LOCAL AND REGIONAL PLANNING FOR A RESILIENT HAMPTON ROADS

"Integrating Resilience into Local Planning"
Local Government Forum
Chesapeake Bay Program Local Government Advisory Committee
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HAMPTON ROADS PLANNING DISTRICT COMMISSION

The Region:

17 member jurisdictions in southeastern Virginia with a total population of 1.7 million residents

The Commission:

Forum for local and elected officials to discuss issues of regional importance

The Staff:

Provide technical assistance, support policy development, and lead Committees of local staff

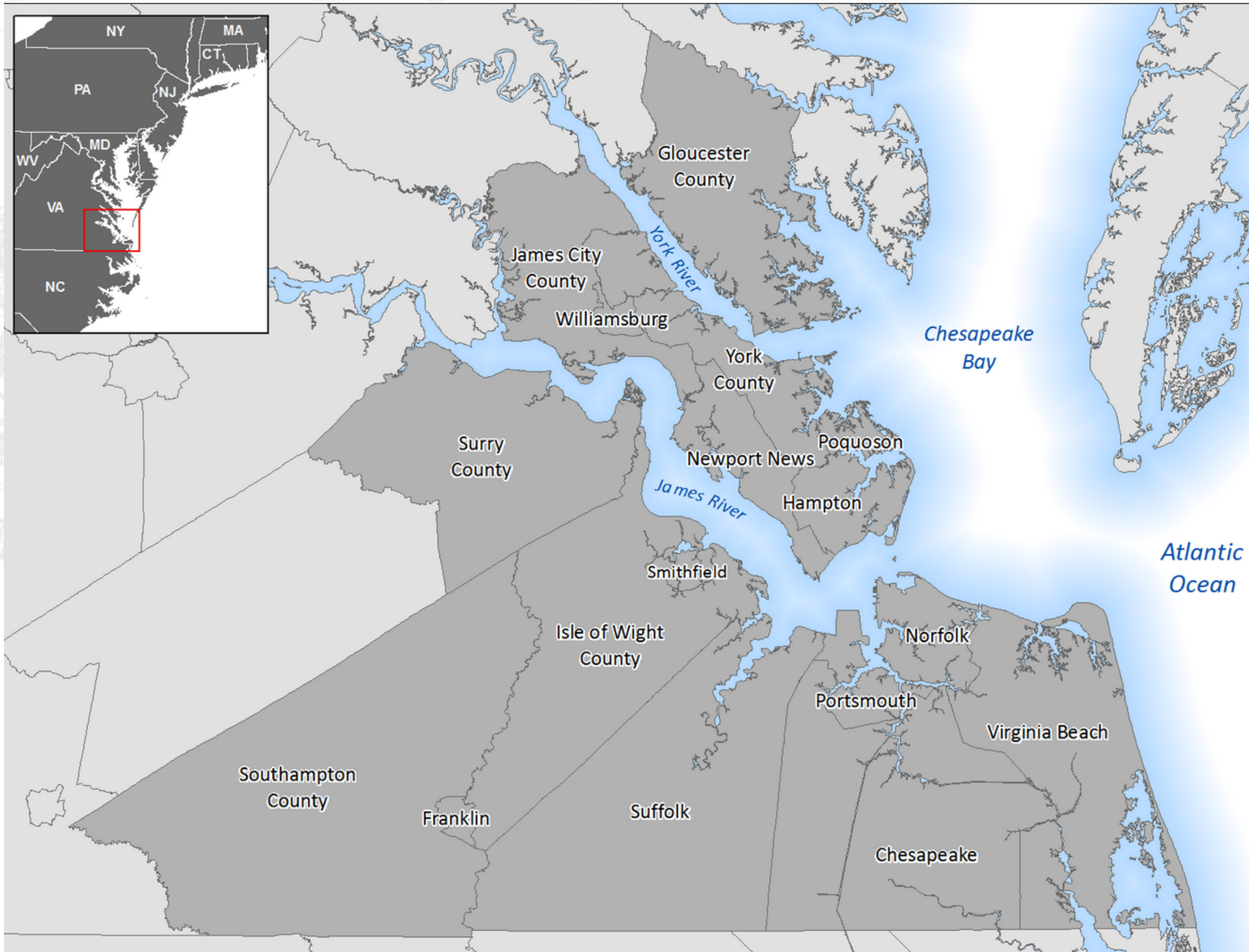


Image Source: City of Norfolk

Image Source: David Powell

Image Source: City of Norfolk

Image Source: Ben McFarlane

LOCAL CASE STUDY: HAMPTON, VA

PLANNING HOLISTICALLY FOR RESILIENCE

Resilient Hampton is a planning approach based on first identifying community values and then developing goals and strategies based on those values.

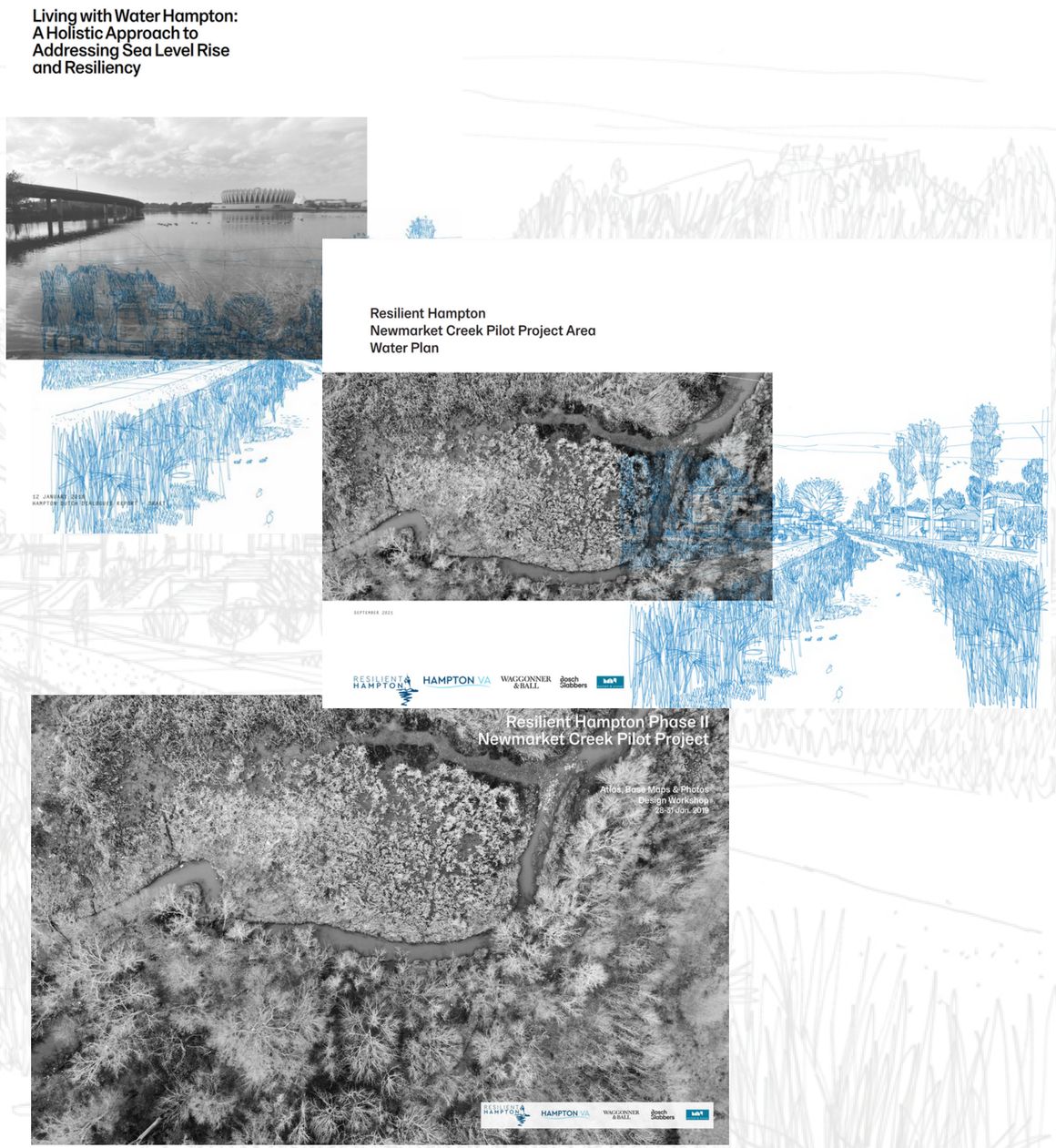
- **Safety**
- **Equity**
- **Nature**
- **Heritage**
- **Integration**
- **Sufficiency**
- **Nimbleness**
- **Innovation**

VALUES >> GOALS >> STRATEGIES

POLICY	EDUCATION & COMMUNICATION	PHYSICAL	OPERATIONS & MAINTENANCE
Zoning Stormwater Incentives	Public data Outreach	Protect assets Demonstration projects	Monitoring Cost savings

Values-Driven Planning

Resilient Hampton provides the foundation for the city's other planning and implementation efforts.

