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Chairman Napolitano, Ranking Member Westerman 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, 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.

Today, I've been asked to address the impact of the Water Resources Development Act and ensuing US Army Corps of Engineers actions and activities from the perspective of coastal states and coastal communities, and how Virginia is preparing to adapt and protect its coastal infrastructure from the impact of sea level rise and recurrent flooding**. Virginia's 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 to ensure environmental equity for underserved communities; and to leverage federal, state and local funds to help make Coastal Virginia more resilient to climate change.

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.** From October 8th to October 13th, Hampton Roads experienced above flood stage sunny- day flooding, caused in part by storms off shore and wind from the North East, for 10 consecutive high tide cycles over 5 days, impeding access and blocking traffic flow in and around the region.[1] This is our "new normal" - it affects every aspect of our lives in ways that we do not yet understand, or even realize.

In Virginia, we have over 10,000 miles of tidally- influenced shoreline.[2] Virginia has the eighth longest tidally- influenced coastline in the country, ranked just behind the state of Texas.[3,4] 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.[5] We are also experiencing

[1] "Water Levels - NOAA Tides & Currents," accessed November 12, 2019, https://tidesandcurrents.noaa.gov/waterlevels.html?id=8638610&units=standard&bdate=20191005&edate=20191015&timezone=GMT&datum=MLLW&interval=6&action=.
[2] MR Berman et al., "Virginia - Shoreline Inventory Report: Methods and Guidelines, SRAMSOE No. 450." (Comprehensive Coastal Inventory Program, Virginia Institute of Marine Science, 2016).
[3] NOAA Office for Coastal Management, "Shoreline Mileage of the United States," 1975.
[4] Berman et al., "Virginia - Shoreline Inventory Report: Methods and Guidelines, SRAMSOE No. 450."
[5] "Sea Level Trends - NOAA Tides & Currents. Sewell's Point VA Station.," 2019, https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8638610.

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.[6] Since the late 1990s, the duration, severity, and impacts of flooding have all increased substantially. [7]

Observed Data Sea Level Rise Projections Exceed USACE Intermediate Curve in Virginia

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. Of particular interest to this committee is that using VIMS Sea Level Report Card, based on actual tide-gauge analysis for Sewell's Point, current sea level rise projections through 2050 exceed those of the USACE Intermediate curve (USACE-INT), the default curve USACE uses for its analysis and Coastal Storm Risk Management Studies.[8]

What this means is that any analysis using the USACE INT Curve is, again by default, underestimating the rate of change, depth, and future impacts, which results in under engineered and underestimated solutions - before the projects enter design phase. In essence, by using these very conservative SLR scenario-planning curves, and not considering local analysis and rates of change, USACE is ***"shooting behind the duck"*** - wasting Federal dollars in a tail chase to address an ever-expanding problem and delivering under- designed and under-engineered outcomes, rather than getting ahead of them with risk-informed analysis. While localities may work with USACE to use higher sea level rise projections to accept less risk, any additional cost to designed outcomes falls to the locality and is not shared under USACE cost share provisions.

[6] 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.
[7] T Ezer and L Atkinson, "Sea Level Rise in Virginia-Causes, Effects and Response," *Virginia Journal of Science* 66, no. 3 (2015): 355–59.
[8] "Norfolk, Virginia | Virginia Institute of Marine Science," Norfolk, Virginia Sea-Level Report Card, accessed July 17, 2019, https://www.vims.edu/research/products/slrc/localities/nova/index.php.

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
- **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 high military concentration is tied 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 in the United States, 43% of which are Navy facilities valued at roughly $100 billion.[9] 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**

[9] "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.

