Sea Level Wise – *A vibrant future for Virginia Beach*

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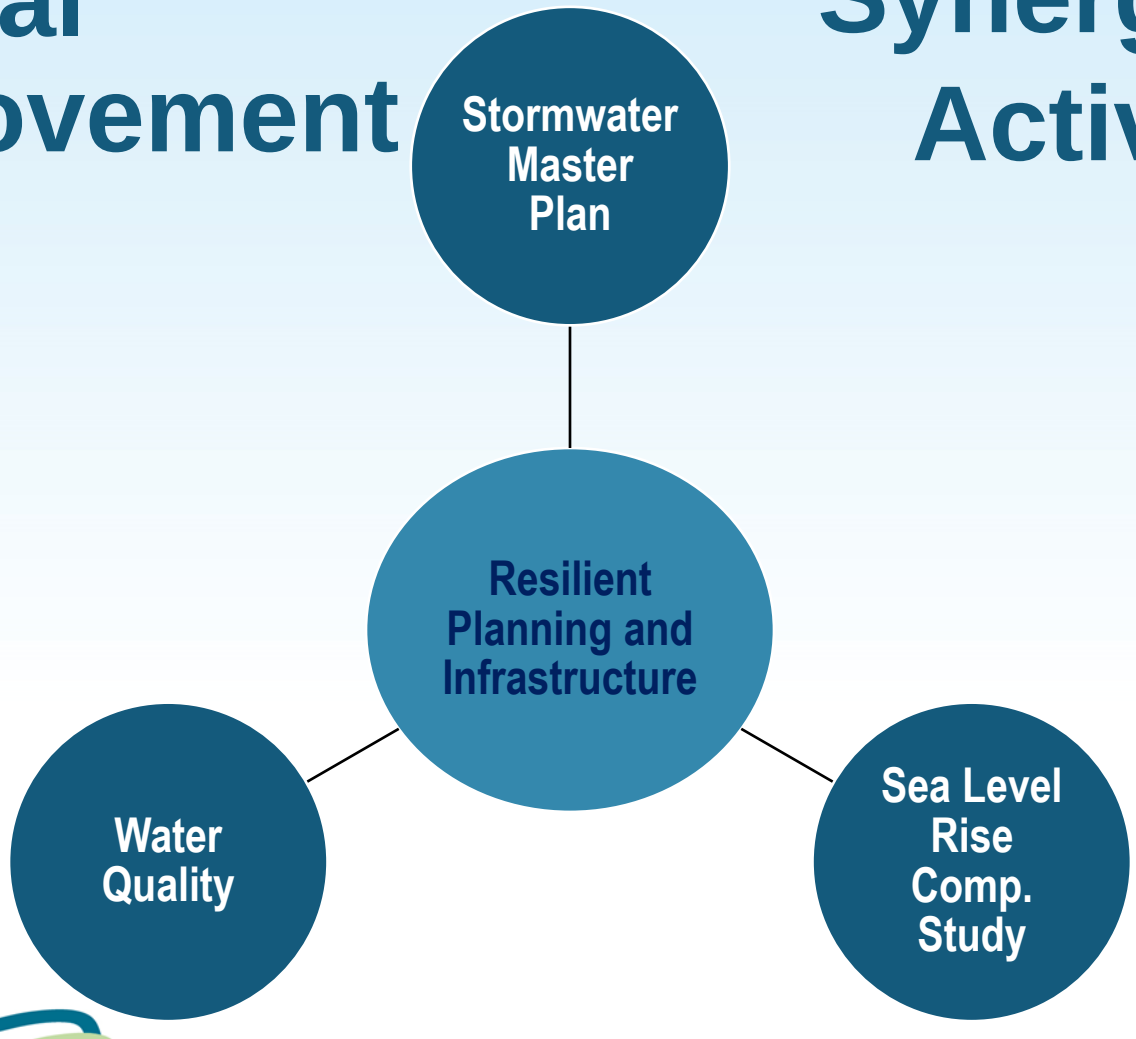
Outline

- Three-pronged approach
- Virginia Beach's resiliency stance
- Overview of Comprehensive SLR Study

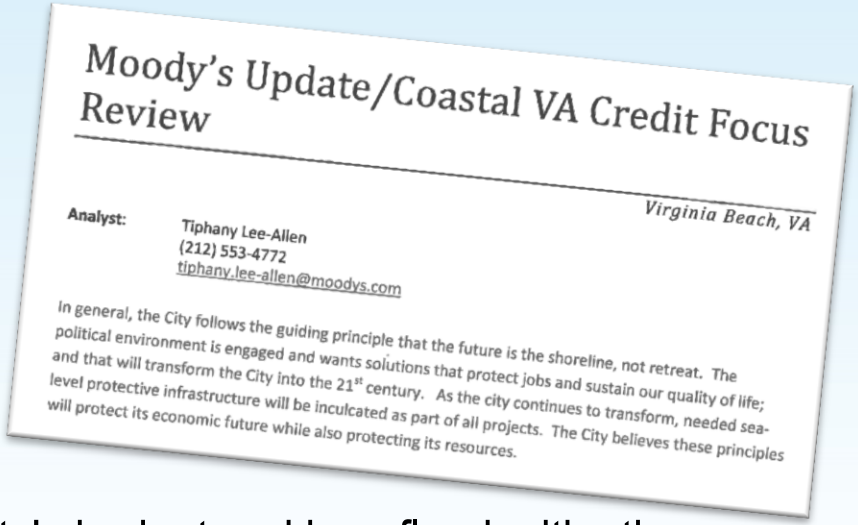
Capital Improvement Plan

Synergized Activities



Moody's Questionnaire to VB

- Does the existing/future CIP include spending for mitigation or resiliency?
- Has your governing body discussed the capital or financial implications of rising sea levels?
- Has there been an estimate on potential impacts from rising sea levels or flooding?



Moody's Update/Coastal VA Credit Focus Review

Virginia Beach, VA

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In general, the City follows the guiding principle that the future is the shoreline, not retreat. The political environment is engaged and wants solutions that protect jobs and sustain our quality of life; and that will transform the City into the 21st century. As the city continues to transform, needed sea-level protective infrastructure will be inculcated as part of all projects. The City believes these principles will protect its economic future while also protecting its resources.

- Please discuss how flooding has impacted the city's budget and how flood mitigation efforts may impact future budgets?
- Have there been any zoning /long-term planning adjustments downtown and along the waterfront to mitigate future flooding impacts?
- What is management's current view on the potential impact/vulnerabilities in your community from rising sea levels and a heightened risk of extreme weather events?