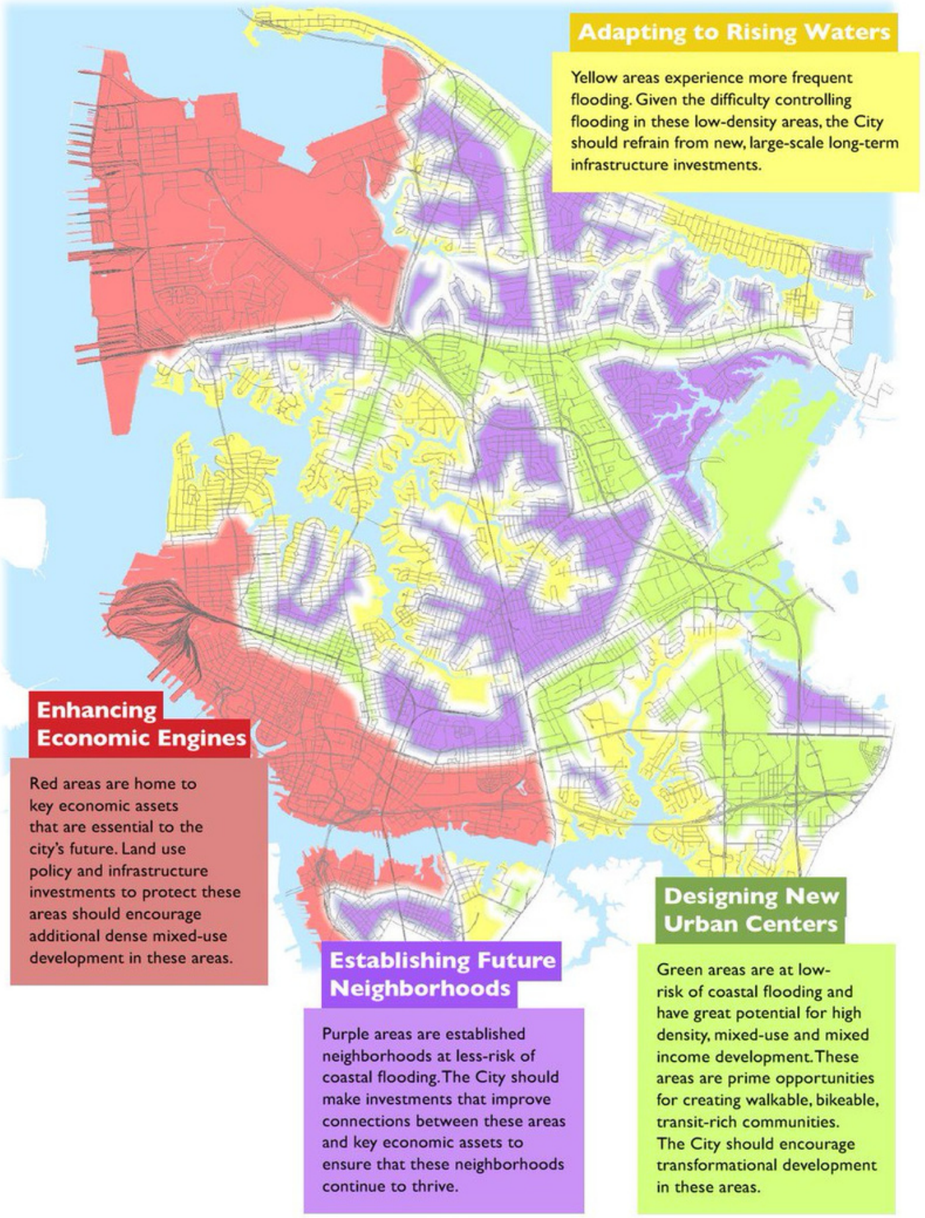


LOCAL CASE STUDY: NORFOLK, VA

(Very) Long Range Planning

Most comprehensive plans look out 20 to 30 years.

Norfolk's Vision 2100 looks out much further to inform the city's long-term priorities and policies for adapting to rising seas.



Norfolk Vision 2100 (City of Norfolk, 2016)

Building Resilience into Zoning

Norfolk incorporates resilience into its zoning ordinances through **higher minimum standards** for all development and a points-based **resilience quotient**.

Higher Minimum Standards

Stormwater Management

Store first 1.25" on site or have rain barrel installed (for SFH)

Risk Reduction

Freeboard requirements in 1% and 0.2% Annual Chance Flood Zones

Energy Resilience

Alternative energy sources on site or generator hookup

Building Resilience into Zoning

Norfolk incorporates resilience into its zoning ordinances through **higher minimum standards** for all development and a points-based **resilience quotient**.

Resilience Quotient

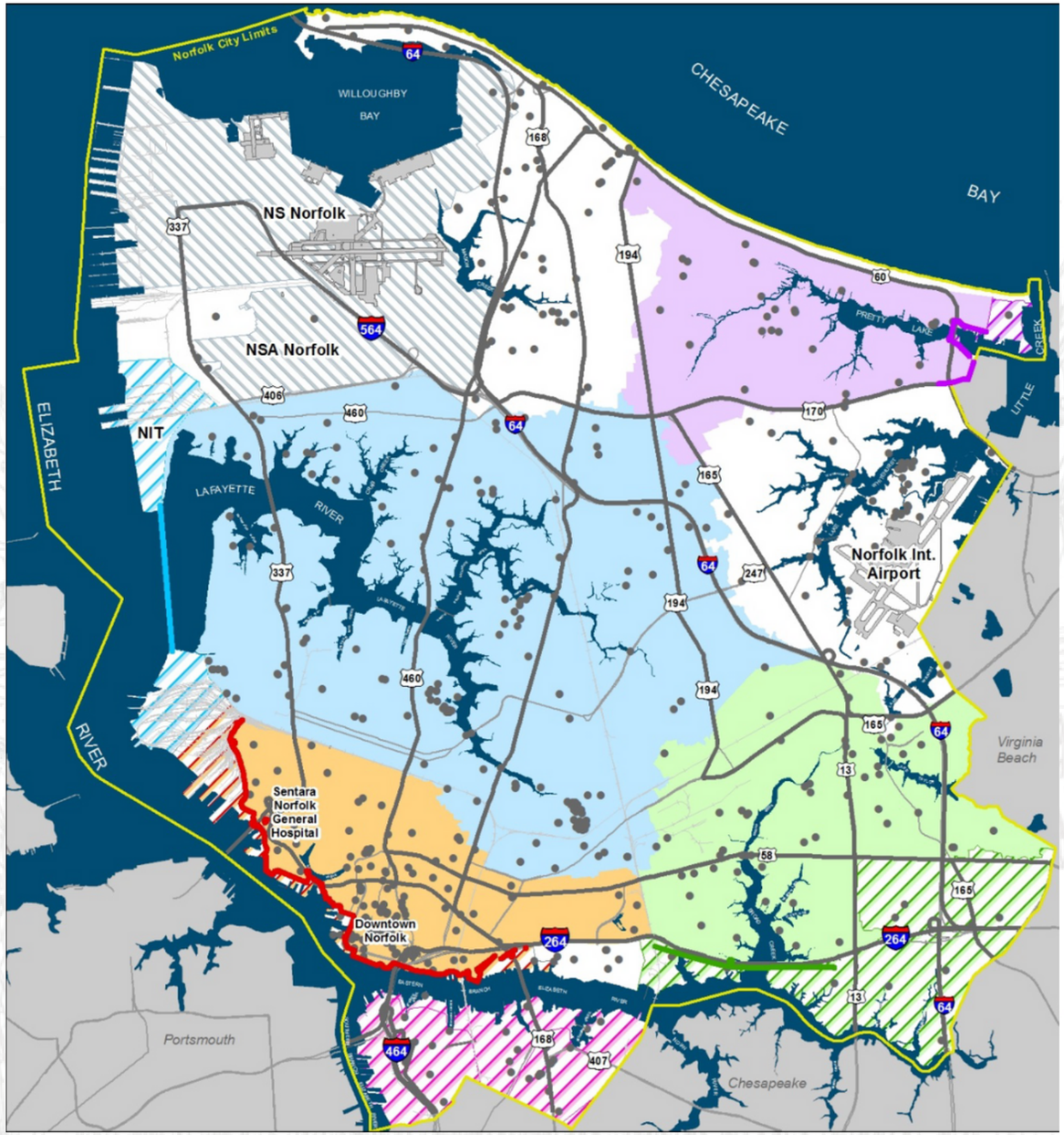
Points scored for certain activities related to stormwater management, risk reduction, and energy resilience.

