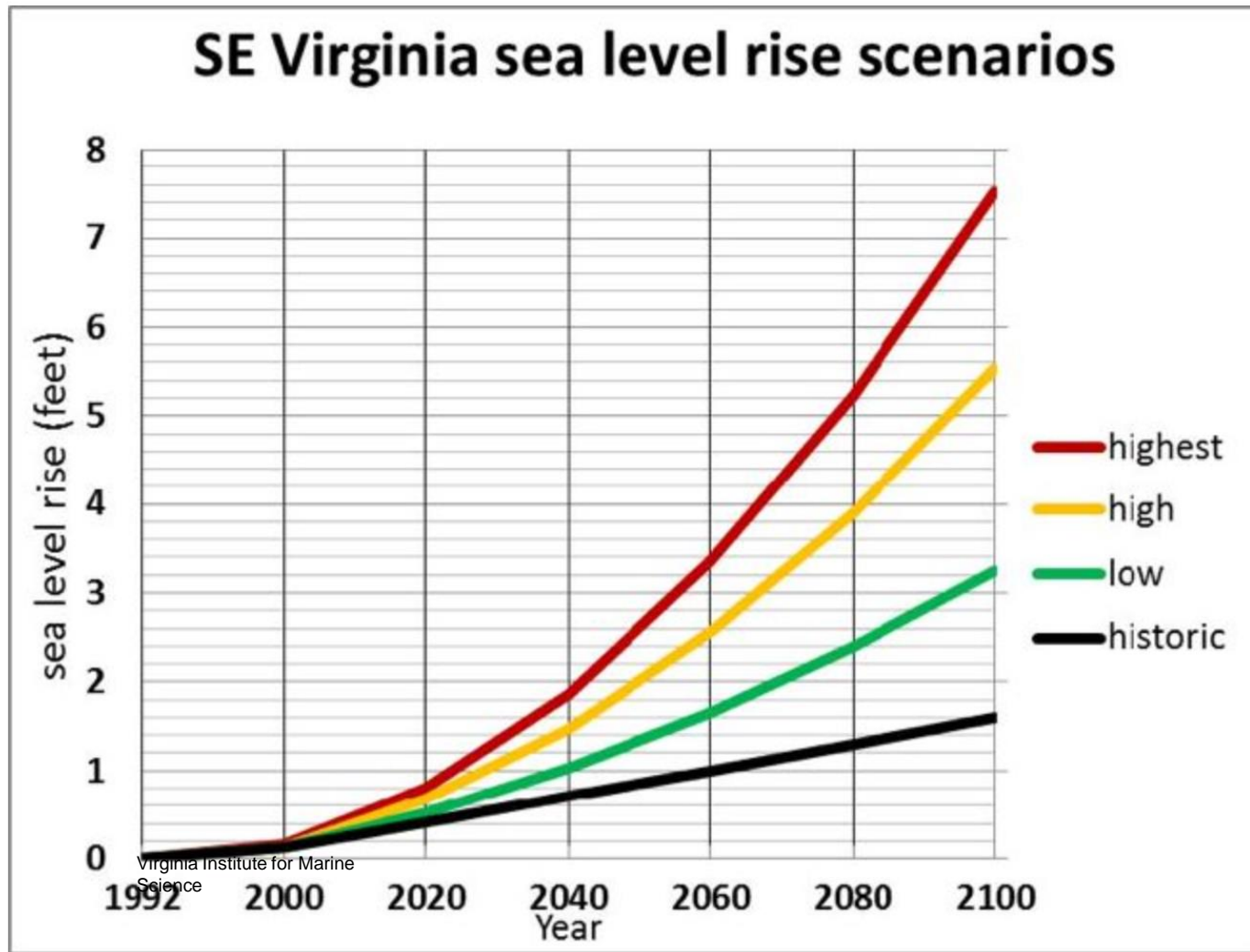
The background is a deep blue gradient with a subtle pattern of white stars. Overlaid on the left side are several white circular and semi-circular lines, some with arrows indicating a clockwise direction. A prominent circular scale with numerical markings from 140 to 260 in increments of 10 is visible on the left. Other smaller circular elements, some solid and some dashed, are scattered across the left half of the image.