Resiliency Viewpoint

"Ensure the vibrant future of Virginia Beach"

- Engage in Systems Thinking
- Achieve Multiple Positive Outcomes
- Maintain a Long-Term View
- Create an Accurate, Positive Community Image
- Ensure Sustainability
- Create Relationships and Partnerships
- Value and Promote Diversity
- Be Proactive and prevent problems

Flood Complaints

Ocean Park Flooding

During the November and December 2009 northeasters, extreme flooding due to abnormally high storm tides and heavy rainfall occurred which impacted the Ocean Park neighborhood, among others. The City of Virginia Beach commissioned a study of these occurrences and the Draft report from Parsons Brinckerhoff was received and made available ember 2010, may be viewed by clicking

NEWSCHANNEL 3 TV SCHEDULE

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Virginia Beach looks for long-term Shore Drive flooding fixes

POSTED 5:47 PM, APRIL 29, 2014, BY TODD CORILLO, UPDATED AT 09:55PM, APRIL 29, 2014

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The Virginian-Pilot
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Va. Beach residents seek answers about flooding

Selene D. Guerrero
Dec. 3, 2012

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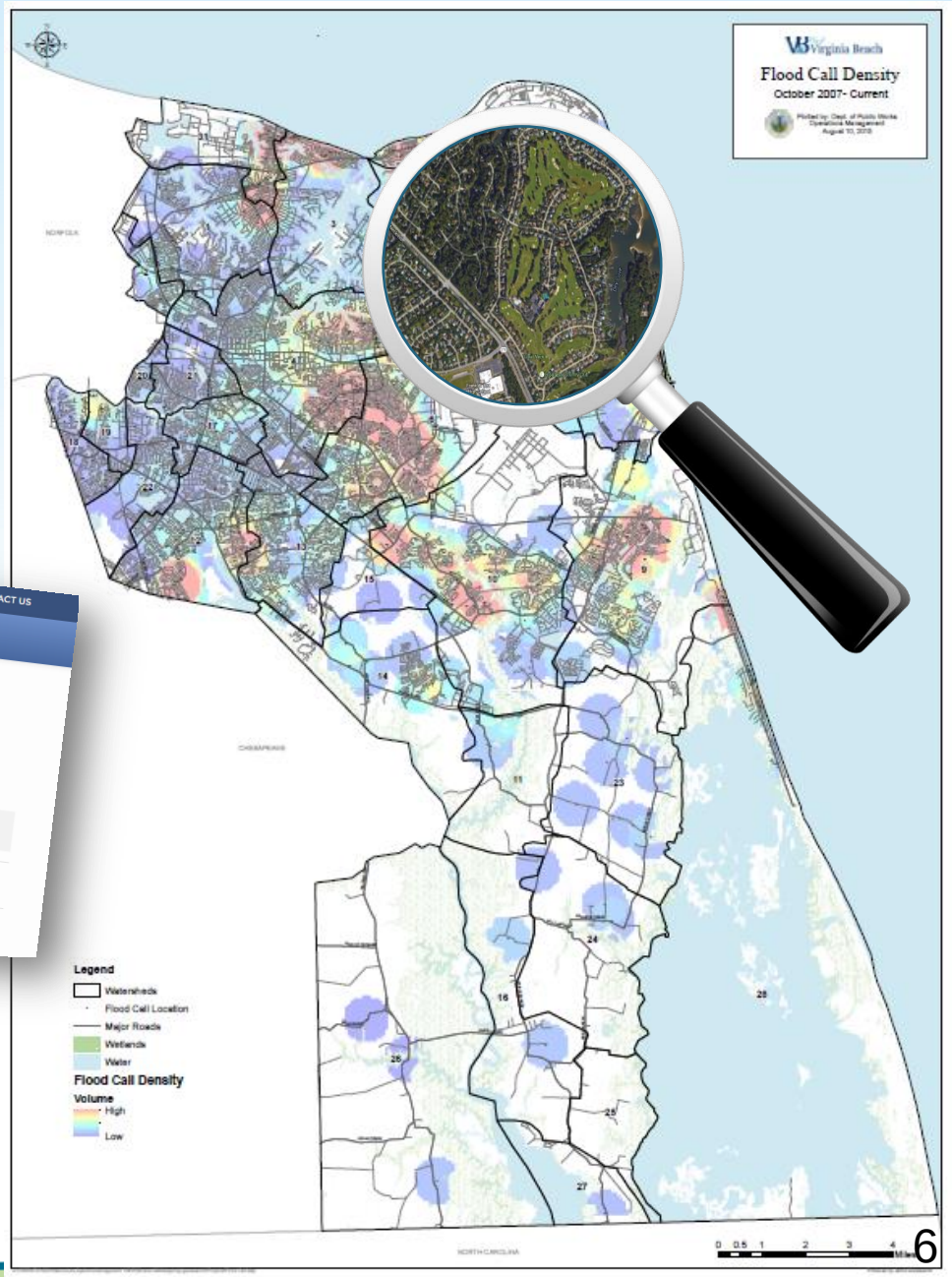
TODAY'S FORECAST



