Coast Guard and Port Infrastructure: Built to Last?

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Chairman Maloney, Ranking Member Gibbs, and distinguished Members of the Sub - Committee, thank you for the opportunity to testify to you today. It is a privilege to be before you at this hearing to discuss this very important topic.

My name is Ann Phillips, and I currently have the honor to serve as the Special Assistant to the Governor of Virginia for Coastal Adaptation and Protection. I am a retired Surface Warfare Officer - I drove and commanded ships for the United States Navy for 31 years, served abroad in Guam and Lisbon, Portugal, and operated extensively with NATO and Partnership for Peace nations. I retired in 2014 as a Rear Admiral and Commander, Expeditionary Strike Group TWO. My experience in coastal adaptation and protection, along with climate and national security, stems from my work as Chair of the Surface Force Working Group for the Navy's Task Force Climate Change while still on active duty, and from my work since retiring, chairing the Infrastructure Working Group for the Hampton Roads Intergovernmental Sea Level Rise Pilot Planning Project from 2014 to 2016, and as a member of the Advisory Board of the Center for Climate and Security, and on the Board of Directors for the Council on Strategic Risks.

I've been asked to address the need for collaboration across and between Federal facilities and the maritime related businesses and communities that surround them, in the context of the current and long term risk to infrastructure, the economy, and social fabric of Virginia's coastal communities as viewed from my position as Special Assistant to the Governor. I would like to first set the stage in Coastal Virginia today, then describe what is at risk, and how Virginia's unique coastline intensifies that

risk. I will then describe Virginia's efforts and intent to prepare, adapt and protect our Coast, and the actions that we as a Commonwealth and that our coastal communities are taking to align our actions with those of our Federal partners. Finally, I will touch on what Congress can do to help as we prepare for our collective climate-changed futures.

SETTING THE STAGE

Climate change has a significant and intensifying impact on our coastal communities in Virginia today. Rising sea levels lead to recurrent nuisance flooding, caused by high tides, accompanied by wind, and /or increased intensity and frequency of rainfall, or any combination of the three. These circumstances intensify the impact of coastal storms and hurricanes and the accompanying flooding and storm surges. **Coastal Virginia deals with water where we did not plan for it to be, and that impedes the expected pattern of life, in some form, nearly every day.** This is our "new normal" - it affects every aspect of our lives in ways that we do not yet understand, or even realize. My current position works at the local, regional, state and national level to foster action across the whole of government, community and society to address and build resilience to this existential threat and to protect and adapt Coastal Virginia.

VIRGINIA'S UNIQUE RISK

We have a water-based economy in Coastal Virginia. The cornerstones of that economy are:

- **Our Federal presence**, **arguably the largest concentration in the nation** - in particular Department of Defense with Navy as the largest service represented, and including the substantial commercial industry surrounding military and commercial shipbuilding, maintenance and repair. We are also home to the Coast Guard's Atlantic Area Command, US Coast Guard Fifth District, (Both in Portsmouth) USCG Force Readiness Command (Norfolk), Coast Guard Sector Hampton Roads, Coast Guard Base Support Unit Portsmouth, and one of the Coast Guard's largest Training facilities, Coast Guard Training Facility Yorktown.
- **The Port of Virginia** – large and expanding capacity with multi-modal access reaching from the East Coast to west of the Mississippi River
- **Beach and Water-related Tourism**

- **Water- adjacent and dependent agriculture, aquaculture, fisheries, commercial property, and housing stock**

All of this is supported by critical public and private utility and transportation infrastructure, as well as a substantial medical / hospital presence, and the universities, schools, and public infrastructure sustaining cities, counties and towns, along our coast.

Virginia's large military and Coast Guard concentration is bound to the water by the very nature of its mission, and at risk from the threat of sea level rise and climate change impacts. In their 2016 report, "The Military on the Front Lines of Rising Seas," the Union of Concerned Scientists found that a 3-foot increase in sea level rise would threaten 128 coastal DOD installations [including US Coast Guard Facilities] in the United States, 43% of which are Navy facilities valued at roughly $100 billion.[1] In its own 2019 "Report on Effects of a Changing Climate to the Department of Defense," the Department found that 53 of its mission-critical facilities are currently vulnerable to recurrent flooding, with 60 such facilities vulnerable within the next 20 years. When other hazards from climate change are considered (wildfire, drought, desertification), 79 total DOD facilities are vulnerable at present. **In Virginia, five Hampton Roads area facilities are on the US Navy and US Air Force list of most vulnerable infrastructure released in June 2019, including Naval Air Station Norfolk, Naval Air Station Oceana, Naval Support Activity Hampton Roads, Naval Support Activity Hampton Roads - Northwest Annex, and Joint Base Langley-Eustis**.[2] US Coast Guard facilities are also vulnerable, and the Coast Guard Authorization Act of 2019 addresses this, at least in part, by including direction similar to that to DOD included in the 2018 NDAA. Specifically, that the Coast Guard identify its top 10 most vulnerable facilities, and address adaptation and mitigation needs and costs related to impact on its missions and facilities.[3] A 2008 study by the Organization for Co-operation and Economic Development, ranked the

[1] "The US Military on the Front Lines of Rising Seas," Executive Summary (Union of Concerned Scientists, 2016), https://www.ucsusa.org/sites/default/files/attach/2016/07/front-lines-of-rising-seas-key-executive-summary.pdf.
[2] United States Department of Defense, "Report on Effects of a Changing Climate to the Department of Defense," January 2019, https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF.
[3] Rep. DeFazio, Peter A., "Coast Guard Authorization Act of 2019," Pub. L. No. H.R. 3049, § 407 (2019), https://www.congress.gov/bill/116th-congress/house-bill/3409/text.