Station Oceana, Naval Support Activity Hampton Roads, Naval Support Activity Hampton Roads - Northwest Annex, and Joint Base Langley-Eustis.[10] A 2008 study by the Organization for Co-operation and Economic Development, ranked the Hampton Roads metropolitan area as the 10th most vulnerable in the world related to the value of assets at risk from sea level rise.[11]

The Department of Defense and our federal partners are the largest employers in the state[12] 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).[13] 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. 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.[14]

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[10] 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.
[11] RJ Nicholls et al., "Ranking Port Cities with High Exposure to Climate Extremes - Exposure Estimates," Environment Working Papers (Organisation for Economic Co-operation and Development. 2008.), http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/WKP(2007)1&doclanguage=en.
[12] "Virginia Statewide Community Profile" (Virginia Employment Commission, 2019). https://virginiawlmi.com/Portals/200/Local%20Area%20Profiles/5101000000.pdf
[13] "Defense Spending by State, FY 2017" (US Department of Defense, Office of Economic Adjustment, March 2019).
[14] "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, [15] 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.[16] 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[17]. 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.

[15] "NAFTA Region Container Traffic - 2017 Port Rankings by TEU's" (American Association of Port Authorities, 2017).
[16] "About the Port of Virginia," accessed July 18, 2019, http://www.portofvirginia.com/about/.
[17] "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,[18] including oysters, crabs, and the largest clam industry on the East Coast of the United States.[19] 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.[20] 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.[21]

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. [22] In an

[18] "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.
[19] 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.
[20] "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.
[21] "New Study: Rapid Ocean Acidification Threatens Coastal Economies in 15 States," 2015. NRDC Press Release https://www.nrdc.org/media/2015/150223.
[22] "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.

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 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.[23]

In terms of real estate value, research reported in the Journal of Financial Economics shows homes exposed to sea level rise are selling for approximately 7% less than equivalent properties that are unexposed to sea level rise and equidistant from the beach. Broken down in more detail, homes that may be inundated with one foot of sea level rise, trade at a 14.7% discount, and properties expected to be inundated after 2-3 feet of sea level rise, at a 13.8% discount.[24] This places Coastal cities and other localities under pressure to determine solutions to not only reduce the risk to these vulnerable properties, but to reduce the risk to their property tax base, without which they cannot remain viable. Yet coastal communities face challenges from another perspective, as the Credit Ratings agencies have begun to take notice of the risks carried by localities exposed to rising waters. The credit rating agencies are asking for detailed plans about localities' strategies to adapt and mitigate the risk as a criterion for retaining their credit and bond rating. The paradox is that some localities find themselves unable to issue any more debt to take action to better protect themselves and build their resilience because of the risk to their credit rating, as evaluated by the same ratings agencies that demand to know what they are doing to reduce the risk and vulnerability to their resilience, in order to retain their good credit. This is a problem today, and without adequate coastal analysis and protection, it will grow worse.

[23] 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.

[24] A Bernstein, M Gustafson, and R Lewis, "Disaster on the Horizon: The Price Effect of Sea Level Rise," *Journal of Financial Economics*, 2018.

There are health risks too. Combined sewer systems exist in about 860 US Cities, with three of them in Virginia (Alexandria, Richmond and Lynchburg).[25] Combined Sewer Overflow events (CSO), pose a significant threat to public health and the environment – a threat that will only increase because of climate change. An EPA study found that climate change could lead to a 12 to 50 percent increase in storm events that lead to combined sewer overflow events[26], with 70 such events releasing a combined one billion gallons of sewage occurring nationwide between January 2015 and September 2016.[27] Additionally, sea level rise is a threat to coastal localities with outflow pipes that may be inundated in the future, (and some are already) preventing discharge without costly pumping systems, and introducing seawater that could damage the mechanical and biological integrity of wastewater treatment facilities.[28]

Further, increased flooding is also a threat to septic systems in rural areas, a tremendous and growing problem in much of rural Coastal Virginia, and in fact, in many Coastal states. Inundated leach fields cause Septic systems to fail, releasing contaminated water into the ground or surface water. Failing septic systems, as well as the absence of either septic or sewer systems, cause significant public health and water quality risks for rural communities throughout Virginia. [29] The risk of septic system failure is increasing as sea level rises and flooding occurs more frequently, creating a unique challenge for the many rural homeowners and localities who lack the resources and capacity to rehabilitate or replace their systems, or install expensive sewage treatment facilities.