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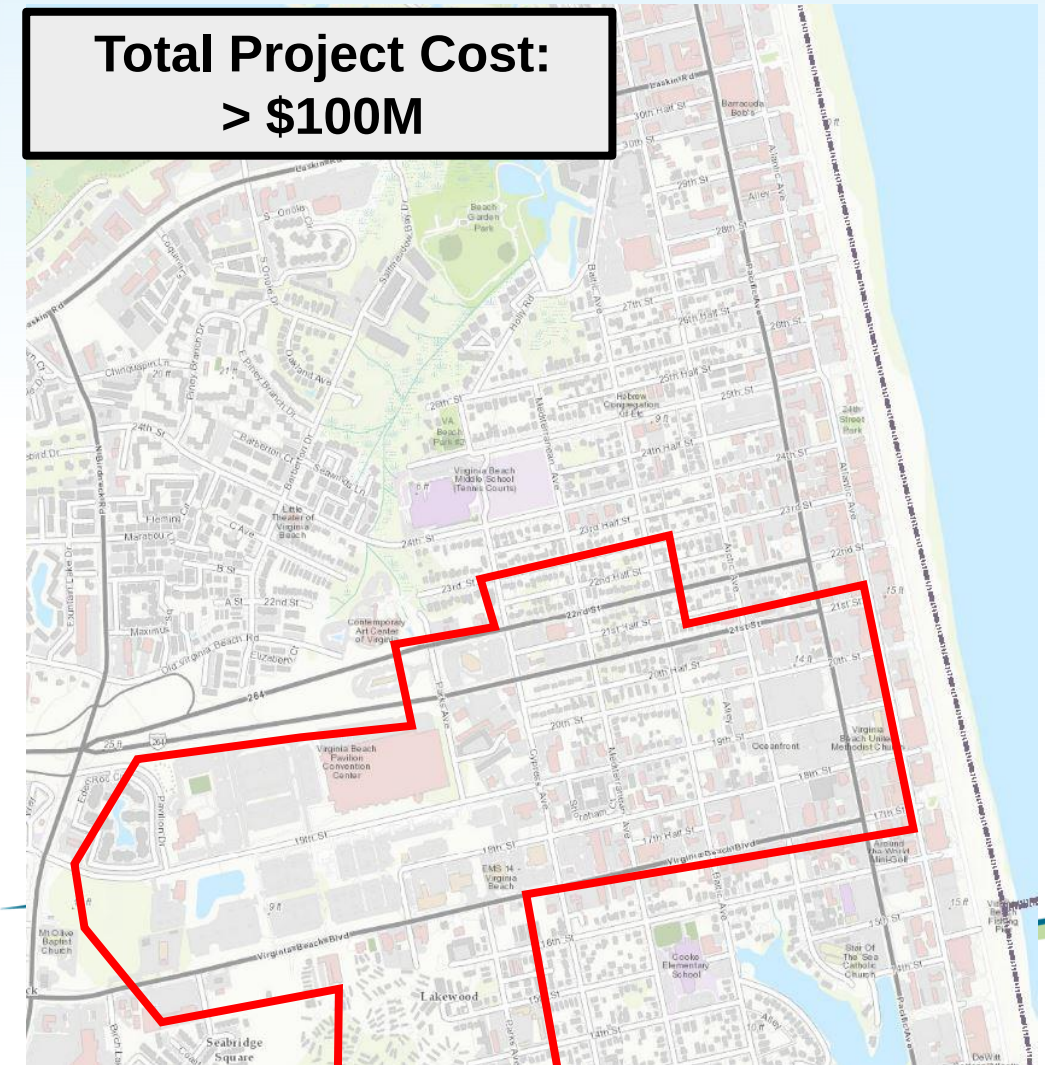
What are the costs?

7-041 Central Resort District Drainage Imp

Total Project Cost:
> $100M



- Study drainage issues and develop alternative solutions
- Review interim improvements to improve drainage in area around Baltic Avenue and 21st Street
- Current Programmed Funding $300K

What are the costs?

7-151 Eastern Shore Drive Drainage

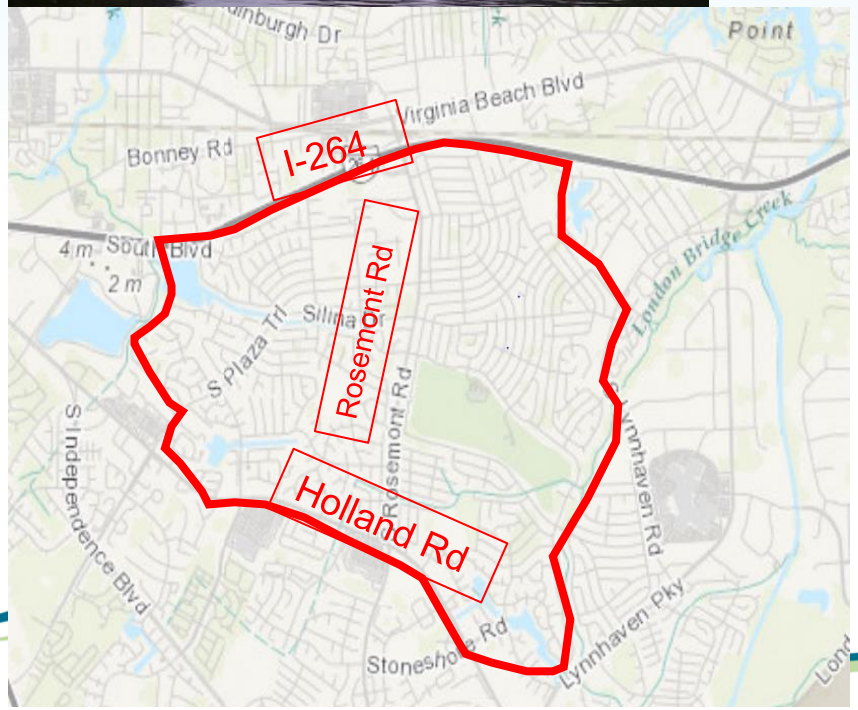
- Drainage study completed July 2012 – June 2014
- Interim Project- Under construction 3/2016 – 12/2016
- Current Programmed Funding $18.9M
- Phases I and II design underway, Phases I and II construction not funded
- Phases III and IV not funded

Total Project Cost: > $70M

What are the costs?

7-028 Windsor Woods Drainage

Rosemont Road near Clubhouse Road



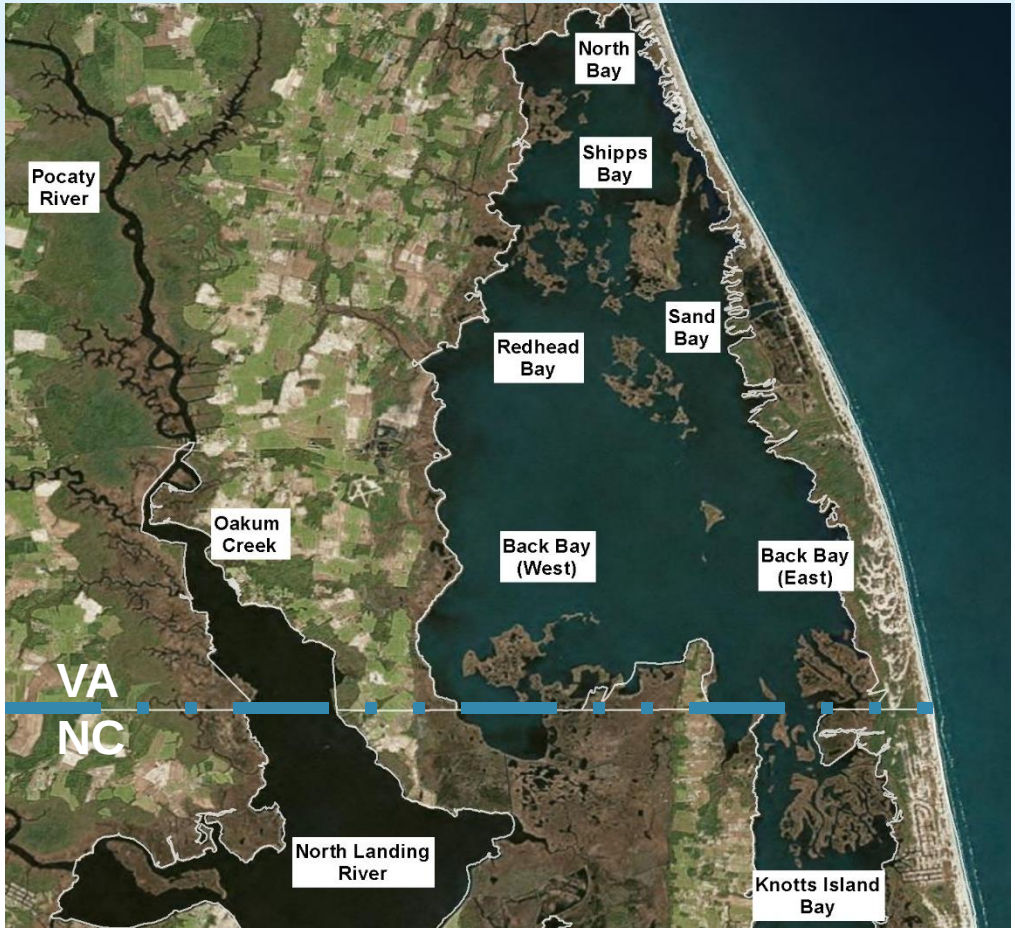
- Drainage improvements to alleviate wide spread repetitive storm water flooding
- Tidally influenced
- First Phase includes improvements to Presidential Canal and Northgate Ditch (Under Design)
- Current Programmed Funding $10.5M

