THRIVE

Resilience In Virginia

HUD-NDRC:

Phase 2 Application

The Commonwealth of Virginia

EXHIBIT A:

EXECUTIVE SUMMARY

COMMONWEALTH OF VIRGINIA

ExhibitAExecutiveSummary.pdf

EXHIBIT A: EXECUTIVE SUMMARY

The Commonwealth of Virginia is partnering with three of the largest localities in the state, the cities of Norfolk, Chesapeake, and Newport News to submit a Phase II application to the US Housing and Urban Development's (HUD) National Disaster Resiliency Competition (NDRC). The six proposed NDRC projects within the partner localities, situated in the Hampton Roads coastal region where flood-vulnerable watersheds on the James and Elizabeth Rivers emanate from the Chesapeake Bay, are conceived as a set of pilot projects to initiate a long-term culture of resilience in every community throughout the region and, eventually, the Commonwealth.

Hampton Roads is home to over 1.7 million people, and following Hurricane Irene in 2011, the entire region was declared a major disaster area by the President. The risk from severe storms like Irene is exacerbated by sea level rise: Hampton Roads has the highest rate of relative sea level rise along the US east coast due to a combination of rising water and significant land subsidence in southeastern Virginia.

While the region is threatened by water, water is also critical to its economy. Hampton Roads is home to the world's largest military base, Naval Station Norfolk, (with a plant replacement value of over $4.2B), and many other major military installations and federal facilities such as NASA Langley. The Port of Virginia, another economic driver, is the only east coast port with shipping channels deep enough to accommodate the new Post-Panamax ships, and the largest shipper of coal in the US. These assets, which position the region as a global leader in security and trade, are investments worth supporting.

Innovation is found in Virginia's holistic regional resiliency approach that extends beyond infrastructure to encompass community and economic development. The Commonwealth's proposed NDRC projects will not only reshape the physical environment through water management, they are also connectional, linking LMI target-area residents with community resources, employment opportunities and expanded recreational amenities. Virginia's approach also provides the means for citizens to continue important community conversations on resilience that began as a result of the NDRC engagement process.

The proposed projects address a variety of extremely challenging social conditions, including high poverty public housing, low-moderate income traditional owner-occupied neighborhoods, industrial working waterfronts, disconnected communities, and areas primed for private commercial investment. Finally, a regional Coastal Resilience Lab and Accelerator Center will generate economic growth from water management innovation by leveraging state-wide academic research and regional workforce development focused on low- and moderate-income (LMI) persons and living wage employment.

Virginia has further refined its rather broad Phase I approach, **THRIVE: *Resilience In Virginia***. In the Phase II development process, stakeholders focused on three of the five original goals: ***Build Water Management Solutions***, ***Strengthen Vulnerable Neighborhoods*** and **Improve Economic Vitality**. Together they will yield two long-term outcomes: ***Create Coastal Resilience*** *and* ***Unite the Region***.

The Commonwealth and its partners have secured over $475 million in direct leverage to support the proposed projects in the Ohio Creek and Newton's Creek Watersheds (City of Norfolk), Crestwood/Oak Grove and South Norfolk/Mill Creek Watersheds (City of Chesapeake), and the Salters Creek Watershed (City of Newport News). Projects and activities vary based on the cities' unmet needs and community objectives, but all of them demonstrate how water management systems can be used to reconnect neighborhoods to natural environments, economic opportunity and to each other.

Since 2014, Governor Terry McAuliffe has implemented a number of state-wide initiatives that are building resilience, including convening the Governor's Climate Change and Resilience Update Commission (July 2014) and appointing the Commonwealth's first Chief Resiliency Officer in 2015. Regional and city collective action is evidenced by the June 2015 Virginia Dutch Dialogues convened by Norfolk, Newport News, and Hampton to explore innovative solutions to regional flooding issues and by Norfolk's selection as one of the first cities worldwide in the 100 Resilient Cities program in 2014.

EXHIBIT B:

THRESHOLD REQUIREMENTS

COMMONWEALTH OF VIRGINIA

ExhibitBThresholdRequirements.pdf

EXHIBIT B: THRESHOLD REQUIREMENTS

ELIGIBLE APPLICANT. The Commonwealth of Virginia is among the 40 Eligible Applicants invited to propose resilience-enhancing disaster recovery projects for the US Department of Housing and Urban Development's (HUD) National Disaster Resilience Phase TWO Competition (HUD-NDRC). The qualifying disaster for the Commonwealth's HUD-NDRC Phase II application is Hurricane Irene (2011).

Unmet Recovery Need (URN) and Target Geography. The Commonwealth's Phase II application focuses on the qualifying jurisdiction MID-URN target areas in three Hampton Roads cities: Norfolk, Chesapeake and Newport News.

NEWTON'S CREEK WATERSHED AND OHIO CREEK WATERSHED (CITY OF NORFOLK). The qualifying MID-URN target area demonstrated in Phase I included 74 out of 80 census tracts where 54% of the population is low- and moderate-income (LMI), with nearly 15% living below the federal poverty level. Additionally, nearly 40% of the census tracts are classified as medically underserved. (See Attachment I). Three hundred and forty-five (345) residential properties in the target area sustained damage during Hurricane Irene. Of the 345 damaged properties, a windshield survey (January 2015) documented that 93 have remaining damage in need of resilient repair and lie within a FEMA designated floodplain. Ten (10) surveyed residents confirmed that; (i) the damage was due to the disaster, and (ii) they had inadequate resources from insurance/FEMA/SBA to complete the repairs.

For Phase II, Norfolk considered additional data, including a GIS analysis, vulnerability assessments and community input to identify and prioritize the sub-area for CDBG-NDR-supported projects within its overall MID-URN qualified target area. See Virginia's Phase II Dropbox folder (V) [V01.pdf]. This analysis revealed distinct needs in two adjacent watersheds on the Southern Branch of the Elizabeth River, the *Newton's Creek* and *Ohio Creek Watersheds*.

Project Sub-Areas Characteristics: (i) the *Newton's Creek Watershed*, contains census tracks (whole or partial) 35.01, 41, 42, 46, 47, 48, and 49; and the *Ohio Creek Watershed* contains census tracts (whole

or partial) 46 and 47. The sub-areas include the neighborhoods of St. Paul's, South Brambleton, Harbor Park, Grandy Village and Chesterfield Heights.

The sub-area contains a total population of 11,840 persons. Of this population, approximately 86% households are LMI. The target area has a median household income of $25,350 (48% of the national median household income.) Within the area, 43.2% of households live below the poverty line. Within this area, over 2,000 public housing units experience frequent chronic flooding.

CRESTWOOD/OAK GROVE WATERSHED AND SOUTH NORFOLK/MILL CREEK WATERSHED (CITY OF CHESAPEAKE). Within the City of Chesapeake, the qualifying target area demonstrated in Phase I included the census tracts: 214.03, 200.02, 200.03, 201, 202, 203, 204, 205, 206, 207, 209.03, and 209.04. The population of the target area is 50,025 and of whom population, 25,940 individuals, or 51.85%, are LMI, as indicated by CDBG LMI summary data.

Three hundred and thirty-five (335) homes in Chesapeake sustained damage during Hurricane Irene, with 166 concentrated in the target area. A windshield survey (January 2015) documented that 59 of these damaged properties lie within a FEMA designated floodplain and have remaining damage in need of resilient repair. Ten surveyed residents confirmed that; (i) the damage was due to the disaster, and (ii) they had inadequate resources from insurance/FEMA/SBA to complete resilient repairs.

For Phase II, additional data were analyzed to further investigate Chesapeake residents' needs and extent of problems, including the *Risk and Vulnerability Assessment* from the FEMA-approved *City of Chesapeake 2014 Hazard Mitigation Plan* (HMP), *2014 Neighborhood Quality of Life Study Update* (NQL), and Chesapeake's *2012 Statistical Profile*. Chesapeake considered all damages from Hurricane Irene within the MID-URN target area census tracts, as well as other needs based on the risk for all populations in the target area. This additional research identified the two sub-areas for proposed NDRC-funded projects; the *Crestwood/Oak Grove* and *South Norfolk/Mill Creek Watersheds*.

SALTERS CREEK WATERSHED (CITY OF NEWPORT NEWS). The Commonwealth of Virginia's Phase II application adds a third qualifying target area in the City of Newport News that includes census tracts: 301, 303, 304, 305, 306, 308, 309, 312, 313, 314, 316.01 and 316.02. See Attachment I for MID-URN Checklist; see dataset at [V18.pdf]. Two hundred and twenty-nine (229) residential properties in Newport News sustained damage during Hurricane Irene, with 91 concentrated in the target area [V19.pdf].

Residents of the target area experience nuisance flooding during common rain storms, as well as significant flooding during nor'easters and hurricanes. Hurricane Irene was atypical because the low tide occurred during the storm, sparing the city from high water. Although flooding from Irene was relatively minimal, there was significant damage from wind and rain.

An unmet need for resilient repair of wind and rain damage could not be observed since most resilient wind repairs cannot be seen from the street (as opposed to resilient repair for floods, where homes are raised), so a comprehensive windshield survey was not possible. Instead, Newport News directly surveyed 22 homeowners (in September-October 2015) to determine if resilient repairs were made.

According to the APA-The Engineered Wood Association standards (in *Building for High Wind Resistance in Light-Frame Wood Construction*, 2011), resilient repair includes more complex nailing patterns and truss/rafter tie downs, which exceed Virginia Statewide Building Code requirements. As such, resilient repair is more expensive than the minimum repairs required, and few homeowners choose or can afford that option. Of 22 target area homeowners surveyed, 21 confirmed (i) their homes experienced damage due to the disaster, and that (ii) they had inadequate resources from insurance/FEMA/SBA to complete resilient repairs [V20.pdf] & V21.pdf].

The Commonwealth has identified the *Salters Creek Watershed* [V22.pdf], which includes census tracts, 301, 303, 304, 305 and 306 as the project area; the LMI population average is 77.77%.

Eligible Activity. All NDRC project activities proposed by the Commonwealth of Virginia meet a HUD national objective (see section below: HUD National Objective), as well as tieback to the qualifying

disaster (see Exhibit D). The proposed project activities directly relate to an unmet recovery need (see Exhibit D) within the target areas identified in the cities of Norfolk, Chesapeake and Newport News.

Resilience Incorporated. As discussed in Exhibit G, the Commonwealth and its three qualified Hampton Roads city partners have taken significant measures to improve long-term community resilience by increasing freeboard requirements, aligning plans, and investing resources into green and gray infrastructure measures that will improve resilience to current and future flooding risk and SLR.

HUD National Objective. The proposed NDRC projects fulfill the national objective of benefiting low to moderate income (LMI) households by protecting their homes and businesses from the effects of extreme weather and flood events, and by improving the quality of life within the communities through decreased risk, environmental resilience, and the creation of additional economic and social opportunities for residents (see Exhibit E). As noted above, the target areas and project areas in the cities of Norfolk, Chesapeake and Newport News meet the required threshold of greater than 50% LMI persons.

Overall Benefit. The Commonwealth of Virginia will allocate at least 50% of funds requested for programs and activities developed within Phase II of the NDRC application to benefit LMI persons. Please see Exhibit E for detailed benefits of the proposed NDRC projects to the target area residents.

Establish a Tieback. All of the Commonwealth of Virginia's proposed CDBG-NDR activities tieback to the 2011 Qualified Disaster, Hurricane Irene, by addressing demonstrated direct and indirect effects of the disaster. Specific details on tieback for the proposed projects are provided in Exhibit E.

Benefit-Cost Analysis. Comprehensive Benefit-Cost Analyses (BCA) for the proposed projects were prepared by the cities of Norfolk, Chesapeake and Newport News (Attachment F). Each BCA considers losses to structures, households and businesses in the target areas, as well as the local and regional social, environmental, economic and resilience benefits of the projects.

CDBG-NDR Applicant Certifications. CDBG-NDR certifications for the Commonwealth of Virginia and the cities of Norfolk, Chesapeake and Newport News are included in Attachment C.

EXHIBIT C:

CAPACITY

COMMONWEALTH OF VIRGINIA

ExhibitCCapacity.pdf

EXHIBIT C: CAPACITY

THE COMMONWEALTH OF VIRGINIA. The Commonwealth of Virginia brings many years of proven experience successfully managing disaster recovery to its National Disaster Resilience Competition (NDRC) grant funding application. Virginia ranges from the Blue Ridge Mountains to the Chesapeake Bay, and this geographical diversity engenders a variety of natural disasters including hurricanes, tornadoes, severe winter storms, and geological hazards like landslides and earthquakes. Within the Hampton Roads region, a main consequence of weather disasters is flooding. Virginia must also be prepared for manmade threats, such as radiological and HazMat problems, and terrorist incidents, given its concentrations of military installations, and major port and rail operations.

The Virginia Department of Emergency Management (VDEM) is responsible for disaster management and building resiliency, including assessing vulnerabilities, mitigating hazards, planning and coordinating assets and resources, and emergency services. Critical skills for resilient disaster recovery include: the ability to assess vulnerability and define needs; to identify long-term resilient solutions; to conduct a Benefit-Cost Analysis; knowledge of construction and GIS; program and fiscal management experience; ability to interpret state/federal regulations; and communication skills for planning and outreach to citizens.

Historically, Virginia's mitigation programs have assisted communities by sponsoring individuals for projects like acquisition of flood-prone properties, elevations of homes, flood-proofing of businesses, and localized storm water management projects, and the state typically provides 20% of the 25% required non-federal match for mitigation projects. Per FEMA, on average, every dollar spent on mitigation returns four dollars, excluding community and business continuity, environmental benefits, or the homeowner benefit of lower flood insurance costs. Virginia has awarded localities and Planning District Commissions over $33,000,000 in total project costs through FEMA disaster and non-disaster grants since August 2012. Based on the FEMA measure, the value of direct mitigation for the last three years exceeds $132,000,000.

Addressing Climate Change and Sea Level Rise. In 2008, Governor Tim Kaine created the Virginia Commission on Climate Change to study climate change, increasing extreme weather events, and SLR. It found a decline or disappearance of key Chesapeake Bay species, increased damage from more frequent and severe storms, and the spread of vector-borne diseases like West Nile virus.

In July 2014, the current governor, Terry McAuliffe, convened the Governor's Climate Change and Resiliency Update Commission, which developed these recommendations: 1) Establish a Climate Change and Resilience Resource Center, 2) Create a Virginia Trust for Energy and Resilience, 3) Establish a renewable energy procurement target for Commonwealth agencies, 4) Adopt a zero emission vehicle program, and 5) Leverage federal funding to make coastal communities more resilient. Decision-making is also informed by the Secure Commonwealth Panel's Recurrent Flooding Subpanel, the Center for Coastal Resources Management at Virginia Institute of Marine Science (VIMS), the Coastal Policy Clinic at William & Mary Law School, Old Dominion University's Whole of Government Pilot Program, Virginia's Coastal Zone Management Program, and the Floodplain Management Program.

Additional Actions. In 2015, Governor McAuliffe appointed the Secretary of Public Safety and Homeland Security, Brian Moran, as the Commonwealth's first Chief Resiliency Officer and the single point of contact for resiliency issues. Secretary Moran's office subsequently began to revamp emergency planning and disaster relief in eastern Virginia, addressing deficiencies identified by the governor.

Innovation and Entrepreneurship. Virginia also recognizes the critical role of the economy in building resiliency. Virginia universities generated 1.94 startups per million residents in 2013, and Governor McAuliffe has made building a strong entrepreneurship support system a priority. Recently, the Governor announced the winners of the first-ever Virginia Velocity Business Plan Competition, which provided $850,000 to five bioscience and energy companies planning to expand their business in Virginia.

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT (DHCD). Governor McAuliffe has designated the Virginia Department of Housing and Community Development (DHCD) as the lead

agency for Virginia's NDRC application. DHCD has significant experience with major projects and will also serve as grant administrator and project implementation manager upon award. As the primary point of contact for programmatic and contractual obligations, DHCD will be responsible for grant oversight, fiscal and budgetary controls, and inter-community coordination.

DHCD partners with Virginia communities to develop their economic potential, regulates the state's building and fire codes, provides training and certification for building officials, and invests more than $100M each year into housing and community development projects throughout the state – and most are designed to support low-to-moderate income citizens. The department also runs a number of programs aimed at preventing homelessness and advancing homeownership, and provides a range of multi-purpose community development grants for a variety of community needs.

Past Experience of the Applicant. DHCD is committed to creating safe, affordable, and prosperous communities in which to live, work and do business in Virginia. The agency strategically invests financial and technical resources into affordable housing and development projects to attract private sector development and further investment. By promoting regional economic collaborations in economically distressed areas, DHCD stimulates job creation, builds community capacity, and empowers residents. DHCD also supports small business and entrepreneurs, incorporating community assets into revitalization strategies to restructure economies and create vibrant and competitive communities.

The agency serves many of Virginia's most vulnerable individuals, including the homeless and special needs populations, and collaborates with partners to offer more creative community-based housing response systems and to provide integrated community housing options for persons with intellectual, developmental, and physical disabilities. DHCD's continues to prioritize the stabilization of neighborhoods still affected by the foreclosure crisis.

General Administrative Capacity. DHCD has extensive experience managing federal resources, including HUD-funded programs to such as the HOME, state Community Development Block Grant

Program (CDBG), Neighborhood Stabilization, Emergency Solutions, Housing Opportunities for Persons with AIDS, and when appropriated, Disaster Recovery programs, along with other federally funded programs including Weatherization Assistance, Low-Income Home Energy Assistance Program, and the Rural Community Development Initiative. DHDC staff are well-equipped to navigate federal cross-cutting and housing-related requirements, including the Environmental Review Process, Section 3, Labor Standards, Lead, the Uniform Allocation Act, and Fair Housing. Staff have significant experience working in both the Integrated Disbursement and Information System, and the Disaster Recovery Grant Reporting System, and are cross-trained to provide back-up coverage as needed. DHCD staff are currently working with the Council of State Community Development Agencies and HUD on the development of an *Affirmatively Furthering Fair Housing* assessment tool for use by states.

The HUD Neighborhood Stabilization Program (NSP) is a high profile program developed to help communities stabilize neighborhoods impacted by foreclosure and abandonment that illustrates DHCD's ability to effectively carry out a highly leveraged, time-sensitive priority program. The Virginia NSP successfully acquired, rehabilitated, and resold over 300 homes, generating close to $50M in program income that is reinvested to sustain program operation. DHCD provided resources and coordinated the efforts of 25 local governments and nonprofits that assist homeowners facing foreclosure.

Another program, the Virginia Enterprise Zone, a state and local government partnership, incentivizes job creation and private investment in designated Virginia Enterprise Zones. In 2014, it attracted $245.6M in new private investments in distressed communities, a 21 % increase over 2013.

***Cross Disciplinary Capacity*.** DHCD is responsible for managing state CDBG funds, federal and state housing programs, disaster recovery assignments, and other major federal and state programs; all require cross-disciplinary work. Agency projects depend on effective coordination of multiple public and private sector functions, teams, and disciplines, including planning, design, engineering, environmental, and socio-economic approaches. DHCD also oversees many of Virginia’s storm disaster management, public

works, environmental quality, building and fire code regulation, and economic revitalization projects.

DHCD's approach to the innovative Building Collaborative Communities program coordinates the resources of multiple state agencies, private sector partners, educational institutions, community groups, and individuals. These partners focus on strategic economic development outcomes, such as job creation, economic development, and increasing community capacity and leadership in economically distressed areas.

Experience with Collaboration and Coordination for Large Projects. DHCD's approach to project management relies on the development of a robust project management team comprised of project stakeholders who are held accountable for oversight and management of each project. Citizen participation is key to the team's success, and each management team includes area residents. DHCD is an active member of the team and facilitates development of the project work plan and contract.

An example of a large-scale community revitalization development strategy and systems change is DHCD's leadership in transforming delivery of homeless services from a strictly shelter-based system to a collaborative community-based system that is responsive to emergency homelessness and uses best-practice strategies like rapid re-housing. As a result, Virginia's overall homelessness decreased by 23% from 2010 to 2015 as did family homelessness. Veteran homelessness decreased by 31% from 2012 to 2015. This successful transformation of its homeless services system is a national model: community-based solutions and rapid re-housing have functionally ended veteran homelessness in Virginia.

Technical Capacity. DHCD encompasses a wide range of programs and services, and its technical capacity is unusually broad. In addition to the community-based programs previously described, DHCD understands the need of vulnerable populations. For example, the HOME Affordable and Special Needs Housing program preserves housing for low-income persons; LMI renters and homeowners are assisted through the Down Payment Assistance, Savers, and Emergency Home and Accessibility Repair programs; and business start-up and revitalization is supported via the Community Business Launch, CDBG, and Industrialized Revitalization Fund programs. DHCD also has oversight of the Virginia Uniform Statewide

Building Code and the Virginia Statewide Fire Prevention Code, and promotes incentives available for Green-Building and Energy Efficiency. Virginia is recognized by the Insurance Institute for Business & Home Safety as having the top-rated building codes among hurricane prone states.

DHCD's program experience has made the agency nimble. When DHCD Weatherization Assistance Program funding increased almost overnight from roughly $10M to $100M, DHCD quickly ramped up its delivery system, adding staff and increasing local provider capacity. While developing a more robust training center, the agency established new partnerships with the community college system to quickly prepare the necessary workforce. Innovations such as a new centralized and coordinated system facilitated application intake and review, project and budget management, invoicing and reporting, transparency and efficiency. DHCD will draw on this flexibility in administering NRDC grant funding.

Capacity for Community Engagement and Inclusiveness. Through its administration of HUD and other social service programs, DHCD regularly works with vulnerable and special needs populations. Most DHCD-administered programs require public participation, and the agency holds public meetings that encourage citizens to participate in the process. Community-based meetings are widely publicized through local advertisements, flyers, outreach through faith-based organizations, and public notices.

VDHCD Management Team and Key Staff. Please see p. 24 for a current organizational chart that identifies key management positions and staff responsible for day-to-day operations, implementation, and monitoring CDBG-NDR projects. DHCD's relevant management structure includes:

Bill Shelton, Director of the Virginia DHCD, is responsible for the management and policy oversight. He will provide oversight and represent DHCD in Disaster Resiliency discussions at the state level.

