

## Report to Congress for Future Water Resources Development (WRRDA 7001) Submission Package

Proposal Name: Comprehensive Regional Coastal Storm Risk Management Study: City of Virginia Beach and Surrounding Areas

Submission Date: 08/27/2019

Proposal ID Number: 5fcc18ec-8234-4792-8d19-172d621817a6

Purpose of Proposal: The purpose of the proposed project is to evaluate the feasibility of conceptual coastal flood risk reduction strategies to enable the City of Virginia Beach to address sea level rise and associated coastal flooding impacts. We anticipate a feasibility study employing the “SMART Planning” process and the “3x3x3” rule. The City of Virginia Beach is located in Hampton Roads, a region that has experienced about 0.75-feet of sea level rise in the last 50-years, placing it 2nd only to New Orleans as the largest population center at risk, and ranking 10th in the world in value of assets exposed to flooding. This study is imperative for long-term economic vitality and quality of life for Virginia Beach, ensuring protection for multiple critical military installations and their supporting workforce. The City of Virginia Beach has made significant investment to date to provide a strong foundation for a successful feasibility study with the USACE. In alignment with the USACE’s integrated coastal flood risk management approach, we have considered including natural, nature-based, nonstructural, and structural protection measures to reduce short- and long-term flood risk. The City has established conceptual strategies through a foundational five-year study and established multiple alternatives for flood risk reduction. The conceptual strategies have been conceived to significantly reduce impacts to known high-risk areas of the city and existing analysis shows that they are cost-beneficial. The City is committed to our projects, and are ready to partner with the USACE as our nation’s authority for flood risk management to take the next steps to generate a preferred alternative that maximizes economic benefits consistent with protecting the nation’s environment.

*1. Administrative Details*

**Proposal Name: Comprehensive Regional Coastal Storm Risk Management Study: City of Virginia Beach and Surrounding Areas**

**by Agency: City of Virginia Beach**

**Locations: NC,VA**

**POC Name:**

**POC Phone:**

**POC Email:**

**Date Submitted: 08/27/2019**

**Confirmation Number: 5fcc18ec-8234-4792-8d19-172d621817a6**

*Supporting Documents*

<b>File Name</b>	<b>Date Uploaded</b>
20190111-CM to CC-USACE Study Request.pdf	08/27/2019
20190823 Norfolk Support Letter.pdf	08/27/2019
20190823 Chesapeake-Letter of Support.pdf	08/27/2019
CVB Map.pdf	08/27/2019
20160618 Moodys Hampton Roads Report.pdf	08/27/2019
CIP 7-027 SWM Master Planning.pdf	08/27/2019
CIP 7-030 SLR.pdf	08/27/2019

2. Provide the name of the primary sponsor and all non-Federal interests that have contributed or are expected to contribute toward the non-Federal share of the proposed feasibility study or modification.

Sponsor	Letter of Support
City of Virginia Beach(Primary)	<p>The City of Virginia Beach is willing and able to participate as the Lead Sponsor to cooperatively perform a detailed feasibility study for the long-term protection for both our city and national assets within our municipal boundaries from continued recurrent coastal flooding. We are ready to sign a Feasibility Cost Sharing Agreement (FCSA) to initiate the study and have the resources to fund the effort. It is our understanding the FCSA targets completion of the feasibility study within 3 years at a total cost of no more than \$3 million. After signing the FCSA, a Project Management Plan will be developed and agreed upon. The study will be conducted and managed by USACE. The cost-sharing for the study is based on a 50% contribution by the Federal government, and City's 50% contribution provided in cash, or by a portion, or all, of the contribution provided through in-kind non-monetary services. The City of Virginia Beach has invested over \$3M, in the last five years, to perform an assessment of our coastal flood risk across our diverse and complicated landscape, and has developed policy and conceptual engineering alternatives for coastal flood risk reduction with engagement from our stakeholders. Our City Council recently passed a budget that focuses heavily on addressing stormwater and recurrent flooding both now and in the years to come, creating a 15-year capital improvement program to generate over \$1.3 billion. This work, as well as the monies invested to date, demonstrates our commitment and provides a strong foundation that will ensure a successful feasibility study. The City is aware that the USACE reserves the right to review the efforts currently undertaken by the City and both parties will negotiate acceptable materials before signing the FCSA. The City understands that a study cannot be initiated unless it is selected as a new start study with associated allocation of Federal funds provided through the annual Congressional appropriations process.</p>
City of Norfolk	<p>The City of Norfolk is in full support of the City of Virginia Beach's application for the Comprehensive Regional Coastal Storm Risk Management in Virginia and Surrounding Areas. This proposal will investigate the flood risk threats from sea level rise, coastal storm surge, and rainfall events, and develop watershed-based mitigation solutions to reduce the flood risks throughout the region.</p>

City of Chesapeake	The City of Chesapeake is in full support of the City of Virginia Beach's application for the Comprehensive Regional Coastal Storm Risk Management in Virginia and Surrounding Areas. This proposal will investigate the flood risk threats from sea level rise, coastal storm surge, and rainfall events, and develop watershed-based mitigation solutions to reduce the flood risks throughout the region.
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*3. State if this proposal is for new feasibility study authority, a modification to an existing feasibility study authority, a modification to an existing USACE project authority, or a modification to an existing USACE Environmental Infrastructure Program authority. If it is a proposal for a modification to an existing study, project or program authority, provide the authorized water resources development feasibility study or project name.*

[x] New Feasibility Study Authority

***4. Clearly articulate the specific project purpose(s) of the proposed study or modification. Demonstrate that the proposal is related to USACE mission and authorities and specifically address why additional or new authorization is needed.***

The purpose of the proposed project is to evaluate the feasibility of conceptual coastal flood risk reduction strategies to enable the City of Virginia Beach to address sea level rise and associated coastal flooding impacts. We anticipate a feasibility study employing the “SMART Planning” process and the “3x3x3” rule. The City of Virginia Beach is located in Hampton Roads, a region that has experienced about 0.75-feet of sea level rise in the last 50-years, placing it 2nd only to New Orleans as the largest population center at risk, and ranking 10th in the world in value of assets exposed to flooding. This study is imperative for long-term economic vitality and quality of life for Virginia Beach, ensuring protection for multiple critical military installations and their supporting workforce. The City of Virginia Beach has made significant investment to date to provide a strong foundation for a successful feasibility study with the USACE. In alignment with the USACE’s integrated coastal flood risk management approach, we have considered including natural, nature-based, nonstructural, and structural protection measures to reduce short- and long-term flood risk. The City has established conceptual strategies through a foundational five-year study and established multiple alternatives for flood risk reduction. The conceptual strategies have been conceived to significantly reduce impacts to known high-risk areas of the city and existing analysis shows that they are cost-beneficial. The City is committed to our projects, and are ready to partner with the USACE as our nation’s authority for flood risk management to take the next steps to generate a preferred alternative that maximizes economic benefits consistent with protecting the nation’s environment.

