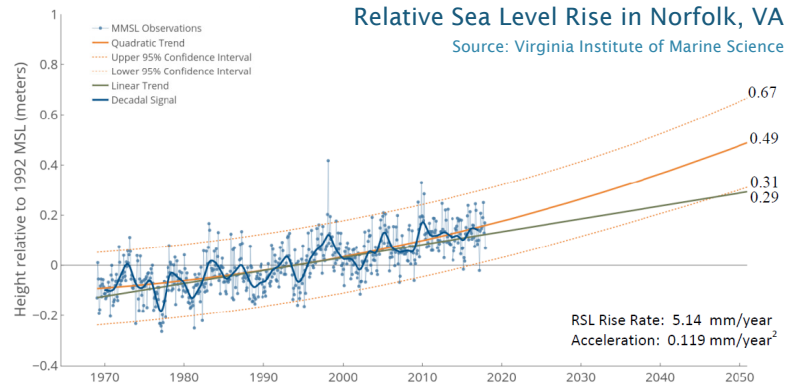


# Overview

In order to address existing, short- and long-term flood risks, the City of Virginia Beach has undertaken a thorough, City-wide analysis to develop strategies and solutions that promote resilience.

## Motivation

Sea levels are rising. Water levels in the Hampton Roads Region have already risen almost a foot in the last century. Looking into the future, sea levels will continue to rise and at an accelerated pace. Over a 50-year planning horizon the Region will likely experience an additional 1.5 to 3 ft of sea level rise and so the CSLRRF Study explores ways to address these risks.



Life Cycle Alignment	Time Horizon	SLR Value	Relevance	Use
Municipal Planning	20–40 years 2035–2055	1.5 ft	Comprehensive Plan & outcomes Commercial and Utility lifecycles	Vulnerability assessment Key planning value Basis for elevation of all adaptation strategies
Critical Infrastructure Long-term Awareness Adaptive Capacity	50–70 years 2065–2085	3 ft	Utility Infrastructure lifecycle 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

## Ongoing Studies

The City of Virginia Beach is developing plans to address both repetitive flooding and projected increases in flooding through two main studies.

### Comprehensive Sea Level Rise and Recurrent Flooding Study (CSLRRF)

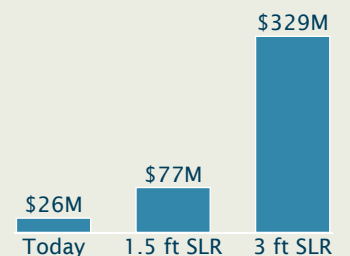
- Assessing existing and future flood vulnerabilities across the City’s four watersheds
- Identifying strategies to ensure our City is more resilient to future flooding events

### Master Drainage Study

- Inventorying stormwater system and evaluating performance under existing and future scenarios
- Identifying deficiencies or needed improvements
- <http://www.vbgov.com/pwsmmp>

## What would be the cost of no action?

If the City were to take no action to reduce flood risks, annual average flood-related losses, including from broader societal impacts, would increase from \$26 to \$77 million with 1.5 ft of sea level rise and to \$329 million with 3 ft of sea level rise.

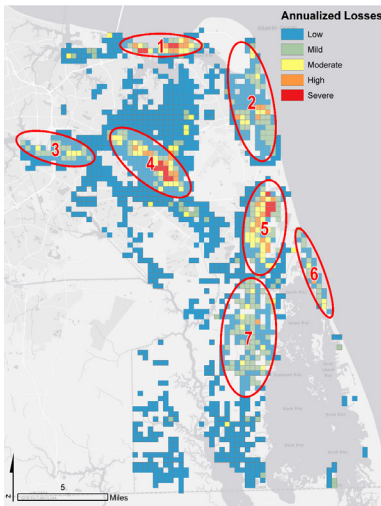


## Study Phases

The CSLRRF study consists of 3 phases and the results of each will serve as the basis for understanding how Virginia Beach can ensure a safe and habitable living environment for all residents in the years to come.



# Overview



## Phase 1: Impact Assessment

### Coastal Flooding

The study team used flood risk modeling and mapping to evaluate current and future coastal flood risk, identify critical flooding pathways, and assess vulnerability of City assets and critical infrastructure. This process found that 88% of economic flood risk is concentrated in seven main areas.

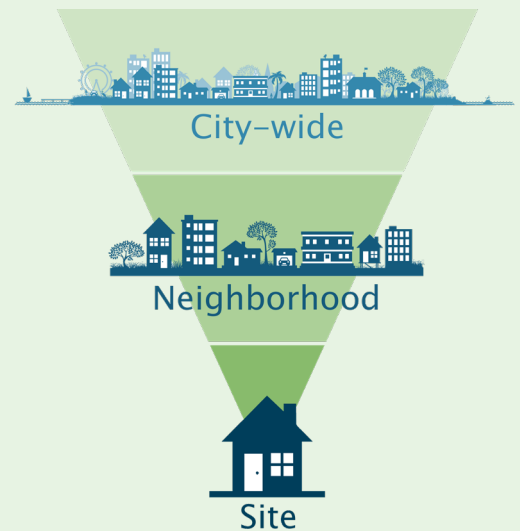
### Rainfall Flooding

Heavy precipitation can overwhelm the stormwater system and is compounded with coastal flooding. An analysis of historical precipitation trends and regional climate models shows the frequency of heavy precipitation events is increasing. Rainfall has increased 10% since 2004 and it is anticipated to increase another 10% by 2075.

## Phase 2: Adaptation Strategies

In order to address existing and future flood risks, the City is considering a wide range of possible strategies: structural, nonstructural, and natural and nature-based interventions to decrease short- and long-term risk. Proposed strategies are being evaluated through a multi-factor feasibility rating for prioritization to identify the most effective and practical solution set.

Employing a “multiple lines of defense strategy” will incorporate a variety of strategies at different scales to provide comprehensive flood protection.



## Phase 3: Implementation



### CSLRRF Study Outcomes

The Implementation Phase will include watershed-specific plans and provide a roadmap for setting these plans into place. The plans will include conceptual design, cost estimates, potential funding sources, and educational and public engagement activities. The City will prioritize and execute actions within the plans that will reduce flood risk within the City.

### Stormwater Design Standards

The City is using the information from the historical and future heavy precipitation analysis to improve stormwater design standards. The current design standards are outdated and do not account for changes in nature. Based on the finding of the analysis, the City is proposing to increase design rainfall intensities by 20% to account for already occurring and/or future increases in heavy rainfall.