Chris Thompson, Deputy Director of Housing, will serve as the Virginia Resilience Project Director, where he will provide primary oversight of operations. With 15 years of program management experience, Mr. Thompson most recently led the Agency's Policy and Strategic Development office.

Al Williams, Deputy Director of Administration and Finance Director, serves as VDHCD's Finance

Director. Mr. Williams oversees all financial management and accounting functions for the agency.

References for the Applicant, the Commonwealth of Virginia:

1) Donald E. Goodwin, CBO, CFM, Director of Community Development; City of Franklin; 207 W. 2nd Avenue; Franklin, VA 23851; 757-562-8681; dgoodwin@franklinva.com.

2) James A. Baldwin, Executive Director; Cumberland Plateau Planning District Commission; P.O. Box 548, 224 Clydesway Drive; Lebanon, VA 24266; 276-889-1778; jimbaldwin@bvu.net

THE HAMPTON ROADS REGION. The Commonwealth of Virginia will pilot strategies to build resilience in the Hampton Roads Region of southeastern Virginia, where its citizens face recurrent flooding and the second fastest rate of SLR on the East Coast. This vitally important area takes its name from the large sheltered harbor ,"Hampton Roads" (formerly *Roadstead*), where five tidal rivers, The York, James, Nansemond, Elizabeth, and Lafayette, converge at the mouth of the Chesapeake Bay. The rivers extend watery fingers into the seven cities that surround the harbor: Newport News, Hampton, Portsmouth, Norfolk, Suffolk, Chesapeake, and Virginia Beach. This strategic location makes the region economically critical to the Commonwealth: it is home to both Naval Station Norfolk, the largest naval base in the world, and the Port of Virginia, the largest ship building and repair complex in US. Hampton Roads is a nexus of trade for the eastern third of the US and a security center for the world. While Virginia may not partner with federal entities for the NDRC, the military is nonetheless an informal partner, and resilience efforts are well coordinated at state, regional and local levels with military commands in Hampton Roads.

Hampton Roads Planning District Commission (HRPDC). As the regional planning agency for 17 local government members, HRPDC has regularly convened localities to discuss coastal flooding and SLR adaptation since 2008. In March 2014, HRPDC created a Special Regional Committee on Recurrent Flooding and Sea Level Rise to foster resilience on a regional scale. Committee members represent Hampton Roads localities, universities, the Army Corps of Engineers, and numerous environmental

organizations. In December 2014, the regional group approved a proposed resolution to encourage localities to adopt new freeboard requirements. Currently, HRPDC is developing Hampton Roads' first regional strategic plan, *Envision Hampton Roads*, based on extensive community input. The HRPDC is well-positioned to coordinate and support public participation in a regional resilience dialogue.

Regional collaboration has been further advanced by the June 2015 "Virginia Dutch Dialogues" workshop, modeled on a workshop held in post-Hurricane Katrina New Orleans. Sponsored by the Dutch Embassy and supported by a four month regional preparation process, the cross-disciplinary workshop was an intensive, multi-day event with over 60 regional stakeholders, including Norfolk, Hampton, Newport News, HRPDC, regional universities, and community organizations.

CITY OF NORFOLK. ***Partner's Past Experience.*** Norfolk is the second largest city in Virginia and has been a key part of America's history, commerce, and innovation, most recently as a national leader in the field of resilience. In 2008, Norfolk city administrators began to analyze its re-current flooding and SLR issues, and completed a citywide assessment to help prioritize problem areas, identify potential flooding scenarios, and define objectives for various remediation flood defense improvements. The next year, a severe Nor'easter confirmed that flood defense and mitigation is a critical issue for Norfolk. Flooding was formally acknowledged as a main priority in 2011 with the establishment of Team Norfolk, which drew members from across all sectors: public, private, nonprofit, higher education and military. Over the next two years, Team Norfolk produced the first effort at a comprehensive, community-wide approach to preparedness and resilience. The group meets monthly, continuing its cross sector resilience collaboration.

Norfolk has actively sought funding to increase resilience and successfully applied to the first round of the Rockefeller Foundation's 100 Resilient Cities (100RC) Initiative in 2013. The two-year 100RC grant provided a wealth of resources, including funding for Norfolk's first (and world's third) Chief Resilience Officer (CRO), access to renowned international experts, and membership in a cohort of global cities with similar challenges. Norfolk's 100RC efforts focused on analyzing the city's three major

challenges: SLR and recurrent flooding; a shifting economy, and a need to build strong, healthy neighborhoods. The CRO and her team conducted extensive research and consultations, engaging stakeholders to understand the city's needs, challenges and opportunities. The project culminated in October 2015, with the launch of Norfolk's Resilience Strategy, which will guide the city in its shift to a successful coastal community of the future.

Norfolk also partnered with Sandia National Laboratories to assess the potential economic impact of a severe storm on the region's key assets and on the resultant economic impact on the nation. This far-reaching research has helped to inform planning for SLR in Norfolk and the Hampton Roads region. Funding for Virginia's proposed NDRC projects will support Norfolk in pursuing its new Resilience Strategy, as well as collaboration with neighboring cities to improve resilience at the regional level.

Cross Disciplinary Capacity. Norfolk routinely coordinates implementation of its wetland and shoreline restoration projects, as well as hard infrastructure projects, with federal, regional and local partners such as the US Army Corps of Engineers (USACE) and the Elizabeth River Project. The city also has extensive experience with successful neighborhood revitalization and affordable housing through its long partnership with the Norfolk Redevelopment and Housing Authority (NHRA).

Technical Capacity. Norfolk has a long record of successfully implementing a variety of projects similar in scale, scope and complexity to those the Commonwealth proposes. The city's Department of Public Works, in close collaboration with Norfolk's Resilience Office, will primarily be responsible for NDRC project management. In the past three years, Public Works has managed $267M in infrastructure projects, including construction of the Court House and the flagship Slover Library.

Since Hurricane Irene, the city's storm water department completed 27 storm water-related Capital Improvement Projects (CIP) and city-wide flood vulnerability assessments valued at over $17M. Norfolk invested $3.5M to raise a tidal flood-prone arterial road to the Midtown Tunnel and ensure the Sentara Norfolk Hospital complex, the area's only level-one trauma center, is accessible during flooding. The city

further improved resiliency by tripling its wetland areas from 60,846 ft^2 in 2011, to 217,070 ft^2 in 2014. Since September 2014, the city has also undertaken several major living shoreline restoration projects valued at over $9.3M, with pathway elevations that are a recreational amenity.

Capacity for Community Engagement and Inclusiveness. The City of Norfolk ensures input from residents, especially low income and other vulnerable residents, through extensive outreach via full-time Neighborhood Specialists who are assigned to city neighborhoods. Recent examples of extensive stakeholder engagement include a 100RC resilience assessment, new bike master plan, zoning code revision, and the design of five new public schools. In the Chesterfield Heights target area, Norfolk is building on a community-led design initiative by regional partners Wetlands Watch, Hampton University, and Old Dominion University as the foundation for the proposed new water management design.

Management Team and Key Staff. Please see p. 25 for a current organizational chart that identifies key management positions and staff responsible for day-to-day operations, implementation, and monitoring CDBG-NDR projects. Norfolk's relevant management structure includes:

Christine Morris, Chief Resilience Officer, has over 25 years' experience in community development and revitalization. The CRO's Office will be an integral part of the project management team.

David Ricks, P.E., Director of Public Works, will oversee project management. He has over 34 years in both program and construction management, infrastructure planning, and financial administration.

Sid Kitterman, P.E., City Engineer, will be responsible for project management. He has over 25 years of extensive engineering and construction experience, with the past 15 in Norfolk's Public Works Dept.

Scott Smith, PE, LS, Senior Project Manager, will be responsible for project management. He has over 28 years of extensive experience in storm water management, infrastructure design, and construction.

Reference for the City of Norfolk, Partner: Chris Stone; President, Clark Nexsen; 4525 Main Street, Suite 1400; Virginia Beach, VA 23462; Office: 757-455-5800/Fax: 757-455-5638; cstone@ClarkNexsen.com

CITY OF CHESAPEAKE. ***Partner's Past Experience.*** The City of Chesapeake brings a number of

strengths to its NDRC partnership with the Commonwealth of Virginia. The third largest city in Virginia, Chesapeake combines a historic urbanized and industrial waterfront with fast growing suburban developments, significant remaining rural land, and many waterways and wetlands.

Chesapeake has significant experience managing large infrastructure projects and with citizen engagement. The city is also committed to assessment and planning for the future, and its "*Moving Forward Chesapeake 2035 Comprehensive Plan,"* based on smart growth principles, advances capacity-building projects and was developed with residents in over 30 community meetings, focus groups, and surveys over two years. *Plan* policies reflect the city's long commitment to improving resilience.

General Administrative Capacity. Chesapeake's administrative capacity is demonstrated by a current major bridge and roadway project. Chesapeake is currently managing the largest locally administered project in the Commonwealth's history, the US Route 17 Dominion Boulevard/Veterans Bridge project, a $400M bridge replacement and roadway improvement, with guidance from the Virginia Department of Transportation and Federal Highway Administration. The 95-foot, fixed span, four-lane bridge will be completed in early 2017 and will improve overall transportation flow and commerce for the entire Hampton Roads region. The project provides multiple example of Chesapeake's broad capacity, including land acquisition for right-of-way, using established procedures.

Technical Capacity. The Dominion Boulevard/Veterans Bridge project also demonstrates the city's technical ability. Like the proposed watershed projects, it is characterized by large-scale engineering design addressing critical public safety deficiencies. Chesapeake is providing proactive management of project development activities including: right-of-way acquisition and utility relocation, construction administration, environmental and permit monitoring, innovative systems and procurement, coordination with multiple agencies, and green infrastructure planning and implementation.

Chesapeake has also managed flood mitigation projects, using over $6.6M in Flood Mitigation Assistance (FMA) grant funds to acquire, demolish and return to green space 25 properties, with five

additional acquisitions expected in 2015. All of these homes are in the MID-URN target area.

Capacity for Community Engagement and Inclusiveness. Chesapeake's authorities, commissions, boards, and committees include over 500 citizens members who advise the City Council, providing public input and stakeholder involvement, from needs assessment and design to implementation, commissioning, and evaluation. This inclusive approach is a hallmark of the City of Chesapeake's local government.

The Natural Event Mitigation Advisory Committee (NEMAC) coordinates expertise in mitigation and resiliency. NEMAC is comprised of eight citizens and nine representatives from city departments. NEMAC holds open meetings (in the evening to accommodate citizens) six times a year to plan the city's mitigation and resiliency efforts, including purchasing properties with recurrent flooding to restore them to green space for perpetuity. Project coordination includes the most important stakeholder, the public.

Management Team and Key Staff. The Department of Public Works has an annual operating budget of approximately $75M, and employs over 450 people in eight divisions. The Department has been accredited by the American Public Works Association since 2006 and was re-accredited in 2014. Please see p. 26 for a current organizational chart that identifies the key management positions and staff who will manage CDBG-NDR projects. Chesapeake's relevant management structure includes:

Eric J. Martin, P.E., Director of Public Works, has over 25 years of extensive engineering and construction experience, and has worked for Chesapeake's Public Works department for 17 years.

Sam Sawan, P.E., CSM, Assistant City Engineer, has 29 years of professional experience and has worked extensively in the areas of Storm water and Transportation Design; Project /Construction Management; and Watershed Studies/Planning and Design.

Brenda Willis, Executive Dir. of Chesapeake Redevelopment and Housing Authority, has over 28 years of experience in housing and community development. She transformed Chesapeake's LMI housing via new construction and revitalization, including the first "green build" project with 40 LMI apartments.

Martha Burns, Senior Emergency Mgmt. Planner, has a Master's in public policy and over ten years of

experience in government as a Planner and Program Manager and 20 years' experience in account management, planning and oversight for private industry. In addition to planning responsibilities, she serves as a liaison between residents and Chesapeake's Emergency Management department.

Reference for the City of Chesapeake, Partner. Scott A. Lovell, PE; Vice President - Area Manager, Parsons Brinckerhoff; 6161 Kempsville Circle, Suite 110, Norfolk, VA 23502; 757-466-9608; Lovell@pbworld.com

CITY OF NEWPORT NEWS. ***Partner's Past Experience.*** The Commonwealth of Virginia will partner with the City of Newport News on critical projects to improve resiliency in the Salters *Creek Watershed*. In carrying out the proposed project, Newport News will draw on its prior experience with major projects. A recent example is the city's public-private partnership and stakeholder involvement in the vulnerable Southeast community, located in the LMI target area and the *Salters Creek Watershed.* Like many impoverished urban neighborhoods, the neighborhood is a "food desert" where affordable, healthy food, such as fresh fruit and vegetables, is unavailable because there are no grocery stores or farmers' markets.

The City of Newport News used public dollars to construct a new police station, making the to the city's most impoverished community neighborhood more attractive to a private grocery retailer. The retailer has collaborated with city officials, held meetings in the low-income community, talked with key community leaders, garnering the support of the nonprofit community and a local financial institution that will provide ongoing nutrition and financial literacy classes in the grocery store. This project reflects the city's capacity for creative solutions, as well as its commitment to economic resilience. The Southeast Neighborhood remains at risk, however: its infrastructure needs repair, and water must be managed differently. Building resilience is necessary to preserve investments in this lower-income area.

General Administrative Capacity. The management team for the project have primary job functions that reflect a depth of all facets of program/project administration as reflected in successful awards and providing fiscal and program management of grants from major federal funders, including: CDBGs, HUD

Economic Development Initiative Grant, HOME Investment Partnership Grant, Homelessness Prevention and Rapid Re-housing Program Grant, State Enterprise Zone Grants, Federal Highway Administration Grants, Virginia Department of Environmental Quality Storm water Local Assistance Fund Grant, MAP 21 Transportation Alternatives Program Grant, Federal Emergency Management Agency Grants, Virginia Department of Fire Programs Grant, and Virginia Department of Emergency Management Grant.

Regional collaboration takes place at the highest level of senior management, including the Assistant City Manager's leadership and participation in the "Mayors and Chairs" group. This group is comprised of regional city manager representatives and meets on a regular basis to address issues common to the Hampton Roads cities, such as port issues, transportation and homelessness. The Mayors and Chairs team includes members with strengths relevant to Newport News' NDRC proposal, including the Virginia Department of Emergency Management, Hampton Roads All Hazards Advisory Committee, Hampton Roads Regional Mitigation Planning Committee, Hampton Roads Special Committee on Recurrent Flooding and Sea Level Rise, and the Hampton Roads Planning District Commission, among others.

Technical Capacity. The technical capacity of the Newport News is evidenced by the experience of its staff. Project implementation will be led by the Engineering Department, whose staff have 37 years of combined experience in the field of engineering and certifications in coastal engineering and floodplain management. This department is responsible for implementation of design, construction, contractual award, construction inspection, project management and monitoring of all public projects undertaken by the city, reviews and approves the process of private development, ensuring compliance with city code.

The city's Development Department representative has 24 years of experience in overseeing HUD grants such as CDBG, HOME, Emergency Shelter Grants, etc. Previous years of grant management and oversight have provided the department with opportunities to work very closely with the Newport News public housing and redevelopment authority; providing oversight to multiple local initiatives such as real property acquisition and relocation, housing construction and rehabilitation. These initiatives have been

focused primarily in the *Salters Creek Watershed*, one of the NDR project sites.

Capacity for Community Engagement and Inclusiveness. Community engagement takes place at multiple levels and departments of Newport News. The city regularly holds public meetings and facilitated discussions to obtain citizen feedback in the development of both public documents and projects. When updating the city's comprehensive plan, *Framework for the Future 2030*, the Planning Department created standing community groups with representation from different parts of the city, as well as subgroups such as elderly, youth, and advocates for low-income residents. In addition, citizen input meetings are held 2-3 times yearly in the city's Southeast neighborhood community, located in the *Salters Creek Watershed* and home to the majority of the city's low-income residents. Recent revitalization investments in the Southeast neighborhood, such as the new police station and grocery store, included multiple consultations with neighborhood leaders, nonprofit organizations, and residents—most recently on September 17, 2015.

Management Team and Key Staff. Please see p. 26 for a current organizational chart that identifies key management positions and staff who will manage CDBG-NDR projects. The City of Newport News's relevant management structure includes:

Mohammad Shar, EngD, PE, CFM, Civil Engineer III, will oversee the *Salters Creek* project. He has significant related experience, including watershed analysis and regional storm water management.

James Clark, Civil Engineer III, will manage the *Salters Creek* project. He has managed projects similar to the *Salters Creek* project, including major projects such as the redesign of entire drainage systems.

Tricia Wilson, Business Development Specialist, will manage administrative aspects of the project, including reporting and data management. She has significant experience in program management and grant administration, including the Newport News Virginia Enterprise Zone program.

Reference for the City of Newport News, Partner:

The Apprentice School (Newport News Shipyard, Huntington Ingalls Industries); 3101 Washington

Avenue, Newport News, VA 23607; 757-380-3809; apprenticeschool@hii-nns.com.

VIRGINIA'S ADDITIONAL PROJECT PARTNERS.

*ARCADIS, Inc***.** is a worldwide engineering and consultancy firm, specializing in civil and structural engineering projects, environmental sustainability design, environmental planning and remediation, storm water and flood control projects. ARCADIS will coordinate multiple components of the NDR projects.

Concursive Corporation, a media and open source software development company, will assist in neighborhood cohesion-building activities, providing technical expertise and capabilities for using technology to connect individuals supporting vulnerable residents.

Downtown Norfolk Council, a membership organization driving revitalization, will provide advice on the implementation of the Resilience Lab/Accelerator.

Greater Norfolk Corporation, a membership organization driving region's competitiveness, will advise the applicant on the implementation of the Resilience Lab/Accelerator.

Elizabeth River Project will implement the Living Shore Line. The Elizabeth River Project is a nonprofit leading community efforts to restore the environmental health of the Elizabeth River, a tributary of the Chesapeake Bay, infamous for pollution.

McNeilan & Associates is a woman-owned, small business engineering firm that is serving as a member of the design team and that will contribute to the *Newton's Creek* and *Ohio Creek Watershed* projects.

Norfolk Redevelopment and Housing Authority (NRHA) is the largest redevelopment and housing authority in Virginia and a national leader in real estate development and property management. With and $85M annual capital and operating budget, NRHA's staff of 294 works with Norfolk citizens to continually renew and revitalize the city. NRHA will assist in the revitalization work in the *Newton's Creek* and *Ohio Creek Watersheds*.

Coastal Resilience Laboratory and Accelerator Center is a newly-created working group of Virginia

universities seeking to actively support innovative approaches to resilience. Members include: Old Dominion University, Hampton University, Norfolk State University, University of Virginia, Virginia Polytechnic Institute and State University, and William and Mary's Virginia Institute of Marine Science (VIMS).

Waggonner & Ball Architects provide design services in support of the project. An internationally active architecture and planning firm with more than 30 years' experience, Waggoner & Ball initiated the Dutch Dialogues and were the prime author of the Greater New Orleans Urban Water Plan.

Wetlands Watch will provide advisory services in support of the *Newton's Creek* and *Ohio Creek Watershed* living shoreline projects. The nonprofit Wetlands Watch is the only statewide organization in the Eastern United States working at the grassroots level with a singular focus on saving wetlands.

Work Program Architects (WPA), a Virginia DMBE SWaM Certified Small and Women-Owned architecture firm, serves as a design team member.

ORGANIZATIONAL CHARTS FOR VIRGINIA AND ITS CITY PARTNERS.