5. *To the extent practicable, provide an estimate of the total cost, and the Federal and non-Federal share of those costs, of the proposed study and, separately, an estimate of the cost of construction or modification.*

	<b>Federal</b>	<b>Non-Federal</b>	<b>Total</b>
<b>Study</b>	\$1,500,000	\$1,500,000	\$3,000,000
<b>Construction</b>	\$0	\$0	\$0

**Explanation (if necessary)**

The complexity of the coastal flood propagation into Virginia Beach, along with the various structural and non-structural engineering alternatives make it difficult to reliably estimate construction costs until a final recommended option is selected. We anticipate a recommended alternative and estimated construction cost s as an outcome of the proposed Feasibility study.

***6. To the extent practicable, describe the anticipated monetary and nonmonetary benefits of the proposal including benefits to the protection of human life and property; improvement to transportation; the national economy; the environment; or the national security interests of the United States.***

Sea level rise impacts, including loss of important natural resources and damage to buildings and critical infrastructure, have already been observed in Virginia Beach. As a major tourism hub and home to important ecological, agricultural, and military assets, the City is a significant driver of Virginia's coastal economy. The City has estimated that existing conceptual alternatives offer benefits of \$2.3 - \$4.1 billion, considering structural, content, and avoided displacement benefits, but we anticipate additional benefits from avoidance of indirect impacts and economic losses. The City is home to four critical military bases, including Naval Air Station Oceana, the Navy's East Coast Master Jet Base, which, along with the Dam Neck Annex employs over ten thousand active duty Navy personnel and forty-five hundred civilians. The JEB Little Creek-Fort Story employs over eighteen thousand military and civilian personnel and is the major east coast operating base supporting Overseas Contingency Operations. The large-scale structural strategies being explored by the City, which would be further evaluated and refined under the proposed Feasibility study, are prioritized actions and in alignment with related coordination strategies outlined in the Norfolk and Virginia Beach Joint Land Use Study (May 2019) that can be implemented to enhance the Department of Defense's ability to carry out its mission. The City's natural coastal environments contribute invaluable ecosystem services (natural flood control, water quality, and habitat productivity). These improve quality of life and attract people to live in and visit the City. Conceptual plans established by work to date include identification of suitable nature-based strategies to compliment and provide redundancy in flood protection to structural strategies. We have support from the National Federal Wildlife Refuge and Virginia State Department of Game and Inland Fisheries to further such concepts into feasibility studies.

**7. Does local support exist? If 'Yes', describe the local support for the proposal.**

Yes

### **Local Support Description**

The City of Virginia Beach recognizes the need to address our increasing flood issues and are committed to develop and implement strategies to reduce flood risk. Coastal flooding is recognized as a top 5 priority by City Council. The Sea Level Rise\_Recurrent Flooding Analysis is funded at \$5.0M in the CIP. This analysis serves as the tool for identifying vulnerable areas and assessing the adaptation strategies. The City analyzed wind tide flooding that occurs in the Southern Rivers watershed when winds push water up from North Carolina into Back Bay and the North Landing River. City Council provided \$14.8M for the Stormwater Master Planning CIP, which includes creating models for the entire City using EPA SWMM and DHI's MIKE software, to provide a stormwater system inventory and to determine flooding locations, which links directly to the Sea Level Rise\_Recurrent Flooding Analysis. The 6 year funding plan to support both CIP projects shows that the City is fully committed to moving forward with solutions to protect our City. In addition, the City conducted 7 public meetings which were held in late 2017 and early 2018 to inform the public on City efforts to combat flooding and gather public input on strategies. A second set of meetings were held in 2019 to introduce the public to policy, nature-based, structural, and site-level flood risk management strategies. The City engaged Old Dominion University to survey attendees. Through these meetings, we found that our citizens recognize the increasing flood impacts and understand strategies are needed to address the issue. Preliminary survey results from the 2019 meetings found that more than 60% of residents surveyed believe planning for a future with more frequent and intense flooding should be a high-priority goal for Virginia Beach. Overall, the public indicated support for the ongoing city planning efforts, and enhancing City flood resilience through capital investments in flood protection infrastructure.

**8. Does the primary sponsor named in (2.) above have the financial ability to provide for the required cost share?**

Yes

# Primary Sponsor Letter of Support

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**20190111-CM to CC-USACE Study Request.pdf**



# City of Virginia Beach

OFFICE OF THE CITY MANAGER  
(757) 385-4242  
(757) 427-5626 FAX

[VBgov.com](http://VBgov.com)  
MUNICIPAL CENTER  
BUILDING 1, ROOM 234  
2401 COURTHOUSE DRIVE  
VIRGINIA BEACH, VA 23456-9001

January 11, 2019

The Honorable Robert M. Dyer, Mayor  
Members of City Council

**Subject: Army Corp of Engineers Request Letter - Sea Level Rise/Flooding Study**

Dear Mayor and Council Members:

Attached for your review is a letter to the U.S. Army Corp of Engineers, Norfolk District requesting startup of a 3x3x3 study for Virginia Beach in Fiscal Year 2020. The study would investigate flood risk threats and develop watershed-based solutions to reduce flood risks in Virginia Beach and surrounding areas. The study would build upon the work already completed by Public Works with respect to the Comprehensive Sea Level Rise Study and the Stormwater Modeling Study.

If you have any questions or require additional information, please contact me or Deputy City Manager Tom Leahy.

Respectfully,

David L. Hansen  
City Manager

DLH/TML/slc

Attachment



# City of Virginia Beach

OFFICE OF THE CITY MANAGER  
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MUNICIPAL CENTER  
BUILDING 1, ROOM 234  
2401 COURTHOUSE DRIVE  
VIRGINIA BEACH, VA 23456-9001

January 11, 2019

Colonel Patrick V. Kinsman, Commander  
Norfolk District, U.S. Army Corps of Engineers  
803 Front Street  
Norfolk, VA 23510

Dear Colonel Kinsman:

The **City of Virginia Beach (the “City”)** is willing and able to participate as the Local Sponsor for the **Comprehensive Regional Coastal Storm Risk Management in Virginia Beach and Surrounding Areas (the “Study”)**, in partnership with the U.S. Army Corps of Engineers (USACE), to cooperatively investigate the flood risk threats from sea level rise, coastal storm surge, and rainfall events, and develop watershed-based mitigation solutions to reduce the flood risks in the **City of Virginia Beach, City of Norfolk, City of Chesapeake, Currituck County North Carolina, and Joint Expeditionary Base (JEB) Little Creek-Fort Story.**

This study is an imperative step for the long-term vitality of Virginia Beach. We are the largest city in Virginia, and home to four critical military bases, their personnel and families. This includes Naval Air Station Oceana, the Navy’s East Coast Master Jet Base, which, along with the Dam Neck Annex employs over 10,000 active Navy personnel and 4,5000 civilians. The JEB Little Creek-Fort Story employs over 18,000 military and civilian personnel and is the major east coast operating base supporting Overseas Contingency Operations. Completion of a coastal flood risk management feasibility study will lay a roadmap for the long-term protection of both City and national assets.

The City understands a study cannot be initiated unless it is selected as a new-start study with associated allocation of Federal funds provided through the annual Congressional appropriations process. If selected, The City intends to sign a Feasibility Cost Sharing Agreement (FCSA) to initiate the study with the USACE. It is our understanding that the FCSA targets completion of the feasibility study within three years at a total cost of not more than \$3 million. After signing the FCSA, a Project Management Plan will be developed and agreed upon by the City and the USACE. The study will be conducted and managed by the USACE. The cost-sharing for the study is based upon a 50% contribution by the Federal government, and a 50% contribution by the City provided in cash, or by a portion or all of the contribution provided through in-kind non-monetary services.

