

IMPACTS OF EXTREME COASTAL AND OCEAN EVENTS ON CIVIL AND MILITARY MARINE TRANSPORTATION INFRASTRUCTURE

VULNERABILITY ASSESSMENT OF HAMPTON ROADS IMPACT ON COMMERCIAL AND MILITARY SEAPORTS

Marine Board – Fall Meeting

Rear Admiral Ann Phillips, USN (Ret)
November 7, 2017

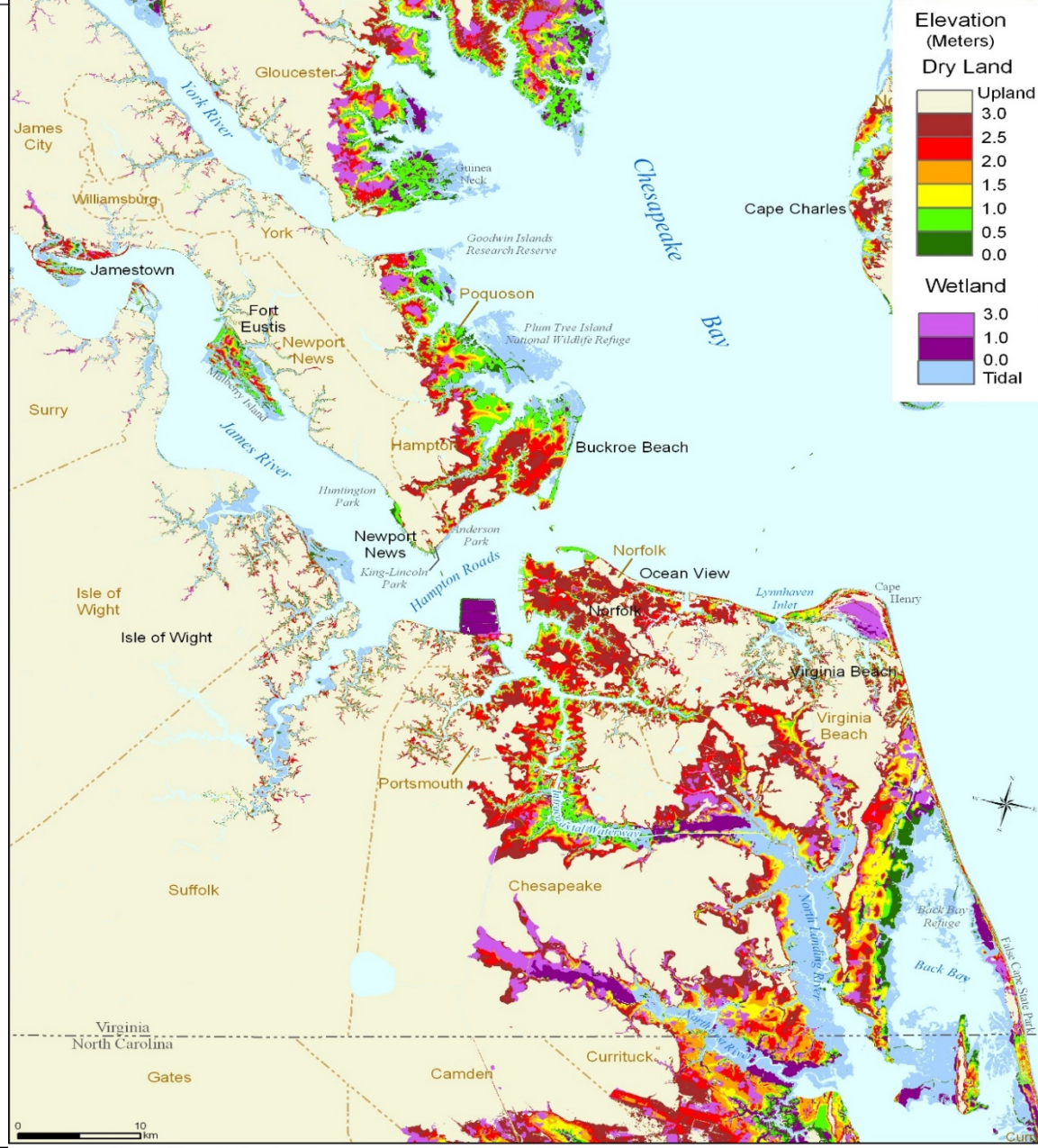
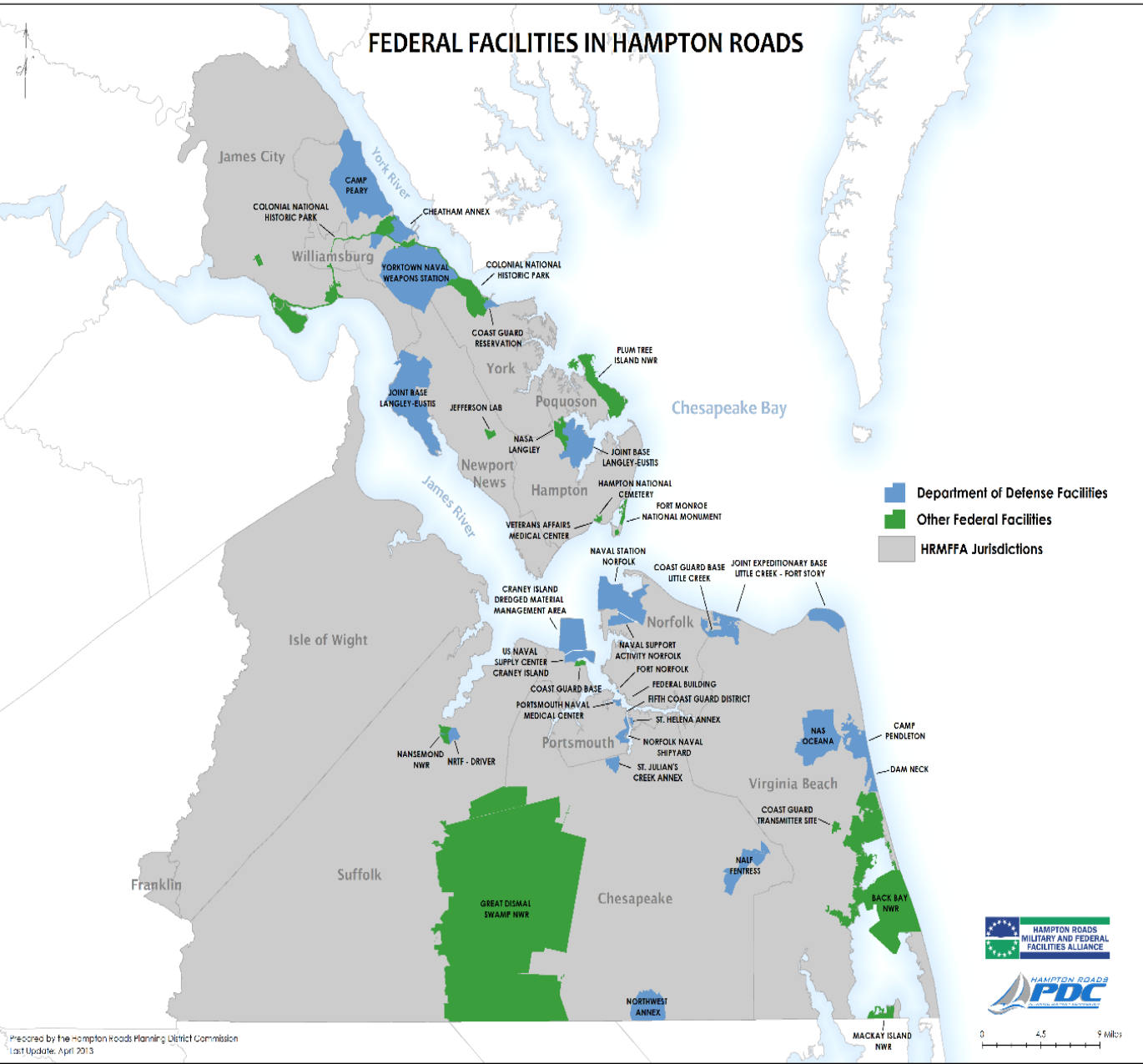