[25] A Kenward et al., "Overflow: Climate Change, Heavy Rain, and Sewage," States at Risk (Climate Central, September 2016), file:///C:/Users/dea29868/Downloads/Overflow_sewagereport_update.pdf.
[26] "A Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow (CSO) Mitigation in The Great Lakes and New England Regions (Final Report)." (Washington, DC: U.S. Environmental Protection Agency, 2008).
[27] Kenward et al., "Overflow: Climate Change, Heavy Rain, and Sewage."
[28] Ben Bovarnick, Shiva Polefka, and Arpita Bhattacharyya, "Rising Waters, Rising Threat: How Climate Change Endangers America's Neglected Wastewater Infrastructure" (Center for American Progress, October 2014), https://cdn.americanprogress.org/wp-content/uploads/2014/10/wastewater-report.pdf.
[29] Jamie Huffman, Sarah Simonettic, and Scott Herbest, "Onsite Sewage Systems: Background, Framework, and Solutions" (Virginia Coastal policy center, Fall 2018).

Virginia Is Taking Action

Under Governor Ralph Northam, Virginia is taking bold and substantive action to identify risk and develop a strategic vision and actionable steps to prepare our coast. He intends to build capacity for Virginia as we set standards and define how we as a coastal state will approach this existential threat, **and has taken a series of executive actions, through Executive Order 24, *Increasing Virginia's Resilience to Sea Level Rise and Natural Hazards***, signed November 2nd, 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 implemented a series of sea level rise scenario planning curves, 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. And we have incorporated substantive changes to our National Flood Plain Program oversight and implementation structure, all as directed by **Executive Order 45,** signed November 14th, 2019 by Governor Northam.

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, in particular the Corps, 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 solutions where feasible,** as the first line of defense and to protect vulnerable built assets while also protecting sensitive coastal environments. **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. **Executive Order 29, establishes the *Virginia Council on Environmental Justice*,** specifically to help address these issues and challenges.[30] **Finally**, **we will facilitate the adoption of resilience practices across federal, state, and local agencies and processes**.

How This Committee Can Help/Recommendations for Congress:

The Commonwealth of Virginia works closely with the US Army Corps of Engineers across a number of programs, including the Feasibility Study 3x3x3 process and Continuing Authorities programs.[31] 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 Feasibility study in February of 2019 and have proceeded to the preliminary engineering design phase.[32] 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

[30] "Commonwealth of Virginia Executive Order 29" (Office of the Governor, January 22, 2019), https://www.governor.virginia.gov/media/governorvirginiagov/executive-actions/EO-29-Establishment-Of-The-Virginia-Council-On-Environmental-Justice.pdf.

[31] "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/.

[32] "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/.

the non-federal sponsor, and the Commonwealth of Virginia as one of several cost share partners.[33]

Support and Appropriate Funds for a Full Coastal Study in Virginia:

In 2018, the Water Resources Development Act authorized a Full Coastal Study for Virginia, to include flood risk management, ecosystem restoration and navigation. This 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. [34]

With this full coastal authorization, Virginia and the Corps should be able to conduct a detailed analysis of the risks and impact to Coastal Virginia, including our eight Coastal Planning Districts and Regional Commissions, from the ocean to the full extent of tidal influence - as well as our critical national security and port infrastructure, our valuable tourism, aquaculture industries, and our beautiful natural resources and natural coastlines. However, in working at the District Level, we have been told the Corps has no interest in conducting a full coastal study for Virginia, as we will never meet the benefit /cost analysis requirements, and that this authorization will simply serve to allow more than one locality to participate in USACE - led studies. When considering the economic impact of our Coastal Region, as described earlier in this testimony, we find it hard to understand this logic. As we work to develop our own Coastal Master Plan to protect and adapt Coastal Virginia, the top priority is to conduct a full coastal analysis, to gain a detailed and multi-layered understanding of that infrastructure that is critical and vulnerable, so that we can identify and prioritize impact, solutions, and costs. This will be true for every Coastal State, and the longer we wait, the less prepared we, as a nation, will be for this threat.