Colonel Patrick V. Kinsman

January 11, 2019

Page | 2

The City met with the Norfolk District on December 18, 2018 to discuss the current on-going sea level rise adaptation study underway in Virginia Beach. The City would propose applicable portions of this study be considered for this Feasibility study. Specific elements of these efforts include the collection and review of topographic and bathymetric data, the development of a regional coastal model to simulate the impacts of coastal storm events, development and analysis of alternatives to reduce flood risks, benefit-cost analyses, and other work products developed during the course of this study. The City is aware that the USACE reserves the right to review the efforts currently undertaken by the City, and that both parties will negotiate acceptable materials before signing the FCSA.

The City is also aware that this letter constitutes an expression of intent to initiate a study partnership to address the specified water resources problems and is not a contractual obligation. The City understands that work on the study cannot commence until it is included in the Administration's budget request, funds are appropriated by Congress, and an FCSA is signed. It is understood that either the City or the USACE may opt to discontinue the study at any time after the FCSA is signed, but both will commit to work together as partners throughout the feasibility study. If it is determined additional time or funding is necessary to support decisions to be made in order to complete the study, the City will work with the USACE to determine the appropriate course of action.

The City is requesting an opportunity to review the completed efforts of the City's on-going study with the USACE. We anticipate our study results will facilitate an expedited review of this request and an agreement to begin the Feasibility Study in fiscal year 2020.

If you require additional information, please contact Deputy City Manager Tom Leahy, at 757-385-8654 or TLeahy@vbgov.com.

Respectfully,



David L. Hansen  
City Manager

DLH/MAJ/CJB/tdc

c: Mayor Robert M. Dyer and Members of Council  
Thomas M. Leahy, Deputy City Manager  
Mark A. Johnson, P.E., Director of Public Works  
Phillip D. Pullen, P.E., Public Works City Engineer  
Mark D. Stiles, City Attorney

# Other Non-Federal Sponsors Letter(s) of Support

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**20190823 Norfolk Support Letter.pdf**

August 23, 2019

Colonel Patrick V. Kinsman, Commander  
Norfolk District, U.S. Army Corp of Engineers  
803 Front Street,  
Norfolk, VA 23510

**Re: FY 2019 US Army Corps Engineers Comprehensive Regional Coastal Storm Risk Management in Virginia Beach and Surrounding Areas**

Dear Colonel Kinsman,

The City of Norfolk is in full support of the City of Virginia Beach's application for the Comprehensive Regional Coastal Storm Risk Management in Virginia Beach and Surrounding Areas. This proposal will investigate the flood risk threats from sea level rise, coastal storm surge, and rainfall events, and develop watershed-based mitigation solutions to reduce the flood risks throughout the region.

The Hampton Roads region, including the City of Virginia Beach, City of Norfolk, City of Chesapeake, and Joint Expeditionary Base (JEB) Little Creek-Fort Story are subject to the highest rate of historic sea level rise (SLR) on the East Coast (about 1.5 ft. in the last 100 years) due to relatively high rates of subsidence. Projected acceleration of SLR may increase local water levels an additional 0.4 to 1.9 ft. over the next 30 years. Rising sea levels are a fact accepted by this region, which is fully committed to taking the needed actions to identify and implement measures to assure a vibrant future through collaboration and coordination at the federal, state, regional and local levels to develop cohesive plans for an effective response.

I ask that you give this proposal every appropriate consideration.

Sincerely,



Scott A. Smith, PE, LS, CPWP-M  
Public Works, Coastal Resiliency

# Other Non-Federal Sponsors Letter(s) of Support

(This is as uploaded, a blank page will show if nothing was submitted)

**20190823 Chesapeake\_Letter of Support.pdf**

Department of Public Works  
P.O. Box 15225  
Chesapeake, Virginia 23328  
(757) 382-6101  
(757) 382-8537 FAX

August 22, 2019

Colonel Patrick V. Kinsman, Commander  
Norfolk District, U.S. Army Corp of Engineers  
803 Front Street  
Norfolk, VA 23510

**Re: FY 2019 US Army Corps Engineers Comprehensive Regional Coastal Storm Risk Management in Virginia Beach and Surrounding Areas**

Dear Colonel Kinsman,

The City of Chesapeake is in full support of the City of Virginia Beach's application for the Comprehensive Regional Coastal Storm Risk Management in Virginia Beach and Surrounding Areas. This proposal will investigate the flood-risk threats from sea level rise, coastal storm surge, and rainfall events, and develop watershed-based mitigation solutions to reduce the flood risks throughout the region.

The Hampton Roads region, including the City of Virginia Beach, City of Chesapeake, City of Norfolk, and Joint Expeditionary Base (JEB) Little Creek-Fort Story are subject to the highest rate of historic sea level rise (SLR) on the East Coast (about 1.5 ft. in the last 100 years) due to relatively high rates of subsidence. Projected acceleration of SLR may increase local water levels an additional 0.4 to 1.9 ft. over the next 30 years. This region is fully committed to taking the needed actions to identify and implement measures to assure a vibrant future through collaboration and coordination at the federal, state, regional and local levels to develop cohesive plans for an effective response to sea level rise.

I ask that you give this proposal every appropriate consideration.

Sincerely,



Earl Sorey, P.E.  
Assistant Director of Public Works  
City of Chesapeake

CES/ha

c: Sam Sawan, P.E., Assistant City Engineer  
Holly Adams, P.E., Stormwater Project Manager