# CURRENT AND FUTURE CONDITIONS

Hours of tidal flooding similar to 6/6/2017 in Cape Charles



# SEA LEVEL RISE SCENARIOS FOR VIRGINIA





# CAPE CHARLES HISTORIC DISTRICT



NOAA Data Viewer

## Darker Shade=Lower Elevation

The darkest shaded areas are Mean Higher High Water (MHHW) and each incremental change to a lighter shade is equivalent to a 1 foot increase in elevation

Example: Plum St. and Madison Ave. has an elevation almost equal to MHHW, with the southerly route of Plum St. not being much higher

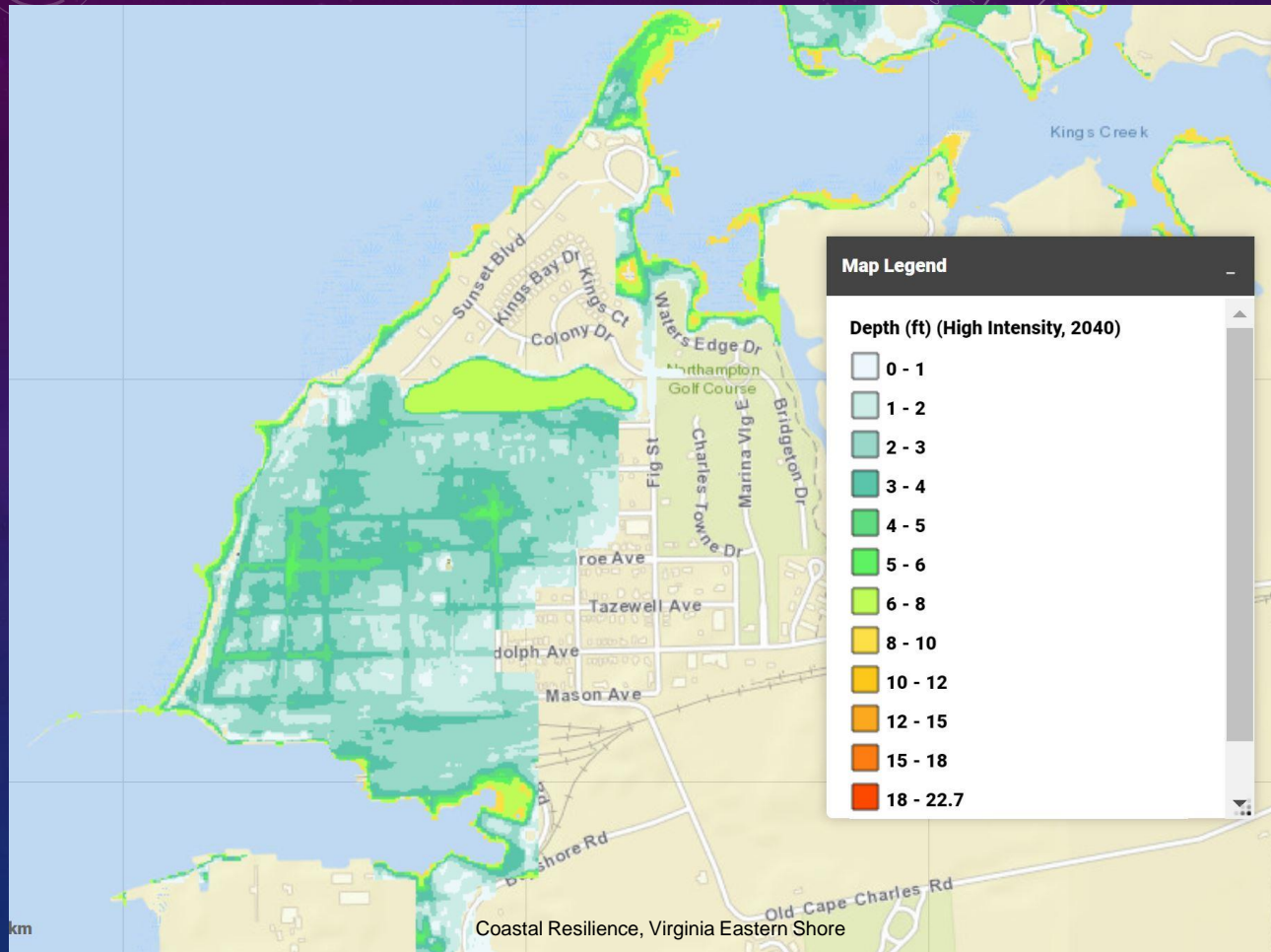
## What does this show?

**Flooding will be worst in the darkest of these dark-shaded low lying areas**

# 2040 STORM SURGE (HIGH-INTENSITY STORM EVENT)

This shows a high intensity storm surge projection (Category 2 and 3 hurricanes with maximum winds between 95 and 115 mph) for 2040.