Hampton Roads metropolitan area as the 10th most vulnerable in the world related to the value of assets at risk from sea level rise.[4]

The Department of Defense and our federal partners are the largest employers in the state[5] and Virginia's percentage of gross domestic product derived from the federal presence in the state is 8.9% (the highest percentage of any state).[6] Virginia also has the highest rate of defense personnel spending of any state, and is second only to California in defense contract spending and defense-related contract spending. The Hampton Roads region hosts federal facilities that are unique and not easily replicable in other locations, including our largest Naval Base, Naval Station Norfolk, as well as the only shipyard where we build aircraft carriers and one of only two places where we build nuclear- powered submarines - Newport News Shipbuilding, owned by Huntington Ingalls Industries. The City of Portsmouth is home to Norfolk Naval Shipyard, one of only four Navy- owned and operated nuclear repair shipyards in the United States, and very vulnerable to flooding. Portsmouth also hosts US Coast Guard Atlantic Area Command, US Coast Guard Fifth District, Coast Guard Sector Hampton Roads, and Coast Guard Base Support Unit Portsmouth, all in flood - vulnerable areas.[7] Joint Base Langley-Eustis, with Fort Eustis in the City of Newport News and Langley Air Force Base in the City of Hampton are also vulnerable. Langley AFB, which deals with rising water as a matter of routine, and has done considerable work to make its facilities resilient, has taken up much of the overflow from the impact to aviation training for the F-22 Strike Fighter from Tyndall Air Force Base after Hurricane Michael's impact on that facility last year.[8]

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[4] RJ Nicholls et al., "Ranking Port Cities with High Exposure to Climate Extremes - Exposure Estimates," Environment Working Papers (Organization for Economic Co-operation and Development. 2008.), http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/WKP(2007)1&doclanguage=en.

[5] "Virginia Statewide Community Profile" (Virginia Employment Commission, 2019). https://virginiawlmi.com/Portals/200/Local%20Area%20Profiles/5101000000.pdf

[6] "Defense Spending by State, FY 2017" (US Department of Defense, Office of Economic Adjustment, March 2019).

[7] "FEMA Flood Map Service Center | Search By Address," accessed September 16, 2019, https://msc.fema.gov/portal/search?AddressQuery=USCG%20Portsmouth%2C%20Virginia#searchresultsanchor.

[8] "Tyndall AFB Personnel, F-22s Temporarily Relocate to Hawaii and Alaska," U.S. Indo-Pacific Command, accessed July 17, 2019, https://www.pacom.mil/Media/News/News-Article-View/Article/1682655/tyndall-afb-personnel-f-22s-temporarily-relocate-to-hawaii-and-alaska-bases/.

The Eastern Shore of Virginia hosts NASA's Flight Facility at Wallops Island, which includes the Virginia Space and Mid Atlantic Regional Spaceport, NASA flight test facility, National Oceanographic and Atmospheric Administration and Federal Aviation Administration facilities, and the Navy's Surface Combat Systems Center Range. These facilities are unique. For example, the Navy Surface Combat Systems Center Range, the only such test range on the East Coast of the United States, supports the majority of new construction combat systems training for the Fleet.

We also are home to the Port of Virginia, the third largest container port on the East Coast and sixth busiest port by container traffic volume in the United States. A multi-modal port with facilities located in Hampton Roads in the cities of Norfolk, Portsmouth, and Newport News, and with barge service to the Port of Richmond and an Inland Port intermodal transfer facility in Front Royal, Virginia, [9] the Port of Virginia is the only East Coast port with federal authorization to dredge to a 55 foot channel depth, and generates a total of $60 billion in economic activity for the Commonwealth.[10] With a focus on sustainability, the Port of Virginia works to build resilience, aligned with the surrounding communities. Much like the regions' federal facilities, however, its future resilience is inextricably linked to that of the surrounding cities and other localities that support and provide its critical utilities, transportation, logistics, and supply chain infrastructure.

Coastal Virginia's substantial tourism industry generates direct travel-related expenditures exceeding $5.2 billion in our Coastal region[11]. Virginia boasts wide beaches, access to a myriad of water sports and recreational activities, as well as natural tidal marshlands, unique barrier island structures, and we are a critical stopover on the North Atlantic migratory bird flyway, all incredible facilities and natural amenities, and all at extreme risk.

[9] "NAFTA Region Container Traffic - 2017 Port Rankings by TEU's" (American Association of Port Authorities, 2017).
[10] "About the Port of Virginia," accessed July 18, 2019, http://www.portofvirginia.com/about/.
[11] "The Economic Impact of Domestic Travel on Virginia Counties 2017: A Study Prepared for Virginia Tourism Authority" (U.S. Travel Association, August 2018), https://www.vatc.org/wp-content/uploads/2018/08/2017-Economic-Impact-of-Domestic-Travel-on-Virginia-and-Localities.pdf.