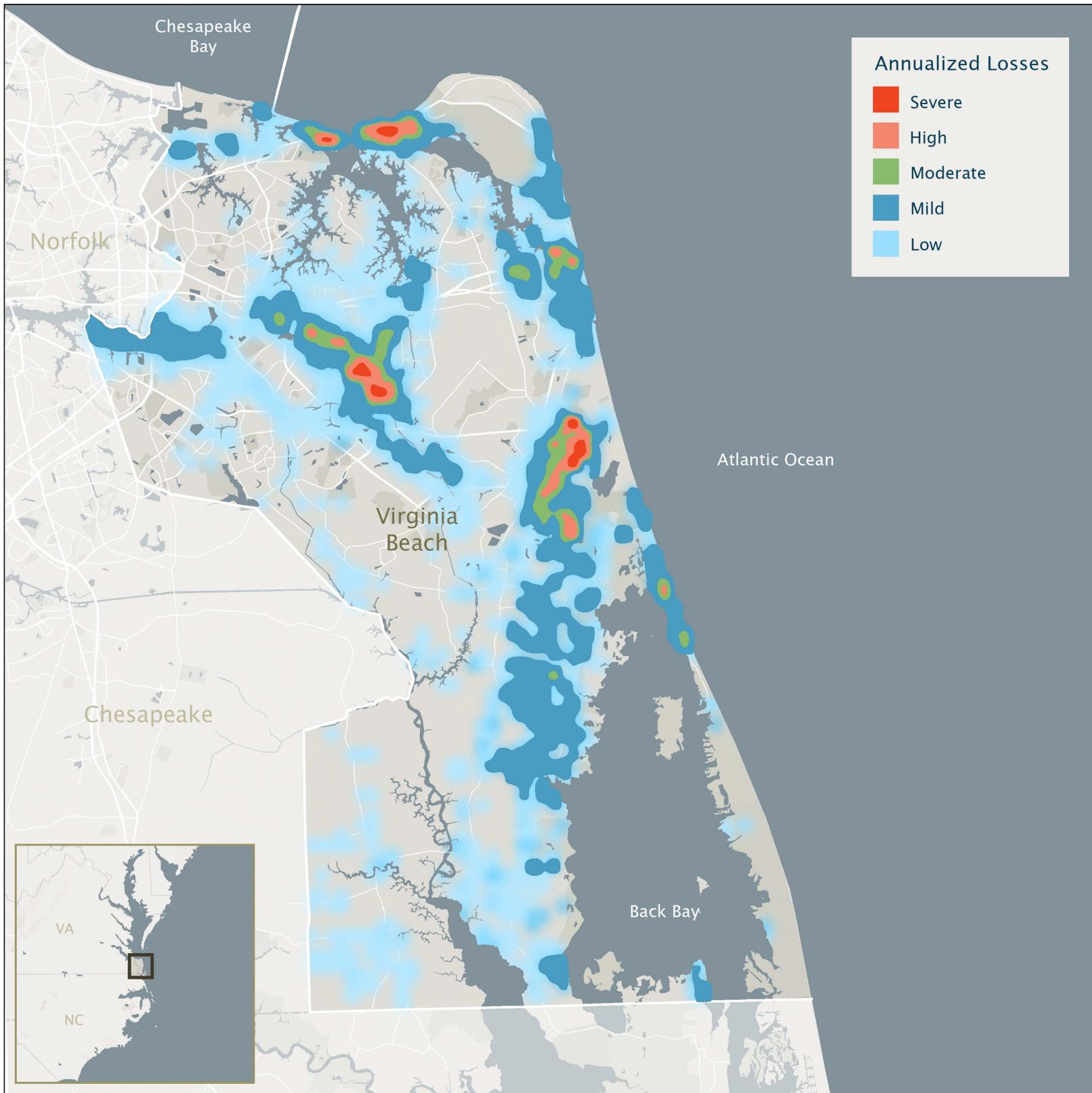
"The City of Chesapeake adheres to the principles of equal employment opportunity  
This policy extends to all programs and services supported by the City."



# Map Document

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**CVB Map.pdf**



# Additional Proposal Information

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**20160618 Moodys Hampton Roads Report.pdf**

## SECTOR IN-DEPTH

18 JUNE 2015

Rate this Research



## ANALYST CONTACTS

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Local Government

## Virginia's Hampton Roads Region Responds to Flood Risk

The Hampton Roads region in southeastern [Virginia](#) (Aaa stable), which includes [Virginia Beach](#) (Aaa stable) and [Norfolk](#) (Aa2) as its largest cities, is at risk of flooding by virtue of its geography. Flooding risk from inland rainfall, storm surges, and high tides challenge the region due to its location at the confluence of the Atlantic Ocean, Chesapeake Bay, and the James and York rivers. Land use planning, building codes, risk planning and preventative investments have thus far prevented any significant credit impact from flooding, but continued development coupled with sinking land, and recurring strong storms, will require further capital investment and effective planning to mitigate negative credit effects on the Hampton Roads coastal municipalities.

- » **The region faces significant flooding risks associated with weather-related and tidal flooding, exacerbated by intensive development.** Damage costs from a future severe storm and flooding event could far exceed \$10 billion, according to a planning report by the Hampton Roads Planning District Commission. Gradual sea level rise would worsen flooding in low-lying areas, and require rebuilding storm sewer infrastructure. Given the region's extensive military ports, the Department of Defense is doing planning for various sea-level rise scenarios over the next 20 to 50 years.<sup>1</sup>
- » **Land use planning, building codes, and capital investment in infrastructure all play a role in mitigating future credit risks.** Planning mitigates vulnerability to storms and flooding, and can enable continued private sector development and property tax revenue. Annual spending for stormwater management in the near term reduces the need to spend larger amounts later. [Hampton](#) (Aa1) has spent nearly \$30 million on flood control over the last three years. However, cost forecasts indicate a potential need for greater investment by local governments across the region.
- » **Conservative financial management and economic strengths benefit the region's municipalities.** Despite flooding risk, credit quality within the region remains generally stable. This largely reflects a strong economic base anchored by the region's concentrated military presence and port activity, together with broadly conservative financial operations across the individual local governments.
- » **Regional coordination at the state and federal level will lessen the cost burden for local governments.** The concentration of military installations and contiguous cities in Hampton Roads suggest that coordination of planning, development and infrastructure investment will reap the strongest benefits and minimize credit impact for municipalities.

## Region faces significant risks from storm and tidal flooding

Water is the lifeblood of the Hampton Roads region, home to a major Northeast commercial port and the world's largest naval base. Access to good harbors and water transportation is both the economic foundation as well as recurring threat to the Hampton Roads region. The region is susceptible to flooding from both the ocean and inland rivers, and its low-lying areas are also vulnerable to storm-driven tidal surges. When combined with sinking land and recurring strong storms, any rise in sea level will require further capital investment and effective planning to lessen the odds of negative credit effects on the Hampton Roads coastal municipalities.

### Hampton Roads Benefits from Military Presence, Port Activity and Tourism

The Hampton Roads region benefits from a substantial military presence, commercial port operations, and a growing tourism business. Norfolk is home to the world's largest naval base with 46,000 active-duty personnel and 21,000 civilians. Other major installations include Langley Air Force Base, Fort Eustis, Fort Story and two National Aeronautics and Space Agency (NASA) facilities. Department of Defense (DOD) accounts for 40% of regional economic activity and increased by 5.6% annually from 2000 to its peak in 2012.

Spending is expected to total \$18.7 billion in 2015, marking a 3% decline from peak 2012 levels.<sup>2</sup> The Port of Virginia is the second-largest port on the East Coast by cargo volume, according to the latest American Association of Port Authorities data. The [Virginia Port Authority](#) (senior revenue-backed debt Aa3 stable) operates the port terminals. Tourism is also a pillar of the Hampton Roads economy. Tourists spent nearly \$1.3 billion in Virginia Beach in 2014 and tourism-related revenues in Virginia Beach have increased an average of 5% annually since 2010. Exhibit 1 shows the locations of the region's assets.

Exhibit 1

#### Hampton Roads Is Home to World's Largest Naval Base and Second-Largest US East Coast Port



Source: Moody's Investors Service

Urbanization and development can exacerbate flooding risks, and contribute to stormwater drainage flows. Last year, for example, storms combining high tides and severe rainfall left some drivers stranded in Norfolk, [Portsmouth](#) (Aa2 stable) and Virginia Beach. In some cases, land use and planning decisions have exacerbated the risks for flood-prone areas. For example, flooding has caused shutdowns of Norfolk's \$318 million light rail system several times since it opened in 2011; the system was built at sea level and thus is particularly vulnerable. Gradual increases in sea level would over time worsen the flooding risks in the region, particularly for low-lying areas and direct waterfront facilities. Eventually, this might require such investments as rebuilding of sanitary and storm sewer outfalls and other related sewer works, and the elevation of roadways or use of floodgates in low-lying areas. In the meantime, land use planning and building code measures can mitigate risks.