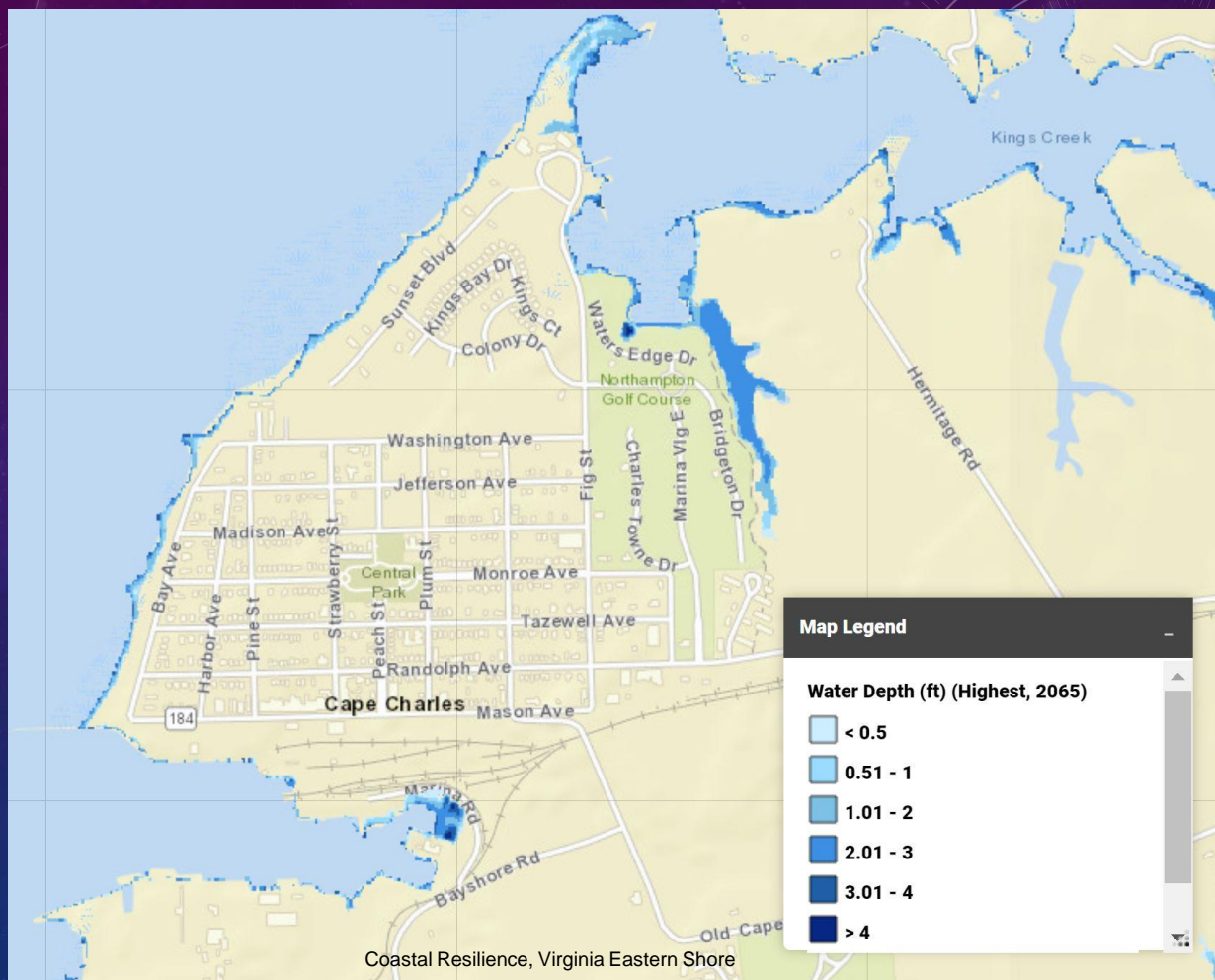
The water depth ranges from **1-2 ft.** to **5-6 ft.** in the Historic District, and up to **8-10 ft.** in the harbor, coastal dunes and northern peninsula.



# 2065 BASIC INUNDATION WITH HIGHEST SLR PROJECTION

This shows the highest projected basic inundation for 2065.

Water depth ranges from less than **0.5 ft** to **greater than 4 ft** in the port, coastal dune edge, and northern peninsula.