Total Project Cost: > $40M

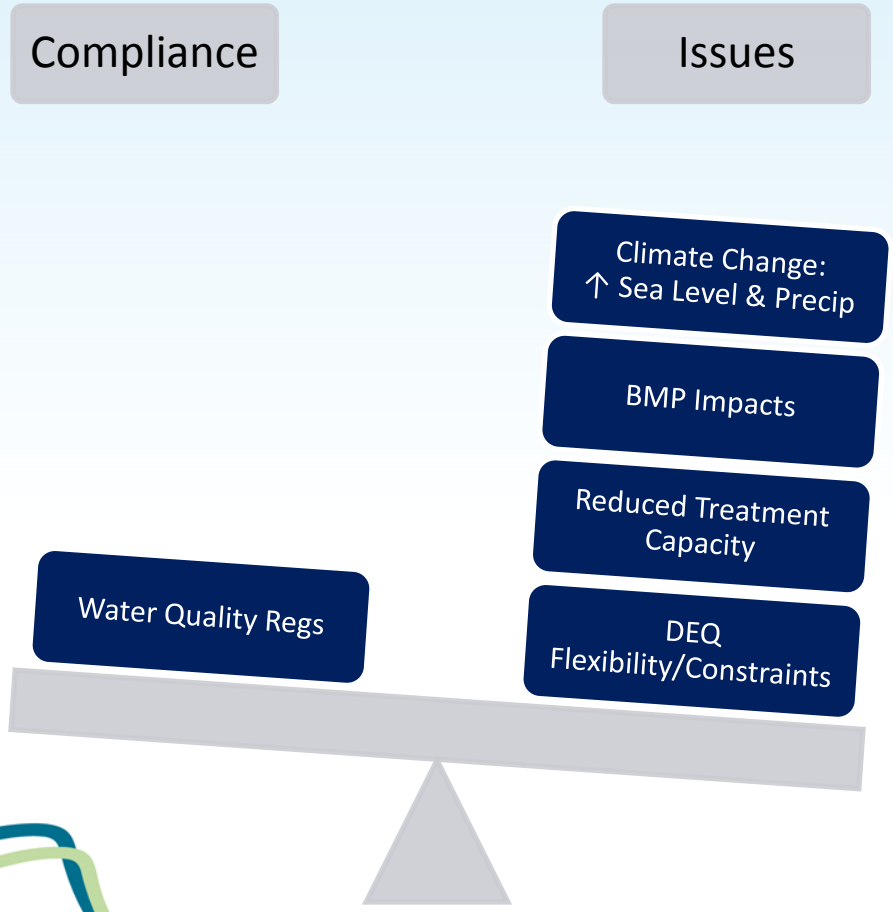
Southern Watershed Challenges

- Low Lying Terrain
- Diverse Land Ownership
- Lack of Historical Water Elevation Data
- High Groundwater Table
- Regulatory Floodplain

Cost Estimate not yet available



Water Quality Challenges



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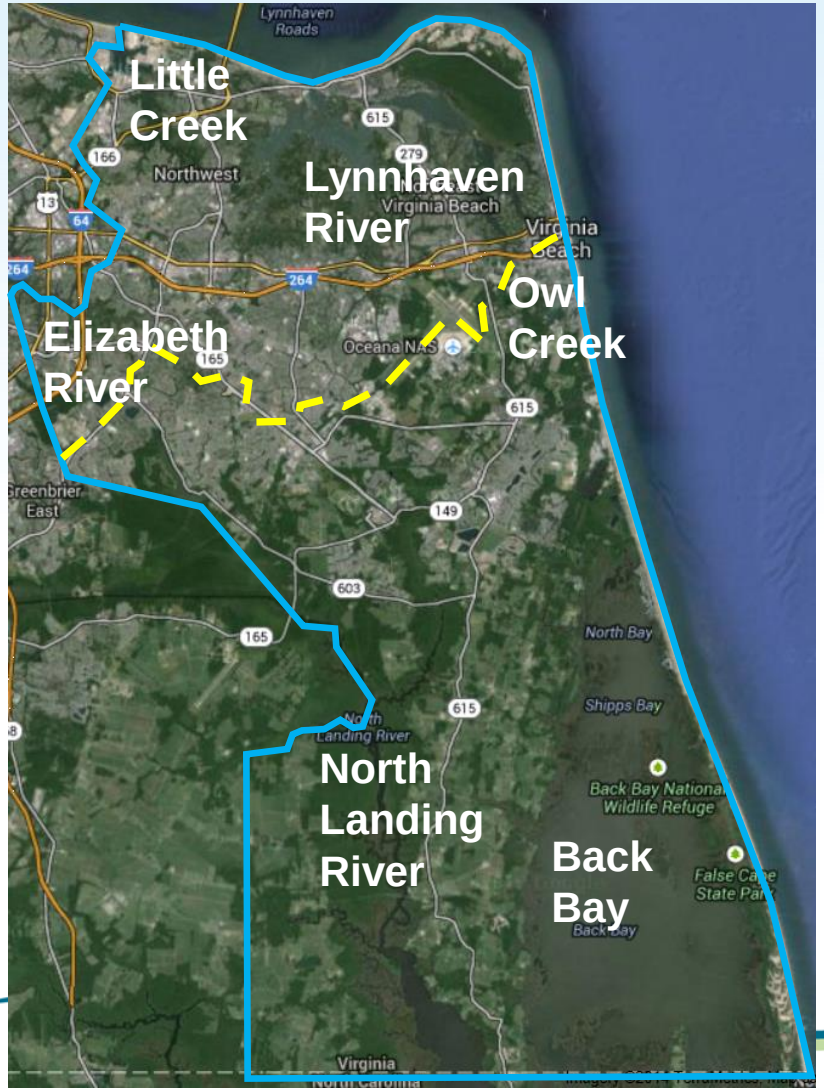
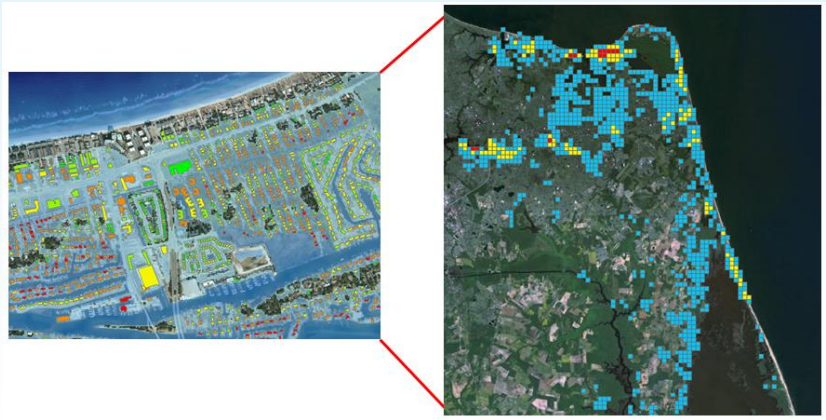
Comprehensive Stormwater Master Plan