Given the extensive naval operations in the region and the problem of recurrent flooding, the US Department of Defense (DOD) is undertaking contingency planning and examining scenarios should long-term sea rise continue or accelerate.<sup>3</sup> Extreme sea rise would be very costly here, as it would be for many other places along the US coast. At the same time, we note that military installations in the area already at or close to sea level, such as Fort Story, have undergone recent expansion. Similarly, Virginia Beach has permitted some 500 residential projects along its waterfront in the past year.

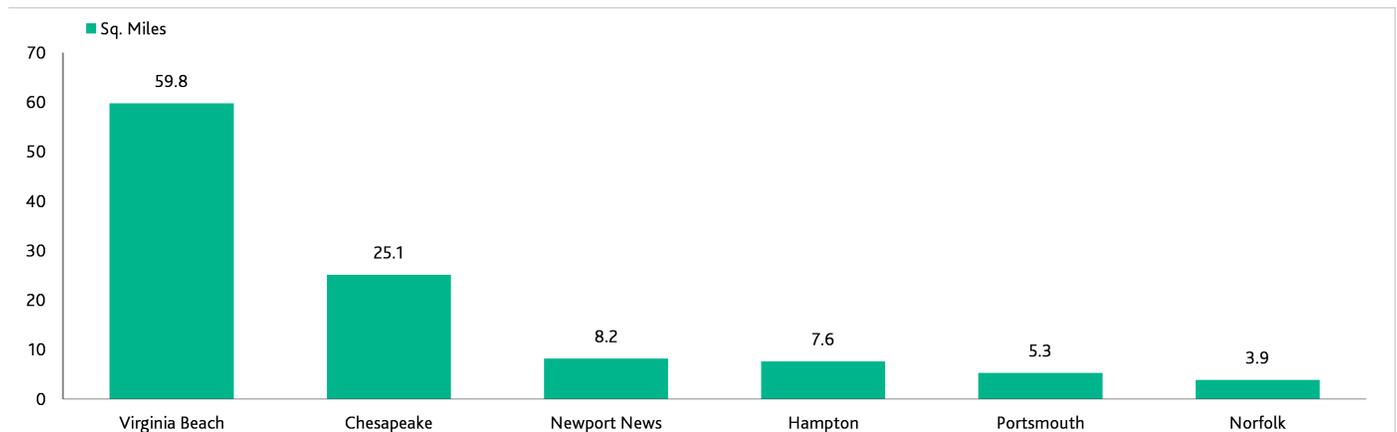
### **Stormwater and flood control management require both hard and soft investment to mitigate risk**

Coastal Virginia municipalities are broadly engaged in measures to prevent serious effects from recurrent weather and tidal-related flooding, as well as the more severe possibility of major ocean storm damage and heavy tidal surge. While capital investment for major works may be required, including floodgates or elevating roadways, flood resiliency can be effectively achieved with many "soft" measures that are both regulatory and physical. This includes land use planning to restrict development in sensitive areas; the stringent application of building codes requiring that any new structures in flood-prone areas be elevated; minimizing runoff through the use of pavers or other permeable surfaces for parking; and the incorporation of natural features such as swales and ponds into the stormwater runoff and impoundment system. At the same time, annual spending for basic maintenance of flood control works is critical, so that the physical system of a municipality is in good working order at all times.

### **Land use zoning and development plans reduce risk to the local economy**

The region's extensive waterfront areas, although obviously most vulnerable to flooding risks, continue to be major drivers of economic growth and tax-base valuation in each community. Residential waterfront locations may be desirable for many reasons, but they inevitably come with some risk. Flood risks could drive housing values down in flood-prone neighborhoods, negatively impacting property values and ultimately a municipality's tax revenue. Property taxes account for the majority of municipalities' operating revenues in the Hampton Roads region. While the lingering effects of the recession must be taken into account, the value of housing permits in the region decreased by 7% in 2014, falling 43% below peak values in 2005.<sup>4</sup> In Virginia Beach, 59.8 out of the nearly 310 square miles are susceptible to flooding over the next 100 years due, in large part, to low-lying land.(see Exhibit 2).

Exhibit 2

**Virginia Beach Is Susceptible to Flooding in Hampton Roads Region**

Source: Virginia Institute of Marine Science, *Recurring Flooding Study for Tidewater Virginia*

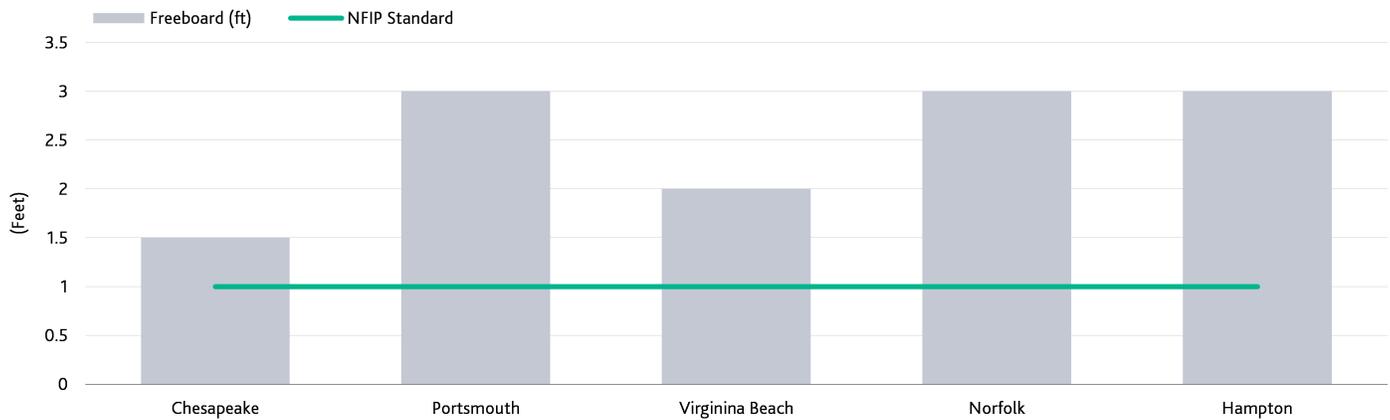
Much redevelopment in Virginia Beach continues to occur along its oceanfront. In 2013, the city strengthened a number of ordinances related to floodplain properties. Officials report a slowdown in the approval process to ensure proposed plans meet zoning requirements.

Virginia Beach officials expect the city's hurricane protection wall, constructed nearly 20 years ago, to withstand a storm event over a 140-year period. As a result, officials report that the majority of the city's oceanfront development is not in a direct floodplain, which is why over 500 residential development projects took place along the city's waterfront in the last year. The permitting process for these projects is extensive and includes advising applicants of their exposure to flooding, along with recommending shoreline stabilization techniques. The Virginia Beach City Council approved \$3 million in the 2015 budget to further study sea level and recurring flooding issues.