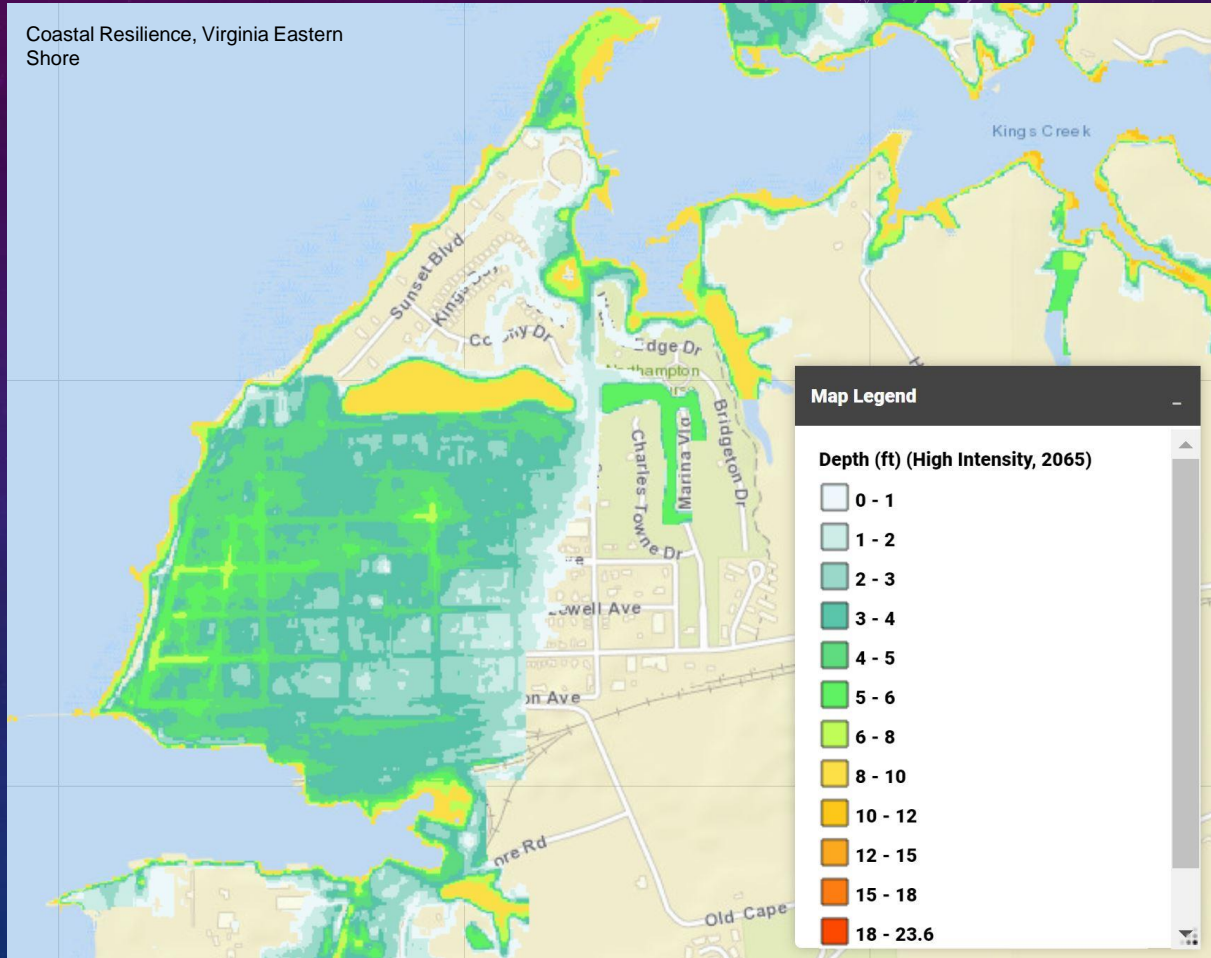




# 2065 STORM SURGE (HIGH-INTENSITY STORM EVENT)

This shows a high intensity storm surge (Category 2 and 3 hurricanes with maximum winds between 95 and 115 mph) for 2065.

Water depth ranges from **1-2 ft.** to **6-8 ft.** in the Historic District, and up to **8-10 ft.** in the port, coastal dune edge, northern peninsula and north side of Washington Ave.