Commonwealth of Virginia: Current Organizational Chart with Management Team & Key Positions:

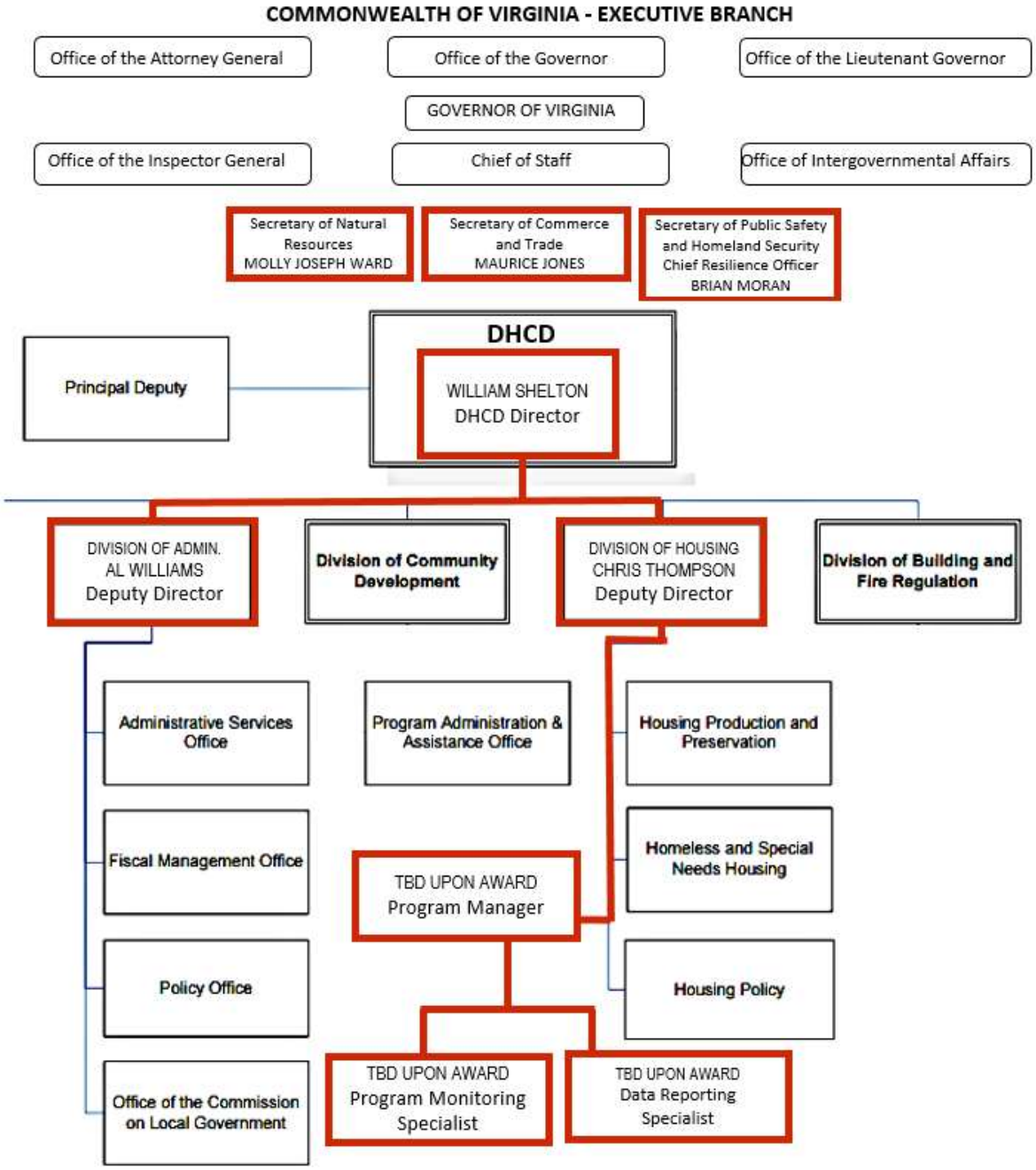
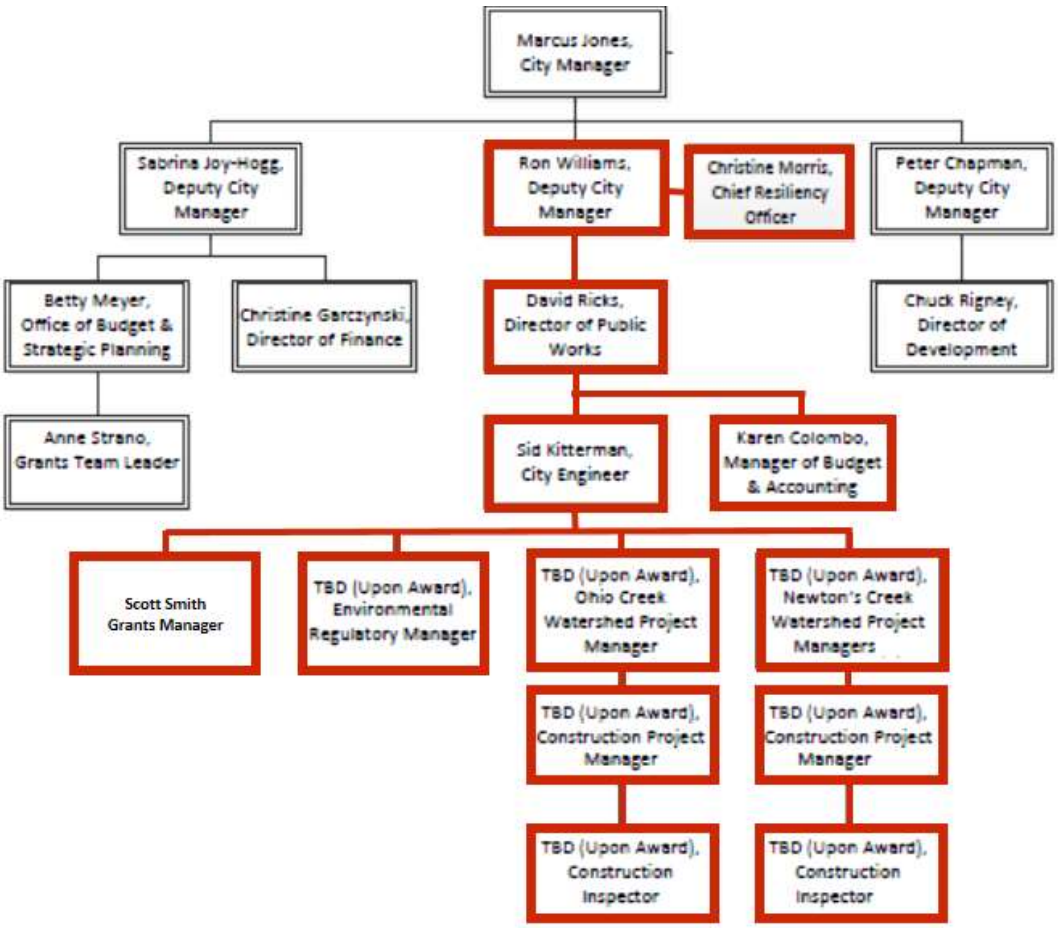


Figure 1. Virginia Department of Housing and Community Development Organizational Chart

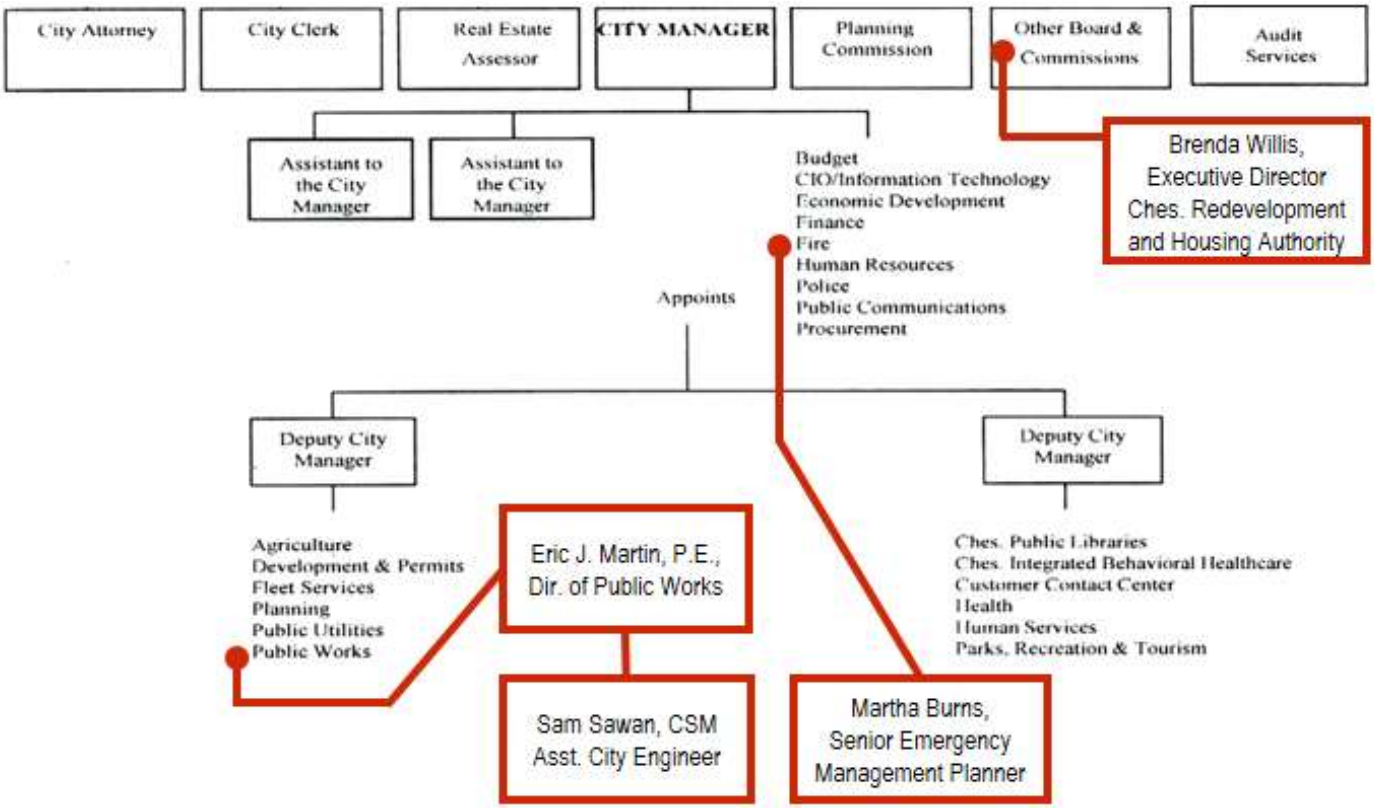
<u>Norfolk, VA</u>: Current Organizational Chart
with Management Team and Key NDR Positions:



<u>Figure 2</u>. City of Norfolk - Relevant Organizational Chart

<u>Chesapeake, VA</u>: Current Organizational Chart

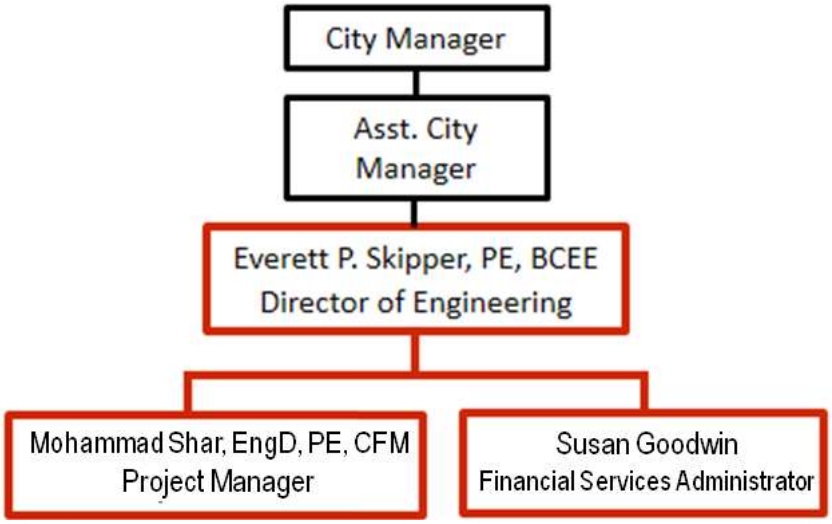
with Management Team and Key NDR Positions:



<u>Figure 3</u>. City of Chesapeake - Relevant Organizational Chart

<u>Newport News, VA</u>: Current Organizational Chart

with Management Team and Key NDR Positions:



<u>Figure 4</u>. City of Newport News - Relevant Organizational Chart

EXHIBIT D:

NEED/EXTENT OF THE PROBLEM

COMMONWEALTH OF VIRGINIA

ExhibitDNeed.pdf

EXHIBIT D: NEED/EXTENT OF THE PROBLEM

Unmet Recovery Need and Target Geography. The Commonwealth of Virginia is partnering with qualifying three Hampton Roads localities, the cities of Norfolk, Chesapeake, and Newport News, for this NDRC proposal. Following Hurricane Irene, the entire Hampton Roads region was declared a major disaster area by the President; however, Norfolk, Chesapeake, and Newport News are the only localities able to meet the HUD-NDRC unmet recovery need and income threshold requirements (see Attachment I). While only three cities qualify as MID-URN target areas, all seven Hampton Roads localities sustained damage to housing and infrastructure, and the region's current and future needs extend beyond the qualifying disaster. Its future needs are exacerbated by SLR, the prevalence of poverty and social vulnerability within the target areas, and by a trend of slow economic decline. The Commonwealth conceives of its proposed NDRC projects as pilots that will initiate a long-term culture of resilience in every Hampton Roads locality and, eventually, in the Commonwealth. The following section discusses the needs of Hampton Roads residents in a broader regional sense; it is followed by detailed descriptions of the unmet and resilience needs in the qualified MID-URN target areas and project-assisted sub-areas.

HAMPTON ROADS REGION. The region is part of the larger Virginia Beach-Norfolk-Newport News Metropolitan Statistical Area (MSA), which includes 17 jurisdictions and extends into Northeastern North Carolina. With a total population of over 1.76M, the MSA contains seven of Virginia's ten most populous cities and is the 33rd largest MSA in the US. The region is frequently affected by hurricanes, tropical storms and extra tropical nor'easters. Hurricane Irene further exposed the area's vulnerability to storm and flooding, compounded by the impact of SLR.

SLR and Flooding. In the last decade, Hampton Roads localities, universities, businesses, nonprofits, military commands, government agencies, and the Port of Virginia completed over 40 studies focusing on current and future water-related risks. The research shows that in addition to SLR, the land in southeastern Virginia is subsiding. As a result, Hampton Roads is experiencing the highest relative rate of SLR on the

East Coast, 14" since 1930, while the global SLR was 5-8" over the last century. Virginia's Hampton Roads region is second only to New Orleans as the largest population at risk from SLR.

Additionally, seven of the ten most severe regional storms since 1933 have occurred in the past thirteen years. Based on the historic record, Hampton Roads experiences significant storm surges every four to five years. As sea level continues to rise, severity of storm surge also will increase. Using the intermediate-low scenario from NOAA's Climate Central model, there is a greater than 50% chance the region will experience floods exceeding 5 feet of the high tide line by 2030-40. Hurricane Joaquin spared the region in October 2015, but a few days of rain caused severe flooding [V03.pdf & V04.pdf].

Vulnerable Populations. As sea level continues to rise, higher flood levels leave a large portion of the region's residents, homes, infrastructure and businesses vulnerable during extreme weather events, high tides and regular precipitation events. Climate Central's Surging Seas risk finder estimates that over 107,000 Virginians live in homes below the 5 feet marker. Close to 77,000 of those residents, most of whom live in Hampton Roads, are ranked as high or medium for social vulnerability. An Old Dominion University survey of 7,000 regional households on the impact of Hurricane Irene indicated that large pockets of the population are medically fragile, financially unprepared and socially disconnected, putting them at risk during disasters [V05.pdf]. According to US Census data, 13% of the region's citizens live in poverty and 9% of Hampton Roads residents report no access to a vehicle leaving them unable to evacuate the region during a disaster without assistance.

Risk to Economic Assets. Hampton Roads' economic wellbeing depends on the same bodies of water that place it at risk. The Port of Virginia and related employment produce nearly 10% of Virginia's workforce opportunities (over 374,000 jobs, $17.5B in wages), and almost 7% of Virginia's Gross State Product is related to the port ($30.5B). Almost 73% of the goods passing through the port serve outside the immediate region (200 miles), including areas as far away as the upper mid-west. The third largest commercial port on the east coast, the Port of Virginia, saw approximately 81M tons of cargo, valued at

$53B, moved through its facilities in 2013. The port has experienced a 29% increase in imports and 34% in exports since 2008, the strongest overall growth of all east coast ports of call. Hampton Roads is also home to Newport News Shipbuilding, sole designer, builder of US Navy aircraft carriers and submarines. With approximately $4B in revenues and over 23,000 employees, it is the largest industrial employer in Virginia and the largest shipbuilding company in the US.

The effects of climate change are projected to impact the region's economy within this century. The Port of Virginia's *Master Plan 2040* estimates its facilities can currently withstand one foot of SLR. A Sandia National Laboratories study notes failure to mitigate the effects of climate change in Virginia could result in $45.4B in lost Gross Domestic Product and the loss of over 314,000 jobs by 2050. Additionally, HRPDC estimates that by the end of the 21st century, SLR could result in direct economic costs of between $12 and $87B, with up to 877 miles of roads in the region and other critical infrastructure permanently or regularly flooded [V06.pdf]. This transportation infrastructure is critical to the economy because the region's workforce commutes: in 2013, 46% of all workers in Hampton Roads worked in a jurisdiction that was different from the one where they reside.

Risk to Military Facilities. Hampton Roads hosts major Navy, Air Force, Army, Marine Corps, and Coast Guard facilities, including Naval Station Norfolk, the largest military base in the world, with a plant replacement value of over $4.2B. Nearly a quarter of the nation's active-duty military personnel are stationed in the region, and 31% of US naval shipbuilding and repair capacity is in the region. Many base personnel commute to work from different cities, and access is critical [V07.pdf]. At an average elevation of 8-1' above mean sea level, many of these assets already experience storm-related flooding. Studies show the 1.5-foot sea-level rise projected between 2032- 2062, combined with a mild 3-foot storm surge, would impede roadway access to nine of the region's military facilities [V08.pdf].

Exposure to Economic Shock. Nearly 60% of the region's economy depends on two economic drivers—Department of Defense and the Port of Virginia. Tourism is also significant, accounting for

approximately 20% of overall travel and tourism expenditures in Virginia; all three could be impacted by SLR. This concentration of economic activity exposes the region to potential shocks should any of the drivers reduce regional activity. For example, the slowdown in defense spending related to sequestration has left the region lagging the rest of the country in the recovery. Between May 2013-2014, Hampton Roads and Detroit were the only two of the 38 largest employment markets to see a decline in jobs. In 2016, Hampton Roads could lose more than 33,000 jobs as a result of regional defense assets downsizing. While the Port of Virginia is thriving, its use of advanced mechanization means the port is unlikely to compensate for a decline in Federal spending. Finally, the region's current business creation climate is not improving, and without accelerated support, is unlikely to drive future economic growth.

THE CITY OF NORFOLK. Surrounded by water with 144 miles of shoreline, low-lying and flat topography and rising sea levels—14.5 inches in the last 80 years, Norfolk is among the nation's most vulnerable cities to coastal flooding. The measured hours of nuisance tidal flooding in the city has increased by 325% since 1960. With local sea level projected to rise between 2 and 7.5 feet by the year 2100, and 25% of Norfolk's parcels already located in the 100-year floodplain, the risk of flooding will continue to increase.

Norfolk is a city of contrasts. The city has the highest concentration of poverty in the region. More than 53% of its residents are LMI, 19.2% live in poverty, and the city is rated the 13th most fiscally stressed locality in Virginia [V09.pdf]. Over 2,000 units of public housing, the highest concentration of public housing in the region, were built on filled historic creeks and inlets which causes regular flooding.

Yet Norfolk houses the region's largest economic engines, Naval Station Norfolk and the Port of Virginia, and is home to the regional medical trauma center, two universities, biotechnical and information technology firms, and a multi-modal transportation network connecting the region. In all, 191,212 jobs are located in the City of Norfolk, and employees from across the region commute there, since, on average, jobs pay more than anywhere else in the region ($50,926 per year). However, overreliance on defense sector spending has translated into a nearly 25% decrease in military jobs and an

overall 11% job loss in the city since 2001.

Unmet Need and Target Geography—MID-URN. See Exhibit B.

Target Sub-Area Characteristics. The Phase I MID-URN was refined through additional analysis and community engagement to identify and prioritize the proposed projects in two sub-areas within the overall qualified MID-URN area. The two sub-areas are in strategic locations and will deliver significant benefits to the entire city and the region. As [V01.pdf] demonstrates, the sub-areas directly served by two projects are the *Newton's Creek* and *Ohio Creek Watersheds*. Adjacent to downtown Norfolk, the sub-areas contain over 2,000 units of public housing, key regional transportation nodes, and 23 critical infrastructure assets, including five low-performing schools, an electrical substation, a fire station, four recreational centers and five historic churches, as well as an impressive 411 buildings on the National Register of Historic Places [V10.pdf] The area features three different shoreline conditions (developed inland, industrial waterfront, and residential) and suffers from coastal and inland precipitation flooding, making it a micro-laboratory for resilient solutions that can be replicated elsewhere [V11.pdf].

In these two watersheds, as in many others in the region, river water is pushed up the drainage system in storms, flooding low-lying areas and preventing rainfall from draining out of neighborhoods. Even during normal tide conditions in the river, these very old, undersized and submerged storm water pipes cannot convey run-off to the river in one of the increasingly frequent heavy rainfalls. The result is water ponding in streets, sidewalks and residents' basements on a monthly basis. In extreme high tides with heavy rains, streets are impassible, houses flood and businesses are forced to close [V03.pdf].

During Norfolk's multi-year community engagement process, residents of both areas were clear that the areas' additional unmet needs for resilience go beyond repair to water damage from Hurricane Irene (See p. F-III.25), to include their physical, economic, and social isolation from the rest of the city.

Residents further identified concentrated poverty, environmental degradation, risk to historic housing and lack of access to waterfront parks and other amenities among key challenges. These vulnerabilities

are reflected in the area's socio-economic make-up: 86% of the 11,840 sub-area residents are LMI, and 92% are African American, with median incomes of $25,395, (only 48% of national median income). 43.2% of households live below the poverty line. Other socially vulnerable populations include seniors (12% over age 65), children (13% under age 5), individuals with disabilities (17.2% disabled), and non-English proficient residents (10%). 32% of sub-area jobs pay less than $1,250 per month.

In the *Newton's Creek Watershed*, a 100-year storm would significantly impact shipyards, restaurants and the real estate industry, which all employ vulnerable populations. Analysis of existing regional economic relationships in the Virginia Beach-Norfolk-Newport News MSA, shows a 100-year storm would impact 397 jobs, $20M in labor income and $66M in industry production or sales.

Resilience Needs within Recovery Needs. Hurricane Irene caused direct physical damage to infrastructure and buildings, displacement of households, and interruption of transportation networks and daily life. In order to better understand Irene's impacts on the area, Norfolk modeled the storm's coastal flood event impacts using depth damage functions provided by the US Army Corps of Engineers (USACE). As reflected in Norfolk's benefit-cost analysis [Attachment F], Irene could have impacted as many as 1,400 buildings in the sub-areas; these structures included businesses, public buildings, and households. Based on model outputs, losses would have been over $5M in structural damage, $12M in contents loss, and over $1.2M in inventory loss. Economic loss to the greater Virginia Beach-Norfolk-Newport News region (due to displacement and modeled business interruption as a result of building impacts within the sub-area) is estimated at additional tens of millions of dollars.

The vast majority of these modeled losses could have been avoided through the combination of Norfolk's added freeboard requirement (had it been implemented prior to the development of buildings in this area), proposed coastal flood protection and comprehensive storm water solution. Additional damages and disruption to transportation infrastructure could have been avoided through the elevation of roads and alignment of the light rail system on higher ground. Those actions would have significantly reduced costs

to individuals, insurance, businesses, and local, state and federal government in Norfolk. With coastal perimeter boundary flood protection alone, structure impacts within the area could be reduced by almost 65%. New and revitalized marshland, better storm water management, and stringent building codes would have further reduced storm's damage in ways not yet measured. Nearly all transportation impacts could have been eliminated with coastal protection, elevation of roads, and improved storm water management.

Investment in coastal and storm water flood protection through the installation of a coastal protection, living shoreline, storm water management activities, and the elevation of roads within the sub-area would cost approximately $185M including design and an allowance for construction risk. However, such activities would result in net benefits of over $236M, even when only potential losses from coastal flood events are considered.