Municipalities participating in the National Flood Insurance Program (NFIP) are encouraged to adopt a minimum freeboard standard of one foot. According to the Federal Emergency Management Agency (FEMA), freeboard is a factor of safety usually expressed in feet above a flood level. Communities are generally encouraged to exceed the NFIP standard. In the Hampton Roads region, many municipalities have gone that route to provide a greater level of protection from flooding and help prepare communities for rising sea levels. Currently, [Chesapeake](#) (Aa1) has one-and-a-half foot freeboard requirements (see Exhibit 3). Virginia Beach has a two-foot requirement, while Norfolk, Portsmouth and Hampton have three-foot requirements.

Exhibit 3

### Hampton Roads Municipalities Exceed National Flood Insurance Program's (NFIP) Minimum Standard for Distance from Waterline to Base Level of a Property (aka Freeboard)



Sources: *Cities of Chesapeake, Portsmouth, Virginia Beach, Norfolk and Hampton*

Further, most Hampton Roads municipalities require that redevelopment projects, new construction and in some cases existing properties meet planning, zoning and building requirements including freeboard guidelines. With the majority of the area's roadways and key economic assets at or near sea level, new development in low-lying areas will continue to be a challenge.

Municipalities that take rising sea levels into consideration in long-term planning and new construction are better positioned to maintain their economic vitality. Further, land use policies that consider areas most vulnerable to sea-level rise and recurrent flooding are crucial to credit strength.

#### Capital investment in infrastructure is key to mitigating future debt burden risks

The region's cities have also actively pursued direct capital projects. Virginia Beach has continued to take an active approach to flood resiliency, particularly along its ocean front.

The city has completed \$43 million in flood control projects over the past five years and plans to spend \$135 million over the next 10 years on multiple stormwater management projects, including development of a flooding and sea level rise response plan by 2017. Additionally, Virginia Beach developed a sea wall at the oceanfront and has installed a number of storm water pump stations throughout the city.

In Norfolk, annual capital investments have allowed the city to manage recent increases in expenses related to storm events without significantly increasing its debt profile. Over the last three years, Norfolk has undertaken a comprehensive approach to address resiliency, and most recently selected by the Rockefeller Foundation to compete in its 100 Resilient Cities Centennial Challenge. The city is investing \$7 million annually for flood resiliency projects, which should help minimize long-term costs including a recently completed \$2.4 million mitigation project to elevate a bridge near Fort Norfolk. Additionally, Norfolk instituted a \$1 increase in residential stormwater rates in fiscal 2013 to help fund its ongoing flood control efforts. Norfolk's flood-related capital expenses would rise significantly if the city follows an action plan from Fugro Atlantic, a Dutch energy infrastructure firm. The city hired the firm to develop the plan, which calls for new floodgates, elevated roads and a retooled stormwater system. City officials report that this would require a total investment of \$1 billion in the coming decades, including \$600 million to replace current infrastructure. In part, the funds are needed to make homes and businesses more resilient to any major sea level rise. The city has not decided on a course of action regarding adoption of the action plan.

While conducting studies related to flood resiliency is valuable to the planning process, municipalities able to follow through with investment will be better positioned to deal with challenges. In Hampton, \$11.5 million in projects were identified in a Tidal Floodplain Study and Protection Plan initiated by the city and presented to the City Council in 2014. The plan includes the installation of storm

gates at high-impact locations and the elevation of roadways. The city's staff has begun to incorporate the projects into the fiscal 2016-20 capital improvement plan, but the City Council will need to make final decisions on funding levels in future years.

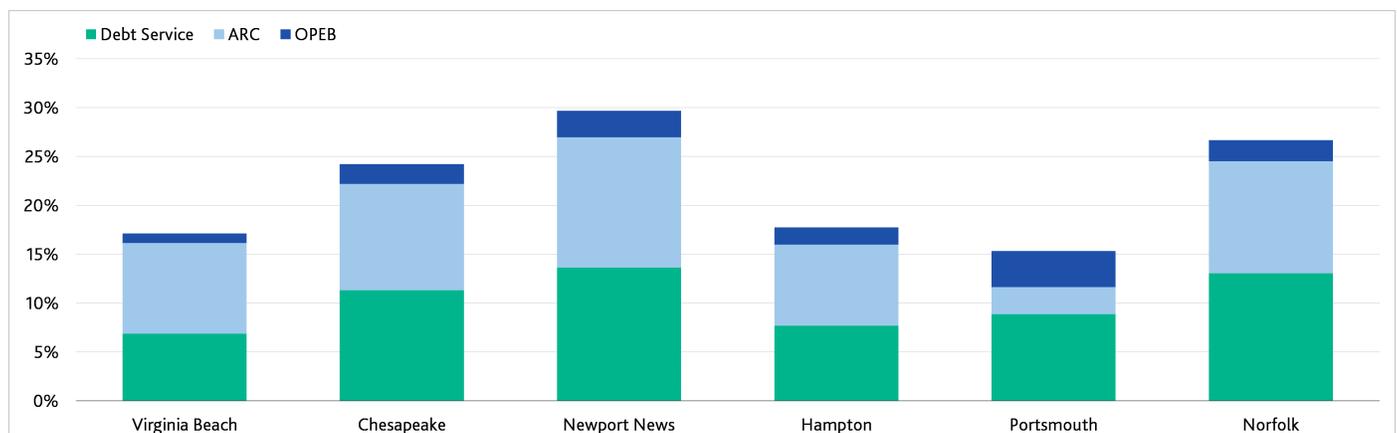
Hampton has spent \$28.7 million on flood mitigation over the last three years, including resiliency studies, construction of stormwater retention ponds, drainage maintenance projects, and installing breakwaters. The city's 2016 budget includes \$100,000 for staff consultants to further prepare for rising sea levels. Hampton reports no significant unexpected budgetary expenses as a result of flood events in the last few fiscal years.

Overall expenses for flood prevention measures, coupled with unexpected costs for storm cleanup, can pressure budgets already impacted by rising fixed costs and education spending, the largest budgetary expense for most Virginia cities. On average, fixed costs such as debt service, the annual required contribution (ARC) for employee retirement systems, and the pay-as-you-go portion of retiree health benefits typically make up between 16% and 30% of a Hampton Roads municipality's budget (see Exhibit 4). Debt service, which increases with additional capital borrowing, is often the largest fixed-cost component.

If fixed costs comprise 30% or more of a locality's budget, that government does not have much flexibility to add in a significant further increase in debt service to fund flood control capital work without pressuring its operating budget.

Exhibit 4

#### Fixed Costs Limit Available Funds for Flood Control in Hampton Roads Region



Note: ARC stands for annual required contribution for pensions expenses. OPEB stands for Other Post-Employment Benefits, mostly retiree health benefits.

Source: 2014 CAFRs

#### Conservative financial management and economic strengths benefit region's municipalities

Even with their flooding risks, municipalities in the Hampton Roads region have relatively high credit ratings, reflecting the overall strong economic base anchored by the region's concentrated military presence and port activity, together with broadly conservative financial operations across the individual local governments. These cities generally possess more than adequate financial flexibility to manage their fixed costs and support the day-to-day functions of government.