Our substantial aquaculture and wild fishing industries generate over $1.4 billion in annual sales,[12] including oysters, crabs, and the largest clam industry on the East Coast of the United States.[13] These industries are vulnerable to both sea level rise and ocean acidification and warming. The infrastructure necessary for their success ties them to low-lying areas near the water - vulnerable to flooding - and accessibility to workplaces and docks is becoming a challenge during the more frequent high tide flooding that impacts road access, as well as activities on the waterfront. Ocean acidification and warming will affect the ability of some species to survive and reproduce in Coastal Virginia waters - in particular shellfish, endangering the wild-caught and grown seafood industry treasured by the Chesapeake Bay region.[14] For Virginia, this may be only a matter of time as such impacts have already been observed in the Pacific Northwest region of the United States, costing that region over $110 million dollars and putting 3,200 jobs at risk.[15]

Finally, our waterfront property and housing stock is a challenge we share with many other coastal states. Within the next 30 years - the lifespan of a typical mortgage - as many as 311,000 coastal homes in the lower 48 states with a collective market value of about $117.5 billion in today's dollars will be at risk of chronic flooding (more than 26 times a year or about every other week). By the end of the century, 2.4 million homes and 107,000 commercial properties currently worth more than $1 trillion altogether could be at risk, with Virginia's coastal real estate significantly exposed. The expected Virginia homes at risk in 2045 currently contribute about $23 million in annual property tax revenue. The homes at risk by 2100 currently contribute roughly $342 million collectively in annual property tax revenue. [16] In an ongoing Comprehensive Sea Level Rise and Recurrent Flooding Study conducted by the City of Virginia Beach and Dewberry, the annualized losses today in that City alone

[12] "Fisheries Economics of the United States 2016" (U.S. Department of Commerce, NOAA National Marine Fisheries Service, 2018), https://www.fisheries.noaa.gov/content/fisheries-economics-united-states-2016.
[13] Thomas J. Murray and Karen Hudson, "Economic Activity Associated with Shellfish Aquaculture in Virginia 2012," , https://www.vims.edu/research/units/centerspartners/map/aquaculture/docs_aqua/MRR2013_4.pdf.
[14] "Virginia Is Highly Vulnerable to Ocean Acidification" (Natural Resources Defense Council adopted from Ekstrom et al., 2015, February 2015), https://www.nrdc.org/sites/default/files/state-vulnerability-VA.pdf.
[15] "New Study: Rapid Ocean Acidification Threatens Coastal Economies in 15 States," 2015. NRDC Press Release https://www.nrdc.org/media/2015/150223.
[16] "Underwater: Rising Seas, Chronic Floods, and the Implications for US Coastal Real Estate" (Union of Concerned Scientists, June 2018), https://www.ucsusa.org/global-warming/global-warming-impacts/sea-level-rise-chronic-floods-and-us-coastal-real-estate-implications.

result in residential damages of $26 million annually due to coastal flooding events. If no action is taken, with 1.5 feet of additional sea level rise, expected within 20-30 years, that number increases to $77 million annually, and with 3 feet of additional sea level rise, forecast within 60-70 years, to $329 million annually, a 12 – fold + increase.[17]

COLLABORATIVE OPPORTUNITIES: THE HAMPTON ROADS SEA LEVEL RISE AND RESILIENCE INTERGOVERNMENTAL PILOT PROJECT

Virginia has a longstanding and vital relationship with our Federal partners, in particular the Department of Defense and Coast Guard, for reasons already stated. In 2014, the Hampton Roads region in particular had an opportunity to become part of a strategic partnership project effort to address and create practices by which Federal, State and Local partners could come together to identify and address climate impacts, and develop a codified process for achieving collaborative solutions. This project, initiated through the National Security Council, was the Hampton Roads Sea Level Rise and Resilience Intergovernmental Planning Pilot Project (Intergovernmental Pilot Project or IPP). Convened by Old Dominion University, the IPP was one of four federal and three Department of Defense climate preparedness and resilience planning pilots.[18] In correspondence as the then Acting Deputy Undersecretary of Defense for Installations and the Environment, Mr. John C. Conger designated the Navy as lead service supporting the Hampton Roads Pilot Project.[19] The intent of this pilot as stated by then Deputy Secretary Conger, was to leverage the Department of Defense's existing relationships and resources, develop additional partnerships and develop a process by which regional preparedness and planning processes that supported both the Department of Defense mission and surrounding communities could be developed.[20]

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[17] CJ Bodnar, "Comprehensive Sea Level Rise and Recurrent Flood Study" (Dewberry and City of Virginia Beach, May 2019), https://www.vbgov.com/government/departments/public-works/comp-sea-level-rise/Documents/slr-update-ccouncil-5-7-19.pdf.

[18] "June 27, 2016 IPP SC Consensus Resolution" (The Steering Committee of the Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project, June 27, 2016), https://www.floodingresiliency.org/wp-content/uploads/2016/11/IPP-Consensus-Resolution-All-Signatures.pdf.

[19] John Conger, "Memoradum for Assistant Secretaries of the Army, Navy and Air Force: DoD Climate Preparedness and Resilience Planning Pilots" (Office of the Under Secretary of Defense for Installations and Environment, October 29, 2014).

[20] John Conger.