Total Investment in Resilience. Before it fully embraced the Commonwealth's innovative approach to thriving with water, the City of Norfolk estimated that $1.5B in hard infrastructure improvements was necessary to address 100-year storms and 1-foot of SLR. This new approach of embracing water, integrating land use, green, grey and other mitigation efforts has yet to be evaluated city-wide. The NDRC projects will catalyze and pilot adaptation of the new holistic approach, demonstrating its effectiveness.

As the BCA (see Attachment F) reveals, in the project areas alone, an investment in the proposed approach results in resilience, environmental, social and economic benefits of over $1.9B compared to a total estimated cost of $299M, a ratio of 7.03. The city has already made significant investment in resilience as demonstrated in Exhibit G. Since Irene, Norfolk has invested in or committed to resiliency actions, either through grants or city revenues, a total of over $34M. Since CDBG-NDR funded projects will address the unmet recovery needs and holistic resilience needs in only part of the overall MID-URN area, the city has identified resources that can be leveraged to address unmet recovery needs and increase resilience elsewhere in the MID-URN target area (see Exhibit F).

THE CITY OF CHESAPEAKE. Located approximately 20 miles inland from the Atlantic Ocean, the City of

Chesapeake has over 120 miles of commercial waterfront land, with more than twelve miles of deep draft channels. The city's elevation is nearly level, averaging about 12.2 feet above sea level, with the highest elevation point at 25 feet above sea level. Excluding the Great Dismal Swamp, Chesapeake has over 300 miles of shoreline, and approximately one-third of its land area consists of wetlands. Water-related infrastructure is prevalent throughout the city for commercial, industrial, and recreational uses.

The City of Chesapeake contains portions of two major watersheds, the James River Watershed and the Albemarle Sound Coastal Watershed and the Elizabeth River's Eastern, Western, and Southern Branches flow through Chesapeake. The North Landing River is also a part of the Intracoastal Waterway, and serves as the easternmost boundary for the city. Other significant bodies of water within the city's jurisdictional boundaries include the Northwest River and Lake Drummond, and localized riverine flooding occurs in lower areas of the city not adjacent to a major body of water. Large sections of the city are subject to tidal flooding during hurricanes and severe nor'easters, like the severe storm in October 2015. Additional impacts from severe floods or floods that exceed the 500-year frequency event include:

- Impassable road crossings and consequential risk for people and cars attempting to traverse flooded crossings [V12.pdf & V24.pdf];
- Damage to infrastructure such as water and sewer lines, bridge embankments, and drainage ways;
- Wave action damage to the shoreline, boats and facilities; and
- Inundation of critical facilities, including certain fire stations, police facilities, public shelters, and several city buildings [V25]. Public shelter availability is limited by the expected severity of flooding.

Chesapeake's *2014 HMP Vulnerability Assessment* identifies current and future threats and hazards, and analyzes the needs and solutions for city populations, including the HUD MID-URN target area. Chesapeake's critical hazard-high risk is flooding, hurricanes and nor'easters, and its critical hazard-moderate risk includes SLR and land subsidence, tornadoes and severe thunderstorms. In the plan, city officials identified specific areas along the Southern Branch of the Elizabeth River subject to historical

flooding, including the streets and neighborhoods of the HUD MID-URN target area: Freeman Ave., Bainbridge Blvd, Money Point, South Norfolk, in the *South Norfolk/Mill Creek Watershed* and many homes in the Mains Creek and Fernwood Farms neighborhoods in the *Crestwood/Oak Grove Watershed*. Areas identified as vulnerable to flooding in Chesapeake are depicted on FEMA's Flood Insurance Rate Maps (FIRMs) [V33.pdf].

In addition to the financial loss caused by flooding, the Commonwealth's proposal addresses another threat to Chesapeake's LMI population in the *South Norfolk/Mill Creek Watershed* target area: living next to tank farms with highly flammable and/or explosive hazardous materials and volatile elements in the Money Point and South Hill industrial areas. The potential for hazardous spills and volatility endangers the lives and safety of these LMI residents, and this is coupled with the effect of flooding [V26] from the Elizabeth River on the rail system that serves Money Point and the region's intermodal network.

In 2008, the small South Hill community suffered the catastrophic failure of a 2-million gallon liquid fertilizer tank spill that required evacuation of the residents of the LMI neighborhood during the incident and later during cleanup [V27.pdf]. The sole ingress/egress street for South Hill was inundated with liquid fertilizer during the spill, cutting off the community from emergency crews during the crisis. The state has since installed a gate in the fence between the neighborhood and the busy I-464 highway to provide an emergency pedestrian egress, but this does not offer adequate protection for residents. [V28], showing the pedestrian evacuation route] The city's South Hill community evacuation plan includes five potential evacuation routes for future hazardous spill scenarios; however two cross railroad tracks at the proposed Freeman Avenue overpass site, where an active train crossing could prevent residents and workers evacuation. See [V29.pdf & V30.pdf] for South Hill's Evacuation Plans 2 and 3.

The unmet recovery need for Chesapeake residents who suffered damages from Hurricane Irene was calculated in Phase I based on windshield survey results that showed damaged homes which have not incorporated resilient measures, such as house elevation, to mitigate similar future damage. In Phase II,

Virginia's proposes projects in four Chesapeake watersheds that use a holistic approach and considers all of the risks outlined above to the MID-URN target area.

In Hurricane Irene, the city identified 45 repetitive loss areas by referencing maps of historically flooded properties on old and new NFIP RL lists and the SLR list. There are 391 Chesapeake properties on FEMA's repetitive loss list, and an additional 2,024 structures were identified in the repetitive loss areas. The Main's Creek and Fernwood Farms neighborhoods are in the repetitive loss area and are targeted for the *Crestwood/Oak Grove Watershed* project.

The flood-prone areas [V31.pdf] located within Chesapeake's MID-URN target area i (1. Money Point, 3. Sunnybrook Apartments, 5. Bainbridge Blvd, 6. Crestwood, 11. Riverwalk, and 5. Bainbridge Blvd.) that will be positively affected by the *South Norfolk/Mill Creek Watershed* project: *Freeman Ave Overpass; Bainbridge Boulevard Road Elevation; Voluntary Relocation of South Hill Community* project activities. The remaining repetitive flood loss areas in Chesapeake share the need for road elevations and voluntary buyout programs with living shorelines as a co-benefit. The Phase II NDRC projects proposed for the City of Chesapeake are replicable and holistic in approach and will be applied to the other flood loss areas as funding becomes available.

Target Area Characteristics. The target sub-areas for proposed NDRC projects in the City of Chesapeake include the *Crestwood/Oak Grove Watershed* and the *South Norfolk/Mill Creek Watershed* [V34.pdf]. Located at a bend in the Southern Branch of the Elizabeth River, approximately 75% of the *Crestwood/Oak Grove Watershed* is in the floodplain, and residents experience chronic flooding. The sub-area includes older neighborhoods with older original owners who have asked the city to buy them out. South Norfolk consists of such neighborhoods as Campostella Square, Providence Terrace, South Norfolk, South Hill, and Portlock. With a 2012 population of 25,203, the median household income in South Norfolk is $32,205. South Norfolk has a poverty level of 19.4% measured for number of persons living below the poverty level (the percentage of persons living below the poverty level for the city is

7.4%). Within the 19.4 %, 31.7% are children and 11.8 % are seniors over the age of 65.

Resilience Needs within Recovery Needs. Local policies that guide community growth and development, incentives tied to natural resource protection, and public awareness and outreach activities are considered in order to build resiliency and reduce the city's future vulnerability to identified hazards. Additionally, to optimize disaster recovery and to improve resilience, the 2014 Hazard Mitigation Plan (HMP) is aligned to Chesapeake's updated Comprehensive Plan, Land Use Plan, and Master Transportation Plan, all which were updated in 2014.

The city's Neighborhood Quality of Life (NQL) Study, updated in 2014, summarizes the quality of life in Chesapeake in the four dimensions: social, crime, economic and physical and is organized by Neighborhood Statistical Areas (NSA). The NQL Study shows that the HUD MID-URN target area received the rating of high priority needs.

The Weldon Cooper Center for Public Service is the state's official demographer and projects a growth of 114.5% in the number of those aged 65 and older compared to an increase of 39.4% in the city's population overall between 2012 and 2040. The number of residents 65 and older that are veterans (another segment of the population that presents unique needs), is projected to grow from 8,200 in 2012 to 16,000 in 2040. Additionally, it is estimated that 21% of veterans suffer from post-traumatic stress disorder and other trauma induced conditions, making them more likely to have challenges in finding and maintaining affordable housing.

According to the US Census Bureau's American Community Survey, in Chesapeake 10.8% of all homeowners are age 65 and older; 6.9% of persons age 65 and older have incomes below the poverty level; and a large percentage of Chesapeake renters age 65 and older in Chesapeake have a high housing burden. HUD defines affordability as housing that cost no more than 30% of income and persons who pay more than 30% are considered "housing burdened." The Chesapeake 55 and Better Comprehensive Plan reveals the older population's concern about affordable housing. Surveyed seniors also expressed concern

that aging housing presents additional maintenance and preservation challenges, making the cost of maintaining a home prohibitive for those on fixed incomes.

The economic development trend for the South Norfolk Area is very good. City Council has already confronted the challenge of revitalizing South Norfolk by creating the South Norfolk Business Overlay to establish special zoning standards for the area which accomplish the following: (1) enhance those physical and architectural aspects of the area which make it attractive and consistent with the historic character of the community it serves; (2) limit uses in the area to those that are consistent with promoting commercial revitalization; and (3) provide development flexibility that allows and encourages the improvement and upgrading of the area.

Economic, social and physical success is being attained with such projects as the South Norfolk Jordan Bridge, which brought 150 new construction jobs to the area; reconnected two revitalizing communities in new commercial enterprises, including commercial and defense-related traffic; and provided a new park and pedestrian and bicycle crossing. In 2012, the city spent $2.1M on vacant space in the Village at Gateway to prevent the planned retail and residential development from going into foreclosure and blight and converted the space to become the South Norfolk Memorial Library. The South Norfolk Memorial Library has exceeded expectations since its new location opened in July 2013.

The Great Recession derailed most of the plans for the residential project built next to the library, but buyers are now showing interest in the condominiums and numerous units have sold. There are additional businesses in the building that houses the library, more parking is planned to accommodate the increase in library and business customers. Several national retail chains, which have shown interest in the Poindexter Street, Liberty Street, and Campostella Road corridors. Chesapeake has invested millions in capital improvements projects and the *Crestwood/Oak Grove Watershed* project will complement the city's ongoing efforts to keep this historic community intact and more resilient for the risks of the future.

The 2035 Comprehensive Plan places great emphasis on economic vitality throughout the city and

expanded economic opportunities for all citizens. Specific goals and action strategies include expanding the inventory of commercially zoned property and meeting the infrastructure and technology needs of its businesses and citizens. The activities proposed under the city's NDRC grant application would help to meet these goals by improving access to commercial areas through elevating portions of Bainbridge Boulevard and Freeman Avenue, particularly to the vital Money Point industrial area. Similarly, the environmental improvement projects in South Hill, Mains Creek and Fernwood Farms would facilitate efforts by property owners to protect their investment and prevent economic instability and disruption due to recovery from floods and other related natural disasters.

The Bainbridge Blvd. activity, coupled with the Freeman Ave. overpass activity [see Exhibit E: Soundness of Approach] will provide long-term resiliency from the threats of flooding, including a safe transportation and life-saving evacuation routes for hurricanes and hazardous spills and volatile materials; bring an improved intermodal transportation system to the area, securing economic well-being and social improvement; and will underpin continued revitalization for the *Crestwood/Oak Grove* and *South Norfolk/Mill Creek Watersheds*. The activities will bring additional construction jobs to the area, and the city will maintain its commitment to HUD's Section 3 regulations. As has been the case with Chesapeake's recently completed South Norfolk Jordan Bridge, an improved transportation system with its accompanying public works and public utilities projects is vital to the revitalization of neighborhoods.

THE CITY OF NEWPORT NEWS. Typically major storm events such as hurricanes and nor'easters produce rainfall and tidal effects, such as flooding, to the city's low-lying areas, however the majority of damage from Hurricane Irene was from wind [see Exhibit B: Threshold]. Additionally, areas within and around the floodplains in the city that have developed over the years are now starting to feel the effects of storm surges, higher than usual tides, more intense rainfall events, and SLR. Newport News recognizes these issues and is beginning to understand what it means to become a resilient community; this was demonstrated on one level through its participation in the Virginia Dutch Dialogues held in Hampton

Roads in June 2015. The *Salters Creek Watershed* project will provide a means of testing a strategy that will increase resilience for residents of the identified target area.

Target Area Characteristics. The target area for proposed NDR projects in Newport News is the *Salters Creek Watershed*, home to the Southeast Neighborhood and its adjacent areas, and comprising the city's largest designated Title 36 or redevelopment area. This redevelopment area is in the oldest part of the city, which means the public facilities and infrastructure in this area are most in need of repair and replacement. The City of Newport News, as a CDBG and HOME entitlement community, spends the majority of grant funds in this area, which frequently floods [V23.pdf]. Some years ago HUD also approved much of this area as a Neighborhood Revitalization Strategy Area.

Ten percent (18,910 people) of the city's total population (181,025) lives in the Southeast Neighborhood. Ninety-one percent of the population identifies as minority, with 85.5% identifying as African-American. The unemployment rate for the Southeast neighborhood is 12.2%, higher than the citywide rate at seven percent. Over 70% of the residents are low-income. The median household income in this target area is $25,917, well below that of the city as a whole at $51,027. The median family income for this area is $31,076; again well below that for the city as a whole at $59,514.

Further hardships also plague the neighborhood. Many of the residents do not own a vehicle, thus they are dependent on other means of transportation, such as public transportation, a bike or walking. The Southeast Neighborhood has the lowest percentage of retail services in the city, based on the number of citizens in close proximity. In addition, just last year the only grocery store in the area closed unexpectedly, leaving residents without adequate fresh produce or meats. To reach a full service grocer, residents had to travel more than four miles. This community also is the location of the majority of public housing complexes and numerous project-based Section 8 complexes. It also is victim to an overabundance of single-family homes with absentee landlords, often used as substandard rental properties. These substandard rental properties combined with abandoned derelict structures create many

streets with slum and blighted conditions [V38.pdf].

Resilience Needs within Recovery Needs. The city has taken steps to assist in the redeveloping of areas in the *Salters Creek Watershed* (Southeast Neighborhood) area of the city to revitalize areas with businesses and affordable housing, as well as improvements in infrastructure such as street-scaping. A new grocery store, daycare center, satellite banking facility and police station are currently under construction to provide safety and supplies to the local community.

In looking at the costs of the various resilience project activities proposed, it would cost a total of approximately $104M to appropriately benefit the communities now and in the future. If these resilient improvements are made, it would protect and support at least $200M in capital improvements undertaken in the last 23 years. This figure was determined from looking at budget spreadsheets reflecting expended funding and completion dates for the project.

To help mitigate some of the issues in the *Salters Creek Watershed* (Southeast Neighborhood) community, the city has made a major commitment and investment over the last two years. This is evidenced by the undergrounding of utilities and streetscape along Jefferson Avenue, one of the major commercial corridors in the community, which cost approximately $12M. The first phase is complete and phase two has been initiated. Additional investment is evidenced by the presence of a new police substation constructed and situated in the "heart" of the community at a cost of $6.6M. The station is almost complete and should be occupied by November of this year.

In conjunction with Brooks Crossing, an overall larger mixed-use $21M project located also in the "heart" of the Southeast neighborhood, the city committed $9M to help bring a full service grocer, Jim's Local Market (JLM), to the area. The site work for the store has begun and scheduled to be completed sometime before the end of calendar year 2016. JLM will employ approximately 65 employees with an emphasis on hiring residents from the surrounding community. Of the 65 employees, there will be approx. 20–25 full time positions and the remainder will be part time. Training will include business management

by focusing on procurement and operational practices to enable career growth within JLM or in the overall retail industry. Other opportunities will exist for local businesses to introduce their products without having slotting fees charged by major chains and suppliers. Additional focus would be given to local produce, including urban farmers.

Any change in the demographic trends of the target area would be very gradual, so the basic demographic mix will likely remain static. The economic trends are somewhat more promising as more economic development projects are in process. With the grocery store development and the Brooks Crossing mixed-use development more job opportunities will be available, thus raising the income levels for the area and decreasing the unemployment rate. These trends will likely not affect recovery and resilience needs, as the land areas will remain vulnerable to the same issues prevalent now in the target area. Although trends are moving in a positive direction, it will be some time until their impact is felt.

THE COMMONWEALTH OF VIRGINIA: APPROPRIATE APPROACHES.

Locality Partners. Each locality actively engaged with target area (see Attachment D) during the proposal process to get residents' input and feedback on proposed projects. This citizen feedback helped refine ideas and shaped the NDR projects.

Norfolk was already involved in a multi-year community engagement process as part of the Rockefeller Foundation 100RC grant, before the HUD-NDRC was announced, and their citizen outreach has dovetailed with the engagement needed for the NDRC. Norfolk will use the increasing exposure to significant flood and rising sea levels that necessitates physical change as an opportunity to remake the landscape to live with water. While keeping the communities safe from increasing flood risk and rising sea level necessitates a changed landscape, Norfolk will continue to adapt land use, critical transportation and other infrastructure networks and building typologies around water (see Exhibit F). As the city changes, the resulting innovation will fuel business creation and expansion, diversifying the regional economy, building the region's strength by ensuring connectivity between cities and to the region's major

economic assets, and uniting our cities around shared solutions.

Norfolk's transformation strategy seeks to build this cohesiveness by giving residents the foundational role in risk reduction. The city's strategy relies on the citizens being more knowledgeable about potential risk, being part of the water management solution by holding water on their property, and better equipped to actively protect vulnerable neighbors during disruptive events. For example, residents already are creating hyper-local networks to support residents vulnerable to disruption of essential services. Using technology to connect three to four people as a safety net, residents are reducing the burden on emergency management during disruptive events.

The response of Chesapeake's citizens to the city's proposed projects has been overwhelmingly positive for both projects, including the three voluntary buyout projects with the co-benefits of the living shorelines and bio-filtration systems, the Bainbridge Blvd. road elevation (elevation to Bainbridge Blvd. north of its intersection with the I-464 entrance/exit) and Freeman Ave. as a way to prevent or reduce flooding of the road and the adjacent properties, as well as the subsequent positive effects the road projects are anticipated to have on the South Norfolk revitalization efforts.

The optimal program will elevate Bainbridge Blvd., so it acts as a berm to protect the residents from flooding, create living shorelines to absorb more flood waters, create bio-filtration systems to protect the living shorelines and Elizabeth River from unhealthy waste, and assist Chesapeake residents through a voluntary buyout program that will allow communities in flood-prone areas and hazardous areas to move to another, safer area. Finally, Chesapeake will also educate citizens about regional resiliency efforts.

The City of Newport News consulted directly with residents to obtain input on the most appropriate approaches for increasing resilience through better water management. Examples of feedback include:

- Correct the drainage and constant flooding of these areas of the neighborhoods. Water damages their homes and property several times a year.
- Include bike paths and walking trails in the community to improve mobility and healthy lifestyles.

- Place power lines underground to reduce the length of power outages from downed trees on the lines.
- Bring Jim's Local Market grocery store to the community. The sole grocery store closed, and many residents do not have access to the variety of groceries they need. Jim's Grocery store opens in 2016.

THE PHASE I AND PHASE II APPROACHES: THRIVE: *Resilience In Virginia*

A thoughtful multi-year, state-guided, locality-based process has refined the Virginia partners' approach organically. The Phase I proposal presented a somewhat broad approach [V25.pdf] to building resilience, with five overarching goals. In Phase II, as Virginia and its partners developed projects aligned with citizen input, the original Phase I structure of the approach shifted naturally. **THRIVE: *Resilience In Virginia*** became more focused, with *three overarching inter-related goals*: **Build Water Management Solutions**, **Strengthen Vulnerable Neighborhoods**, and **Improve Economic Vitality**, which together will *yield two important long-term outcomes:* **Create Coastal Resilience** *and* **Unite the Region** (below).