For example, even though Virginia Beach's available reserves fall below the national median, the city benefits greatly from a large and diverse \$50 billion tax base stabilized by the presence of the tourism industry and military bases. Officials are also committed to raising revenues to maintain financial flexibility, and to this end, the city's 2016 budget includes a 6-cent real estate tax increase. Additionally, city management proactively monitors revenues and expenditures on a monthly basis and has historically made adjustments to revenue and expenditure projections throughout the fiscal year.

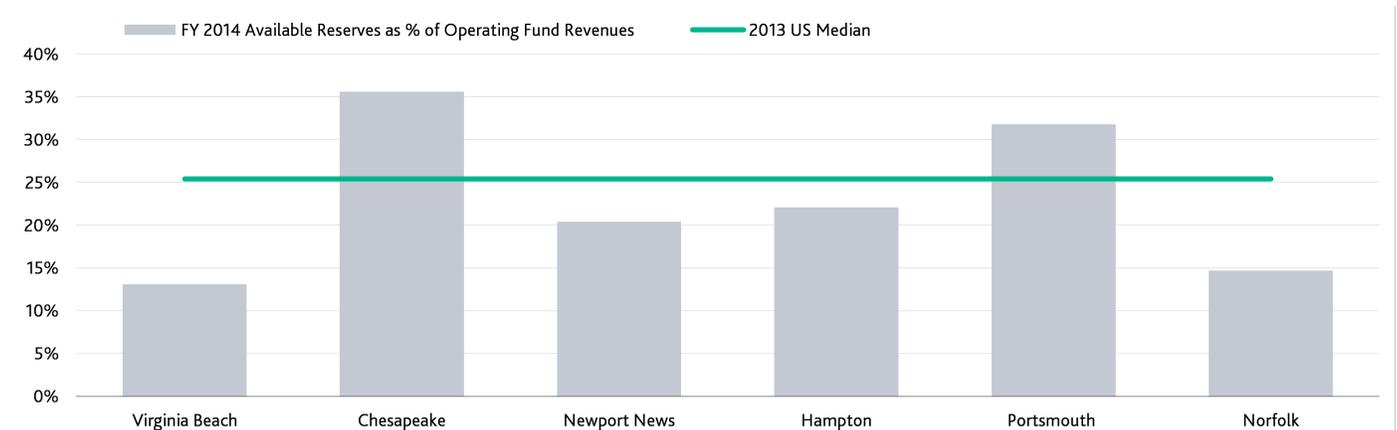
#### Flooding risks jeopardize reserve levels

However, the threat of increased flooding could materially impact budgets in the future and lead to draws on reserves. Exhibit 5 shows available reserves as a percentage of operating revenues at multiple Hampton Roads' local governments. Many of the regions'

municipalities have available fund balance levels below the national 2013 median, but we view the current reserve levels as satisfactory at their respective rating levels, given conservative budget management of each locality and the strong revenue-raising flexibility and expenditure control among Virginia local governments. Virginia cities have an institutional framework score of "Aaa," or very strong. Cities rely primarily on property taxes to support operations, providing high revenue-raising flexibility as property tax rates are not limited. Expenditures, which are primarily for education, are predictable and municipalities have the ability to reduce expenditures if necessary.

Exhibit 5

#### Available Reserves Provide Hampton Roads Communities Adequate Financial Flexibility for Flood Events, Though Budgetary Pressure Remains



Source: 2014 comprehensive annual financial reports (CAFRs)

General government operating expenses, leverage for flood prevention measures, and unexpected costs for storm cleanup can pressure budgets and lead to declines in a municipality's available reserves and overall financial flexibility. Thus, the Hampton Roads' municipalities, and all US local governments exposed to flooding risk, face difficult decisions in determining the right balance needed for flood mitigation work at the cost of lower operating flexibility and increased debt, and for waterfront development at the cost of putting additional assets at risk. In our bond ratings, we will continue to review these factors through our existing methodologies. Our general obligation bond methodology puts a 30% weight on a local government's tax base and demographics, another 30% for finances, 20% for management and 20% for debt and pension leverage.

### Flood mitigation risk is a matter for regional cooperation

When multiple municipalities occupy the same peninsula and surround the same harbor, coordinating flood control works, land use planning, and flood-related building codes can be effective. In the case of the Hampton Roads region, that coordination should extend to the concentration of military and related federal government institutions that control much of the land area here. A regional approach to flood resiliency is likely the most effective way to lessen the possibility of severe credit implications for the region's municipalities. Substantial costs to fund flood control infrastructure by one city, for example, could easily be undone by inadequate mitigation by a neighboring town. A regional approach is also warranted given the national economic and strategic importance of the area's port and military installations, along with its transportation infrastructure, such as the Chesapeake Bay Bridge-Tunnel.

The Commonwealth of Virginia has taken steps in this direction with a pilot project aimed at coordinating efforts at the local, state and federal level, including the Department of Defense, and has established other task forces relating to sea level and recurring coastal flooding. Recent legislation in the Virginia General Assembly also acknowledged benefits in treating Hampton Roads as a region when considering sustainable, effective and affordable flood control. Though the bill failed, it was the state's first attempt at a comprehensive approach to managing continued flooding in the region. Local universities and other government agencies are also contributing to a regional approach through coordinated research.

## Moody's Related Research

- » [US Federal Disaster Aid Is Critical for State and Local Governments](#)
- » [Moody's Research on Environmental Risks and Developments](#)

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

## Endnotes

- 1 US Department of Defense 2014 Climate Change Adaptation Roadmap
- 2 Regional Economic Forecast, Old Dominion University
- 3 US Department of Defense 2014 Climate Change Adaptation Roadmap
- 4 Regional Economic Forecast, Old Dominion University

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Danielle Jett

# Additional Proposal Information

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**CIP 7-027 SWM Master Planning.pdf**

**City of Virginia Beach, Virginia Fiscal Years 2020 through 2025 Capital Improvement Program**

**Project:** 7027000    **Title:** SWM Master Planning, Analysis, and Inventory    **Status:** Approved

**Category:** Storm Water    **Department:** Public Works

**Project Type**

**Project Location**

**Project Type:** Rehabilitation/Replacement    **District:** Citywide

**Programmed Funding**

Programmed Funding	Appropriated To Date	Budgeted FY 2020	Non-Appropriated Programmed CIP Funding					Future Funding
			FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	
14,788,056	9,770,906	0	997,430	1,002,430	1,002,430	1,007,430	1,007,430	0

**Description and Scope**

This project will provide master planning, analysis, and inventory/mapping of the City's Storm Water Management (SWM) system to improve operation and maintenance, and identify needed improvements. A comprehensive system inventory and maintenance of this inventory is a requirement of the City's Virginia Pollutant Discharge Elimination System (VPDES) permit. The SWM system consists of a primary system (canals, lakes, and ponds) and local systems (neighborhood collector systems), both natural and manmade.