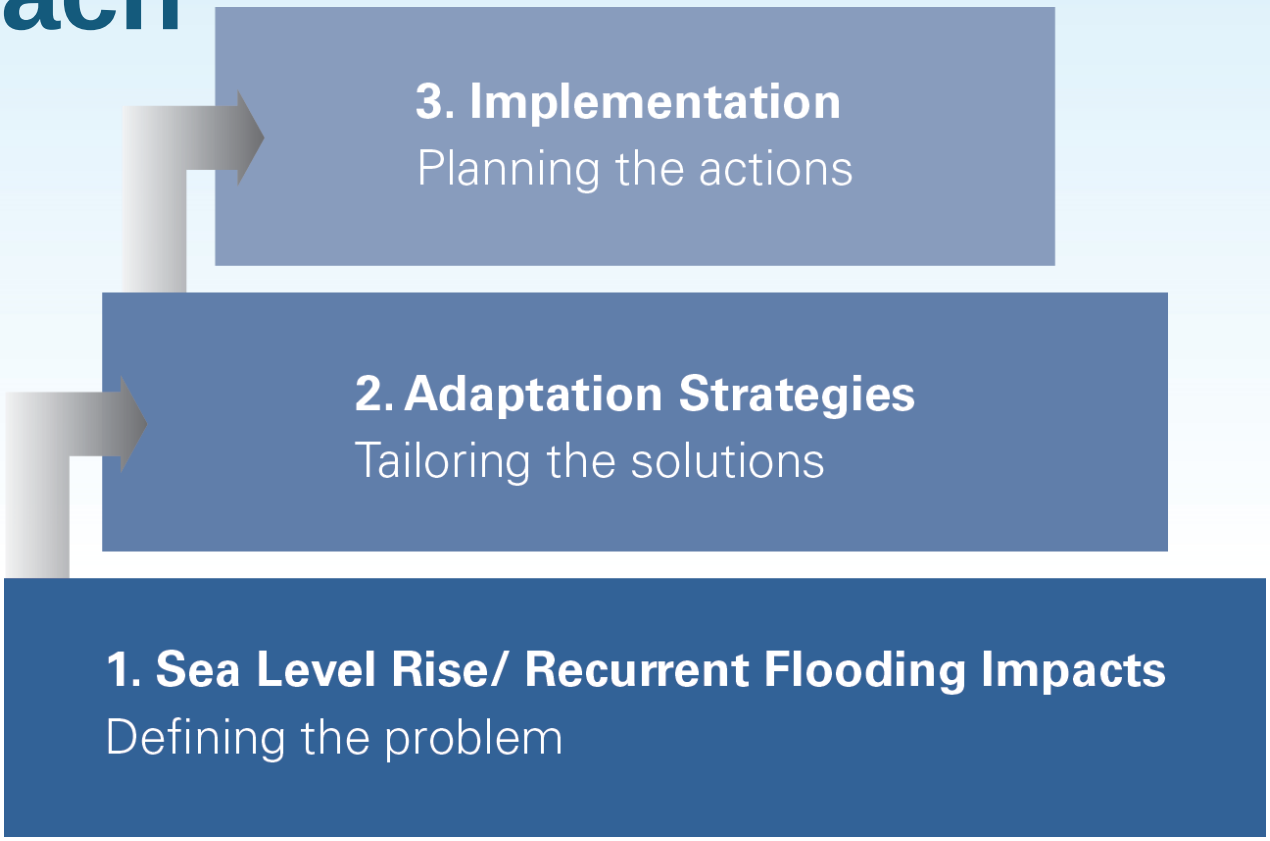
- Stormwater management and flood mitigation
- Stormwater quality improvement
  - TMDLs (TN, TP, TSS, bacteria)
- Regulatory compliance
  - NPDES MS4, TMDLs
- Sea level rise and tidal surge
- Capital improvement planning and funding