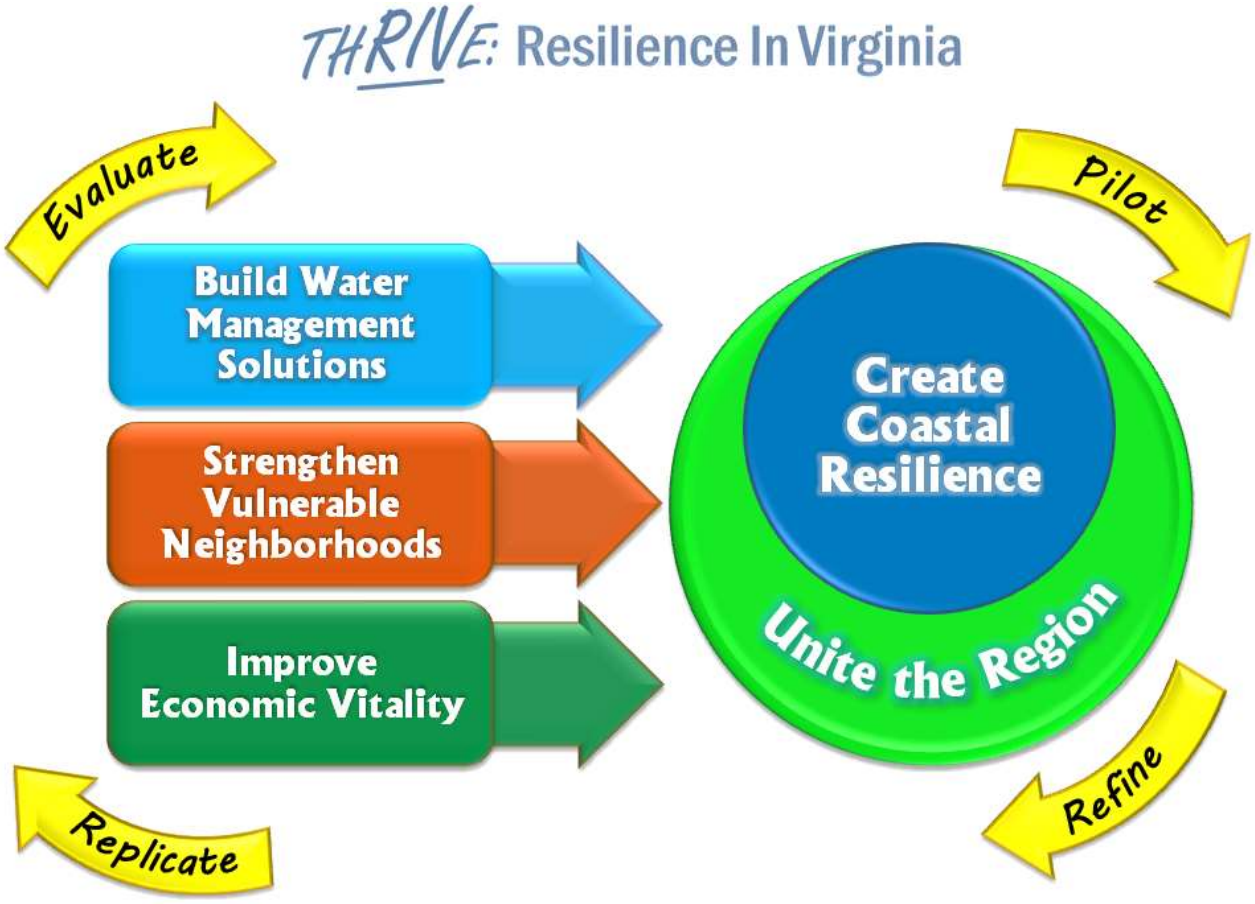


Figure 5. Phase II Refined Approach for **THRIVE: *Resilience In Virginia***

EXHIBIT E:

SOUNDNESS OF APPROACH

COMMONWEALTH OF VIRGINIA

ExhibitESoundnessofApproach.pdf

EXHIBIT E: SOUNDNESS OF APPROACH

The Commonwealth of Virginia seeks to improve resilience in its Hampton Roads region, which has the highest rate of relative SLR on the east coast and already experiences regular flooding during greater than average rainfall. Virginia's approach, **THRIVE: *Resilience In Virginia***, uses opportunities presented by the challenges of climate change, flooding and SLR to improve water management, strengthen neighborhoods, and increase economic vitality. Projects and activities vary based on the unmet needs and community objectives of partner cities, but they all demonstrate how water management systems can be used to *connect* neighborhoods to natural environments, economic opportunity and to each other.

Virginia's NDRC projects have been developed after thorough consideration of potential options for increasing resilience to SLR. At the Phase I hearing, residents suggested building a storm surge barrier to protect the entire region. Regional solutions were explored in the Dutch Dialogues; however, international experts concluded a barrier is not a good fit for Hampton Roads. It is a very expensive option and only offers protection from coastal surge, not precipitation flooding. Further, as SLR increases over time, the surge barrier would close more often, interfering with shipping and military operations vital to the region.

The most appropriate solution for the Hampton Roads region is the creation of adaptive shorelines and interventions tailored specifically to site-related challenges. The Commonwealth's proposed NDRC projects across five watersheds speak to a wide range of coastal environments including rivers, bay fronts, streams and marshes [V13.pdf]. These projects address a variety of social conditions, including high-poverty public housing, LMI traditional owner-occupied neighborhoods, industrial working waterfronts and areas primed for private commercial investment – by making connections that will increase resilience.

Although only three Hampton Roads cities met the eligibility threshold for the NDRC, all of the region's localities experience similar flooding, economic and social issues. Together, the proposed projects form a strategy for resilience that is flexible enough to unite the region in an approach to coastal adaptation. The adaptive solutions created and lessons learned will be shared through a regional learning

and community engagement initiative on resilience, coordinated by the HRPDC. In piloting these proactive strategies to addressing its stressors, Hampton Roads can lead Virginia into greater resilience.

NEWTON'S CREEK WATERSHED AND OHIO CREEK WATERSHED PROJECTS (CITY OF NORFOLK). The Commonwealth is proposing two projects in the City of Norfolk target area, the *Newton's Creek Watershed* and *Ohio Creek Watershed*.

The projects proposed in this application lay the foundation for Norfolk's *Coastal Adaptation and Community Transformation Plan*, the city's long-term commitment to using water management—blocking, holding, channeling, absorbing, cleaning and releasing water—as a vehicle for revitalizing neighborhoods, connecting residents to economic opportunities, ensuring the protection of transportation networks, and reintroducing the natural environment. Norfolk's proposed flood control systems will create green spaces to hold and absorb excess water while filtering it to remove pollutants. Restored creek systems will hold water and create natural walking trails that reconnect neighborhoods while providing easy access to the shoreline. The expanded open space will also provide residents with recreational amenities, facilitating social cohesion. The redesigned landscape will redevelop and revitalize large areas where innovative water management practices combine with mixed-use and mixed-income development strategies. In short, Norfolk is using the necessity of adapting to SLR to bounce forward by creating safer communities, greater social equity, improved physical amenities and better economic opportunity.

Unmet Need, Project Eligibility, and alliance with a HUD National Objective. See Exhibit B.

Project Descriptions.

Newton's Creek Watershed Project. This watershed encompasses three flood-prone, socially and economically vulnerable LMI, predominantly African-American neighborhoods adjacent to the vibrant and recently revitalized downtown, which serves as the city's urban and commercial core. The watershed contains several areas that are ideal for a comprehensive transformation and are the city's priority for redevelopment. In the heart of the watershed is the St. Paul's area, home to the region's highest

concentration of public housing with nearly 1,700 aging units which have reached the end of their design life and are slated by the Housing Authority and the city for gradual demolition and replacement. The adjacent South Brambleton and Harbor Park neighborhoods include a mix of industrial waterfront activities, several apartment buildings, and many hardscape, publically-owned vacant areas and parking lots, which all divide the community from the rest of the city and the waterfront. The envisioned transformation takes advantage of the opportunity to use innovative water management solutions to recurrent flooding as a catalyst for economic and social revitalization by reconstituting the landscape around natural systems, historic hydrology patterns and landscape elements.

In extensive discussions, charettes, and design workshops, community residents identified flooding as a critical issue, but were equally concerned with the neighborhood's physical, economic, social isolation, concentrated poverty, environmental degradation and barriers to the waterfront, parks and other amenities.

The area experiences frequent flooding. Hurricane Irene, the Qualifying Disaster, caused water damage to homes and made roads impassable, but residents regularly cope with chronic nuisance flooding during high tide and flash rain events [V02.pdf]. Residents now experience more than 100 hours of street flooding per year due to SLR. Like many areas in Norfolk, this area floods as a result of a combination of issues: it sits atop a historic creek filled in a century ago and part of the land is located in the 100-year floodplain. Storm water infrastructure is also undersized, and during high tides, the outfalls are below water level so runoff from flash rain events overwhelms the system.

The neighborhood's economic and social isolation is a result of the 1960s public housing development configuration, which created an inward-facing community with circular street patterns that disconnect the community from adjacent neighborhoods. This disconnection ultimately concentrates poverty, limits economic activity and cuts off residents from waterfront and downtown amenities. By physically reconnecting the area using an innovative water management solution, the proposed NDRC-funded projects will lay the foundation for the complete revitalization of the area.

The water management strategy consists of two components: storm water management and coastal protection.

Component 1 –Storm water Management: The catalytic transformation restores the historic hydrology by using the old filled creek bed as a water spine around which a network of green-blue corridors will be developed [V14.pdf]. The spine and corridors create a system that holds water where it falls, using the new creeks to slow the water's movement through the watershed, and using newly created green spaces to absorb and clean the water before releasing it into living shorelines that filter the water and slow river wake. The new natural system will serve as a water management tool, while creating new pathways and green spaces throughout the community, and reconnecting it to the adjacent downtown, waterfront and amenities [V15.pdf]. New streets will contain large green spaces and bioswales that act as sponges to control water runoff and augment reconfigured grid pattern by providing green walkways (see p. F-II.21)

Component 2: Coastal Protection. Along this part of the Elizabeth River, the estimated future coastal surge elevation to protect the inland regions from coastal flooding is 11-feet. A continuous line of coastal protection using configurations appropriate to land use is proposed along the shoreline. This shoreline protection will include raised green berms, restored marshlands flanked by a raised, multi-purpose promenade connected to walking/biking greenways, breakwaters for wave attenuation and erosion control and folded shoreline to allow water-based commerce access to the river. In addition to neighborhood protection, the coastal fortifications protect a key Interstate 264 on/off ramp area that is a key access point to the downtown corridor. Additionally, it protects a critical electrical substation that supplies the entire city and Naval Station Norfolk. For technical details, see p. F-II-21.

Ohio Creek Watershed Project. The *Ohio Creek Watershed* includes two fully built-out, residential, LMI, predominantly African American, neighborhoods with strong community identity and civic leagues: historic Chesterfield Heights with over 400 houses on the Historic National Register and Grandy Village, which includes public housing community of over 300 units. In contrast to *Newton's Creek Watershed*,

which lends itself to a comprehensive renewal, the water management tactics deployed in the *Ohio Creek Watershed* must be integrated into the existing landscape, while maintaining the character of place and the location of existing road networks as the community requested during the year-long community engagement period around design. The strategies identified offer the advantage of a small-scale, replicable, and community-oriented approach to resiliency at a neighborhood scale.

The *Ohio Creek Watershed* experiences the same flooding dynamic as the *Newton Creek Watershed.* In addition to the tidal and precipitation flooding issues, residents expressed similar concerns about being cut off from the rest of the city because the community is accessed by only two roads. One is completely impassable during regular nuisance flood events. Finally, the community is concerned about shoreline erosion that exacerbates river flooding, fouls the coastal waters constraining recreational activities such as fishing and swimming.

During Hurricane Irene, the coastal storm surge pushed up the Elizabeth River and into the few remaining low-lying areas that were the originally the Ohio Creek bed, and from there, the water slowly inundated the neighborhood. Even during normal tide conditions in the river, the antiquated storm water system is too small to convey run-off to the river in a heavy rainfall event. As a result, neighborhood streets and sidewalks flood frequently, decreasing real-estate value and constraining residents' ability to get to work and school, or evacuate the neighborhood when necessary.

In 2014 the community reached out to a local environmental organization, Wetlands Watch, and two universities to identify solutions to chronic flooding in the neighborhoods. Supported by a Virginia Sea Grant, through a year-long exploration of potential solutions that combine storm water management and coastal protection strategies. The community developed a series of cost-effective green parcel, street and neighborhood level solutions, including rain gardens, bioswales, wadis, and roof water management systems, to stem the area's flooding issues. These solutions will support plans to strengthen the coastal

edge condition by raising the existing edge to resist a 10 foot surge. The resulting fully vegetated, green edge will contain recreational areas and permeable walking paths that connect the area.

Component 1: Storm water Management: to capture rainfall across the watershed, slow its flow into the storm water system, and provide additional storage for rainwater so that water does not pond in the streets the community, in collaboration with engineering students from Old Dominion University and Hampton University Department of Architecture, developed a series of cost-effective, green parcel, street and neighborhood level solutions—including rain gardens, bioswales, wadis, roof water management systems—to stem the area's chronic precipitation flooding. In addition areas near the curbs will be retrofitted with pervious pavement to perk standing water. Three marsh retention areas on the west side of the watershed will provide 1.7M cubic feet of rainwater storage, and will be connected to wetlands and park areas [V16.pdf]. For specific technical details, see p. F-II.9.

Component 2: Coastal Protection: The collaboration also identified a strategy for strengthening of the coastal shoreline by raising the existing shoreline to resist a 10 foot surge bordered by a living shoreline feature to minimize erosion and provide wake attenuation. The resulting fully vegetated, green shoreline will contain recreational areas and permeable walking paths that will connect the area to adjacent neighborhoods. To further fortify the coastline, two roads will be elevated to 11 feet and a new bridge will be constructed to prevent water from inundating the road, providing safe egress from the neighborhood during high tides and storms. For specific technical details, see BCA p. F-II.9.

Supporting Components. To address all resident identified issues and to build residents' resilience to future events, the City of Norfolk is launching a series of initiatives that will buttress communities against economic downturn and other acute shocks and chronic stresses. These initiatives include poverty reduction programs, land use regulatory improvements, business expansion and workforce development programs along with innovative water management practices that will address unmet needs in the rest of the MID-URN area not proposed for the Phase II NDRC projects. Norfolk's proposed NDRC-funded

projects focus on using water management systems as a catalyst for this community revitalization. The city's supporting initiatives build upon the proposed NDRC-funded projects to create economic opportunity and social connection in both proposed watersheds and in the entire MID-URN area, (see Long-term Commitment Factor and Leverage).

Project Schedules. The schedule was developed based on the expertise of design and engineering staff that are familiar with construction for projects of this magnitude (see p. F-II.49). The implementation will be executed in three main phases.

The notice to proceed – 24 months: Conceptual designs will be developed with input from communities. The city will begin the process of acquiring necessary properties and permits.

Phase 1: Months 24-48 – Phase 1 will increase parcel-level involvement in storm water management, build out coastal protection system, improve roadways to maintain connections during a rainfall event, begin restoration of *Newton's Creek* and naturalize retention areas in the *Ohio Creek Watershed* and assist in hiring in hiring initial staff to develop Coastal Resiliency Accelerator. Outcomes of this phase include increased parcel-level involvement in storm water management.

Phase 2: Months 48-64 – Phase 2 will increase the storm water management to sustain flooding from a 10 year rainfall event, improve connectivity in the *Newton's Creek Watershed* with additional open space and new roadways, create new drainage and roadway infrastructure in the St Paul's area; Coastal Resiliency Accelerator staff begin developing plans.

Phase 3: Months 64-72 – Building on the projects in earlier phases, the city will build a more equitable community in the St Paul's public housing area and encourage new investment in the rest of the project area by finalizing Harbor Park waterfront promenade and Grandy Village landscape. The current residents in the two watersheds will see improved living conditions in flood-free, beautiful, healthier, more connected and equitable environment. For detailed schedule, please see p. II.49.

Project Budget. Please see p. 77. The total budget for the *Newton's Creek Watershed* project is $200,032,000 with total requested funds of $192,987,000 from HUD-NDRC. The total budget for the *Ohio Creek Watershed* project is $130,595,000 with total requested funds of $115,549,000 from HUD NDRC. The total project costs for both watersheds is $330,627,000 with total requested funds of $308,577,000 from HUD-NDRC. For a detailed budget, please see p. F-II.52.

Alternatives. Several alternatives were considered for the project areas, including no action, a river barrier and house elevation. As [V17.pdf] demonstrates, without any action, and with projected 2.5 feet of SLR by 2065, residents' vulnerability to coastal and chronic precipitation flooding would increase significantly. While a considered river barrier constructed at the mouth of the Eastern branch of the Elizabeth River would protect the area from coastal surge flooding, the barrier would not address rainfall nuisance flooding that affects the area's residents every time high tide combines with rain. The barrier would be more expensive and less flexible, requiring uneconomical navigation gates for industrial shipping while negatively affecting the health of the river. Finally, while house elevation would prevent homes from flooding, this single-purpose solution would be costly and would not provide any resilience co-benefits such as increased connectivity and amenities. Flooded roadways would continue to disrupt regular daily activities, commuting, and access by emergency services.

Metrics. See p. 73 and p. FII.60.

Current and Future Risks. Norfolk is an older colonial city with some original historical infrastructure dating back to the 1800's. Infrastructure improvements were most recently performed in the 1950's and this infrastructure is currently approaching the end of its serviceable life. The portions of the system designed before the 1950's were sized to accommodate a 2-year rainfall event, while the newer portions were designed to accommodate a 10-year rainfall event. Both are below present day design standard for municipal storm water systems. The 65-year old storm water system was not designed to

handle the additional backwater flows caused by storm surges or high tide, which may occur concurrently and with increasing frequency due to subsidence and SLR.

The bulk of both watershed sub-areas for the proposed NDRC projects is within the 100-year floodplain, sitting on filled creek beds with the flood risk areas reflecting the historic flow of the creek bed. A large portion of Tidewater Drive, a major Norfolk thoroughfare, drains to this area, causing storm water systems to back-up and unable to handle an abnormal rain event. This causes significant flooding on Tidewater Drive and within the Tidewater Gardens public housing, physically cutting off already socially and economically segregated residents from the adjacent downtown by making roads impassable. A similar situtation is present in the *Ohio Creek Waterhshed*, as another road connecting both a historic neighborhood and a public housing community also floods. Nuisance flooding due to flash rain and high tide regularly disconnects this area with nearly 2,000 public housing units from the rest of the city. In addition to decreased access to resources, homes in the target area are losing value due to increased home flooding (e.g., basements), impassable roads and increased flood insurance rates.

With recent increases in flooding, a significant projected increase in sea-level rise, the continuation of land subsidence, and elevation below 15 feet, undersized underground storm water systems, and the prevalence of impervious surfaces, the flooding situation in Norfolk is only expected to worsen. In the proposed project areas, where nuisance flooding is experienced during even relatively mild rainfall, the disruptions to daily life and travel are becoming more a more frequent and of longer duration. GIS modeling demonstrates that without intervention, nuisance flooding will only increase in frequency, depth and duration, causing further hardship for residents.

Benefits to Vulnerable Populations The proposed NDRC projects for the Norfolk target area will provide safety to vulnerable residents from nuisance and coastal flooding, as well as future SLR. The proposed projects will protect the areas from 10-year rainfall events, effectively eliminating chronic

nuisance flooding during rain and high tides, and a 100-year storm with 2.5 feet of SLR projected by 2065 [V17.pdf].

In addition to physical safety, the proposed projects will provide significant resilience, economic revitalization, environmental, and social benefits to vulnerable residents in the two watersheds, the city and the region. Restored creeks systems to hold water create natural walking trails to reconnect segregated neighborhoods to downtown, while providing easy access to the shoreline and waterfront. The expanded open space needed to hold water provides new green, multipurpose amenities for residents to enjoy. The redesigned, reconnected and flood-free landscape allows for redevelopment and revitalization of large areas where innovative water management practices are combined with mixed-use and mixed-income development strategies.

The proposed projects, especially the linked sequence of green spaces aligned with historic creek that will become a "spine of opportunity," as public housing residents dubbed it during an NDRC community meeting and will add new and improved park space, bicycle, and pedestrian trails, as well as community gathering and recreational spaces and amenities. As neighborhood streets are improved with green storm water techniques, new permeable bicycle and sidewalk connections will be constructed, providing safe routes to school and other community facilities.

Urban parks help improve the quality of life and social sustainability of cities by providing recreational opportunities and aesthetic enjoyment, promoting physical health, contributing to psychological well-being, enhancing social ties, and providing opportunities for education. Furthermore, these types of spaces foster social interaction and promote social cohesion within diverse communities. In addition, maintained green spaces can encourage more use and increased social monitoring of public spaces, sometimes referred to as crime prevention through environmental design (CPTED).

The proposed projects paired with long-term commitments proposed by the City of Norfolk will also provide significant economic revitalization benefits to vulnerable residents. Once the St. Paul's area and

Harbor Park waterfront area is protected from flooding, revitalization efforts are planned consisting of additional retail and office space, new residential units, and more hospitality opportunities all of which will provide new jobs to the vulnerable residents. In the *Ohio Creek Watershed*, the revitalization effort funded by NHRA is planned to replace obsolete housing with improved, energy-efficient units and green spaces for recreation. Several of the proposed revitalization districts are considered long-term objectives of Norfolk's Coastal Adaptation and Community Transformation Plan. Economic analysis demonstrates that the proposed NDRC projects in Norfolk's two watersheds are expected to generate more than 2,550 jobs, $141M in labor income, and $199M in industry output through the Virginia Beach-Norfolk-Newport News MSA alone, increasing local GPD by $199M, which will enhance the city's and residents' resilience to economic stresses.

Model for Other Communities. Norfolk's proposed NDRC projects are prototypical pilots that speak to a wide range of coastal environments including rivers, bay fronts, streams and marshes. The proposed projects address a variety of social conditions including high poverty public housing, low-moderate income traditional owner-occupied neighborhoods, industrial working waterfronts and areas primed for private commercial investment and revitalization. Because these typological conditions repeat themselves across the city, the region, the Chesapeake Bay water system and water systems all along the US East Coast and indeed coastal systems across the world, the projects prosed will create learning that is transferable and replicable in thousands of watersheds that experience coastal inundation, precipitation flooding and SLR. As huge amounts of economic activity occurs in these coastal cities, the investment in the innovative projects proposed will realize significant returns on investment.

Feasibility. While there are many innovative components to the proposed holistic approach of integrating coastal and storm water flooding, the individual components are standard practice (see p. F-II.57). The methods for estimating storm surge risk and for computing storm water volumes have been well validated in the engineering community and result in dependable design of berm heights and

pumping volumes. The construction of the berms and pump stations are straightforward and the sites are accessible by traditional construction equipment. The terraforming and landscaping of the green spaces and bioswales are likewise standard practice. Feasibility, including permitting and environmental reviews, was confirmed during the city's meeting with the Army Corps of Engineers, as detailed in the Consultation Summary. The proposed retrofit of green water collection, pervious pavement, and sub-grade water storage in the *Ohio Creek Watershed* have been implemented previously and have been demonstrated to work. The cost estimates have been carefully considered to include all the direct projects costs and some contingency to account for uncertainties such as unknown sub-surface soil conditions. Several regions require conversion of land use from typical residential lots into water storage sites, and fortunately, the city already owns most of the desired sites.

Consistency with Other Planning Documents. The projects proposed in this application are consistent with the City of Norfolk's Consolidated Plan, the 2011 Southside Hampton Roads Regional Hazard Mitigation Plan, Norfolk's long-range comprehensive plan, PlaNorfolk 2030, and Norfolk's Coastal Resilience Strategy.

THE CRESTWOOD/OAK GROVE WATERSHED AND SOUTH NORFOLK/MILL CREEK WATERSHED (CITY OF CHESAPEAKE). The Commonwealth is proposing two THRIVE projects within the City of Chesapeake's target area, the *Crestwood/Oak Grove* and *South Norfolk/Mill Creek Watershed* projects.

Unmet Need, Project Eligibility, and alliance with a HUD National Objective. See Exhibit B.