Minimum points based on **location** (more points for areas with more risk), **size**, and **type** of development.

Alternative to satisfying quotient is site plan review.

Coastal Storm Risk Management

Norfolk's Coastal Storm Risk Management Plan with the U.S. Army Corps of Engineers was completed in February 2019. The city is now in the Preliminary Engineering and Design phase and was recently selected for construction funding.



Norfolk Coastal Storm Risk Management Plan (USACE 2019)

LOCAL CASE STUDY: VIRGINIA BEACH, VA

Engineering Solutions

Virginia Beach's Sea Level Wise Adaptation Strategy builds on a comprehensive assessment of the city's future climate, risk, and options for mitigation and adaptation.

Modeling

Future precipitation
Compound Flooding
Wind Tides
Stormwater

Socioeconomic Analysis

Insurance
Population Vulnerability

Strategy Development

Natural and Nature-Based Features
Neighborhood-Scale Structural
City-Wide Structural
Site-Level Risk Reduction
Policy Responses

Engineering Solutions

What impacts will there be?

What options do we have?

Which options are feasible?

How can we actually do it?

Image Source: City of Virginia Beach

Engineering Solutions

Not all strategies will work in all locations. Virginia Beach has identified appropriate solutions for each of the city's main watersheds.

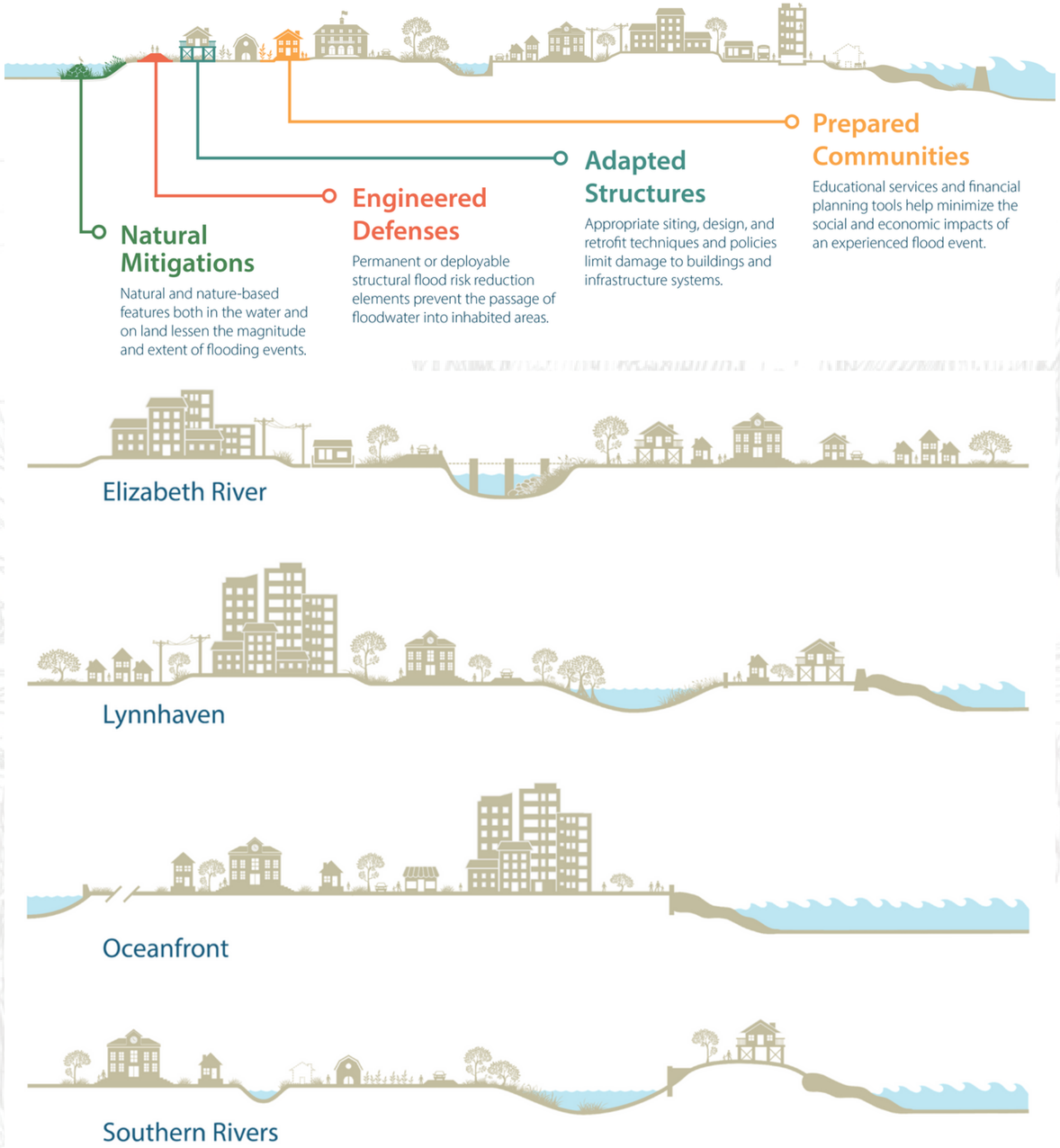


Image Source: City of Virginia Beach

Engineering Solutions

Virginia Beach has also adopted higher requirements that will force public and private development to address current and future flooding.