[33] "Northern Virginia Coastal Study," accessed September 16, 2019, https://www.nab.usace.army.mil/DC_Coastal_Study/.

[34] "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.

Include DOD properties and Federal infrastructure in studies – this is essential for Virginia

The challenge for any USACE civil works study 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 recurrent flooding for Naval Station Norfolk or Naval Support Activity Hampton Roads. Both facilities have extensive territory within their fence line in the Coastal, 100 year and 500 year flood plains, with watersheds that extend into the City of Norfolk - by excluding them, the study is incomplete. Further, by only doing one city and not considering regional watershed impacts broadly, the study is further incomplete. This in no way lessens the need for outcomes defined within the Norfolk Flood Control Feasibility Study, in fact, it drives home the need for a broader and more thorough full Coastal Study of Virginia by the Corps, one that engages both the civil works and military construction sides of USACE.

Beach Renourishment May Not be a Long Term Solution.

NASA's Wallops Island Flight Test Facility is also entirely in the Coastal Flood Plain and with billions of dollars in critical national infrastructure at risk. The current plan for protecting Wallops Island is ineffective as a long-term strategy, relying on beach renourishment every five years at a cost exceeding $50 million, and with limited consideration for sea level rise impacts.[35] [36] USACE is the contracting authority in support of the current NASA Wallops Beach renourishment project, which has State permitted approval, and this pending renourishment should be effective short term. However, current sea level rise projections show an additional 3 to 4.5 feet of sea level rise over the next 60 years for the area, which further reinforces the need for studying long term impacts, as a part of a full Coastal Study, to better understand

[35] "NASA Wallops Island Shoreline Stabilization Project," accessed November 12, 2019, https://www.nao.usace.army.mil/About/Projects/NASAWallopsShoreline.aspx.

[36] "PEIS WALLOPS FLIGHT FACILITY SHORELINE RESTORATION AND INFRASTRUCTURE PROTECTION PROGRAM," Environmental Impact Statement (Wallops Island, VA: NASA, October 2010), https://code200-external.gsfc.nasa.gov/sites/code250-wffe/files/documents/SRIPP_Final_PEIS_Volume_I.pdf.

potential damaging side effects from renourishment, and to determine options and strategies to adapt and protect this critical and important facility.
This demonstrates the problem with benefit- cost analysis in the short term, versus understanding the longer-term climate impact - and costing more in the end to taxpayers. Again, the longer we delay in determining and considering broader outcomes, the fewer options remain, and the more costly they become. We recommend that the Committee consider changes to the USACE benefit-cost formula to ensure that non-structural and long-term climate adaptation solutions pass muster.

In addition, in a recent letter, Department of the Interior Secretary David Bernhardt wrote to Congressman Van Drew (NJ) announcing the Trump administration would change a 25-year – old policy to make it easier for coastal communities to take sand from protected ecosystems to improve or renourish beaches. Destroying protected ecosystems in favor of short-term flood abatement is not in the long-term interest of Virginia or the United States. We recommend the committee reverse this rule change in the next Water Resources Development Act.

Federal Agency Funding Alignment

While USACE can work for DoD and other Federal agencies, they must be funded with DOD or other agencies' appropriations for such work, which does not often happen because of a lack of coordination. In a region like Hampton Roads, or on the Eastern Shore at NASA's Wallops Island Flight Test Facility – both with billions of dollars if critical national infrastructure at risk, the failure to include Federal facilities in Coastal Storm and Environmental planning by the Corps is a grave oversight.

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 Engineers that may adapt such risks. This will help mitigate this challenge, but meanwhile, the gap in federal resilience planning alignment with the USACE

Feasibility Study and larger study process continues, placing communities and military facilities at risk.