Project Descriptions.

The Crestwood/Oak Grove Watershed. The *Crestwood/Oak Grove Watershed* is located in the City of Chesapeake and includes three tidal creeks, Mains Creek, Hodges Creek, and Newton Creek, which all empty into the Southern Branch of the Elizabeth River. This watershed is home to two of Chesapeake's most flood prone neighborhoods, Mains Creek and Fernwood Farms, both in that city's MID-URN area. These houses and roads in these neighborhoods range in elevation from 3-6 feet above sea level, well

under the standard 8-feet 100-year base flood elevation. Several properties have repetitive flooding and are affected by high tide, even during a relatively "minor" storms such as the early October 2015 storm that slowly made its way, bringing 2-3 days of rain. As a neighborhood photo [V24.pdf] shows, water reached heights that created risks for people and property in the *Crestwood/Oak Grove Watershed* areas; minor flooding caused closed streets and prevented residents from carrying on with daily activities. At some schools, flooding prevented buses from leaving school and/or returning children to their homes. Flooded roads [V40.pdf] stranded residents in flooded homes and neighborhoods, travelers were likewise stranded, and flooding impacted the ability of public safety officials to serve the public.

Residents of both neighborhoods have asked for help from the city, and at the NDRC public input meetings, many residents asked to be put on a list for the voluntary buyout program.

To improve resilience in the *Crestwood/Oak Grove Watershed*, the Commonwealth of Virginia proposes a voluntary buyout program, coupled with a micro-mitigation program to help homeowners, who choose not to sell their property, retrofit their homes for greater protection against flood in this repetitive flood loss area. The project also includes the demolition of all homes acquired and utilizing this area for wetlands restoration to enhance environmental benefits for the surrounding areas including the attenuation and treatment of storm water flow before discharging to the shorelines of the Elizabeth River. Residents of both neighborhoods have enthusiastically attended public meetings on the proposed project and their response to the project activities has been overwhelmingly positive. The vast majority are willing to sell their properties and move to a safer location.

In tidal flooded neighborhoods, many homeowners are taking part in FEMA mitigation grant opportunities. Unfortunately, some homeowners are unable to participate, unable to obtain flood insurance, or unable to maintain the property and subsequently are foreclosed upon by the bank, sold for back taxes or the property is abandoned. This project would include purchasing distressed, blighted, or foreclosed properties to convert the property to green space for perpetuity. Removing the damaged

properties that have unmet recovery needs will remove blighted properties and stabilize the remaining home values.

Homeowners who do not wish to sell, will be offered micro-mitigation opportunities to protect the more expensive necessities in their home (electrical panel box, HVAC system, water heater, and washer/dryer). Projects will be coordinated by Chesapeake, which will procure necessary contracts. Micro-mitigation can even include installation of flood vents in the foundation to relieve hydrostatic pressure on foundation walls during a flood event and allow for the automatic entry and exit of floodwaters without human intervention so the floodwaters can flow through without damaging the home.

Complementing the other projects is a conceptualized living shoreline project located within each voluntary buyout area. The proposed 7.88-acre Fernwood Farms Living Shoreline project will be located at or near the terminus of Shore Side Road and Fernwood Farms Road, directly contiguous to the Southern Branch of the Elizabeth River. The Mains Creek living shoreline is a 10-acre project near an area just south of Mains Creek Road and Malbon Drive, and contiguous to Mains Creek. Both project sites have access to navigable waters on the Elizabeth River, a recreational amenity that will contribute to health and well-being. Project sites will be elevated to accommodate SLR and graded from the water's edge with various zones of intertidal emergent plants and riparian shrubs/trees [V41.pdf & V42.pdf].

Additional co-benefits of the Living Shoreline projects include observation platforms, wooden walkways, and educational interpretive signage. An ADA-compliant kayak launch and fishing pier will be constructed at the southern seaward edge of the Fernwood Farms living shoreline, providing non-motorized access and fishing on the Elizabeth River. A second ADA kayak launch will be built along the southwestern edge of the Mains Creek living shoreline, providing non-motorized access to Mains Creek.

While it is expected that the vast majority of homeowners in these two neighborhoods will participate in the voluntary buyout program, the living shoreline and additional green space will offer additional

mitigation from flooding and intertidal emergent plants and riparian shrubs/trees and the elevations of the project activity sites that accommodate SLR will increase resiliency.

South Norfolk/Mill Creek Watershed. The *South Norfolk/Mill Creek Watershed* project encompasses a suite of actions for a north-south road corridor that is a major business and evacuation route (Bainbridge Blvd.) for the populations in the MID-URN area, and which pre-dates modern, safe and more resilient building codes.

Component 1 –Bainbridge Elevation and Living Shorelines. One component of the project is the elevation of Bainbridge Boulevard, north of the I-464 entrance/exit, which encounters regular tidal flooding, endangering the population in the neighborhoods of Rivercrest and historic South Norfolk, inhibiting their ability to safely travel to work, school, and other daily requirements, prohibiting their ability to safely evacuate, and inhibiting first responders' ability to access the area. Bainbridge Blvd. is a major north-south corridor that serves as an emergency evacuation route. Built in the 1940s, the roadway elevations currently range from 3 to 6 feet above mean sea level. A significant portion of Bainbridge Blvd. and surrounding areas are within the 100-year floodplain and are impacted by high tides from even minor tidal flooding during storms such as the Commonwealth's October 2-5, 2015 severe storm event. As the photograph [V35.pdf] shows, this minor flood event resulted in water reaching heights that created risks for people and property along numerous sections of the Bainbridge Blvd. corridor and resulted in closed streets, flooded homes and cars, the inability of residents to leave their homes by automobile, and reduced ability of public safety officials to reach residents. In the Bainbridge Blvd. area of Historic South Norfolk / Portlock / Freeman Ave. area, the streets were flooded and impassible, including the exit street for Chesapeake Fire Station No. 2. Critically, Bainbridge Blvd. connects residents to bridges for evacuation purposes, and it is important to note that the region's tunnels close in advance of major storm events, thus the Bainbridge Blvd. route becomes important to safely evacuating this LMI community.

The Bainbridge Blvd. roadway elevation project activity will elevate the road above the current 100-year base flood elevation of 8 feet. In the design stage, city engineers will investigate additional elevation strategies to address SLR for the next 100 years. In addition to protecting the boulevard from flooding, the elevated road will serve as a berm to prevent flooding of homes east of the corridor.

The elevation component of the project includes a road diet concept that will convert the road surface from a four-lane roadway to a three-lane road with bike lanes within the current pavement width. Other infrastructure improvements on this road include major utility work, such as the utility undergrounding of a significant number of poles and overhead lines that provide power and communication services in the area. The city also has current plans to replace and upgrade waterlines, sanitary sewer and storm water facilities. The proposed work along and directly off Bainbridge Blvd. will support resiliency for SLR and flooding in the *South Norfolk/Mill Creek Watersheds* and protects a critical evacuation route.

Integral to the Bainbridge Blvd. elevations are two living shorelines: one at the intersection of Bainbridge Blvd. and Burrow Ave., in the Portlock area of South Norfolk; the second along Lakeside Park, a city-owned community park accessed from Bainbridge Blvd., located in the South Norfolk community and connecting directly to Scuffletown Creek. The living shorelines will be attractive, and will help manage storm water in this low-lying area [V37.pdf].

At the Bainbridge Blvd. and Burrow Ave living shoreline, Chesapeake will construct approximately 0.46 acres of living shoreline from a city-owned property. The project activity site is directly adjacent to Milldam Creek, which is a tidal tributary to the Southern Branch of the Elizabeth River in the *Mill Creek Watershed*. Historically, much of the shoreline areas in South Norfolk were filled, and fill; Chesapeake from this area has the potential to leach contaminates into the groundwater and local waterways without a living shoreline to help mediate pollutants.

The Lakeside Park living shoreline, with 0.21 acres of living shoreline, will be located directly adjacent to Truitt Middle School. The sites will be elevated for SLR and graded up from the water's edge

to accommodate various zones of intertidal and brackish emergent plants and riparian shrubs/trees. Observation platforms, wooden walkways, and interpretive signs will be constructed on the sites to provide community education. Because of the proximity of the Lakeside Park living shoreline site to Truitt Middle School, the site will incorporate a teaching marsh with wooden walkways that connects to the school property and interpretive signs for on resilience for students. The proposed bike and pedestrian path along Bainbridge Blvd. will complement the living shoreline sites and provide a resilient urban habitat that connects the living shoreline and the local community.

Component 2 – Freeman Overpass and Living Shorelines. The second component of the South Norfolk/Mill Creek Watershed project is the construction of a roadway overpass along Freeman Avenue that would eliminate the existing at grade railroad crossing of the Norfolk Portsmouth Belt Line (NPBL) railroad. Currently, Freeman Avenue offers the only roadway into the Money Point industrial area, which also serves as a residential area. When this railroad crossing is blocked due to railroad operations, there can be serious impediments for residents traveling to work and first-responder access to the area.

Integrated into the Freeman Ave. project are two bio-filtration management facilities, located within the industrial area of Money Point. Individual bio-filtration areas can serve highly impervious drainage areas less than two acres in size. Surface non-point source storm water runoff is directed into a shallow landscaped depression that incorporates many of the pollutant removal mechanisms that operate in a natural forested or wetland ecosystem. The primary component of a bio-filtration practice is the filter bed, which has a mixture of sand, soil, and organic material as the filtering media with a surface mulch layer. During storm events, runoff temporarily ponds six to twelve inches above the mulch layer and then rapidly filters through the media bed. Bio-filtration facilities provide excellent runoff reduction, filtration, biological uptake, microbial activity, and provide high pollutant removal. According to the Virginia Department of Conservation and Recreation, bio-filtration methods can reduce annual runoff volume by 40 percent, with a total phosphorus reduction of 25 percent and total nitrogen reduction of 40 percent.

One of Chesapeake's innovative water bio-filtration storm water management facilities will be located in a highly industrial area of Money Point adjacent to Buckeye Terminals. The Buckeye site currently collects nonpoint source storm water runoff from a petroleum tank farm through the Buckeye Terminals' oil/water separator, in addition to storm water sheet flow from Colton Drive. A second storm water bio-filtration storm water management facility will be located at the intersection of Freeman Avenue and Felton Street, within the highly industrialized area of Money Point. The 0.79-acre bio-filtration facility will provide storm water management for Chesapeake's Freeman Ave. overpass project, as well as providing pre-treatment to non-point source storm water runoff from Freeman Ave.

The storm water bio-filtration facilities will use existing topography to create a storm water bio-filtration cell and fore bay area to facilitate operations and maintenance [V43.pdf & V44.pdf]. The fore bay areas will provide initial treatment and store storm water where it is easily accessible for maintenance. Storm water will then flow into the bio-filtration cells prepared by removing the existing surface and portions of the subsurface materials and installing a mixture of sand, topsoil, and compost (i.e., soil media). Finally, the bio-filtration cells will be covered with hardwood mulch and planted with a variety of hardwood species. A denser than typical planting of the trees and use of larger stock will aid in the uptake of priority pollutants.

The Freeman Ave. bio-filtration storm water management facility will incorporate an underdrain system and infiltration sump to collect filtered runoff and return it to the storm drain system. The underdrain consists of a perforated pipe in a gravel layer installed along the bottom of the filter bed. The infiltration sump will help recharge the groundwater and can provide extra storage for larger storm events.

Activity 3. The third component of the *South Norfolk/Mill Creek Watershed* project is a voluntary buyout for a blighted residential area in historic South Norfolk. The South Hill neighborhood, a 15.91 – acre site, encompasses 38 residences within an area zoned M-2 Heavy Industrial. South Norfolk dates back to 1661 and grew from a small village to city status in 1951, merging with what is now the City of

Chesapeake in 1963. South Norfolk, including the neighborhood of South Hill, was once a bustling, close-knit community with thriving waterfront businesses, and declined economically as a result of the Great Depression. The community remained close through its schools and churches, however, and a number of descendants of the 20th century inhabitants still live in the homes where they grew up. Cut off from other South Norfolk's residential areas by the construction of I-464, South Hill's decline progressed to blight. Currently the community has the interstate on one side, the railroad on another and tank farms on the other two sides. In 2008 South Hill residents were confronted with the catastrophic failure of a 2-million-gallon fertilizer tank that created hardship for all residents through mandatory evacuations, cleanup, and damage to their property [V27]. The Freeman Overpass and South Hill voluntary buyout projects, both address flooding as well as the additional risks of hazardous spills and volatile materials in the nearby Money Point rail yard area.

After the fertilizer spill, the City of Chesapeake worked closely with the Commonwealth of Virginia, and pursued amending regulation of non-petroleum storage tanks, as well as providing a gate that could serve as an emergency pedestrian egress onto busy I-464 [V28.pdf]. These measures helped mitigate the risk to the South Hill Community, but do not address the incompatibility of the land uses and resulting risk to life and property. Additionally, South Hill is affected by the tidal flooding from the Elizabeth River and by tidal flooding, even during storms such as the Commonwealth's October 2-5, 2015 severe storm event. As the photographs [V38.pdf & V39.pdf] show, this minor flood event resulted in water reaching heights that created risks for people and property and resulted in flooded streets, limiting residents' ability to leave in their cars, and that of public safety officials to reach residents. Because South Hill's ingress egress intersects with the Bainbridge Blvd. area of South Norfolk/Portlock/Freeman Ave., where the streets are flooded during minor storms and impassible in many areas, South Hill has become a vulnerable LMI neighborhood that has difficulty carrying on daily activities amidst significant risks of hazardous

spills, volatile materials, and flooding. For the people of this community, resilience will mean having the option to live elsewhere, safe from hazardous materials and flooding.

Scaling and Scoping. The projects planned in Chesapeake, are designed to be scaled, scoped, and implemented in phases if necessary, according to each activity. They are budgeted separately, scheduled separately, and have a separate BCA. The projects are separated by activity as a means of scaling, and each activity can standalone, although resiliency is further enhanced by implementing project components together. The City of Chesapeake priorities for project implementation are based on the project impact on resident resiliency:

1. Relocation for South Hill residents. Voluntary buyout programs completely remove residents from the flood risks and in South Hill's case, from the risk of floods and hazardous spills and volatile materials; buyouts also received the most comments from residents, and the vast majority want to relocate. The first and highest priority for Virginia and its partner city is the relocation of South Hill residents. The South Hill BCA of 1.27 is lower than others, but that is offset by the high level of risk to this community. The area floods and has experienced a hazardous spill, and the blight and poverty rate in South Hill is high. Resident safety is the priority, and Chesapeake requests $9,662,188 to the safety of South Hill residents.
2. Relocation for Mains Creek (Crest Harbor) residents and creation of a living shoreline. This LMI neighborhood has repetitive flood loss and had the largest number of homes damaged in the qualifying criteria for the threshold of Phase 1. Crest Harbor has high BCA at 3.08 and an initial expenditure of $32,452, 975.
3. Relocation for Fernwood Farms residents and creation of a living shoreline. Fernwood Farms has a high BCA at 2.31 and an initial expenditure of $37,907,475.

Project Schedule. Please see the Virginia-Chesapeake Partner Agreement for detailed project schedules for all activities.

Project Budget. Please see p. 77.

Alternatives Considered. The city evaluated the construction of floodwalls and tide gates and concluded these projects provide only partial protection and will be costly with many environmental concerns (wetlands and stream impacts). The voluntary buyout project addresses the future problem of SLR and land subsidence by moving people out of harm's way in a 50 to 100 year flood scenario, and for perpetuity, as the property will be returned to green space and living shore lines.

Metrics. Please see p. 73.

Current and Future Risks. Chesapeake's 2014 NQL applies dimensional priority scores on four dimensions (social, crime, physical and economic) within neighborhood statistical areas (NSA). This study identifies that within Chesapeake's HUD NDRC MID-URN, three NSAs meet the high priority criteria for four dimensions (social, crime, physical, economic); 11 NSAs meet the high priority criteria for three of the four dimensions; and nine NSAs meet the high priority for two of the four dimensions.

Areas in Chesapeake subject to hurricanes and frequent flooding include numerous areas along the Southern Branch of the Elizabeth River, including the streets and neighborhoods in our HUD MID-URN target area. There are a total of 22 areas that regularly flood and 45 repetitive loss areas. In the repetitive loss area there are 391 properties and an additional 2,024 structures identified as being within those repetitive loss areas. Despite the resilience progress this HUD grant will foster in Chesapeake, the city's continued flooding presents an ongoing social, physical, and economic risk to residents.

The main impacts from severe floods or floods that may exceed the 500-year frequency event are expected to be: inundation of low-lying residential neighborhood impassable road crossings and consequential risks for people and cars attempting to traverse flooded crossings; damage to public and private infrastructure, including but not limited to water and sewer lines, bridge embankments, and small and large drainage ways; wave action responsible for shoreline damage, and boat and facilities damage; and inundation of critical facilities, possibly including some fire stations, police facilities, public shelters,

and several city buildings. Public shelter availability is limited by the expected severity of flooding.

The 2014 HMP used a methodology for estimating average annual losses expected from SLR is supported by FEMA. In 1991, FEMA issued a report to Congress documenting the estimated impact of relative SLR on the Flood Insurance Rate Maps. The agency estimates that existing development in the coastal zone would experience a 36% to 58% increase in annual damages for a 1-foot rise in sea level by 2100, and a 102% to 200% increase resulting from a 3-foot rise by 2100. Based on this estimate, average annual flood damages from storm surge could be expected to increase to between $30M and $46M under a 1-foot rise scenario, and to between $45M to $87M under the 3-foot rise scenario.

Benefit to Vulnerable Populations. Removing people from this area will protect them from the risks and cost of recurrent flooding, and the properties will be returned to green space for perpetuity. LMI residents who have not previously had affordable options will be able to relocate to safer areas, improving their economic, environmental, and social resiliency. Using the area for wetlands restoration will enhance environmental benefits for surrounding areas including attenuation and treatment of storm water flow.

In the South Hill community, helping people voluntarily re-locate from the area will protect them from multiple risks and the costs associated with flooding, hazardous spills, and volatile materials. It will allow LMI households in the target areas to relocate to a safer environment, improving their economic, environmental, and social resiliency as well as eliminating blight while returning the property to green space for perpetuity. Finally, the project meets HUD's objective of urgent community development needs because existing conditions pose a serious and immediate threat to the health and welfare of the community and other financial resources are not available to mitigate the problems.

The Bainbridge Blvd. elevation benefits low- and moderate-income persons by protecting their property from flooding and by providing the safety of a direct evacuation route. The Freeman Avenue overpass project will eliminate the at-grade rail crossing, eliminating all vehicular delay (passenger car and truck) associated with the train crossing, which will in turn reduce fuel use and greenhouse gas

emissions. This project will contribute to improved air quality in the neighborhood by reducing the release of nitrogen dioxide (NO2), ozone (O3), and sulfur dioxide (SO2).

Model for Other Communities. Chesapeake's projects are designed to serve as models for other communities and are scalable and replicable. The model combines infrastructure and environmental engineering with a voluntary buyout program that will be conducted using a model used locally with HUD and FEMA grant funding. Projects are scalable because each component can be accomplished independently of the others, or together, depending on funding. It is replicable because infrastructure projects and environmental projects are done nationwide and as a part of localities capital improvements.

Feasibility. Bainbridge Blvd Elevation: The criteria used for the design of this project shall conform to applicable local, state and federal design guidelines such as the city's Public Facility Manual, HR Regional Construction Standards and the most current edition of VDOT "Road Design Manual, Volume 1." When these manuals do not cover a specific situation, the governing criteria will be as stated in A Policy on Geometric Design of Highways and Streets 2011, published by the American Association of State Highway and Transportation Officials (AASHTO).

Freeman Ave Overpass: The criteria used for the design of this project shall conform to applicable local, state and federal design guidelines such as the city's Public Facility Manual, HR Regional Construction Standards and the most current edition of VDOT "Road Design Manual, Volume 1." When these manuals do not cover a specific situation, the governing criteria will be as stated in A Policy on Geometric Design of Highways and Streets 2011, published by the American Association of State Highway and Transportation Officials (AASHTO).

Voluntary Buyout projects: No design criteria here but land acquisition will be in accordance with all applicable local, State and Federal guidelines and/or requirements.

Living shorelines: The projects will be in compliance with the Virginia Marine Resources Commission (VMRC) Chapter 4VAC20-1300-10 ET SEQ, the US Army Corps of Engineers Section 404

and the Virginia Department of Environmental Quality (DEQ) Section 401 of the Clean Waters Act (CWA). In addition, the projects will conform to the latest Virginia Institute for Marine Science (VIMS) Center for Coastal Resources Management Decision Tools, Chesapeake Public Facility Design Manual, Virginia Storm Water Management Program, the Virginia Best Management Practices Clearinghouse requirements and specifications, and the Virginia Erosion and Sediment Control Program.

Bio-filtration projects: The project will be in conformance with the latest Chesapeake Public Facility Design Manual, Virginia Storm Water Management Program, the Virginia Best Management Practices Clearinghouse requirements and specifications, and the Virginia Erosion and Sediment Control Program.

Consistency with Other Planning Documents. The projects proposed in Chesapeake have been developed with input from the areas' citizens, and are guided by plans and data presented in the city's *2014 Consolidated Plan, 2014 Hazard Mitigation Plan*, and *2014 Neighborhood Quality of Life Study Update.* These plans and assessments complement each other, increasing resiliency across dimensions.

SALTERS CREEK WATERSHED (CITY OF NEWPORT NEWS). The Commonwealth is proposing a project to increase resiliency in the qualifying target area of the City of Newport News, *Salters Creek Watershed*.

Unmet Need, Project Eligibility, and alliance with a HUD National Objective. See Exhibit B.