Comprehensive SLR/Recurrent Flooding Study

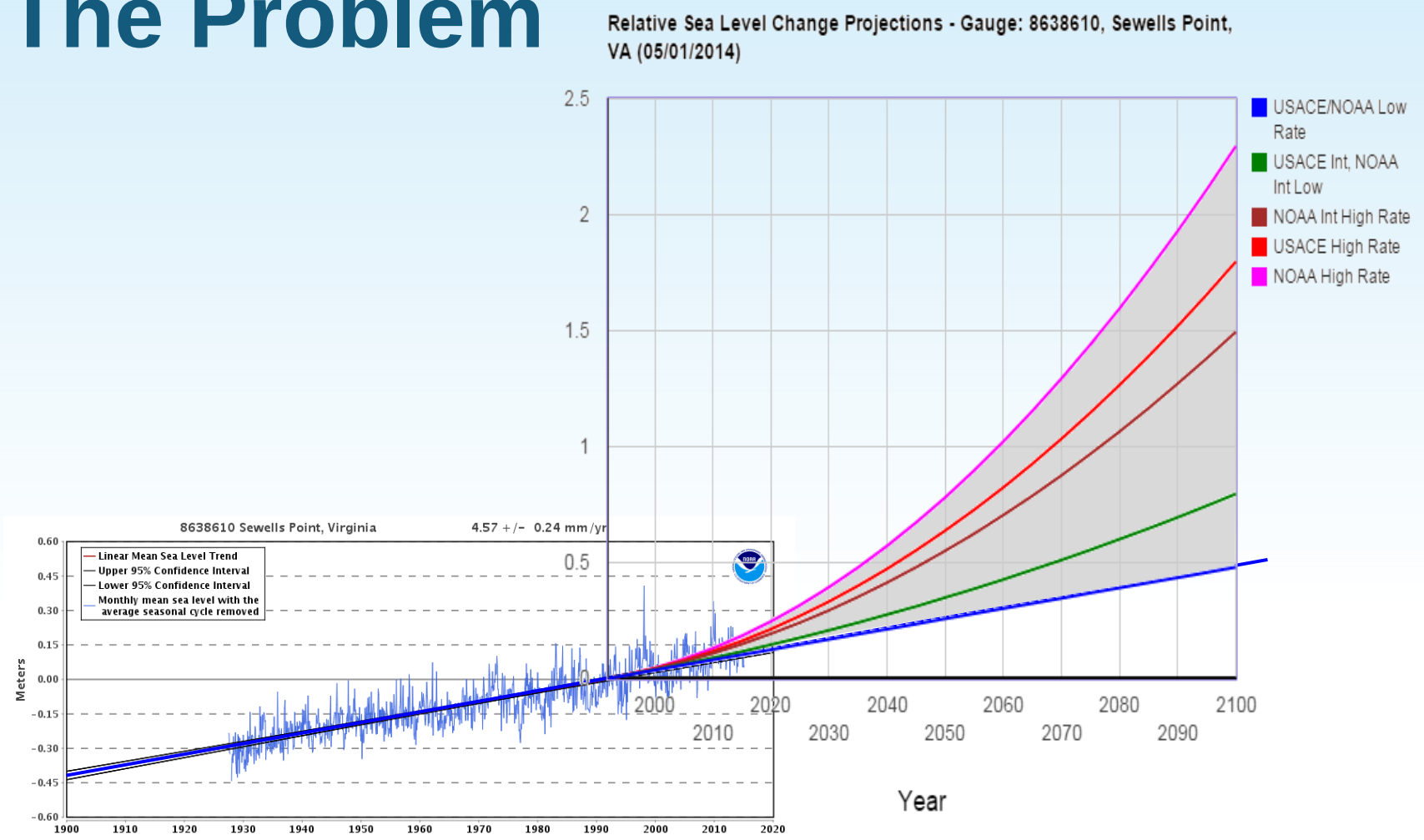


- **Flood risk assessment**
- **Adaptation strategy formulation**
  - Policy and Planning
  - Risk Aggregation
- **Strategy evaluation**
  - Feasibility
  - Return on Investment
- **Watershed-based adaptation plans**
  - Policy, Comprehensive Plan
  - Capital improvement planning and funding

Comprehensive SLR Study Approach



The Problem



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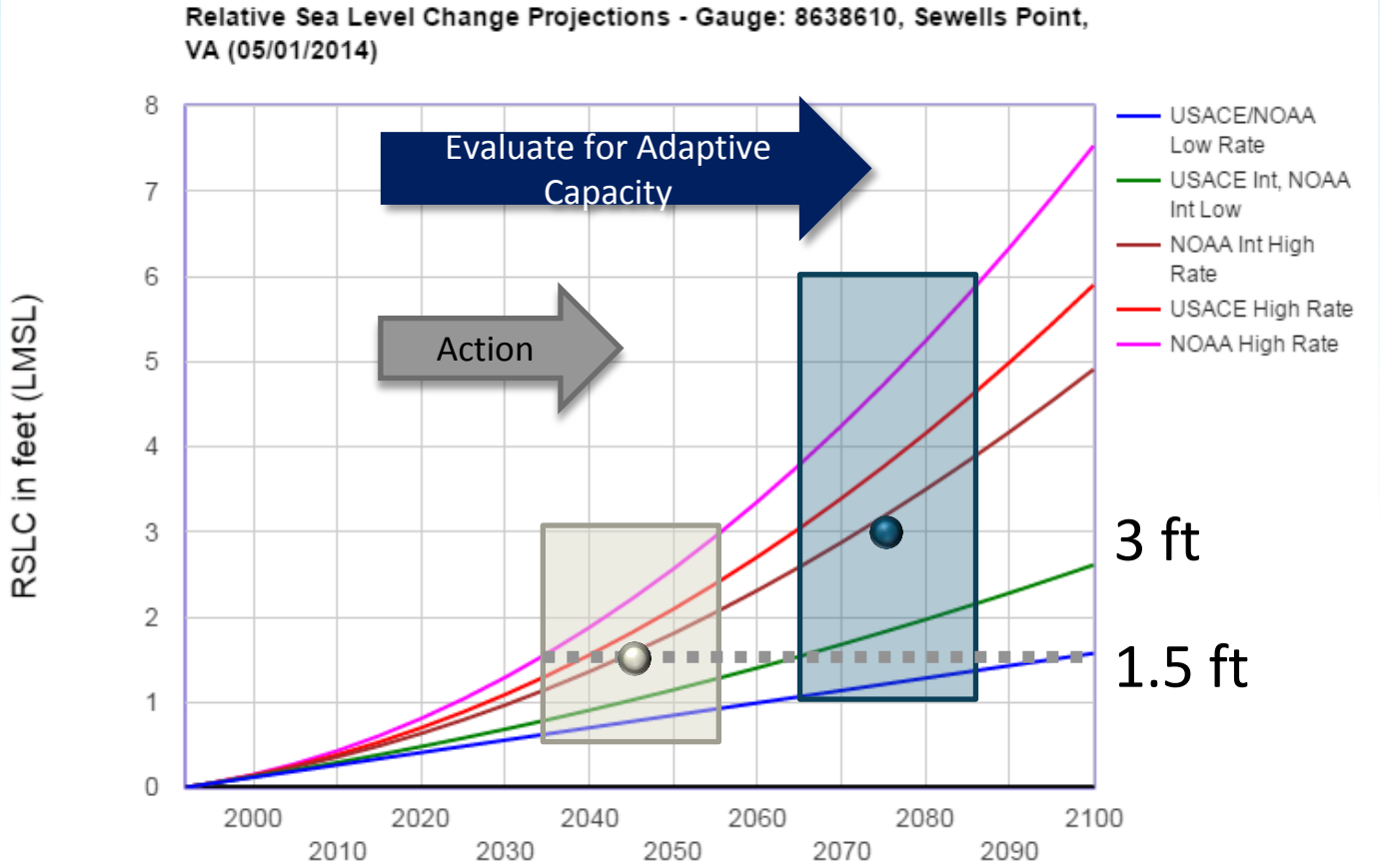
Selected Scenarios vs Federal Curves