The Intergovernmental Pilot Project (IPP) in Hampton Roads ran for two years from June 2014 to June 2016, and brought together more than 200 federal, state and regional professionals over the two-year period. Focused on collective holistic understanding of shared challenges and developing solutions to prepare for sea level rise and recurrent flooding impacts in the Hampton Roads Region, the IPP developed a series of final reports, and included five key priorities for action.[21]

- First: Set standards – including but not limited to sea level rise scenario planning, first finished floor elevation, and building code, and ensure that those standards are common across regions and localities with similar anticipated impacts from climate change and extreme weather to facilitate aligned planning and resilience efforts.
- Second: Ensure the support of a consortium of universities, to guarantee the best possible science and engineering technology is available to decision-makers.
- Third: Collect, analyze, process and share data. Shared data enables common regional understanding and analysis of outcomes, essential to the success of any collaborative planning effort.
- Fourth: Develop an understanding of what is critical and what is vulnerable from the context of shared infrastructure dependencies and interdependencies. Without a full and agreed-upon understanding of the nature of critical infrastructure affected by rising waters, it will be very difficult to develop a regional holistic plan.
- Fifth and finally, develop a plan and a set of strategies to achieve desired outcomes and then a process to fund the work necessary to achieve those outcomes. The financial instruments that we will use to pay for these challenges have not yet been developed, and federal support and collaborative alignment across communities is essential to address shared impacts.[22]

At the conclusion of the IPP, the steering committee and advisory and working group committee chairs signed a resolution recommending paths forward that the region might consider.[23] While the resolution was not ultimately adopted at a regional level, many of the recommendations have been

[21] Emily E. Steinhilber et al., "Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Pilot Project. Phase 2 Report: Recommendations, Accomplishments and Lessons Learned" (Old Dominion University, October 2016), https://digitalcommons.odu.edu/hripp_reports/2/.
[22] Steinhilber et al.
[23] "June 27, 2016 IPP SC Consensus Resolution."

taken up and implemented by cities, localities, and the Hampton Roads Planning District Commission, and many more are under consideration today. Those adopted include: setting standards, establishing a consortium of universities, and collecting and sharing data at a regional level. At the state level, Virginia is developing an analysis of critical and vulnerable infrastructure. Our challenge, like that of our Federal partners and fellow coastal and riverine states remains: how will we pay for this?[24]

The Intergovernmental Pilot Project was also one of two regional collaborative efforts analyzed in a recently completed doctoral dissertation by Dr. Hannah M. Teicher for her PhD in Architecture for the Massachusetts Institute of Technology, Department of Urban Studies and Planning, in June 2019.[25]

Her dissertation addresses the critical essential elements of this committee hearing, and can provide extensive value to Congress and the Federal Government as it works to address collaborative planning across and between Federal, State and local partners.

I have included Dr. Teicher's Dissertation **"Climate Allies: How Urban/Military Interdependence Enables Adaptation,"** as an attachment to this testimony, available at the link cited below.

Dr. Teicher identifies key points and outcomes highlighting the value of such partnerships and alignments between communities and regional entities, and their Department of Defense and other Federal partners.[26]

In particular, she states *"the shared risks between installations and the communities that surround them bring great potential for joint adaptation planning and in fact drive a need for it*". Her research found that, by using the circumstances and processes already in existence in these two unique communities of practice, "*Hampton Roads, Virginia and San Diego, California employed the most*

[24] Steinhilber et al., "Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Pilot Project. Phase 2 Report: Recommendations, Accomplishments and Lessons Learned."
[25] Hannah M Teicher, "Climate Allies: How Urban/Military Interdependence Enables Adaptation" (Doctoral Dissertation, Massachusetts Institute of Technology; Department of Urban Studies and Planning, 2019), https://dspace.mit.edu/handle/1721.1/122193.
[26] Hannah M Teicher.

readily available joint planning mechanisms" to elevate their broader adaptation agenda. In Hampton Roads, the IPP led to Joint Land Use Studies to further expand resilience planning, and in San Diego, the Integrated Natural Resource Management Plan (INRMP) process became the foundation for a Memorandum of Understanding between the Navy and the Port of San Diego to expand joint adaptation planning.[27]

Finally, Dr. Teicher points out two main enabling mechanisms in her dissertation: those of "**recognizing independence and constructing credibility,"** as key to not only initiating such alliances, but to reinforcing and expanding them.[28]

- Teicher points out the "benefits of such collaboration –[include] **expanded regional cooperation across a range of jurisdictions and sectors**, and **enhanced technical capacity and increased access to federal funding.**"[29]

- And the "**emerging risks** [to such collaboration, including] **prioritizing high-value assets over vulnerable populations, emphasizing adaptation at the expense of mitigation - addressing immediate impact rather than cumulative human causes - and prioritizing sensational risks, such as sea level rise rather than more pervasive risks, like heat stress**" or recurrent flooding.[30]

Certainly the IPP process in and of itself brought hundreds of stakeholders together, built lasting and ongoing relationships, and produced many workable recommendations for the region, accomplished by a variety of partnerships. The key deliverables - a whole of government mitigation and adaptation planning process, and a recommended integrated regional strategy to move forward, can both serve as a template for other regions[31] . Some of this work may be specific only to a unique circumstance or

[27] Hannah M Teicher.
[28] Hannah M Teicher.
[29] Hannah M Teicher.
[30] Hannah M Teicher.
[31] Steinhilber et al., "Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Pilot Project. Phase 2 Report: Recommendations, Accomplishments and Lessons Learned."

area, but when taken as a whole, it brings substantive change in the context of local, regional and federal collaboration. Finally, the IPP built on previous efforts accomplished by other leaders in the Hampton Roads region, and continues to leverage those outcomes to accelerate regional adaptation. [32]