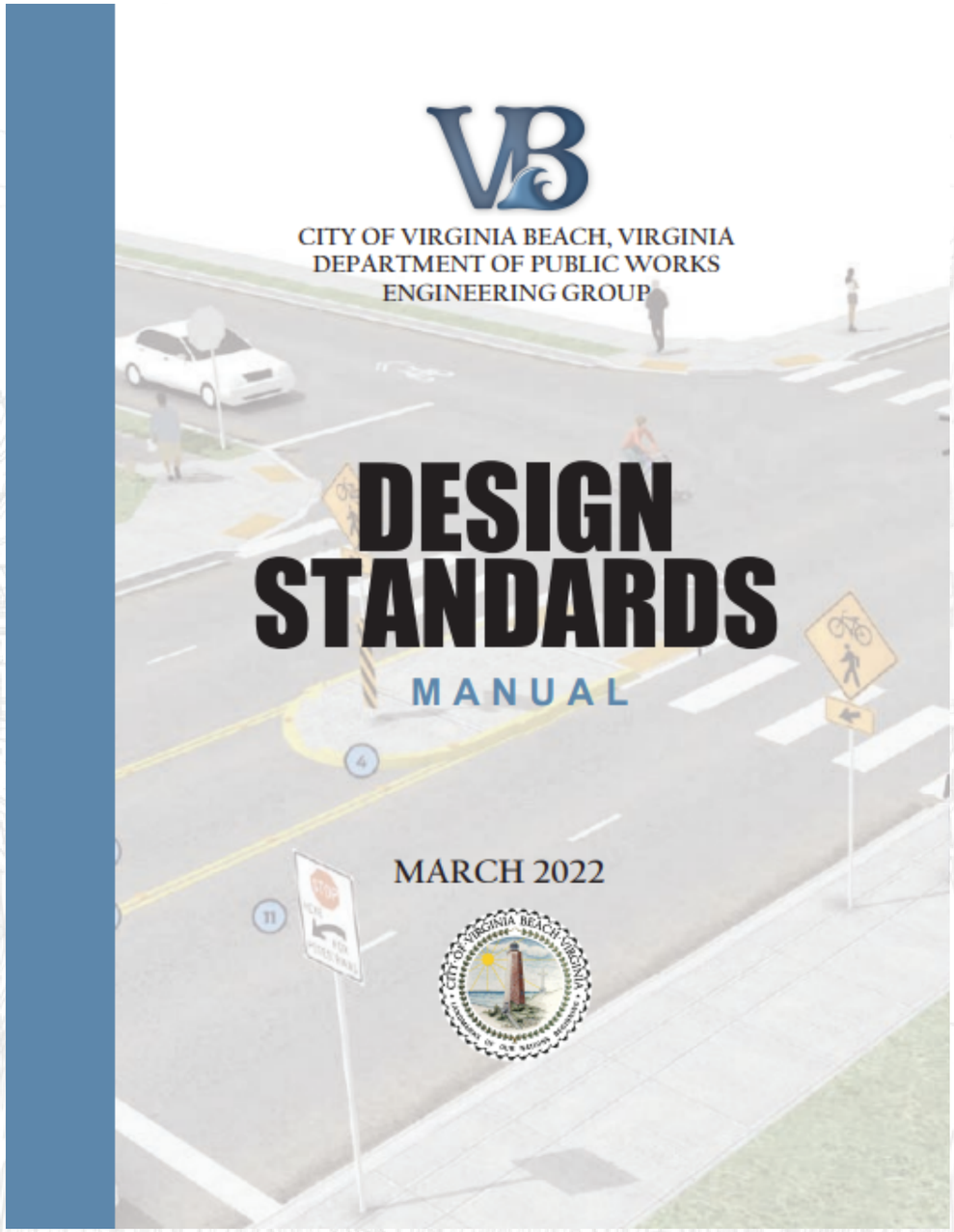


Image Source: City of Virginia Beach

Engineering Solutions

Virginia Beach is now funding a 10-year flood protection program with the proceeds from a $567M bond referendum passed in November 2021.

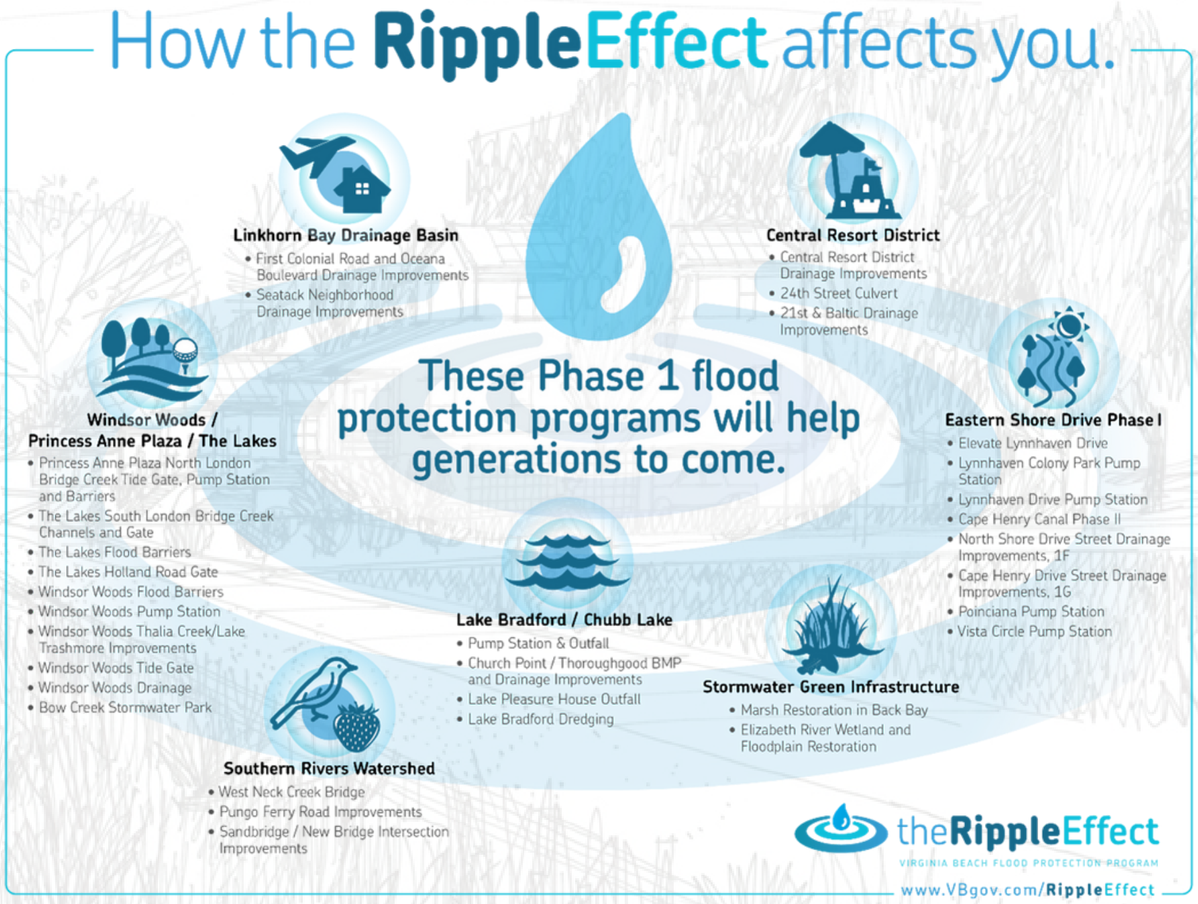
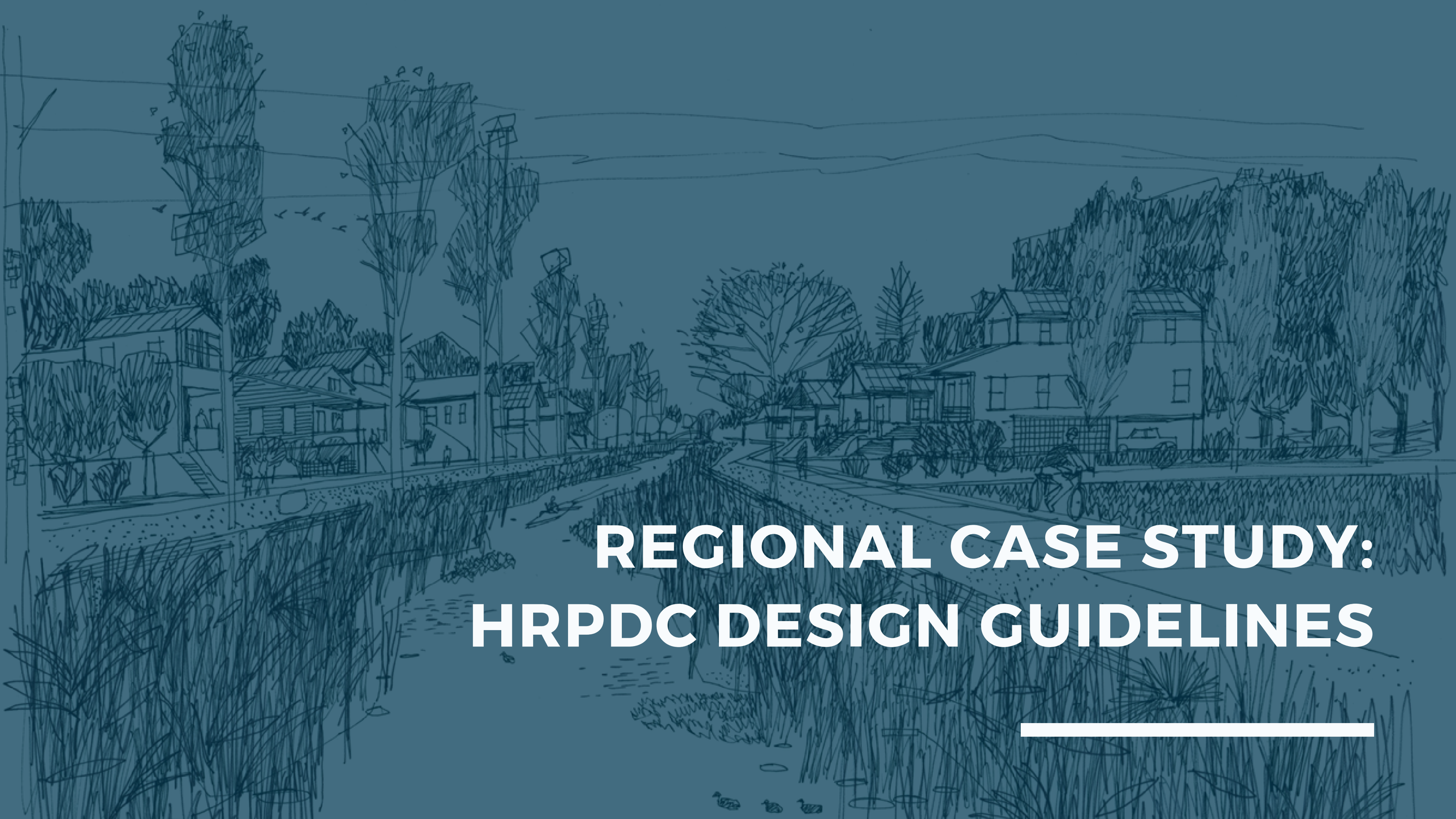