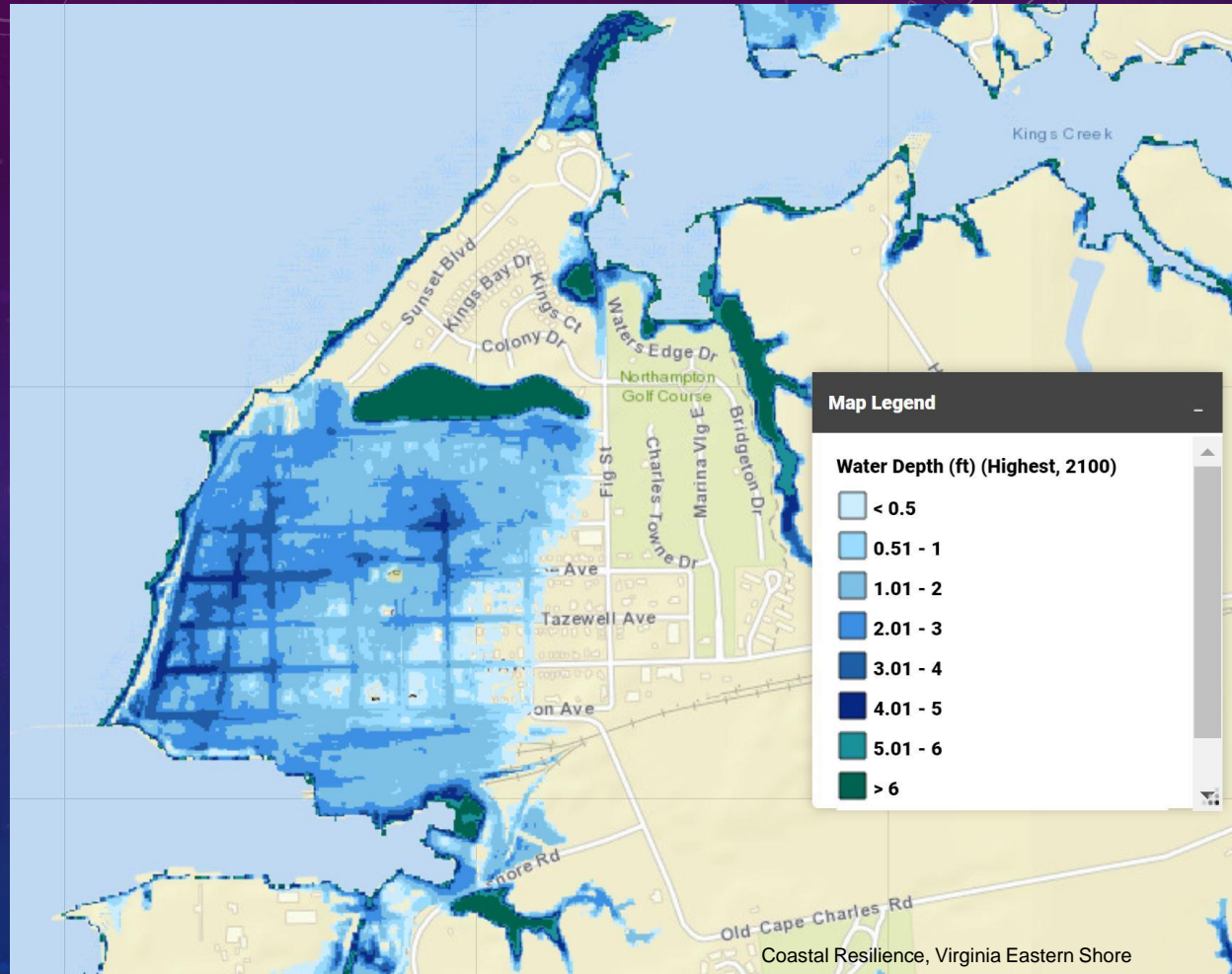




# 2100 BASIC INUNDATION WITH HIGHEST SLR PROJECTION

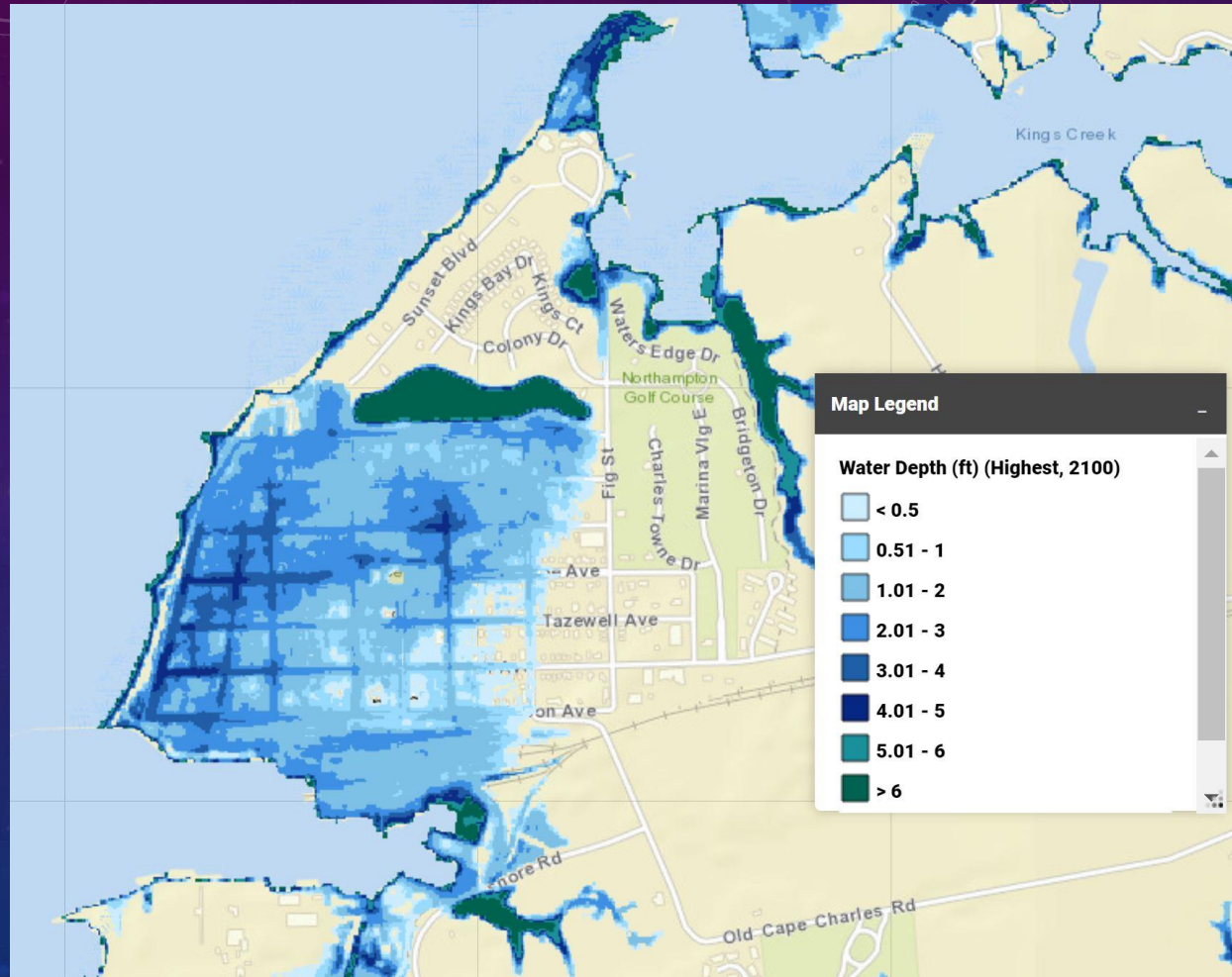
This shows the highest projection for basic inundation in 2100.