TAKING ADVANTAGE OF EXISTING FEDERAL PROGRAMS

As a direct outcome from the IPP, and as recommended by Commander Navy Region Mid-Atlantic, the Navy's Executive Agent for the IPP, the Department of Defense, Office of Economic Adjustment (OEA) undertook a series of Joint Land Use Studies (JLUS) within the Hampton Roads Region. The context of these studies, understanding compatible use of infrastructure by federal and local partners, focused on how infrastructure external to federal DOD facilities would be impacted by the encroachment of recurrent flooding, storm surge, sea level rise, and other coastal hazards, and how those impacts and outcomes would affect the environmental resilience of the federal facilities in the region. The first of the studies, completed in June 2018, built upon an existing JLUS with the City of Hampton in 2010, expanded to include compatible use aspects, and included the city of Newport News, James City and York Counties, and Joint Base Langley-Eustis, with a focus on the FT Eustis facility.[33]

JLUS Study objectives typically include four focus areas:

- Provide meaningful input by the public.
- Identify areas where land use conflict occurs.
- Identify strategies to reduce encroachment and promote land use compatibility including considerations for regional roadway congestion, sea level rise and recurrent flooding, waterway and access management, and safety and security for the installation.
- Create an implementation plan and narrative report with recommendations and strategies.

Key recommendations from the Newport News /Hampton JLUS study also support IPP outcomes. In particular, establishing a formal communications process and developing a series of memoranda of understanding to ensure standardized processes for future collaboration between the localities and

[32] Commonwealth of Virginia, "EO 24; Increasing Virginia's Resilience to Sea Level Rise and Natural Hazards.," November 2, 2018, https://www.governor.virginia.gov/executive-actions/.
[33] "Joint Base Langley Eustis (Fort Eustis) Joint Land Use Study" (City of Newport News, March 2018), https://docs.wixstatic.com/ugd/3a99a7_58423e7847ce4078af32aceafeb6489f.pdf.

the federal facilities on a host of topics, including GIS, land use compatibility, communication, sea level rise and recurrent flooding, traffic, waterway access, energy and natural resources.[34]

The IPP led directly to two additional new JLUS study efforts. The Norfolk/Virginia Beach JLUS, including Naval Station Norfolk, Joint Expeditionary Base Little Creek/ Fort Story and Naval Air Station Oceana, and the Portsmouth/Chesapeake JLUS, including Norfolk Naval Shipyard in Portsmouth, outlying Fentress Field in Chesapeake, and the Portsmouth Naval Medical Center. The Norfolk/Virginia Beach Study has just been completed and just finished its final public comment – the Portsmouth/ Chesapeake study has just started.[35] These studies are a great value to the region and to the Commonwealth of Virginia, as not only do we now have a better understanding of how shared infrastructure interdependencies will be negatively impacted by climate change effects over time, but we also have a prioritized process from which to work with our federal partners begin to adapt across the region in ways that provide mutual support.

Through the assistance of the Department of Defense Office of Economic Adjustment, we have the opportunity to apply for additional planning grants to allow us to take steps collaboratively with our federal partners to begin to plan for some of the IPP/JLUS recommended outcomes. This program provides critical planning funding to communities adjacent to DOD/Federal facilities that offers direct assistance to those facilities for resilience work, and should be fully funded and expanded.

The Commonwealth of Virginia also works closely with the US Army Corps of Engineers across a number of programs, most specifically the Feasibility Study 3x3x3 process and Continuing Authorities programs.[36] Both processes allow Army Corps districts to work with local governments to study the needs of communities dealing with rising waters and storm surge. Related to recommendations from the 2015 North Atlantic Coast Comprehensive Survey, completed by USACE North Atlantic Division, the City of Norfolk and USACE Norfolk District completed a 3x3x3 in February of 2019 and have proceeded

[34] "Joint Base Langley Eustis (Fort Eustis) Joint Land Use Study."
[35] "Joint Land Use Studies | Hampton Roads Planning District Commission," accessed September 16, 2019, https://www.hrpdcva.gov/departments/joint-land-use-studies/.
[36] "The Corps Feasibility Study – Finding a Balanced Solution," Headquarters, accessed September 16, 2019, https://www.usace.army.mil/Media/News-Archive/Story-Article-View/Article/643197/the-corps-feasibility-study-finding-a-balanced-solution/.

to the preliminary engineering design phase.[37] The second recommended study area, Potomac River shoreline in Northern Virginia, has just started a Coastal Storm Risk Management Study (July 15 , 2019) under the auspices of the Baltimore District, USACE, with the Metropolitan Washington Council of Governments as the non-federal sponsor, and the Commonwealth of Virginia as one of several cost share partners.[38] The 2018 Water Resources Development Act authorized a full coastal study for Coastal Virginia, to include flood risk management, ecosystem restoration and navigation, which gives the Commonwealth the flexibility to include more than one city or municipality in the study area, critical to a region such as Hampton Roads, where multiple cities, localities, and federal facilities exist in close proximity. [39]

The challenge, though, is that such studies do not include Federal property, as dictated by restrictions to funding appropriations sources, and so require additional coordination between USACE, DOD, State and local participants to align appropriated funding. As an example, the Norfolk CSRM study only includes the City of Norfolk, and did not include a similar level of effort or the impacts to or outcomes of storm surge and flooding for Naval Station Norfolk or Naval Support Activity Hampton Roads. While USACE can work for DoD, they must be funded with DOD appropriations for such work, which does not often happen because of a lack of coordination.