Image Source: City of Virginia Beach



REGIONAL CASE STUDY: HRPDC DESIGN GUIDELINES

HRPDC COASTAL RESILIENCY PROGRAM

Policy

Develop policy recommendations for local governments and technical products

Coordination

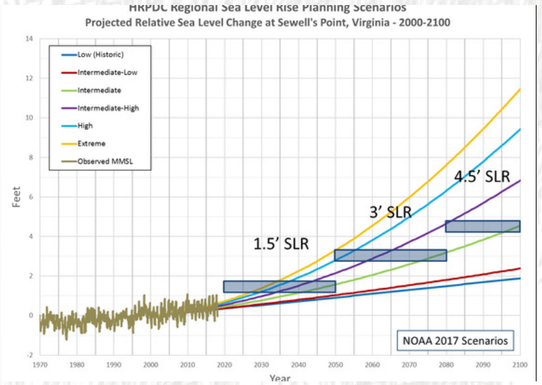
Coordinate regional planning efforts with localities and other partners

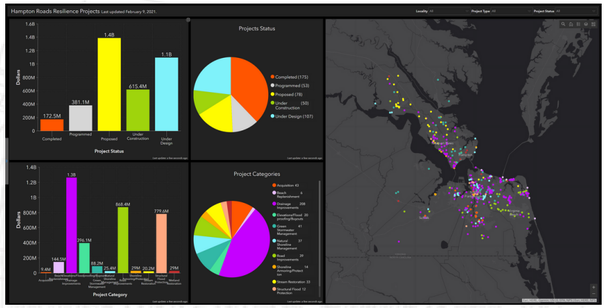
Outreach

Communicate actions that enhance resiliency and data to inform decisions across multiple scales

Projects

Conduct and implement research, analysis, and other projects





INFORMING DECISIONS

Community Actions

Document what localities are doing:

- Adaptation studies and plans
- Flood mitigation projects
- Programs that increase community resiliency

Identify possible opportunities for coordination and collaboration

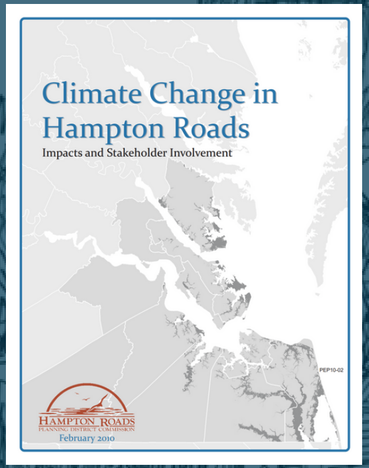
Individual Actions

Educate about flood issues and share facts specific to Hampton Roads

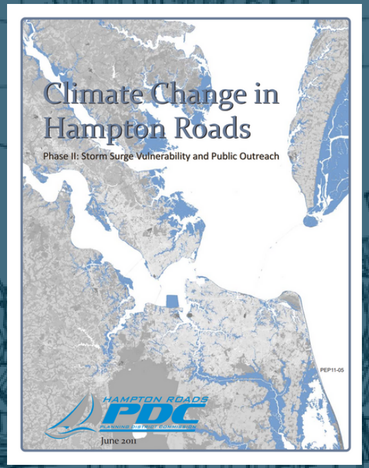
Encourage flood protection and mitigation actions:

- Purchasing flood insurance
- Protecting home and property from flood damage
- Staying safe before and during a flood event

HRPDC RESILIENCY PROJECTS



FY08



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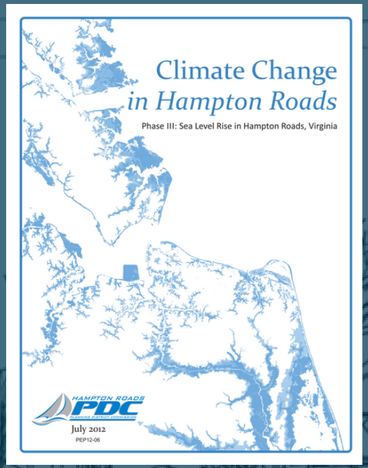

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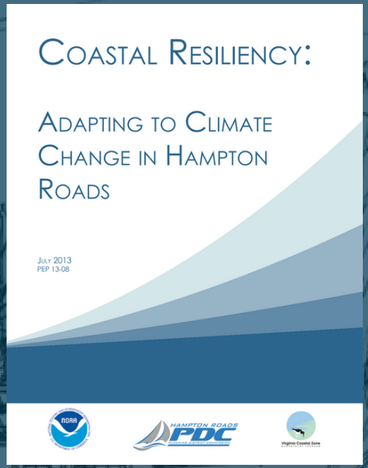

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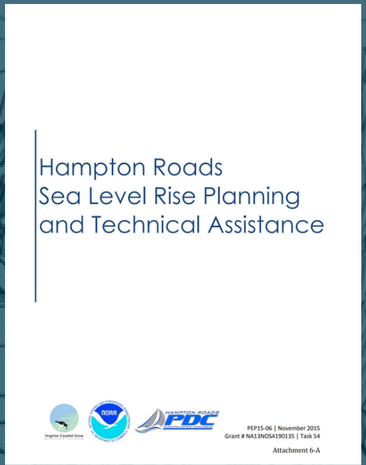

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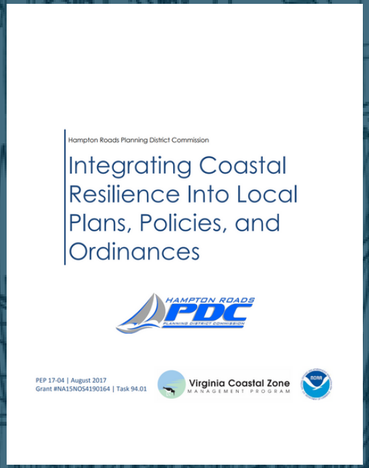

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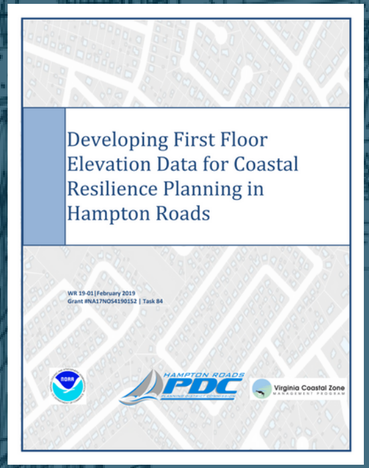

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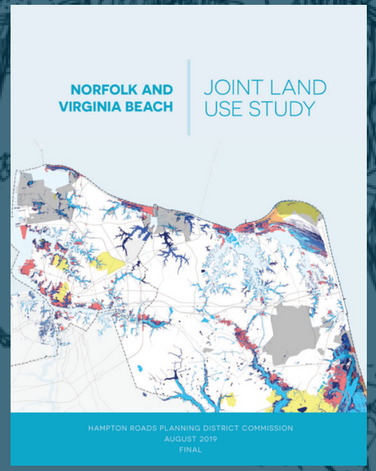

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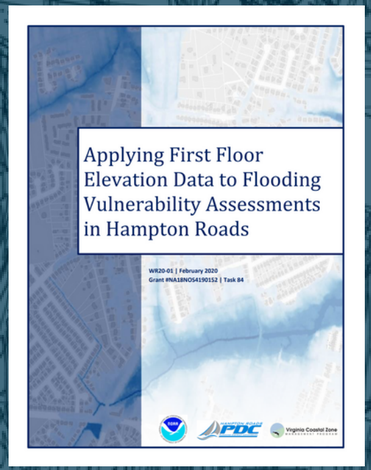

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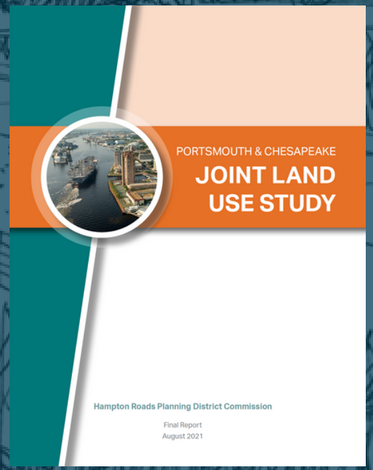