Water depth ranges from less than **0.5 ft.** to **4-5 ft.** in **Historic District**, up to **more than 6 ft.** in port, coastal dune edge, northern peninsula and north side of Washington Ave.



# 2100 NO STORM SURGE MAPS AVAILABLE

- BUT – it's likely safe to predict it would likely be THIS map (basic inundation with SLR)
- PLUS ANOTHER 1 to 10 ft. of water (amounts shown in 2065 storm surge), depending on elevation



This app allows you to insert secure web pages starting with https:// into the slide deck. Non-secure web pages are not supported for security reasons.

Please enter the URL below.

https:// coast.noaa.gov/slr/#!/layer/slr/4/-8461673.434432281/4477309.773359/15/satellite/3646/0.8/2056

Note: Many popular websites allow secure access. Please click on the preview button to ensure the web page is accessible.

The background is a dark blue gradient with a subtle pattern of white dots. On the left side, there are several concentric circular patterns. One large circle has a degree scale from 140 to 260. Other smaller circles have partial scales or arrows indicating rotation. The text is positioned on the right side of the image.

WHAT OTHER LOCALITIES  
HAVE DONE?



# DUNES AND RESILIENCE

- First line of defense from coastal storm hazards
- Provides a critical buffer for properties, absorbs wave energy
- Beneficial impact on water quality
- Provides habitat for variety of plants and animals




Photo Credit: Larry DiRe, Planner, Cape Charles

## CAPE CHARLES DUNES (PUBLIC BEACH)

Deposit site for dredge material from the USACE federal harbor dredging project

# DUNES CLASSIFICATION

- VIMS Shoreline Studies Program
- Dune system classification
- Cape Charles Dunes
  - Sites 40, 41A, and 41B
  - Public Ownership
  - Primary Status
  - Site 41B also has secondary dunes

MEW  Primary Dune Crest **NORTHAMPTON COUNTY DUNE SITE 41B**


Site Information	
1. Date Surveyed: 27 Sep 1999	3. Profile Coordinates: N: 349,850 ft E: 2,720,540 ft
2. Central Coordinates: N: 349,850 ft E: 2,720,540 ft	3. Profile Coordinates: N: 349,850 ft E: 2,720,540 ft
Virginia South State Plane Grid NAD 1927 (4802)	
4. Site Length: 600 ft	
5. Ownership: Public	Plate: 5

Site Parameters	
6. Type: Marmade	
7. Fetch Exposure: Open Bay	
8. Shoreline Direction of Face: West	
9. Nearshore Gradient:	
10. Morphologic Setting: Dune Field > 500 ft Alongshore/Linear	
11. Relative Stability: Accretionary	
12. Underlying Substrate: Upland	
13. Structure or Fill: Bulkhead, Jetty, and Beach Fill	

Site Measurements	
Primary Dune:	
14. Crest Elevation (ft MHW): 13.1	
15. Extent from Crest: Landward (ft): 26	
16. Extent from Crest: To MHW (ft): 295	
Secondary Dune:	
17. Crest Elevation (ft MHW): 8.1	
18. Extent between Second and Primary Crest (ft): 55	
19. Second Crest - Landward (ft): 55	


Vegetation Communities	
20. Primary Dune: N/A	
21. Secondary Dune: N/A	

22. Remarks: NH 41B is the southern part of the Cape Charles Public Beach. It is bounded by the Cape Charles Harbor Jetty that traps southward moving sand. The result has been an accretionary foredune and dune.
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12 Apr 1999

Looking north from the channel jetty.