Prioritize and Organize USACE Missions, Flood Control Projects and Studies

Within the three primary missions of the USACE Civil Works Division, Navigation, Environmental Restoration and Flood Control, often work against each other, as navigation projects are a nearer term priority, often overshadowing costlier and longer-term flood control requirements. This results in navigation projects receiving funding at the expense of flood control, which further delays critical flood and water infrastructure projects. This Committee should consider the creation of some type of "firewall" or funding limit that considers navigation projects separately, and only evaluates them against other navigation projects so that flood control projects can be prioritized with dedicated funding. The USACE also needs to find a comprehensive way to evaluate whether navigation projects may be adversely impacting flooding or environmental restoration. The National Environmental Policy Act and Clean Water Act provide some protections, and those must be maintained or strengthened.

Evaluate and Reduce USACE Flood Control Project Backlog

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.[37] 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

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

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.

The Corps must **evaluate the complete list of back-logged projects for currency recommend to Congress which projects are** not addressing current or future flooding needs, or are otherwise unnecessary, or do not address resilience, pre-disaster mitigation, or infrastructure and flood plain actions. Further, the Corps must assist states in the **prioritization and aggregation of flood control projects so to streamline the most effective projects** and reduce projects and studies that overlap or leave gaps in coverage along jurisdictional lines. Congress must instruct The Corps to **prioritize projects that provide the greatest flood risk reduction and assist regions with the greatest economic needs, as well as prioritizing projects that are part of regional comprehensive plans.**

Develop and Promulgate Guidance for States and Localities / Include and Validate Commercial and Academic Analysis

The Corps should develop guidance on addressing Sea Level Rise and pre-disaster mitigation. As an example, the Naval Facilities and Engineering Command released an excellent *Climate Change Planning Handbook: Installation Adaptation and Resilience p*lanning guide in January 2017, but with little follow-up on how and when facilities should use it. This document could be a key tool in federal facility resilience planning, and the Corps could either adopt it, or incorporate it in their guidance to States and localities. [38] As the Corps begins new Feasibility *S*tudies, Congress should ensure the Corps will accept and validate commercial and academic study work as the basis for, or in place of, a feasibility study (for example, Virginia Beach's own Back Bay study and storm water study discussed earlier). We simply cannot delay any longer, the costs and risk are too great.

[38] "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.

Emphasize Green Infrastructure, and Develop Expanded Benefit/Cost Analysis that Quantifies Green Infrastructure and Natural and Nature-based Feature (NNBF) Benefits, and the needs of Underserved Communities

The Corps must move from a grey infrastructure/ hardscape focus to one that emphasizes green infrastructure and natural and nature –based features wherever feasible. While ERDC has plenty of capacity to address such infrastructure through its Engineering with Green Infrastructure Initiative, its work is rarely considered in the Coastal Storm Risk Management process.[39]

Green infrastructure and NNBF's buy time, and in many circumstances, are more effective, and more cost-effective through reducing the amount of water overall, and by absorbing, capturing and slowing down run-off and floodwaters while providing ecosystem services and co-benefits. This is particularly valuable in the context of providing services to underserved communities, and ensuring environmental equity across communities. In summary, we need a fundamental reconsideration of BCA, including strong environmental review, quantification of green and NNBF infrastructure benefits, and consideration of environmental equity, given what we now know about costs and the longer term nature of climate change as a threat.

CONCLUSION

Virginia values its relationship with the US Army Corps of Engineers and their ongoing work with State agencies and localities. Virginia wants and needs a Full Coastal Study, and looks forward to working with USACE to plan, fund and implement our authorization.

There is an urgent need to align Corps planning standards, Feasibility Study, and benefit-cost analysis processes to better serve coastal States and their communities dealing with rising waters and recurrent flooding.

[39] "EWN | Dr. Todd Bridges | Bio," 3, accessed November 12, 2019, https://ewn.el.erdc.dren.mil/bios/bio_bridges_todd.html.

Federal facilities must be included in the Feasibility Study process, and guidance from the Corps on quantifying green infrastructure and natural and nature-based features, along with reducing and prioritizing the flood control project backlog, will expedite opportunities to reduce flood risk in communities across the nation. Rising waters and recurrent flooding know no political boundaries; they know no boundaries of wealth or race; they know no 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 the need to align Corps responsibilities with sea level rise, recurrent flooding and coastal resilience 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 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.