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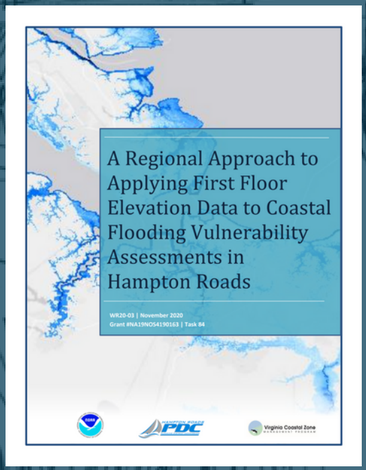
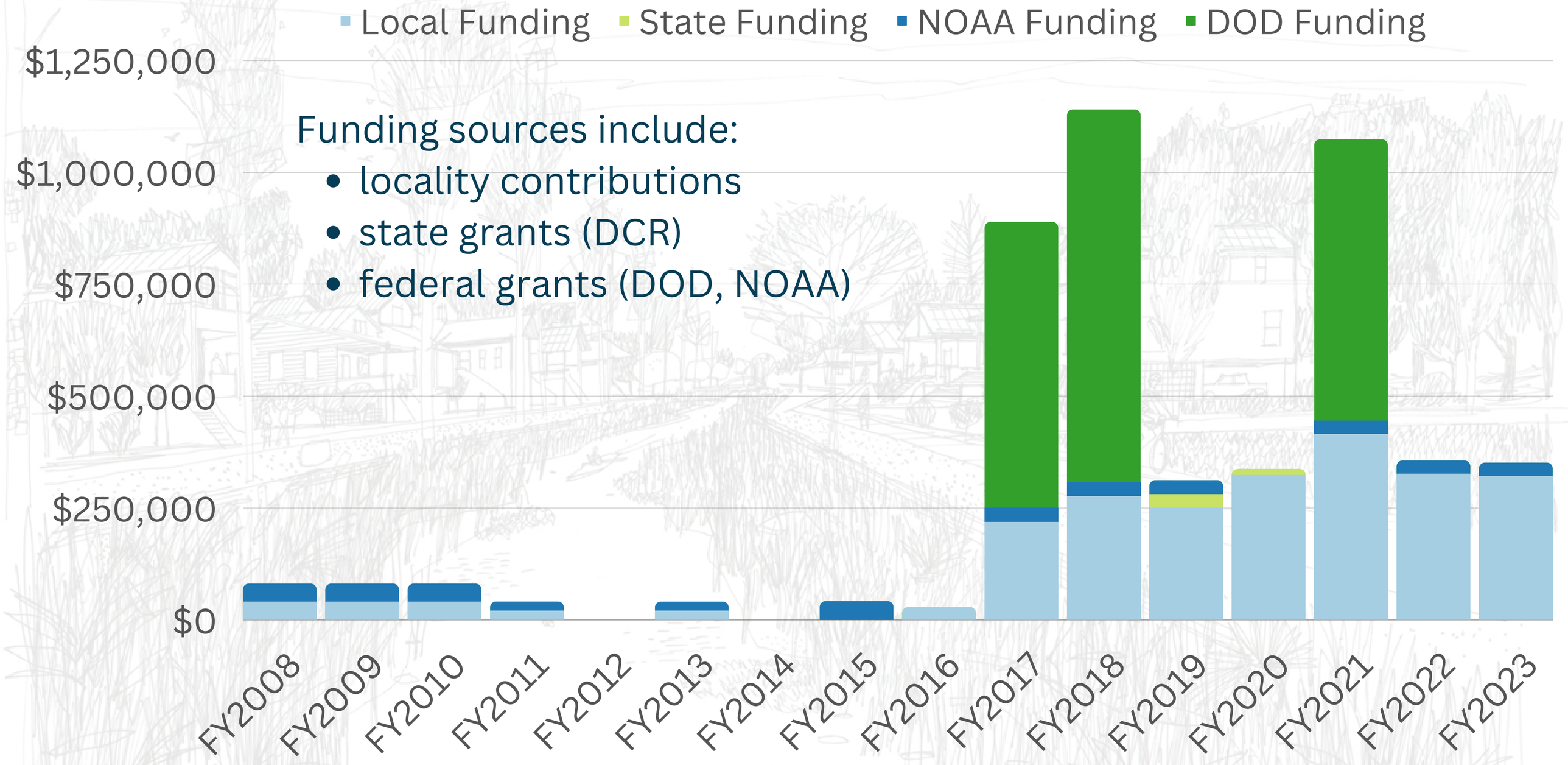


FY19

HRPDC RESILIENCY FUNDING



Funding sources include:

- locality contributions
- state grants (DCR)
- federal grants (DOD, NOAA)

REGIONAL RESILIENT DESIGN GUIDELINES

THE PROBLEM

Our design standards are based on the past, not where we are going to be in the future.

For public policies to work, it's important for expectations align with reality, which means we need to factor in expected changes.

Uncertainty in future conditions and climate modeling increases the difficulty in developing and implementing cost-effective public policies.

A (PARTIAL) SOLUTION

Using available information, amend local ordinances and policies to include design standards reflecting future conditions under climate change.

These changes should reflect the best available science and be subject to regular review and updates.

Resilient Design Guidelines for Stormwater Management

SEA LEVEL RISE	TAILWATER ELEVATIONS	PRECIPITATION	JOINT PROBABILITY EVENTS
Regional sea level rise planning scenarios	Boundary conditions based on watershed tidal elevations with sea level rise.	Future precipitation values based on climate models.	Design storms that pair tidal and rainfall events.

Principles

Resilient design guidelines should be scientifically-based, appropriate, and implementable

Scientifically-Based

Guidelines should be developed using sound data, models, and methods.

Appropriate

Guidelines for specific uses should be based on agreed-upon level of risk tolerance.

Implementable

Guidelines should be practicable and not considered impossible or overly difficult to achieve.

Challenges and Solutions

Data

Data may be incomplete or unavailable. Sometimes it is better to collect new data than to rely on a bad fit.

Relying on state and federal agencies

State and federal agencies can provide guidance and authoritative products, but their ability to deliver may depend on government priorities and annual budgets (ex. FEMA FIS, NOAA Atlas 14).

Limited Capacity

Local governments are often stretched thin. Adding new tasks requires making it as simple and easy as possible.

Takeaways and Recommendations

Don't reinvent the wheel

If someone else has already done it, use it.

It's not enough to have a "resilience plan"

Implementing resilience requires incorporating it into established processes - comp. plans, CIPs, budgets, public facilities manuals, etc.

Waiting on others can take a while

Sometimes it helps to work together (horizontally or vertically), but sometimes it is better to go it alone or in a small group.

Take advantage of available resources

NOAA, FEMA, USACE, EPA, etc.

Questions

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HRPDC:

- https://www.hrpdcva.gov/departments/water-resources/coastal-resiliency/

Hampton:

- https://hampton.gov/3459/Resiliency

Norfolk:

- https://www.norfolk.gov/1055/Flooding-Awareness-Mitigation
- https://www.norfolk.gov/3612/Office-of-Resilience

Virginia Beach:

- https://www.vbgov.com/government/departments/public-works/flood-protection-program/Pages/Flood-Protection-Program.aspx
- https://www.vbgov.com/government/departments/public-works/comp-sea-level-rise/Pages/default.aspx