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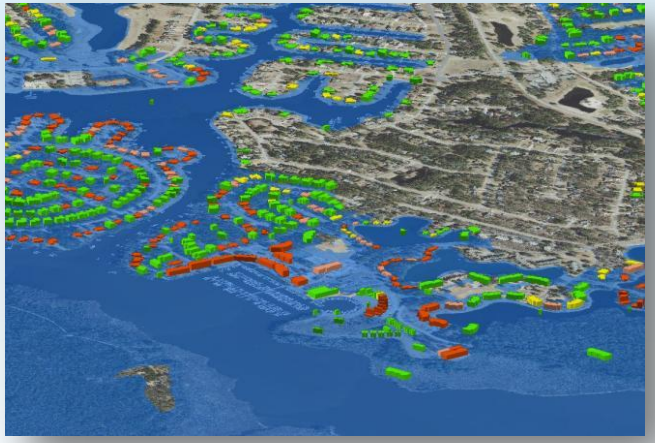
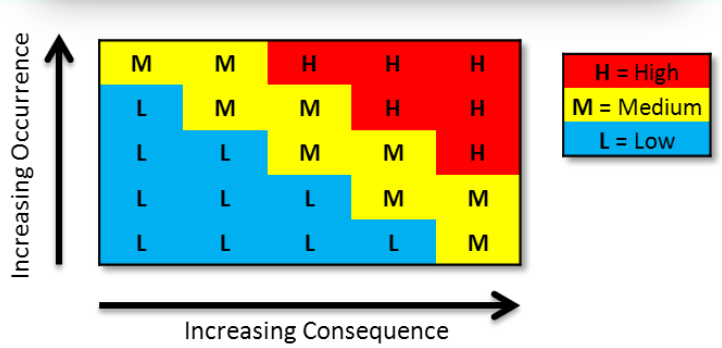
VB SLR Scenarios

Life Cycle Alignment	Time Horizon/ Time Period	SLR Value	Relevance	Use
Municipal Planning	20-40 years 2035-2055	1.5 ft	Comprehensive Plan & Outcomes Short end of Commercial and Utility life-cycles	Vulnerability assessment Key planning value Basis for evaluation of all adaptation strategies
Critical Infrastructure Long-term awareness Adaptive Capacity	50-80 years 2065-2085	3.0 ft	Utility Infrastructure life-cycle Transportation infrastructure lifecycles Residential structure lifecycles	Secondary vulnerability assessment to provide insight into long-term risk Basis for long-term infrastructure decisions Evaluate cost-effectiveness of additional protection for adaptable resilience strategies

Phase 1: Impact Assessment

- How will vulnerability change with increasing flood levels due to SLR?
  - Where will we see the flood footprint expand?
  - How much more frequent will flooding occur?
  - What assets are vulnerable?
  - How will losses change?
  - How will insurance requirements change?
  - What assets are at the highest risk?





Assessment Conditions

- Tidal
  - Future permanent inundation
- Nuisance
  - Repetitive losses/issues
- Storm Surge
  - Regulatory, disaster scenarios, economics

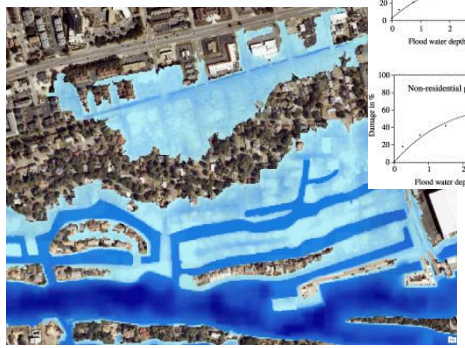
Risk Assessment Focus Areas:

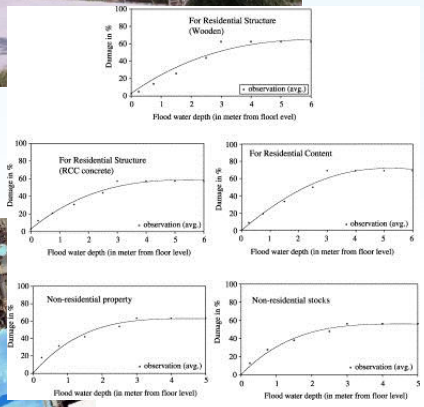
- Shoreline/Land Vulnerability
- Building Exposure
- Future Development
- Stormwater
- Public Utilities
- Groundwater
- Agricultural
- Societal

Insurance Economic Analysis

- **Current Conditions:**
  - Policy/claim concentration in and outside the SFHA
  - Identify under-insurance issues on current policies in force
  - Allow estimation of risk estimation
- **Increased Policy Penetration:**
  - Tools to encourage flood insurance penetration
  - Prioritize risk mitigation or transference for current assets at risk
- **Future Conditions & Regulatory Changes:**
  - Identify and prioritize mitigation of high risk assets
  - Changes to insurance liabilities and residual risks
  - Promotion of increased flood insurance penetration outside existing SFHA
- **Flood Insurance Affordability:**
  - cost burden of flood insurance to socio-economic vulnerable areas