Further, the Naval Facilities and Engineering Command released an excellent Climate Change Planning Handbook: Installation Adaptation and Resilience planning guide in January 2017, but with little follow-up on how and when facilities should use it. This document should be a key tool in federal facility resilience planning.[40]

Finally, language in the draft 2020 NDAA directs DOD to fund US Army Engineering Research and Development Center (ERDC) to undertake a national study of water related risks and vulnerabilities to military installation resilience, along with an assessment of ongoing or planned projects by the Corps of

[37] "North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk," Study (United States Army Corps of Engineers, 2015), https://www.nad.usace.army.mil/CompStudy/.
[38] "Northern Virginia Coastal Study," accessed September 16, 2019, https://www.nab.usace.army.mil/DC_Coastal_Study/.
[39] "Water Resources Development Act of 2018," Pub. L. No. H.R. 8, § 201 (9) (2018), https://www.congress.gov/bill/115th-congress/house-bill/8/text.
[40] "Climate Change Planning Handbook Installation Adaptation and Resilience," Final Report (Naval Facilities Engineering Command Headquarters, January 2017), https://www.fedcenter.gov/Documents/index.cfm?id=31041.

Engineers that may adapt such risks. This will help mitigate this challenge, but meanwhile, the gap in federal resilience planning alignment with the USACE 3x3x3 process continues, placing communities and military facilities at risk.

VIRGINIA IS TAKING ACTION

This is our challenge. In Virginia, we have over 10,000 miles of tidally- influenced shoreline.[41] Virginia has the eighth longest tidally- influenced coastline in the country, ranked just behind the state of Texas.[42,43] We have experienced over 18 inches of sea level rise in 100 years, as indicated by NOAA Sewell's Point tide gauge at Pier Six, Naval Station Norfolk. With an average of 4.66 mm of sea level rise per year, Virginia has one of the highest rates of relative sea level rise change of any state on the East Coast of the United States, including the Gulf of Mexico.[44] We are also experiencing land subsidence - most evident in areas where there is heavy use of water from our aquifers. Land subsidence varies across Coastal Virginia, and can range from as much as 40% to as little as 0% of the observed relative sea level rise.[45] Since the late 1990s, the duration, severity, and impacts of flooding have all increased substantially. [46] Current scientific projections, as documented by the Virginia Institute of Marine Science Sea Level Report Card, show that our sea levels will continue to rise and the rate of rise will accelerate, such that we expect an additional 18 inches of relative sea level rise by mid-century.

Under Governor Ralph Northam, Virginia is taking bold and substantive action to identify and fill the gaps. He intends to build capacity for Virginia as we set standards and define how we as a coastal state will approach this existential threat. During the 2019 General Assembly Session, Governor Northam

[41] MR Berman et al., "Virginia - Shoreline Inventory Report: Methods and Guidelines, SRAMSOE No. 450." (Comprehensive Coastal Inventory Program, Virginia Institute of Marine Science, 2016).
[42] NOAA Office for Coastal Management, "Shoreline Mileage of the United States," 1975.
[43] Berman et al., "Virginia - Shoreline Inventory Report: Methods and Guidelines, SRAMSOE No. 450."
[44] "Sea Level Trends - NOAA Tides & Currents. Sewell's Point VA Station.," 2019, https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8638610.
[45] D. P. S. Bekaert et al., "Spaceborne Synthetic Aperture Radar Survey of Subsidence in Hampton Roads, Virginia (USA)," *Scientific Reports* 7, no. 1 (2017): 14752, https://doi.org/10.1038/s41598-017-15309-5.
[46] T Ezer and L Atkinson, "Sea Level Rise in Virginia-Causes, Effects and Response," *Virginia Journal of Science* 66, no. 3 (2015): 355–59.

proposed legislation to begin to do just that, the Virginia Coastal Protection Fund Act, which would have modified and funded the Virginia Shoreline Resilience Fund, recast as the Virginia Shoreline Protection Fund, and provided a continuing source of income – estimated to be at least $50 million annually - generated by the sale of carbon dioxide emissions allowances received from Virginia joining the Regional Greenhouse Gas Initiative. Funds so generated would support implementing hazard - mitigation projects to both mitigate and prevent further flood damage. This legislation failed in Committee. And the General Assembly went further, preventing Virginia from participating in RGGI under any circumstance by blocking the use of agency funds for RGGI participation, even though it has already been approved by the Virginia State Air Pollution Control Board.[47]

Despite these efforts, Governor Northam remains committed to coastal resilience. His priorities are to identify critical infrastructure that is vulnerable to rising waters and recurrent flooding; to determine the best and most practical, innovative and cost effective solutions to adapt and protect that infrastructure; to use creative and less costly green or green-gray infrastructure approaches to protect more dispersed assets and communities; and to leverage federal, state and local funds to help make coastal Virginia more resilient to climate change.

To do this, **Governor Northam has established a series of executive actions, through Executive Order 24, *Increasing Virginia's Resilience to Sea Level Rise and Natural Hazards***, signed on November 2, 2018. With this Order, Virginia is directed to determine the vulnerability of and set standards for future built infrastructure throughout the Commonwealth, to make Commonwealth holdings more resilient. We have established and will implement a series of sea level rise scenario planning curves, which we will use to ensure the resilience of state-owned infrastructure and as recommendations for local governments and regions to use in planning and preparations for the future. We have also established a series of recommendations for first finished floor elevation for future constructed state-owned buildings that may be located in floodplains.