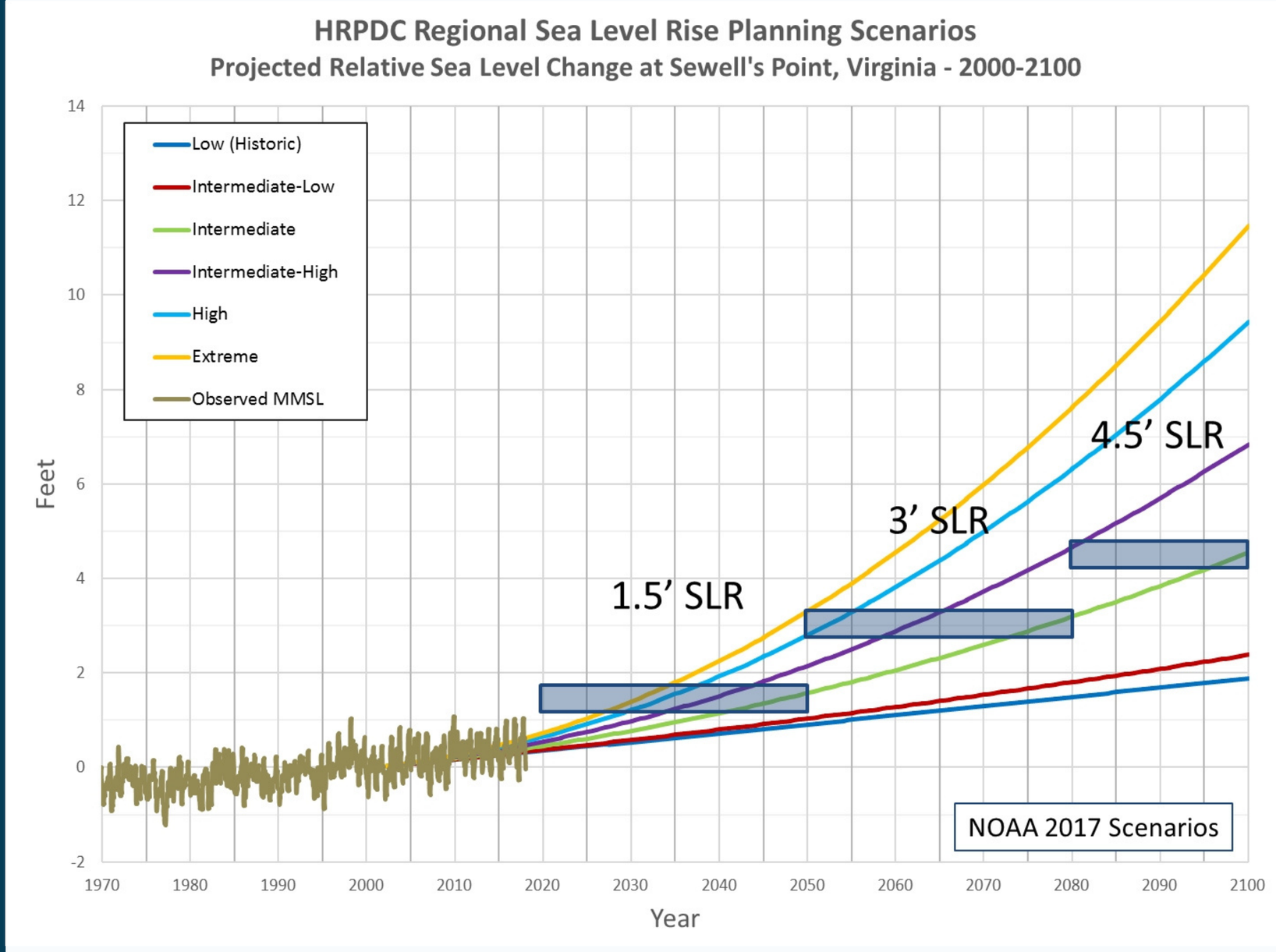
SEA LEVEL RISE

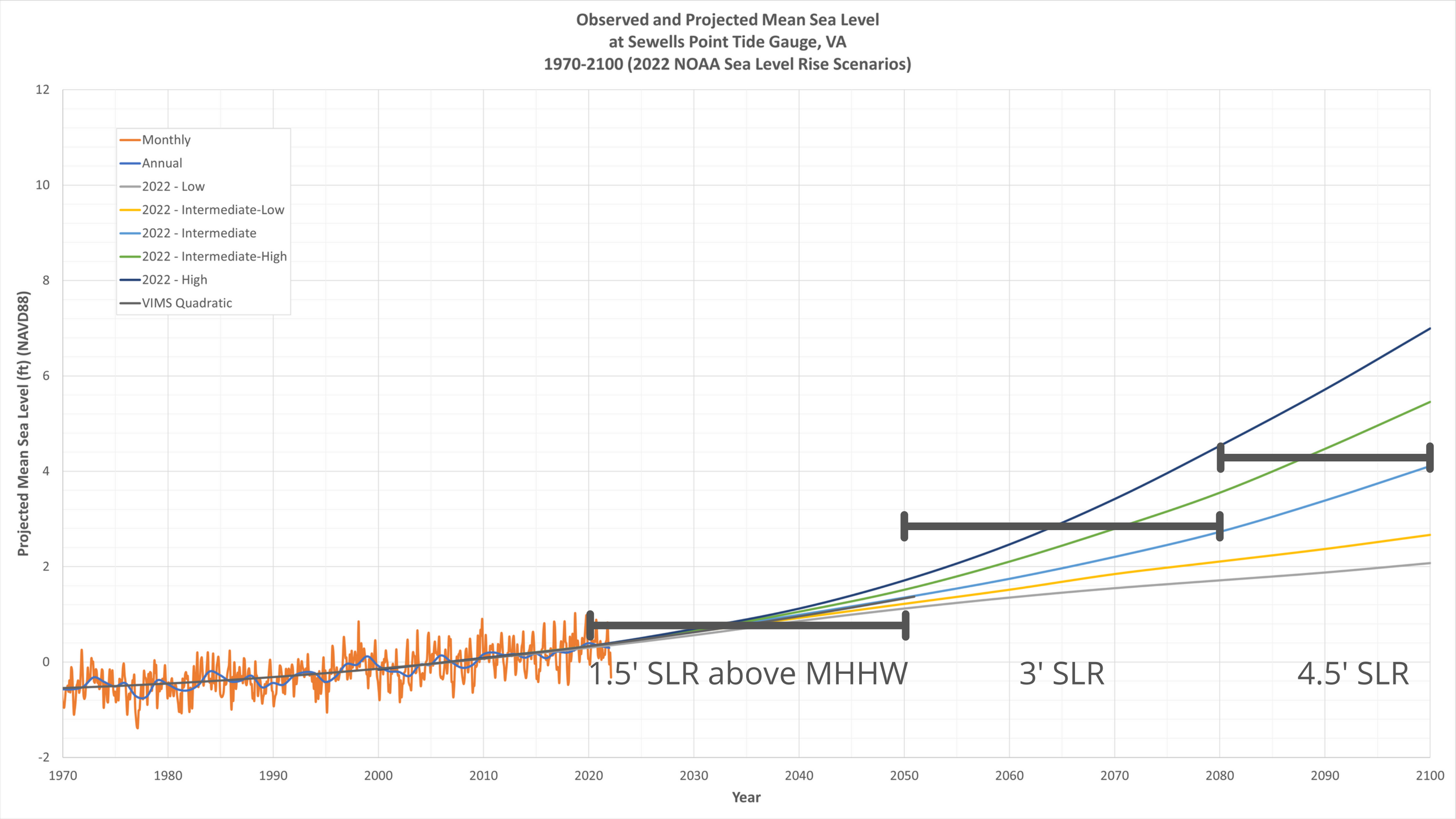
Planning Scenarios

Planning scenarios based on multiple sea level rise curves

2020-2050: 1.5'
2050-2080: 3.0'
2080-2100: 4.5'

Recommended by HRPDC board in October 2018




Observed and Projected Mean Sea Level
at Sewells Point Tide Gauge, VA
1970-2100 (2022 NOAA Sea Level Rise Scenarios)
Monthly
Annual
2022 - Low
2022 - Intermediate-Low
2022 - Intermediate
2022 - Intermediate-High
2022 - High
VIMS Quadratic
Projected Mean Sea Level (ft) (NAVD88)
12
10
8
6
4
2
0
-2
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Year
1.5' SLR above MHHW
3' SLR
4.5' SLR

TAILWATER ELEVATIONS

Stormwater outfalls are designed to account for a certain amount of "tailwater"

Default tailwater assumptions do not always account for tidal conditions

Sea level rise will decrease the capacity of stormwater systems that do not take future conditions into account

Approach

Calculate tailwater values for each watershed incorporating regional sea level rise scenarios

These values can be used as inputs for stormwater calculations.