Loss Estimation Process





Flood Hazard Data

Data Improvement

Model Built Environment

Assign Depth Damage Function

Perform Damage/Loss Estimation

Summarize Results

Evaluate Economic and Social Impacts

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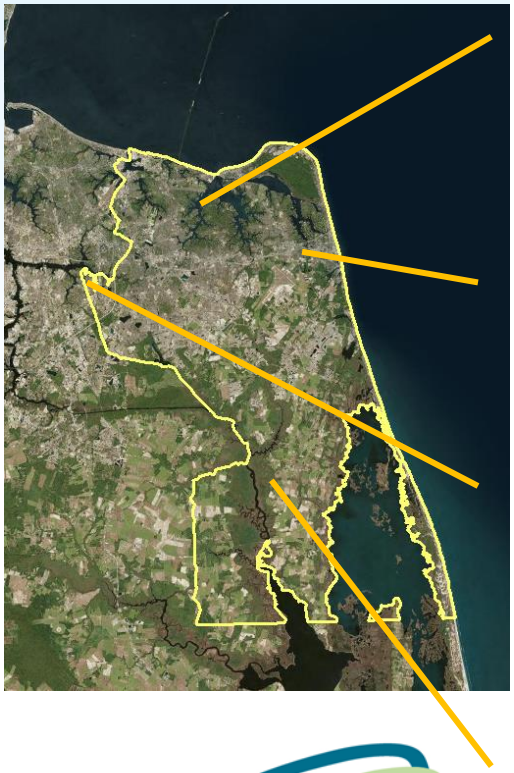
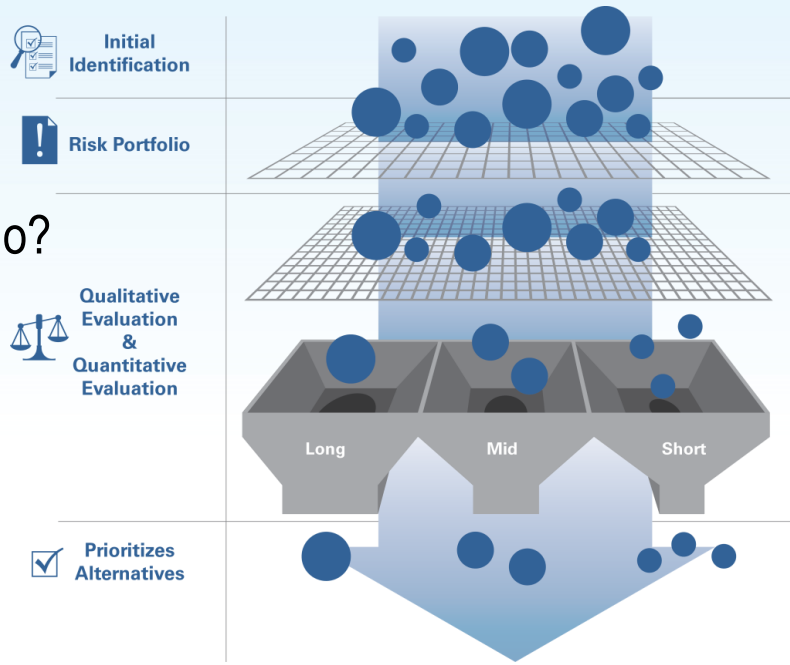
Environmental, Economic Diversity



Planning Area/ Natural Resources	Defining Characteristics	Challenges
Lynnhaven / Tidal sheltered bay, estuarine, fringing marsh 	Mixed residential, military, commercial, lower elevation properties with high tax base. High quality natural resources. Assets at vulnerable elevations.	Addressing repititive losses from recurrent flooding and preservation of low-lying natural resources.
Oceanfront / Ocean, headland beaches, tidal inlet, bay 	Dense commercial and residential development. Tourism as primary economic driver. Re-development opportunities. USACE Civil Works flood risk reduction project.	Protecting existing development and economic base while instilling resilience as a keystone in re-development.
Elizabeth River / Estuarine, fringing marshes 	Dense residential, commercial, industrial development. Aging infrastructure.	Upgrading infrastructure and maintaining water-based industrial economy with higher sea levels.
Southern / Ocean, barrier beaches, bays and extensive marshes 	Light residential, military, rural, recreational, waterfowl and land preserves. Agriculture important economic concern. Low elevation gradients.	Establishing land use strategies that preserve resources and limit new development and infrastructure in areas susceptible to future flooding.

Phase 2: Adaptation Strategies

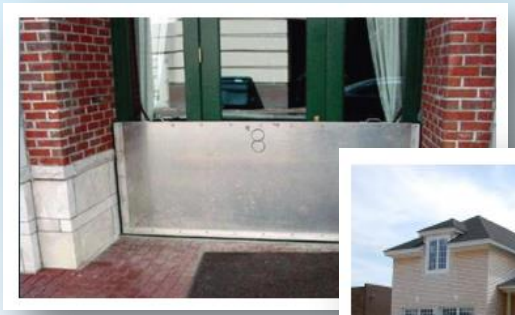
- Objective: Develop, assess and prioritize a range of adaptation strategies through feasibility and performance metrics that incorporate stakeholder input to inform climate adaptation and resilience plans across the City's diverse geography.



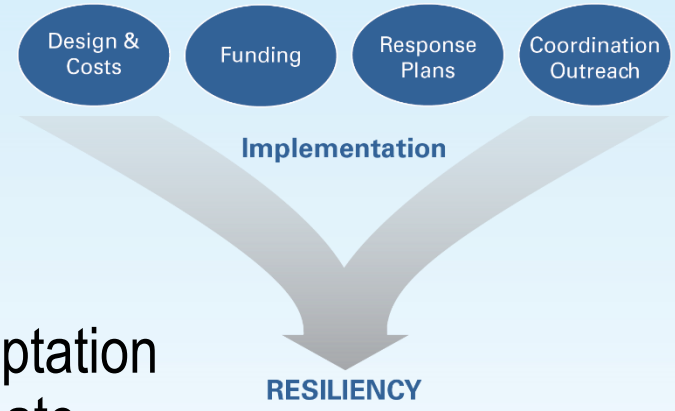
- What strategies are needed to address the risk portfolio?
  - What policy has to be created or changed?
  - How can land use be managed?
  - Where do structural solutions make sense?
  - What's the return on investment?
  - What strategies work best?
  - When should implementation occur?

Adaptation Tools

Planning Tools
Update Comprehensive Plan
Update Hazard Mitigation Plan
Regulatory Tools
Extend Floodplain Boundaries and Freeboard Requirements
Designate Targeted Redevelopment
Require Flood-proofing
Encourage Cluster Development
Require Setbacks, Buffers, or Rolling Conservation Easements
Restrict Rebuilding in High Hazard Areas
Require Mitigation through Site Plan Review
Incentives and Fees
Create Transferable Development Rights Program
Use Conditional Zoning, Exactions and Impact Fees



Phase 3: Implementation



Objective: Integrate the best-performing adaptation strategies in actionable watershed-based climate adaptation and resilience plans that include funding and monitoring mechanisms to stimulate follow-on implementation.

- How do we move forward with the preferred solutions?
  - What are the costs and design features?
  - How do we fund?
  - What is our action plan for each watershed?
  - How do we get public buy-in, sponsors, and/or regional support?

Outreach - Integration

- Engage – Coordinate – Leverage

Partners:

- HRPDC
- ODU/Virginia Sea Grant
- Georgetown Climate Center
- NOAA

Schedule


Milestone Schedule
Year 1
(2016)
Q2
Q3
Q4
Year 2
(2017)
Q1
Q2
Q3
Q4
Year 3
(2018)
Q1
Q2
Q3
Milestone
Lynnhaven
Risk Portfolio (In-Kind)
Objective 1: Strategy Evaluation
Objective 2: Adaptation Plans
Southern
Risk Portfolio (In-Kind)
Objective 1: Strategy Evaluation
Objective 2: Adaptation Plans
Elizabeth River
Risk Portfolio (In-Kind)
Objective 1: Strategy Evaluation
Objective 2: Adaptation Plans
Oceanfront
Risk Portfolio (In-Kind)
Objective 1: Strategy Evaluation
Objective 2: Adaptation Plans
Objective 3: Outreach, Coordination, Dissemination

Questions?

Points of Contact:

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