12 Apr 1999

Looking south toward the channel jetty.

Not intended for use in determining legal jurisdictional limits.

B-25

# DUNES MANAGEMENT

- Virginia Code §§ 28.2-1400 to 1420 establish authority for certain localities to adopt a coastal primary sand dune zoning ordinance
- Cape Charles Zoning Ordinance, Appendix C
  - Definition: “. . . a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent, and upon which is growing any of following [list of dune plant species]. . . shall not include any mound of sand, sandy soil, or dredge spoil deposited by any person for the purpose of temporary storage.”
- Lists authorized uses and activities
- Otherwise, application must be made to local wetlands board for a permit

# CASE STUDY: NORFOLK SAND MANAGEMENT PLAN

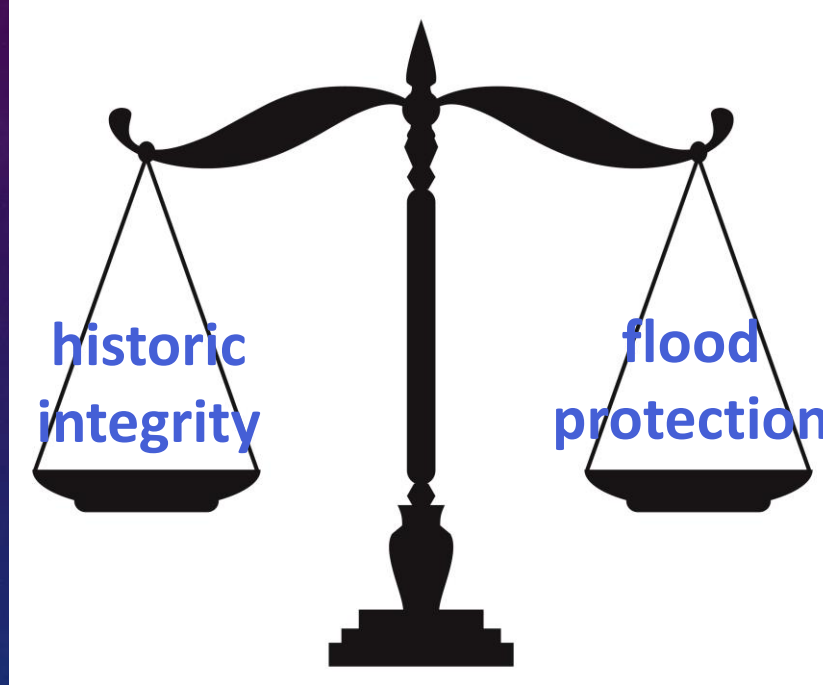
- Comprehensive guide to sand management criteria
  - provide guidance and a long-term strategy intended to promote sand dune and beach stability, functionality, and resiliency consistent with applicable laws and regulations
- Objectives (in order of decreasing priority)
  - maintain or improve ability of primary frontal dune to protect properties
  - minimize inundation of areas behind primary front dune crest by accumulation of wind-blown sand
  - maintain sand reservoirs, the stability of the shore, and the sandy upland
  - maintain and improve public access to the beach
  - maintain or restore water views, to the extent possible, in conjunction with one or more of the other listed priorities