[47] Lewis et al., "A BILL to Amend and Reenact § 10.1-603.25 of the Code of Virginia, Relating to the Virginia Coastal Protection Fund; Establishment of a Carbon Dioxide Cap and Trade Program; Authorization to Establish an Auction Allowance Program Consistent with the Regional Greenhouse Gas Initiative Memorandum of Understanding; Deposit and Distribution of Proceeds of Allowance Auctions; Virginia Coastal Protection Act.," Pub. L. No. SB1666 (2019), 10.1-603.25 (2019), https://lis.virginia.gov/cgi-bin/legp604.exe?191+ful+SB1666.

Executive Order 24 also directs development of a Virginia Coastal Protection Master Plan to adapt and protect our coastal region. This plan will build on and align those actions, which our localities and regions have already taken to prepare themselves for their future, and will lay out a series of recommended actions and strategies for our state to develop and prioritize how it will adapt and protect our valuable and vulnerable coastline. In this context we view it as essential to work with our federal partners as we move forward to better prepare our state, regions, localities, and communities, to build trust, and demonstrate value. Finally, Executive Order 24 will serve to coordinate, collaborate, and communicate across state entities, across and with federal entities, and across our Coastal regions, communities, and localities to ensure coordinated objectives, and the best use of scarce funding dollars.

Virginia has identified four key areas of focus. First, the use of natural and nature-based features as a way to buy time – as the first line of defense - as we build our strategy and understanding of what infrastructure is critical and vulnerable, and what the best plans and processes will be over time to adapt that infrastructure. Second, we are focused on collaborative efforts at every level, working with and across localities to expand the capacity of their dollars, of state dollars, and where possible, of federal dollars. Third, we are committed to ensure environmental justice, as underserved communities often bear the most substantial brunt of flooding challenges, and yet have the least capacity to plan, apply for grant dollars, determine or meet federal and state match requirements, and to sort out solutions to fund and implement actions to keep their communities and their histories viable into the future. Finally, we will facilitate the adoption of resilience practices across state agencies and processes.

Executive Order 24 builds on actions already underway across Coastal Virginia. At the federal level, the Department of Defense, Office of Economic Adjustment has initiated a series of “compatible use” Joint Land Use Studies (JLUS) in Coastal Virginia. The Joint Base Langley-Eustis Study with the Cities of Hampton and Newport News was completed in 2018, and the Norfolk - Virginia Beach JLUS just entered its public comment period in June, and is nearly complete. The third JLUS study, including the

cities of Chesapeake and Portsmouth, has just begun and should be complete in FY 2020. These studies help Coastal Communities understand the impacts of rising waters and flooding on infrastructure in and around their shared federal facilities, and give the communities and their federal partners a better understanding of how to prepare and prioritize project outcomes of benefit to both to ensure operational and community readiness.

As described earlier, the US Army Corps of Engineers North Atlantic Coast Comprehensive Survey (2015), a post-Hurricane Sandy report, recommended seven additional Coastal Storm Risk Management Studies, two specific in Virginia. The first, the Norfolk Coastal Storm Risk Management Study conducted by the USACE Norfolk District, received its signed Chief's Report in February 2019. The second, Northern Virginia/Potomac River Shoreline, executed by the USACE Baltimore District, officially started July 15th, 2019.

To give you a sense of the enormous costs of making our coast more resilient, the City of Norfolk USACE Coastal Storm Risk Management Study outlines $1.57B in proposed projects to reduce the impact of storm surge and risk on the city.[48] Though this is valuable work, critical to the city's future, it does little to address nearer term recurrent flooding across the city, and again, such studies do not, by law, include Department of Defense infrastructure in considering impacts and design outcomes.

And the City of Virginia Beach is completing a series of studies, including a full watershed analysis, and a sea level rise and recurrent flooding study that has estimated $2.4B in anticipated costs to reduce flooding and surge impacts across the city. Virginia Beach has raised taxes and storm-water fees, and committed to $1.3B in spending over a 15-year period to begin to prepare for these impacts, and yet realizes that much of what it must do will require the cooperation of nearby cities to achieve the full set of desired resilience outcomes.

[48] "Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study Report/Environmental Impact Statement," Feasibility Study (Norfolk, VA: US Army Corps of Engineers, Norfolk District, September 2018), https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/5490/.

Many other cities are staring down costs on a similar scale, and rural localities with more dispersed populations and limited tax bases have a wholly different set of needs that must be addressed through more creative solutions.