**Purpose and Need**

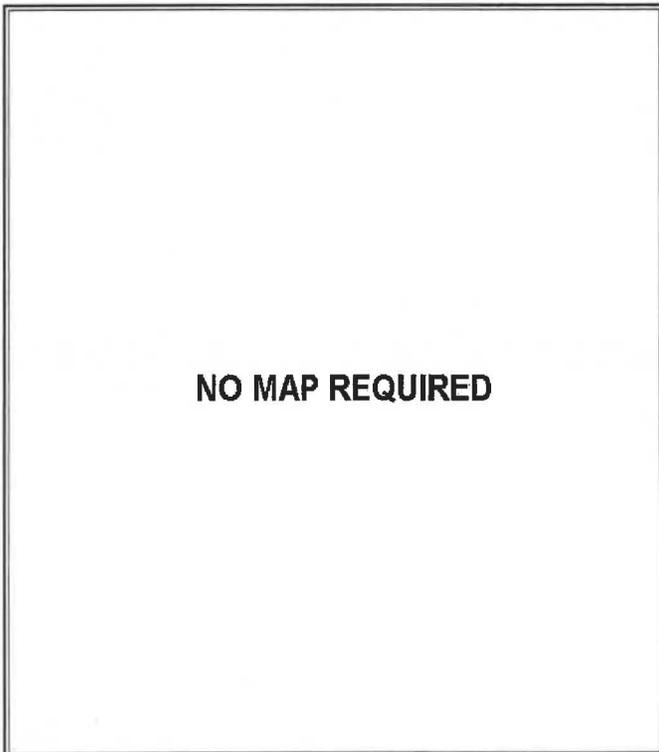
This program supports the development of the Comprehensive Storm Water Management Plans identified by the Green Ribbon Committee as a clean water initiative and updating the Storm Water quantity watershed studies. Additionally, the City's VPDES permit requires that the City maintain a system inventory to aid in spill response and system maintenance. This program will update drainage studies of the 32 watersheds within the City by assessing conditions; classifying deficiencies, both storm water quality and quantity; propose corrective actions and plan for future development. In addition, the study will provide base information in support of appropriate growth, compliance with surface water quality regulatory programs (MS4, VSMP and TMDLs), and serve to support ongoing studies regarding sea level rise. The study will establish appropriate regulatory and capital improvement projects per watershed. In addition the areas within the specific watersheds will be studied further as required to define the need for future drainage improvements construction projects.

**History and Current Status**

This project first appeared in the FY 2000-01 CIP. More recently, this project's drainage analysis was directed to respond to the Green Ribbon strategies. The responsibilities of this project were expanded in FY 2009-10 to address the increasing storm system inventory needs. Current project responsibilities include updating the comprehensive storm water master plans (both water quality and water quantity) to link with the City's GIS system to meet the maintenance and water quality needs dictated by the City's VPDES permit and to the Sea Level Rise/ Recurrent Flooding project CIP 7-030. The project will also maintain the City's tide and rain gauges through a reimbursement contract with the United States Geological Survey agency. The data collected through these gauges provides an invaluable tool to enhance and refine the SWM plan models. The gauges also provide data to the Natural Weather Service providing enhanced capabilities for responding to emerging storms.

**Operating Budget Impacts**

**Project Map**



**Schedule of Activities**

Project Activities	From - To	Amount
Design	10/00 - 06/25	14,788,056
<b>Total Budgetary Cost Estimate:</b>		<b>14,788,056</b>
Means of Financing		
Funding Subclass	Amount	
Local Funding	14,788,056	

**Total Funding:** 14,788,056  
Capital Projects

# Additional Proposal Information

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**CIP 7-030 SLR.pdf**

**City of Virginia Beach, Virginia Fiscal Years 2020 through 2025 Capital Improvement Program**

**Project:** 7030000    **Title:** Sea Level Rise/Recurrent Flooding Analysis    **Status:** Approved

**Category:** Storm Water    **Department:** Public Works

**Project Type**

**Project Type:** Rehabilitation/Replacement

**Project Location**

**District:** Citywide

**Programmed Funding**

Programmed Funding	Appropriated To Date	Budgeted FY 2020	Non-Appropriated Programmed CIP Funding					Future Funding
			FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	
5,044,447	3,844,447	160,000	240,000	400,000	200,000	200,000	0	0

**Description and Scope**

This project is for the Comprehensive Citywide Sea Level Rise (SLR)/Recurrent Flooding Analysis of the four major watersheds located within the City (Lynnhaven, Elizabeth River, Oceanfront, and Southern Watersheds). The analysis will serve as the tool for developing the City's comprehensive response to SLR and Recurrent Flooding. It will identify vulnerable areas and assess the appropriate role of recognized adaptation strategies for each vulnerable area. It will develop recommendations for responding to SLR/Recurrent Flooding in each vulnerable area, and provide budgetary costs along with funding options for implementing the recommendations. The analysis will require multi-departmental assessment and consideration.

**Purpose and Need**

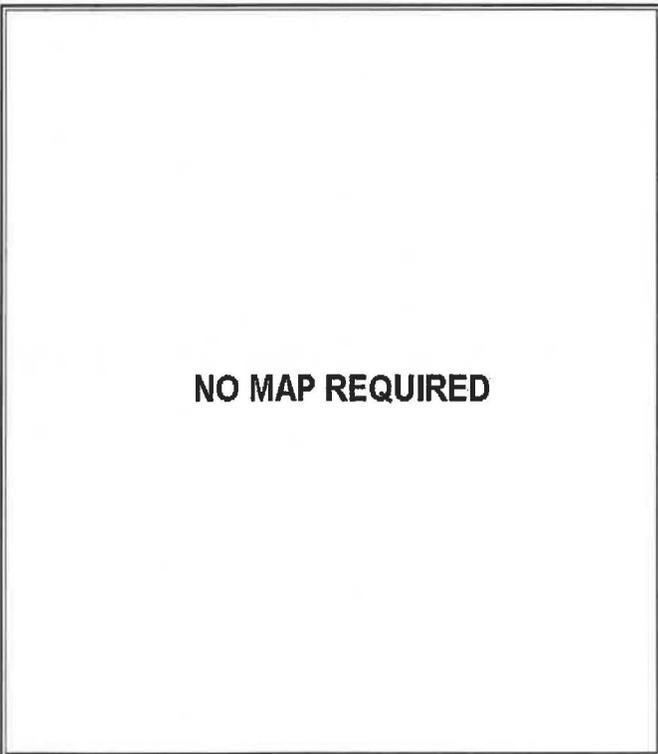
Multiple areas throughout the City currently are or are projected to experience recurrent flooding. A comprehensive Sea Level Rise (SLR) and Recurrent Flooding Analysis for the City of Virginia Beach is needed to help the city develop a comprehensive response to SLR and recurrent flooding impacts to the City.

**History and Current Status**

This project first appeared in the FY 2014-15 CIP. Data suggest both sea level and the high water levels produced by coastal storms are increasing. Additionally, the Virginia Institute of Marine Science (VIMS) reports that Sea Level Rise will continue to rise into the future. A Comprehensive Sea Level Rise/Recurrent Flooding Analysis will serve as the basis for the City Response and will: identify the probable extent of impacts; evaluate the appropriate role of each adaption strategy in vulnerable areas and; identify budgetary cost and funding options for implementing engineering protection measures as well as other recommended adaptation programs.

**Operating Budget Impacts**

**Project Map**



**Schedule of Activities**

Project Activities	From - To	Amount
Study Only	07/14 - 06/24	5,044,447

**Total Budgetary Cost Estimate:** 5,044,447

**Means of Financing**

Funding Subclass	Amount
Local Funding	4,200,000
Federal Contribution	844,447

**Total Funding:** 5,044,447  
Capital Projects