Design Tidal Elevations for Chesapeake

All elevations in feet relative to the North American Vertical Datum (NAVD) of 1988

HUC12	Watershed	Design Level	1-Year	2-Year	3-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
020802080201	New Mill Creek-Southern Branch Elizabeth River	Existing Condition	3.9	4.5	4.8	5.2	5.8	6.6	7.2	7.8	9.2
		1.5 ft SLR	5.4	6.0	6.3	6.7	7.3	8.1	8.7	9.3	10.7
		3.0 ft SLR	6.8	7.4	7.7	8.1	8.7	9.5	10.1	10.7	12.1
		4.5 ft SLR	8.3	8.9	9.2	9.6	10.2	11.0	11.6	12.2	13.6
020802080203	Deep Creek-Southern Branch Elizabeth River	Existing Condition	3.4	4.1	4.5	5.1	5.9	6.7	7.3	8.0	10.0
		1.5 ft SLR	4.9	5.6	6.0	6.6	7.4	8.2	8.8	9.5	11.5
		3.0 ft SLR	6.4	7.1	7.5	8.1	8.9	9.7	10.3	11.0	13.0
		4.5 ft SLR	7.9	8.6	9.0	9.6	10.4	11.2	11.8	12.5	14.5
020802080204	Eastern Branch Elizabeth River	Existing Condition	2.9	3.7	4.2	4.8	5.9	6.6	7.3	8.0	10.4
		1.5 ft SLR	4.4	5.2	5.7	6.3	7.4	8.1	8.8	9.5	11.9
		3.0 ft SLR	6.0	6.8	7.3	7.9	9.1	9.8	10.5	11.2	13.6
		4.5 ft SLR	7.5	8.3	8.9	9.5	10.6	11.3	12.0	12.7	15.2
020802080205	Western Branch Elizabeth River	Existing Condition	3.7	4.5	4.9	5.4	6.1	7.0	7.9	8.6	10.3
		1.5 ft SLR	5.2	6.0	6.4	6.9	7.6	8.5	9.4	10.1	11.8
		3.0 ft SLR	6.9	7.7	8.1	8.6	9.3	10.2	11.2	11.9	13.6
		4.5 ft SLR	8.4	9.2	9.6	10.1	10.9	11.8	12.7	13.4	15.2
030102051104	Indian Creek-Northwest River	Existing Condition	0.1	0.5	0.7	1.0	1.4	2.0	2.4	2.8	3.8
		1.5 ft SLR	1.6	2.0	2.2	2.5	2.9	3.5	3.9	4.3	5.3
		3.0 ft SLR	3.2	3.6	3.8	4.2	4.6	5.2	5.6	6.0	7.1
		4.5 ft SLR	4.8	5.2	5.4	5.7	6.1	6.8	7.2	7.6	8.6
030102051201	Chesapeake Canal	Existing Condition	3.0	3.6	4.0	4.4	5.0	5.8	6.4	7.0	8.4
		1.5 ft SLR	4.5	5.1	5.5	5.9	6.5	7.3	7.9	8.5	9.9
		3.0 ft SLR	6.0	6.6	7.0	7.4	8.0	8.8	9.4	10.0	11.4
		4.5 ft SLR	7.5	8.1	8.5	8.9	9.5	10.3	10.9	11.5	12.9
030102051203	Upper North Landing River	Existing Condition	0.4	0.8	1.0	1.3	1.8	2.2	2.5	3.0	4.0
		1.5 ft SLR	1.9	2.3	2.5	2.8	3.3	3.7	4.0	4.5	5.5
		3.0 ft SLR	3.5	3.9	4.1	4.5	5.0	5.4	5.7	6.2	7.3
		4.5 ft SLR	5.1	5.5	5.7	6.0	6.5	7.0	7.3	7.8	8.8

Notes:

1. Sea level rise scenarios are based on HRPDC Sea Level Rise Planning Policy and Approach (2018).
2. All elevations sourced from statistical analysis of the distribution of water elevations in each watershed from the FEMA Region III Storm Surge Study conducted by the U.S. Army Corps of Engineers Engineer Research and Development Center (2013).
3. Conditions related to the 3-ft and 4.5-ft sea level rise design levels include non-linear increases derived from numerical modeling completed by the U.S. Army Corps of Engineers as part of the North Atlantic Coast Comprehensive Study.

PRECIPITATION

Observations over the last several decades and climate models indicate that precipitation patterns are changing, resulting in both higher overall and increased concentrations of rainfall

Failure to account for changing precipitation patterns could result in lower levels of service from stormwater management infrastructure

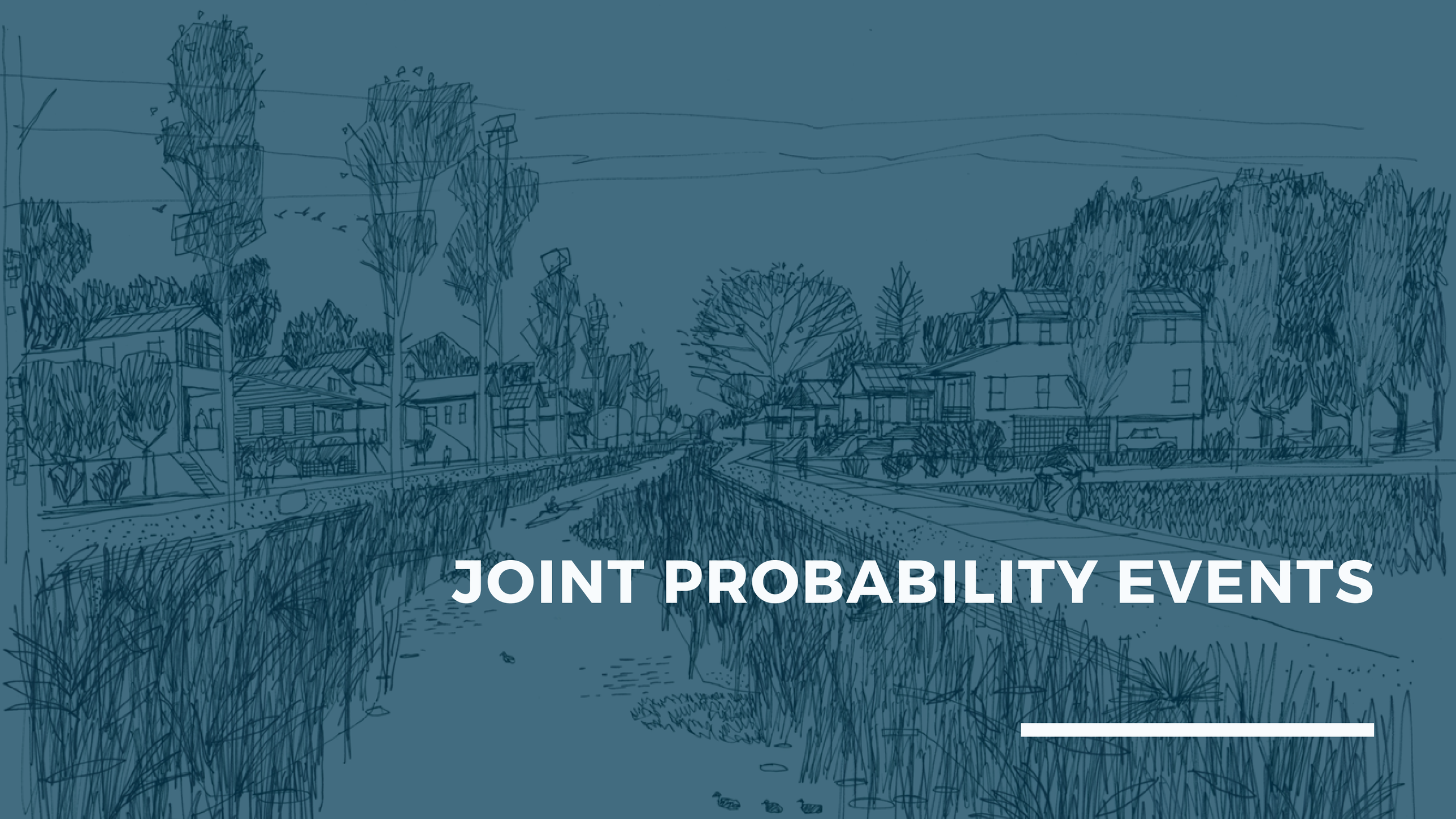
Approach

Calculate baseline values using NOAA Atlas 14

Use RAND/MARISA tool to calculate future precipitation values

Recommend single multiplier for each locality based on climate projections and existing impervious cover

Multiplier	Localities
1.1	Gloucester County Isle of Wight County Southampton County Surry County
1.15	James City County Suffolk Williamsburg York County
1.2	Chesapeake Franklin Hampton Newport News Norfolk Poquoson Portsmouth Smithfield Virginia Beach



JOINT PROBABILITY EVENTS

Flooding in coastal areas is often caused by a combination of rainfall and tidal conditions.

Virginia Beach has adopted an approach that considers both types of flooding simultaneously.

Joint Probability Events

Flooding in coastal areas is often caused by a combination of rainfall and tidal conditions.

Define design storms as pairs of tidal and rainfall events

Assign different design storms based on project attributes (scale, type)

Design Storm	Tidal Elevation	Rainfall
1-Year	10-Year	1-Year
2-Year	5-Year	2-Year
10-Year	1-Year	10-Year
25-Year	2-Year	25-Year
50-Year	2-Year	50-Year
100-Year	3-Year	100-Year