WHAT CONGRESS CAN DO TO HELP

First, I would like to thank both the House and the Senate for the addition of climate- related amendments in the 2018, 2019, National Defense Authorization Act language and the 2020 NDAA mark-up language, and for the language contained in the 2019 Coast Guard Continuity Act. These efforts help coastal communities in Virginia with substantial federal presence improve coordination at the federal, state, and local level and improve resilience for our federal and defense facilities along with that of the surrounding communities, without which they would not be able to ensure our forces are prepared to deploy. I would also like to thank the House and the Senate for their work on the 2018 Disaster Recovery Reform Act and its many innovative solutions to focus on pre-disaster hazard mitigation, which will also give options and opportunities for coastal communities to better prepare themselves in advance of increased hazardous weather and storm activity. Further, in February, 2019, Virginia Secretary of Natural Resources, Matthew J. Strickler, submitted testimony for the record with specific recommendations as to how Transportation and Infrastructure Committee could assist Virginia and other states in mitigating and adapting to the impact of sea level rise and extreme weather events.[49] Several of his recommendations are particularly germane to this Subcommittee testimony, and include:

- **Helping States organize and prioritize flood control projects with USACE,**
- **Delivering timely USACE studies, and considering third party analysis and study, and**
- **Delivering strong environmental review**

I have included Secretary Strickler's letter of February 22, 2019 as an attachment for the record.[50]

[49] Matthew J Strickler, "Letter to Submit for the Record of the February 27, 2019 Transportation & Infrastructure Committee Hearing Titled 'Examining How Federal Infrastructure Policy Could Help Mitigate and Adapt to Climate Change.,'" February 22, 2019.
[50] Matthew J Strickler.

As sea levels rise and extreme weather events, like the extreme rain and flash flooding event of July 8th 2019 here in Washington, DC, and the events leading up to and post Hurricane DORIAN, become more and more common, the United States is under stress. Since 1980 there have been have been 219 disasters costing over $1 billion each, for a cumulative cost of $1.57 trillion.[51]

Because of this, since 1980 the federal government has appropriated over $73 billion for disaster preparedness and recovery. In response to disasters, Congress has provided an additional $254.6 billion in supplemental and contingency funds, nearly three times more than had been provided in the annual budget.[52] This is a fiscal and budgeting problem as well as a resilience and disaster preparedness problem. We know every dollar spent on disaster mitigation saves $6, which should be full justification for Congress to take action to increase the amount of money spent on resilience and pre-disaster mitigation. The funding is needed, whether it is money for the Army Corps of Engineers to study and construct flood control projects, or for DOD and Coast Guard to study, understand, and prepare their facilities for current and future risk, or for FEMA to improve predictive floodplain mapping and help communities move out of floodplains, or money for USGS or NOAA to better monitor, analyze and understand flooding and storm surges. Increased spending now will better protect people, property and the fiscal strength of the United States for tomorrow, and save precious dollars over time.

Further, this Committee and Sub Committee must recognize climate resilience and disaster preparedness as one of the country's greatest and most immediate needs. Without significant funding for and coordination across the federal agencies that provide resilience and pre-disaster mitigation, Congress will fail to meet its charge of protecting the communities of the United States. In addition, Congress should encourage greater alignment of these programs to eliminate redundancies and ensure the most expedient and effective use of funds to protect people and property and reduce repetitive disaster spending.

[51] Adam Smith, "2017 U.S. Billion-Dollar Weather and Climate Disasters: A Historic Year in Context." (NOAA Climate.gov, January 2018), https://www.climate.gov/news-features/blogs/beyond-data/2017-us-billion-dollar-weather-and-climate-disasters-historic-year.
[52] William Painter, "The Disaster Relief Fund: Overview and Issues" (Congressional Research Service, February 2019).

In addition to resilience, pre-disaster mitigation, and infrastructure and flood plain actions, the U.S. Army Corps of Engineers (USACE) has a $96 billion backlog of authorized but unconstructed projects, while annual appropriations for the USACE Construction account under Energy and Water Development appropriations bills have averaged $2 billion in recent years. Congress has also limited the number of new studies and construction projects initiated with annual discretionary appropriations, with a limit of five new construction starts using FY2019 appropriations.[53] Since only a few construction projects are typically started each fiscal year, numerous projects that have been authorized by previous Congresses remain unfunded and backlogged. This problem has worsened in recent decades as Congress has authorized construction of new projects at a rate that exceeds USACE's annual construction appropriations. This drives competition for funds among authorized activities during the budget development and appropriations process, and only a few projects make it into the President's budget each year. Non-federal entities involved in USACE projects are frustrated with the extreme effort it takes to fund the projects their localities need, and again, those processes do not include federal bases that are within or adjacent to community boundaries.

Finally, additional topic areas of need include:

- **Substantive and timely, publically-available scientific data**
- **Expanded USACE Project Development, and alignment with DOD/USCG resilience needs**
- **Support for Department of Defense Office of Economic Adjustment**
- **Aligned and Expanded Federal Block Grant Programs**
- **State resilience incentivized with Federal Matching Funds**

CONCLUSION

In summary, as viewed from the state and community level, there is an urgent need for a coordinated federal effort, and for codified Federal /community aligned planning processes to deal with the impacts of climate and rising waters on Coastal Communities. Rising waters and recurrent flooding know no political boundaries; they know no boundaries of wealth or race; they know no

[53] "Army Corps of Engineers Annual and Supplemental Appropriations: Issues for Congress" (Congressional Research Service, October 2018), https://crsreports.congress.gov/product/pdf/R/R45326.

boundaries of society. Coastal communities and their Federal partners across Virginia and around the country are being impacted today.

This Committee can help by recognizing climate resilience and disaster preparedness as one of the country's greatest and most immediate needs.

Virginia is committed to building capacity for our coastal communities to prepare for and build resilience to this threat, and as one of many impacted coastal and riverine states, we need the support of a coordinated nationwide federal response to make this happen.

We have no time to waste because **"Time and Tide wait for no man."**
(The words of Geoffrey Chaucer)

Thank you again for the opportunity to offer this testimony, and I look forward to your questions.