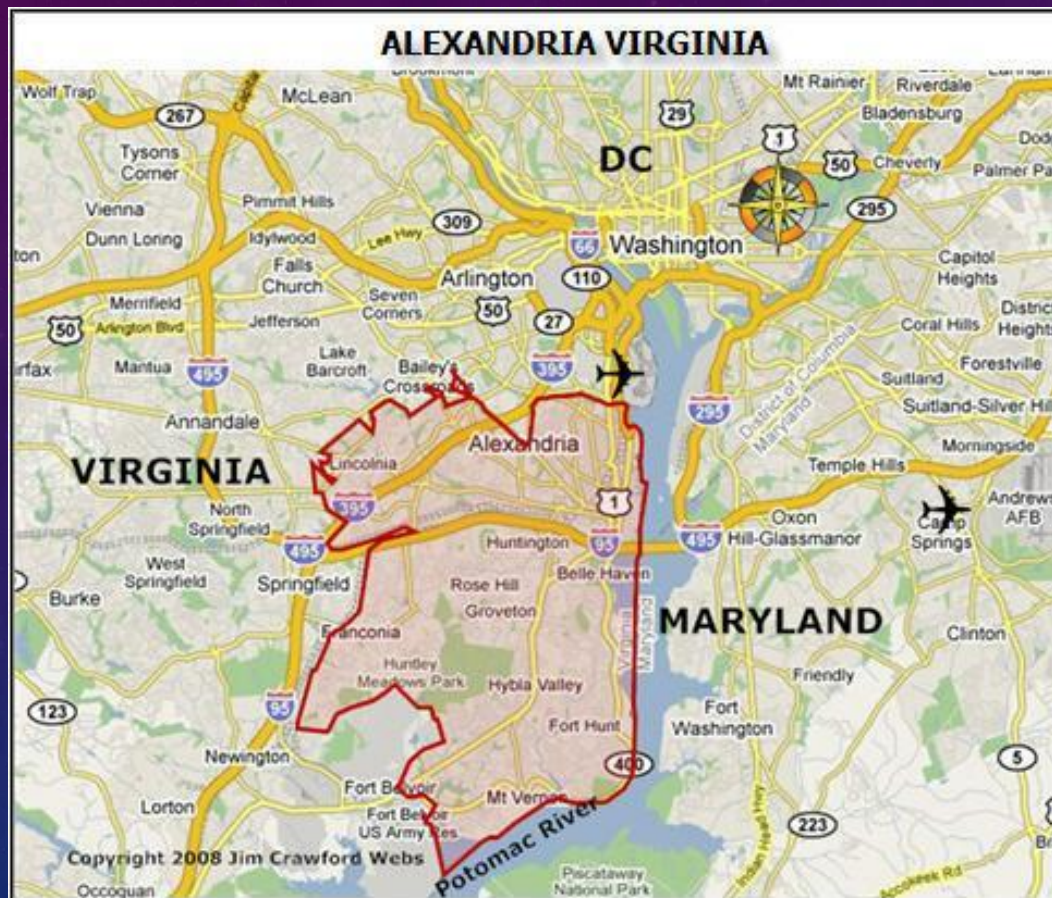
# CASE STUDY: NORFOLK SAND MANAGEMENT PLAN

- FEMA and National Flood Insurance Program
  - Primary Frontal Dunes
  - Zone VE
  - Norfolk's Dune Integrity Assessment
- Cottage Line
  - pilot project so many unknowns present
  - involves both private and public property

# HISTORIC DISTRICTS AND ADAPTATION PLANNING



# CASE STUDY: ALEXANDRIA, VIRGINIA



## CASE STUDY: ALEXANDRIA, VIRGINIA

- City-sponsored sand bag distribution program
- Private property owners actions (doors fitted for flood gates and use of flood-resistant materials such as cement floors)
- Ordinance requirements regarding building elevations and buffers
- City's Waterfront Plan – includes multi-year capital program focused on flood mitigation, infrastructure, and open space improvements
- Jones Point Park – National Park Service (seawall, riprap, earthen berm, offshore plantings, higher capacity stormwater drainage system)



# CASE STUDY: ELIZABETH CITY, NORTH CAROLINA





# CASE STUDY: ELIZABETH CITY, NORTH CAROLINA

- Stormwater system upgrades –pumping stations and replaced drainage lines
- Ordinance requirements regarding building elevations, stormwater management plans, landscape plans
- Streets – with assistance from state department of transportation, elevated intersection
- Reconstructed wetlands – City project to restore wetlands and native vegetation

# CASE STUDY: ST. AUGUSTINE, FLORIDA

Topographic  
And  
Mean  
Low Water  
Data



## CASE STUDY: ST. AUGUSTINE, FLORIDA

- Historic seawall - National Park Service (“living” riprap seawall), Community Development Block Grant to replace portions of seawall, later FEMA money to replace entire seawall
- Maria Sanchez Lake Weir Gate Installation Project
- Stormwater system upgrades - large pipes and check valves
- Published informational flyer informing property owners of non-structural adaptations
- Ordinance requirements regarding building elevations and buffer areas



# LESSONS LEARNED

- Consider current conditions AND projected conditions
- Consider specifics of your community
  - Proximity to existing natural features
  - Density of development
- Stakeholder involvement throughout process
  - Importance of informed citizens
  - Role of the state
- Combination of approaches – hard, soft, and non-structural
- Creative approaches to funding



The background is a deep blue gradient with a subtle pattern of white stars. Overlaid on the left side are several white circular and semi-circular lines, some with arrows indicating a clockwise direction. A prominent circular scale with numerical markings from 140 to 260 in increments of 10 is visible. Other smaller circles and arcs are scattered across the left half of the image.

QUESTIONS?

An aerial photograph of a coastal town, likely in the Midwest, showing a mix of residential areas, green fields, and a large body of water. A multi-lane highway runs along the right side of the town. The text 'The RAFT' is overlaid in large, bold, white letters across the center of the image.

# **The RAFT**

**The Resilience Adaptation Feasibility Tool**

**Thank you**