Project Description. Proposed activities in the *Salters Creek Watershed* project, including improvements in the Southeast neighborhood, are designed to enhance and stabilize shorelines and roadway embankments along Chesapeake Ave, and reduce the impact and risk of flooding to private and public properties. It will increase water quality by implementing dredging and stream restoration projects, and minimizing erosion and sediment transport. It will improve the neighborhood's resilience and sustainability by improving the safety and appearance of the neighborhood and attracting recreational, as well as commuter pedestrians and cyclists, in order to improve the quality of life for citizens. Further, the improvements will improve the neighborhood's access throughout the city to create a more sustainable and safe pedestrian atmosphere. The proposed project activities are below:

Chesapeake Avenue Seawall Stabilization: The seawall is approximately 3,550 lf in length and extends from Monitor Merrimac Overlook Park to the south of Hampton/Newport News city limits. The seawall protects the shoreline adjacent to Chesapeake Avenue from Hampton Roads body of water. The water body has semidiurnal tides with fluctuations of 2 to 3 feet between high and low tides. It is not known when the original Chesapeake Ave seawall was constructed. In 1984, the original stone rip-rip was covered with a layer of concreted reinforced with wire-mesh. In September of 2003, Hurricane Isabel destroyed a 540 lf section of the seawall. The damaged section was removed and replaced in 2004 at an approximate cost of $1,000,000.

Another activity of the Seawall Stabilization project is the Chesapeake Avenue Bike Trail and Sidewalk project. The city plans to construct a separate bike path and a sidewalk along the shoreline of Chesapeake Avenue. The 0.64 mile bike trail and sidewalk will improve the safety of the cyclists and pedestrians by separating them from the 1,694 vehicles per day traveling along Chesapeake Ave.

16th Street Tide Gate and Pump Station: Installation of a tide gate and pumping station to control the back flow of water from Hampton Roads Bay into Salters Creek before, during and after storm events to reduce the numbers of properties affected by flooding in the drainage basin. A secondary benefit will allow better control of storm flow in Salters Creek.

Hampton Avenue Channel Improvements and Constructed Wetlands: Restoration and stabilization of an existing open drainage channel along an existing city right-of-way. Improvements range from hard and soft stabilization, such as stone riprap, channel benching, wetlands vegetation, and adding bends to the channel flow. Replacement of the culverts under Buxton, Poplar, and Maple Avenues will be included with the overall project. Project also includes the construction of tidal wetlands as part of the channel improvements, and constructed wetlands as water quality BMPs for TMDL credits.

The new channel will provide improved flow of storm water runoff as well as flood control in the area. Area will become more aesthetically pleasing and reduce nuisances of undesirable animal life. An

additional benefit with the BMP and a natural channel design is the reduction of pollutants such as sediment, nitrogen, and phosphorus entering the Chesapeake Bay. Replacing the culvert increases the stability and lifespan of the structure, which will reduce the cost for maintenance and repair. The length of the channel is approximately 1300 LF.

Salters Creek Stream Restoration: Restoration and stabilization of an existing open drainage channel along an existing city right-of-way. Improvements range from hard and soft stabilization, such as stone riprap, channel benching, wetlands vegetation, and adding bends to the channel flow. The new channel will provide improved flow of storm water runoff, making the area more aesthetically pleasing and reduce nuisances of undesirable animal life. An additional benefit of the BMP and a natural channel design is a reduction in pollutants such as sediment, nitrogen, and phosphorus, entering the Chesapeake Bay. The channel length is approximately 1400 LF.

Other activities under the *Salters Creek Watershed* project are the 27th Street and Buxton Avenue Grade Adjustments, Short Street and Christopher Shores Drainage Improvements projects. This project, located on the boundary between the City of Newport News and the City of Hampton has frequent street flooding during heavy rains and high tides. The project will raise the pavement grades to alleviate this project allowing residents and emergency vehicles continued use of the roadways in the area. The Short Street Drainage Improvements project. These improvements, located upstream of Salters Creek, will disconnect the storm sewer system from the sanitary system and address flooding problems for residents. The Christopher Shores drainage improvements project, within a drainage system that runs parallel to Salters Creek, will be replaced to alleviate flooding caused by tidal action of the Hampton Roads Bay. Both of these projects will improve resiliency in the *Salters Creek Watershed,* including the Southeast neighborhood.

Scaling and Scoping. The *Salters Creek Watershed* project can go together and be completed within 2-3 years; the seawall repair is another stand-alone phase that can be designed/constructed; the tide gate

and pump station is another phase of the whole project that is to be designed/constructed according to the timeline for the project.

Project Schedule. Please see the Virginia-Newport News Partner Agreement for detailed project schedules for all activities.

Project Budget. Please see p. 77.

Alternatives Considered. Several alternatives were reviewed by the Engineering Department for the *Salters Creek Watershed* project that could have reduced overall disaster recovery needs in the impacted area, including the activities above. One alternative considered, but not included in the project, was additional funding and outreach for city's Flood Assistance Program (FAP). Additional funding may attract more homeowners to consider and enroll in program and provide additional areas for city projects or creating natural environment within an urban community.

Metrics. Please see p. 73.

Benefits to Vulnerable Populations. The *Salters Creek Watershed* project will create coastal resilience by improving the stability of shorelines along the roadway, reduce neighborhood flooding through stream restorations and wetland areas and tide gate and pump station construction. These actions strengthen appearance, quality of life and safety attributes of the area by providing more protected shorelines, sidewalks and a bike trail. In addition, a tributary of Salter's Creek extends upstream into the City of Hampton. Stream restoration benefits such as flood control and water quality can be beneficial to Hampton. The expected life of the project is 25-50 years.

When funded, the city will bid out construction work with language that will encourage participation by Section 3 persons or persons from the community. The city will advertise procurement opportunities directly in the impacted community and in media utilized by residents in the community. The city will collaborate with the local housing authority to advertise procurement opportunities in public housing complexes and in their newsletter. Additionally, the city can utilize the housing authority's contractor list

of those that have worked on previous CDBG and HOME projects. The city also has longstanding relationships and financially supports a local community action agency working with the LMI community to further self-sufficiency and aids small and minority contractors in getting licensed and bonded.

Model for Other Communities. Using a variety of techniques will help the community be resilient with the drainage improvements (Hampton Ave. & Salters Creek), barrier improvements (seawall repair/replacement), and protection of the watershed (tide gate & pump station). The restoration of the coastal plain is more innovative in that it is higher than what Newport News has used before and the technique could be used in other areas.

Feasibility. There are three factors that drive the feasibility of a project used by the city; citizen input, accepted techniques, and cost. All proposed techniques for Seawall Replacement and Stream/Channel Restorations were implemented in other projects throughout the city and demonstrated viable.

Consistency with Other Planning Documents. The proposed project in Newport News are consistent with the city's Consolidated Plan for Housing and Community Development AND WITH. The project also links with recommendations found in the Hampton Roads Planning District Commission's *Coastal Resiliency Final Report,* adopted by the Commission in August 2013.

The City of Newport News is in the process of updating its comprehensive plan, which will support the Newport News hazard mitigation plan by providing recommendations to mitigate issues in the most impacted and distressed areas related to land use, transportation, infrastructure and open space policies. The comprehensive plan, a community-based effort, will be ready for adoption in 2016 and will align with regional resilience actions facilitated through the Hampton Roads Planning District Commission's Metropolitan Planning Organization.

COASTAL RESILIENCE LABORATORY AND ACCELERATOR CENTER. These projects will also jumpstart the creation of a new economic cluster around water management and resilience solutions through a proposed Accelerator that will help diversify the regional economy.

Project Description. The Coastal Resilience Laboratory and Accelerator Center (the Center), an independent 501(c)(3) organization, will serve as the nexus for technological and organizational innovation around community revitalization, water management, resilience measurement, and port, Navy, and other water-sector business-related resilience challenges. Managed by a Board of Directors inclusive of community and private sector partners and the Commonwealth's major universities, and staffed by a small team, the Center will assist entrepreneurs skilled at identifying problems, matching them with potential solutions, working with companies to create product and moving product quickly to market.

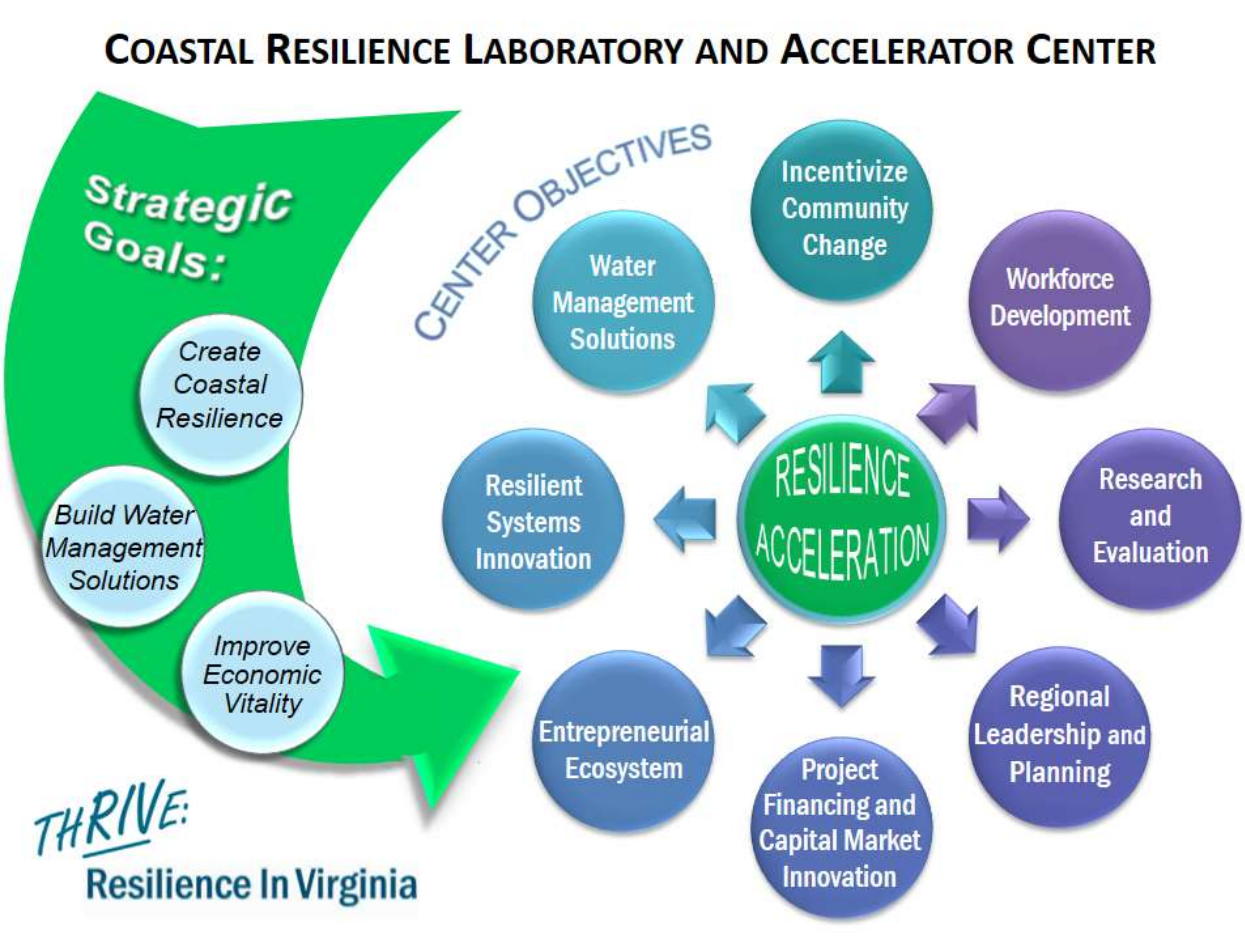


Figure 6. Coastal Resilience Accelerator Goals and Impact

As depicted in ***Figure 6***, the Center will focus on generating economic growth by concentrating on three core areas, serving as a connector between the region's existing academic research, workforce

development, and entrepreneurship systems to drive problem identification, solution innovation, product production and market expansion. Please see p. F-II.32 for technical information on the Center.

The Center will accelerate:

- Water management innovation, Ecosystem Creation, and the Incorporation of Resilient Principles
- Financing and Capital Market Innovation
- Workforce Development focused on LMI and living wage employment
- Awareness of climate change and resulting risks through the K-12 education systems
- Research and Evaluation

Table 1. Project Metrics

PROJECT	CATEGORY	METRIC
Newton's Creek Watershed, Norfolk	**Resiliency**	Reduce the number of lost service days for transit services and the number of road closures in the target areas.
	Environmental	Increase the percentage of building permits with projects employing "Green" building techniques.
	Social	Increase the use of recreational, community gathering spaces and park space in the target area.
	Economic	Increase employment opportunities in the target areas.
Ohio Creek Watershed, Norfolk	**Resiliency**	Reduction in property damage and loss of service during the next presidentially-declared flood disaster in Norfolk.
	Environmental	Increase the area of wetlands and/or shoreline restoration projects.
	Social	Increase linear feet of bicycle lanes/paths in target area; Increase number of new/improved transit access pts.
	Economic	Decrease the number and amounts of flood insurance claims for target area properties.

PROJECT	CATEGORY	METRIC
Crestwood/Oak Grove Watershed, Chesapeake	**Resiliency**	Decrease the effects of future/repeat disasters from flooding and reduced related property damages.
	Environmental	Improved ecosystem and bio-diversity effects from wetlands restoration.
	Social	Benefit to LMI persons and/or households and improved living environment.
	Economic	Decrease the effects of future/repeat disasters from flooding and reduced related property damages
South Norfolk/Mill Creek Watershed, Chesapeake	**Resiliency**	Elimination of blight and reduced impact from future flooding.
	Environmental	Improved water quality from reduction in reduced storm water runoff.
	Social	Reduced danger from flooding and hazards for people and/or households and an improved living environment.
	Economic	Decrease the effects of future/repeat disasters from flooding and reduced related property damages.
Salters Creek Watershed, Newport News	**Resiliency**	There will be an overall reduction in cost of property damage from severe weather events.
	Environmental	Improved water quality.
	Social	Reduction in flooding, mold accumulation, and health issues and increased community amenities/recreational sites.
	Economic	Stabilization of project area equaling measured increased of residential and commercial property values.

PROJECT	CATEGORY	METRIC
Coastal Resilience Laboratory/ Accelerator Center	**Resiliency**	Increase in innovation in water management.
	Environmental	Develop products/applications that help create/support resilience.
	Social	Increase the number of living wage jobs.
	Economic	Increase in number of businesses/ increase in existing business revenue.

THRIVE: *Resilience In Virginia*

Combined Budget

MASTER BUDGET

BUDGET LINE ITEM	TOTAL BUDGET	HUD-NDRC BUDGET	NON-NDRC BUDGET
Master Budget			
ADMINISTRATION			
Execution of DHCD Contract	$150,000	$150,000	$0
R/W Agent - Negotiations	$1,260,000	$1,260,000	$0
Legal - titles/closing/Appraisals	$1,135,000	$1,135,000	$0
R/W City Staff - Monitoring & Accounting	$442,000	$442,000	$0
Staffing	$4,184,399	$3,934,399	$250,000
Execution of Project Contract(s)	$500,000	$500,000	$0
Contract Monitoring	$4,482,600	$4,482,600	$0
Construction Completion	$4,245,600	$4,245,600	$0
Achievement of Benefits	$1,600,000	$1,600,000	$0
Administrative Project Closeout	$750,000	$750,000	$0
Subtotal	**$18,749,599**	**$18,499,599**	**$250,000**
PERMANENT RELOCATION			
Owner-Occupied Households	$9,960,000	$9,960,000	$0
Renter-Occupied Households	$11,665,000	$1,965,000	$9,700,000
Relocation Specialist	$980,000	$980,000	$0
Subtotal	**$22,605,000**	**$12,905,000**	**$9,700,000**
ACQUISITION (Land/Improvements	**$65,002,838**	$65,002,838	$0
but not any easements)	**$65,002,838**	$65,002,838	$0
CLEARANCE & DEMOLITION	**$6,820,000**	$6,820,000	$0
OWNER-OCCUPIED HOUSING REHABILITATION			
MicroMitigation Grants	$400,000	$400,000	$0
Owner-Occupied Construction	$0	$0	$0
Rehabilitation Specialist	$0	$0	$0
Temporary Relocation	$0	$0	$0
HMEP	$0	$0	$0
Subtotal	**$400,000**	**$400,000**	**$0**
SUBSTANTIAL RECONSTRUCTION			
Clearance & Demolition	$350,000	$0	$350,000
Owner-Occupied Construction	$0	$0	$0
Rehabilitation Specialist	$0	$0	$0
Temporary Relocation	$0	$0	$0
HMEP	$0	$0	$0
Subtotal	**$350,000**	**$0**	**$350,000**

THRIVE: *Resilience In Virginia*

Combined Budget

MASTER BUDGET

BUDGET LINE ITEM	TOTAL BUDGET	HUD-NDRC BUDGET	NON-NDRC BUDGET
SEWER/STORM DRAINAGE			
Architect/Engineer/Design	$17,546,895	$17,546,895	$0
Inspection	$3,975,342	$3,975,342	$0
Acquisition (Easements Only)	$1,500,000	$1,500,000	$0
Temporary Relocation	$400,000	$400,000	$0
Long-Term O/M	$1,820,000	$0	$1,820,000
Construction/Improvements	$111,003,502	$85,128,950	$25,874,552
Subtotal	**$136,245,739**	**$108,551,187**	**$27,694,552**
WATER		$0	$0
Architect/Engineer/Design	$0	$0	$0
Inspection	$0	$0	$0
Acquisition (Easements Only)	$0	$0	$0
Temporary Relocation	$0	$0	$0
Construction/Improvements	$12,690,000	$11,835,000	$855,000
Subtotal	**$12,690,000**	**$11,835,000**	**$855,000**
STREETS			
Architect/Engineer/Design	$7,410,000	$7,410,000	$0
Inspection	$2,620,000	$2,620,000	$0
Acquisition (Easements Only)	$3,500,000	$3,500,000	$0
Temporary Relocation	$2,500,000	$2,500,000	$0
Construction/Improvements	$66,256,000	$44,640,000	$21,616,000
Subtotal	**$82,286,000**	**$60,670,000**	**$21,616,000**
FLOOD DRAINAGE FACILITIES			
Architect/Engineer/Design	$35,860,000	$35,860,000	$0
Inspection	$3,780,000	$3,780,000	$0
Acquisition (Easements Only)	$0	$0	$0
Temporary Relocation	$0	$0	$0
Construction/Improvements	$232,260,800	$164,523,800	$67,737,000
Subtotal	**$271,900,800**	**$204,163,800**	**$67,737,000**
Coastal Resiliency Accelerator	**$12,000,000**	$5,000,000	$7,000,000
Subtotal	**$12,000,000**	**$5,000,000**	**$7,000,000**
City of Norfolk Direct Leverage - Detailed in Attachment B	**$340,138,564**	**$0**	**$340,138,564**
TOTAL	**$969,188,540**	**$493,847,424**	**$475,341,116**

EXHIBIT F:

LEVERAGE

COMMONWEALTH OF VIRGINIA

ExhibitFLeverage.pdf

EXHIBIT F: LEVERAGE

STATEWIDE COMMITMENTS. Virginia has obtained $583,989,952 in leverage commitments across state and local government, the academic community, and the private sector. This includes $475,341,116 in direct leverage commitments and $108,648,836 in supporting leverage commitments. Projects span the entire resilience spectrum from education programs and scientific studies to better define those at risk to alert systems, infrastructure improvements, erosion control, wetland restoration, and energy improvements (see Attachment B).

Supporting leverage commitments include $2,000,000 from the Blue Moon Fund in the form of ten grants to Old Dominion University, the Virginia Institute of Marine Science (VIMS), the Virginia Coastal Policy Center at William & Mary Law School and five other organizations that increase Virginia's capacity to build resiliency in the Hampton Roads region. These grants will launch a sea level rise data repository and portal at VIMS, which will be a valuable tool for planners and decision makers; enable completion of the Intergovernmental Planning Pilot Project, which is developing procedures for coordinating Federal, state and local resilience planning and is critical in Hampton Roads due to the large waterfront areas that are Federal or state property. It will also greatly expand existing education and training programs on SLR adaptation and coastal resilience for professionals (engineers, planners and managers) and the public.

Dominion Resources, Inc. has committed approximately $34,000,000 in supporting commitments in the form of electric transmission system upgrades and EnergyShare funding. These investments will increase Virginia's capacity to build resiliency in the electric system supporting the cities of the Hampton Roads area. In addition to improving and maintaining electrical reliability in the area, the transmission investments will provide the region with greater access to lower-emissions forms of electric generation, including generation resources with no or lower carbon emissions.

The increased funding for EnergyShare will provide additional energy assistance to many customers, including persons with low incomes, the elderly, military veterans and Virginians living with disabilities. Additionally, the EnergyShare funding will support property improvements to weatherize homes, making them more energy efficient over the long term and reducing their energy usage. The more efficient use of energy also will support Virginia's goal of improved resiliency. The new resiliency efforts provide an opportunity to not just make investments in the region, but to change the way Virginia does business. With heightened awareness of the importance of resilience and economic vitality, the Commonwealth's Commission on Climate Change has put forward a bold recommendation to create a state infrastructure bank which would strategically target resiliency measures; seed funding for this resource is currently under consideration. The Coastal Resilience Lab and Accelerator will leverage private foundation, corporate investment, state and federal support, including the Department of Defense and other organizations to ensure long-term sustainability and focus for the work. Additional potential sources of funding for early stage technology development will include the competitive Small Business Innovation Research Program (SBIR) and the Small Business Technology Transfer (STTR) program. The Virginia Equipment Trust Fund, accessible to university partners, may serve as a key source of leverage through the contribution of lab equipment. Direct commitments include $50,000 from the Commonwealth's partner Old Dominion University.

REGIONAL COMMITMENTS. The Hampton Roads Planning District Commission has committed $280,194 through a funded grant from the Virginia Department of Emergency Management's Hazard Mitigation Grant Program to complete a regional hazard mitigation plan that will comply with state and federal legislative requirements.

The Commonwealth has secured $424,111,116 in total leverage with $423,736,116 direct and $375,000 supporting commitment funding since September 2014 to implement the overall resilience program to address Unmet Needs in the Most Impacted and Distressed area (MID-URN) in the City of

Norfolk. Virginia proposes two watersheds in the City of Norfolk, *Newton's Creek* and *Ohio Creek*, as MID-URN sub-areas for the proposed CDBG-NDR-assisted projects while using the city's own and partners' resources to address unmet needs in the rest of the MID-URN qualified target area.

Within the CDBG-NDR assisted sub-areas of *Newton's Creek* and *Ohio Creek* (direct leverage of $83,597,552) the City of Norfolk will commit nearly $61,600,000 in Operational and Maintenance (O&M) costs for the proposed projects over their full lifecycle. Further, Norfolk Redevelopment and Housing Authority has committed direct leverage of $15,000,000 in capital grant funding and low income housing tax credits. The funds will be used to demolish outdated public housing units affected by Hurricane Irene and construct 70 new apartments, as well as a community center, dedicated open space, a new roadway, and storm water improvements to alleviate flooding in Grandy Village. The Commonwealth's and its partners' direct commitment of $7,000,000 for the Coastal Resilience Accelerator are also included in the $83,590,000 direct leverage total in the MID-URN sub areas.

The total leverage pool further includes $23,030,000 expended (since September 2014) or to be expended directly in the CDBG-NDR-assisted project area (*Newton's Creek* and *Ohio Creek Watersheds*). This direct leverage will address unmet needs and accelerate outcomes for the proposed CDBG-NDR-assisted projects. These projects include $20,000,000 from Nusbaum Realty to construct 126 affordable housing units in the St. Paul's area of *Newton's Creek*, $2,825,000 from the City of Norfolk in storm water infrastructure projects to alleviate flooding in *Ohio Creek* and $205,000 from the Elizabeth River Project to install green water management solutions in the *Ohio Creek Watershed*. In addition to this direct leverage, Purpose Built Communities, a nonprofit consulting group, will contribute $250,000 in supporting leverage for technical assistance to develop a comprehensive neighborhood revitalization plan in St. Paul's area. In Phase 1, Norfolk also committed $125,000 in supporting leverage for an Urban Land Institute Resilience Technical Panel that informed development of the Phase II projects.

Finally, the total leverage pool includes $317,108,564 from direct funds to stabilize shorelines and implement green water management (Elizabeth River Project - $465,000) and address housing and poverty de-concentration as well as flooding and related clean water and utility projects (City of Norfolk - $316,643,564) in the remaining qualifying target area. As city non-CDBG-NDR funds will be used in the remainder of the MID-URN target area outside of the proposed project sub-areas to address unmet needs and strengthen resilience, the Commonwealth counts these as direct leverage.

The Commonwealth has secured a total of $41,240,000 of leverage within the City of Chesapeake through identified city capital improvement projects. The 22nd St. Bridge provides a vital link between the Poindexter Corridor in Chesapeake's target area of South Norfolk and the Berkley-Campostella area of the adjoining City of Norfolk. The existing bridge was constructed in 1937 and is structurally deficient with a sufficiency rating of 2 on a 100-point scale. Due to the diminished structural capacity, bridge traffic is currently limited to five (5) tons. This bridge continues Chesapeake's commitment to its LMI populations and will be important to the continued economic resiliency of the South Norfolk area. The bridge is designed for two travel lanes with bicycle and pedestrian accommodations to create the co-benefits of increased health benefits through more public access to walking and biking paths in the South Norfolk community. The amount budgeted for the 22nd Street Bridge is $18,000,000.

Additionally, the City of Chesapeake has committed $1,500,000 for public works infrastructure system replacement and upgrade in the South Norfolk/Liberty Street area to protect and enhance drainage for this flood-prone sector. The city has committed a total of $5,000,000 to a five-year public works project that increases resiliency in the South Norfolk/Oakdale area and to a drainage improvement project totaling $800,000 in the South Norfolk/Portlock area that is in the conceptual stage and will be under construction in 2016. Each of the four projects incorporates best water management practices: to collect storm water runoff, reduce soil erosion and remove pollutants.

The South Norfolk target area will also see increased resiliency from a Chesapeake/Hampton Roads Sanitation District (HRSD) project. Eight million dollars will be spent in South Norfolk to replace the 100-year old wastewater transmission lines. HRSD is an award winning, industry leader at the national, state, and local levels in protecting public health and the waterways, and the regional wastewater treatment agency that treats water for Chesapeake and other localities in Hampton Roads.

Chesapeake has budgeted $7,000,000 for the Bainbridge Blvd. corridor five-year public utilities project. By burying utilities along this major thoroughfare, the city will eliminate the risk of utility interruption created during floods. A more resilient infrastructure will generate greater social and economic benefits in the South Norfolk LMI community. Improved infrastructure is an asset in building economic revitalization, as well as in improving utility service to residents during tidal flooding and/or heavy rains, including rains from hurricanes. Finally, Chesapeake has determined that the long-term maintenance cost of the proposed NDRC projects totals $940,000 and will count this as direct leverage per HUD NDRC guidelines.

Within the City of Newport News, Virginia has secured $10,115,000 in direct commitments through citywide planned projects that will increase Virginia's capacity to build resiliency in the *Salters Creek Watershed* (Southeast Community). Commitments include a combination of programmed and expended project investments to enhance drainage, provide more resilient infrastructure and improve social and economic resiliency in this flood-prone area: $707,000 city funding committed for the Chesapeake Avenue Bike Trail and Sidewalk; $441,000 for urban stream restoration and wetlands; $840,000 in Short Street and Christopher Shores Drainage Improvements; $1,472,000 for 27th St. and Buxton Ave. grade adjustments, $2,000,000 for the Lower Jefferson Ave. Streetscape (12th-24th Streets); $855,000 for the Chesapeake Ave. Tide Gate and Pump Station; and $3,800,000 for the Southeast Neighborhood grocery store.

ADDITIONAL RESILIENCE INVESTMENTS. With the plethora of defense installations, personnel and facilities, a historically substantial source of federal project funding has been the US Army Corps of Engineers (USACE). Since 2011, USACE has provided the cities of Norfolk, Chesapeake and Newport News regular funding from its Civil Work appropriation to manage recurring flooding as a result of aging infrastructure (approximately $500,000 per year). This funding is possible under Section 22: Planning Assistance to States (not specific study authority or appropriation) and includes studies in 2014-2015 on living shoreline conceptual designs and the Newmarket Creek Hydraulics and Hydrology study in Newport News and Hampton.

Another beneficial project following Hurricane Irene (2011) through the Continuing Authorities Program (CAP) was approximately $3,000,000 in wetlands construction for Old Dominion University with a non-federal cost share from the City of Norfolk of 25%. A current CAP Project (2015) for the City of Norfolk is underway and will result in flood control projects totaling $5,000,000-10,000,000.

In 2014, the USACE provided $5,410,000 in funding to the City of Chesapeake toward the $100,000,000 design and construction of the Deep Creek Bridge, a critical evacuation route for the citizens of Chesapeake. The Norfolk District intends to provide the City of Chesapeake with an additional $10,000,000 in FY16 to complete the design to 100%, purchase the needed remaining property and relocate utilities to ensure neighborhoods in Chesapeake have a dependable, higher traffic volume bridge for future evacuations. Additionally, the Corps of Engineers and the City of Norfolk signed a Federal Cost Share Agreement for a $25,000,000 beach nourishment project to protect coastal housing along a 10-mile stretch of Willoughby Spit. The city's cost share for this is approximately $5,000,000.

EXHIBIT G:

LONG-TERM COMMITMENT

COMMONWEALTH OF VIRGINIA

ExhibitGLong-TermCommitment.pdf

EXHIBIT G: LONG-TERM COMMITMENT

COMMONWEALTH OF VIRGINIA. Virginia's Consolidated Plan addresses both the lack of affordable housing and the need to create more economically competitive and sustainable communities, two objectives also at the heart of the THRIVE proposal. The full Commonwealth of Virginia Consolidated Plan can be found online at: http://www.dhcd.virginia.gov/images/ConPlan/Con-Plan-ActionPlan-Final-5-2013.pdf. In addition, recognizing that sustained economic and social vitality of communities throughout Virginia depend on the quality, availability, and affordability of housing, Governor McAuliffe's Executive Order 32 directs state agencies to collaborate on improving access to affordable housing.

The resilience challenge in Virginia requires a whole of community approach. The Commonwealth has launched a comprehensive, interagency, intergovernmental plan studying four lines of effort: policy, technology, funding, and collaboration/coordination. Governor McAuliffe appointed Virginia's first Chief Resilience Officer in 2014, Secretary of Public Safety and Homeland Security Brian Moran, who is responsible for coordinating efforts across state government, federal partners, the private sector, and localities.

Collaboration and Coordination. Virginia initiatives demonstrate an on-going commitment to building resilience capacity for the state and its citizens. The Commonwealth and Hampton Roads region participate in the federal Intergovernmental Pilot Project, convened by Old Dominion University, in developing recommendations on how to best employ resilience projects and solutions using a regional approach. Participation in the US Coast Guard's (USCG) Area Maritime Area Security Committee enables stakeholders to better understand threats to the Port of Virginia and the surrounding shipping lanes. Recent initiatives from the USCG Committee are focused on port resilience and impacts of sea level rise.

Policy. The Governor has formed special advisory panels to develop legislative and policy actions. Such on-going efforts include the Climate Change and Resilience Update Commission, which generated

five aggressive recommendations including the Economic Accelerator and Infrastructure Resilience Bank. The Secure Commonwealth Panel's membership of community subject matter experts closely monitors threats to the Commonwealth, including climate change. In 2013, it established a sub-panel on recurrent flooding to provide strategic and tactical recommendations to respond and otherwise adapt. The House of Delegates formed the Joint Subcommittee for Recommendations to Address Recurrent Flooding to seek solutions to improve coastal and inland flooding in the most flood-prone areas of Virginia.

Technology. In 2015, the Commonwealth's Chief Resilience Officer initiated a project to develop a resilience dashboard. William and Mary's Virginia Institute of Marine Science (VIMS) will partner with the Virginia Department of Conservation and Recreation to develop and maintain a website portal containing locality specific data, legal condition analyses, project reports, socio-economic condition analyses, and physical environmental condition analyses. The dashboard will assess how changing conditions or proposed resilience projects impact the overall resilience score for a region. This project has garnered private sector funding of $900,000 over two years from the Blue Moon Fund.

Other Resilience Related Actions. In 2015, Governor McAuliffe created the *Go Virginia* initiative providing state-funded incentives to promote regional action including incentives for start-up capital for projects that promise substantial economic impact. These include: regional cooperation in recruiting new business; efficiency-enhancing and cost-saving collaboration between local governments, school divisions, and higher education institutions; private and other research and development investments; and capital projects of regional significance. The Climate Change and Resilience Update Commission has put forth a recommendation to establish an Infrastructure Resilience Bank or trust fund for energy and resilience projects. The goal is to use finite public dollars to fill gaps in private investments thereby enabling additional support and emphasis for energy and resilience projects. The trust would function as a public-private partnership providing low-cost financing for clean energy and resiliency projects in a manner leveraging public funds as well as attracting private investment. The trust could provide such

financing through subordinated loans, warehousing and securitization, or other instruments, guarantees, loan loss reserves or other credit enhancements. In addition, the Virginia Department of Emergency Management (VDEM) and the USACE initiated a new 2-year study, employing state of the art technology, to assess hurricane storm and surge effects in the Hampton Roads region.

HAMPTON ROADS REGION. The Hampton Roads Region has implemented several initiatives in the areas of sea level rise and economic vitality.

Sea Level Rise. In 2013 the Hampton Roads Transportation Planning Organization working with the military, universities, the Hampton Roads Planning District Commission (HRPDC) and regional cities produced a study that identified transportation corridors critical to military operations that are vulnerable to disruptions due to increased flooding. In 2014 HRPDC established a Sea Level Rise Advisory Committee, comprising the senior leadership of the region's seventeen municipalities, to develop a regional strategy and policies to address the impacts of sea level rise.

Economic Vitality. In 2014 the Hampton Roads Community Foundation launched Reinvent Hampton Roads, a community leadership initiative focused on generating high-paying, satisfying jobs to underpin a vibrant economy. The initiative is focused on four core areas: expanding business clusters, developing leadership, supporting entrepreneurship and improving workforce development. Early successes include the establishment of a new angel investment network to support startups, and creating training and mentoring opportunities to speed the transition of military veterans into the regional workforce.

CITY OF NORFOLK. Norfolk has implemented policies that prioritize resilience. As an example, the City Manager asked all departments when submitting their FY2016 budget to identify how the budget request met with the city's current resilience priorities. The city administration took further steps to institutionalize the commitment to resilience by signing the 10% Resilience Pledge Proposal dedicating 10% of city resources annually, starting in FY2017, in support of defined resilience goals and activities articulated in the city's comprehensive Resilience Strategy.

Legislative Action and Raising Standards. Effective in January 2014, an additional three (3) feet of required elevation for structures in the mapped floodplain was added to the city's flood damage prevention ordinance as the standard for new construction and any substantial repair or improvement. An 18 inch freeboard is also required in the 500-year floodplain to protect property and resilience during flood events. Baseline: No additional freeboard in A zones, no freeboard required in the 500-year floodplain, no additional regulation of coastal A zones. Change expected: All new and substantially improved construction brought to the new standards. Method of measurement: Measure by documenting code changes and maintaining elevation certificates. Tracking period: These measures are expected to be effective over at least the next ten years.

Resilience action related to plan updates or alignment. Norfolk is presently undergoing a complete rewrite of its zoning code ordinance to analyze deficiencies and find areas for strengthening zoning against flooding hazards and in support of economic and neighborhood resilience. Baseline: Current status of all City codes. Change expected: City zoning codes that have incorporated flood risk mitigation in order to direct development away from flood prone areas and support resilient construction. Method of measurement: These changes will be adopted by the city in early 2017. Tracking period: Once the new codes have been adopted and the metric has been successfully applied and completed for long-term resiliency.

Since 2014, Norfolk has been developing a comprehensive Resilience Strategy that identifies numerous short and long term actions to build resilience. The Resilience Strategy, which includes an updated risk and vulnerability assessment across coastal, economic and social systems will be released on October 28, 2015. Baseline: No current plan. Change expected: The city will have a completed comprehensive resilience strategy and long-term recovery plan. Method of measurement: The plan will be released in late October 2015 for comment and adoption by the city. Tracking period: Once the strategy has been adopted, this metric will have been successfully completed for long-term resiliency actions in the

city. The Resilience Strategy builds on the Comprehensive Flooding Strategy and a Combined Coastal & Precipitation Flooding Master Plan for the city adopted in 2014 to integrate findings from a series of watershed specific flooding studies conducted since 2007. The Master Plan guides allocation of the city's storm water budget totaling approximately $5 to $7M annually.

Resilience actions related to financing and economic issues. Annually, Norfolk spends approximately $5 to 7M on storm water improvements and floodplain management. The city has established a Recurrent Flooding Fund (2014) for the purpose of storm water project design, hydrologic and hydraulic studies, local grant match, and other costs related to flood risk reduction. This fund generates approximately $1.3M annually for these activities, which help to lower flood risk and increase local economies. Baseline: The city increased fees by $1 per month in 2012 and the Fund was established in 2014. Change expected: The city has an annual budget for storm water management and recurrent flooding projects to reduce the risk of flooding over time. Method of measurement: The city's annual Capital Improvements Plan lists storm water management and other flood projects being implemented in any given fiscal year. Tracking period: This metric is tracked each year as projects are completed that reduce flood risk.

As part of the new Resilience Strategy, the city is launching and expanding a series of initiatives that will make the community more resilient against acute shocks and chronic stresses. These initiatives include poverty reduction programs, land use regulatory improvements, business expansion and workforce development programs along with innovative water management practices. Illustratively, in FY2015 and FY2016 the city allocated over $3.5M to begin implementing the Mayor's Commission on Poverty Reduction recommendations, including new programs supporting early childhood development, youth career pathways, workforce development and neighborhood revitalization.

As Norfolk's Plan to Reduce Poverty demonstrated, housing costs are a threat to neighborhood stability. Therefore, as part of this effort, the city is working with a consortium of private sector and

nonprofit partners to launch a new Affordable Housing Trust Fund. In the city's FY2016 budget, Norfolk's city council authorized $1.3M to establish the trust fund to help improve low-income housing within the city. Norfolk is also launching the "Lots of Opportunity" program to build single-family houses on vacant properties throughout the city, with a goal of increasing homeownership and de-concentrating poverty. The program targets households in a range from 60% to 120% of median income. The program is aimed at first-time homebuyers and allows the city to develop housing for a variety of incomes.

Since Hurricane Irene, the city has also worked to strengthen its National Flood Insurance Program (NFIP) Community Rating System (CRS) practices, and can measure this commitment through an expected rate change from the current 9 to an improved rating of 8, at a minimum, or 6 at a maximum, in May of 2016. This hard work demonstrates the excellence and higher overall standards of floodplain management that is recognized by FEMA and results in reduced flood insurance premiums for properties in the mapped floodplain. For example, if the city receives a CRS rating of 7 in May of 2016, policyholders in the Special Flood Hazard Areas of the City will see a premium reduction of an additional 10% over the 5% discount they currently receive (total 15% discount.) This level of savings for local property owners can be significant, allowing residents to have more financial resources available during times of emergency. Baseline: The current CRS rating of 9 gives Norfolk policyholders a discount of 5%. Change expected: An increase of at least another 5% discount is expected in May 2016. Method of measurement: FEMA publishes the updated CRS ratings list on May 1 and October 1 each year. Tracking period: Over the next five years as CRS ratings are released each spring and fall.

CITY OF CHESAPEAKE. Chesapeake has been and remains supportive of enhanced zoning and building codes that protect wetlands and open-space, and would be supportive of state legislation that mandated disclosure of flood zones and flood damages in real estate transactions. Currently, the city's freeboard is above the NFIP requirement at 1.5 feet above the base flood elevation.

Chesapeake uses the Commonwealth of Virginia's building code as its development standard, but the

city has enhanced building standards to reduce the impact of flooding. A minimum road grade at the two percent likelihood storm event (50 years) was established several years ago. BMPs must have emergency overflow or be designed for 100-year storms, an increase over the normal 50-year storm design, and Chesapeake adopted a new enhanced Floodplain Management Ordinance (FMO) in 2014. The ordinance requires all development within the floodplain district to have elevated and flood-proofed structures and prohibits the city from locating critical infrastructure within the special flood hazard area.

In the South Hill Community, Chesapeake is working closely with the Commonwealth, seeking amended regulation of non-petroleum storage tanks, as well as emergency pedestrian egress on to I-464 to mitigate the risks of hazardous spills. However neither action will ensure the safety of the residents in this community, therefore only a buyout program can provide opportunities for real resilience. The city's current building codes do not allow mixed zoning; future neighborhoods are thus protected from similar encroachment with the risk of industrial accidents.

Chesapeake's land-use plan and Hazard Mitigation Plan (HMP) were updated in 2014. The HMP is responsible for addressing all hazards, includes flooding issues from Hurricane Irene and is supported by the city's Comprehensive Plan. The HMP planning committee reviews many relevant data, documents, plans and procedures as part of the planning process. Included in the review process are: Chesapeake's Comprehensive Plan goal statements; the 2013 Commonwealth of Virginia Hazard Mitigation Plan goals and objectives; the Governor's Commission on Climate Change Final Report (December 2008); the 2011 Southside Hampton Roads Hazard Mitigation Plan Goals and Objectives; and the city's floodplain management regulations, site plan review process, and permitting procedures.

Proposed mitigation actions for local adoption are listed in the Mitigation Action Plan (MAP) within the 2014-15 HMP and will be implemented according to the plan maintenance procedures established for the city. Each proposed mitigation action has been identified as an effective measure to reduce hazard risk in Chesapeake and implementation mechanisms are provided for each action, including

the designation of a lead agency responsible for carrying out the action, as well as a timeframe for its completion.

CITY OF NEWPORT NEWS. The City of Newport News adopted floodplain development regulations in 2014 that will measurably increase resilience. The new regulations require at least two (2) feet of freeboard on all new residential construction or substantially improved residential structures. Non-residential structures must observe the two (2) feet freeboard on all new construction and substantially improved structures or the construction must be entirely flood proofed. These regulations are included as a special overlay district in the zoning ordinance. In addition, the following improvements have been documented since the 2011 plan adoption: 1) Certified Floodplain Managers increased in number across at least two departments and they participate in hazard mitigation planning on a regular basis; 2) the City Watch program was expanded to include post-disaster messages as a result of a careful capability analysis; 3) the city formed a Generator Committee to address needs identified during hazard mitigation capability review; and 4) the Hazard Mitigation Plan (HMP) recommended developing a natural hazards school curriculum. Existing fire department programs were expanded to address this need and the HIRA in the previous HMP identified City Line apartments, located in the Newmarket Creek Watershed, as high hazard and some retrofits were made to the complex's HVAC system. Additional flood protection measures for this and an adjacent housing complex are being pursued in conjunction with the City of Hampton, HUD and other State and Federal agency partners.

The city is in the process of updating its comprehensive plan. As required by Virginia Code, the comprehensive plan revision will address coastal resource management and sea level rise, providing goals, strategies and actions necessary to ensure Newport News has the capacity to maintain or regain functionality following natural, climate-induced, or man-made disturbances. Planning staff is working closely with the Division of Emergency Management to identify potential hazards and land use to ensure the city is proactive in responding and adapting to changing conditions. As part of this effort, the

comprehensive plan will support the HMP by identifying the most impacted and distressed areas and providing recommendations to mitigate issues related to land use and transportation policies. The comprehensive plan will be ready for adoption in 2016 and will align with regional resilience actions facilitated through the Metropolitan Planning Organization.

The Peninsula Hazard Mitigation Plan, approved in 2011, was a joint effort by the cities of Hampton, Williamsburg, and Newport News and the counties of York and James City. This plan conforms to all requirements of the Disaster Mitigation Act of 2000 and was reviewed and approved by both the Virginia Department of Emergency Management (VDEM) and the Federal Emergency Management Agency (FEMA). The hazard mitigation plan is due for update in 2016. The updated plan will also emphasize floodplain management through ordinance administration.

Newport News is planning to develop a rental inspection program, which includes rehabilitation assistance, in the next fiscal year. In addition, the city has several revolving loan programs already in place that businesses can utilize and one of the requirements is job creation. The city has worked over the last 10-15 years with our housing and redevelopment authority to redevelop the Southeast Neighborhood area. Over 100 new homes have been constructed and over 200 rehabilitated in that timeframe. These efforts have helped improve the ownership rate in the Southeast Neighborhood target area.