- ▶ The region is flat – a little sea level rise inundates a lot of land
- ▶ Sea level rising + land subsidence causing more hours of flooding and more extreme flooding events = serial flooding
- ▶ Huge Federal and Commercial Maritime presence in Hampton Roads
 - ▶ Increasing risk
 - ▶ Not easily relocated
- ▶ Challenge: How to adapt facilities, cities, municipalities, neighborhoods, and transportation corridors to increased flooding.
- ▶ Adaptation is happening but:
 - ▶ Not collaborative across region
 - ▶ Slow pace (series vice parallel progress)
 - ▶ Danger = Wait for the “Big One” to make progress?

SETTING THE STAGE



ISABEL 2003

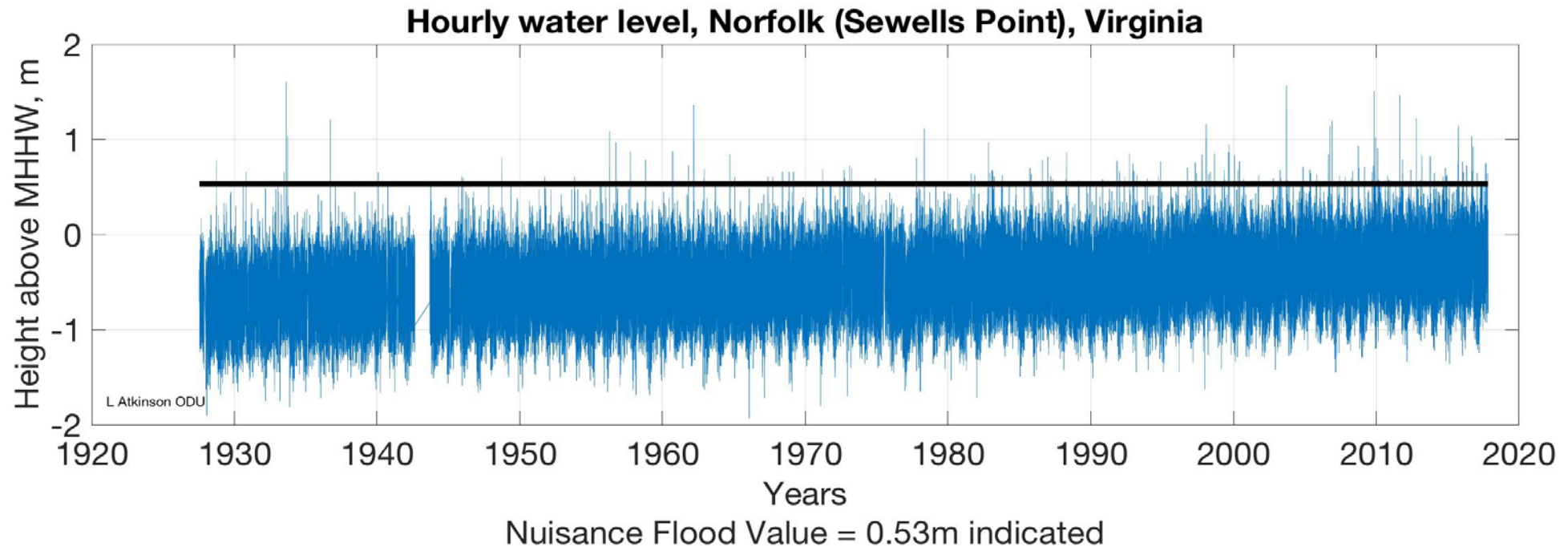
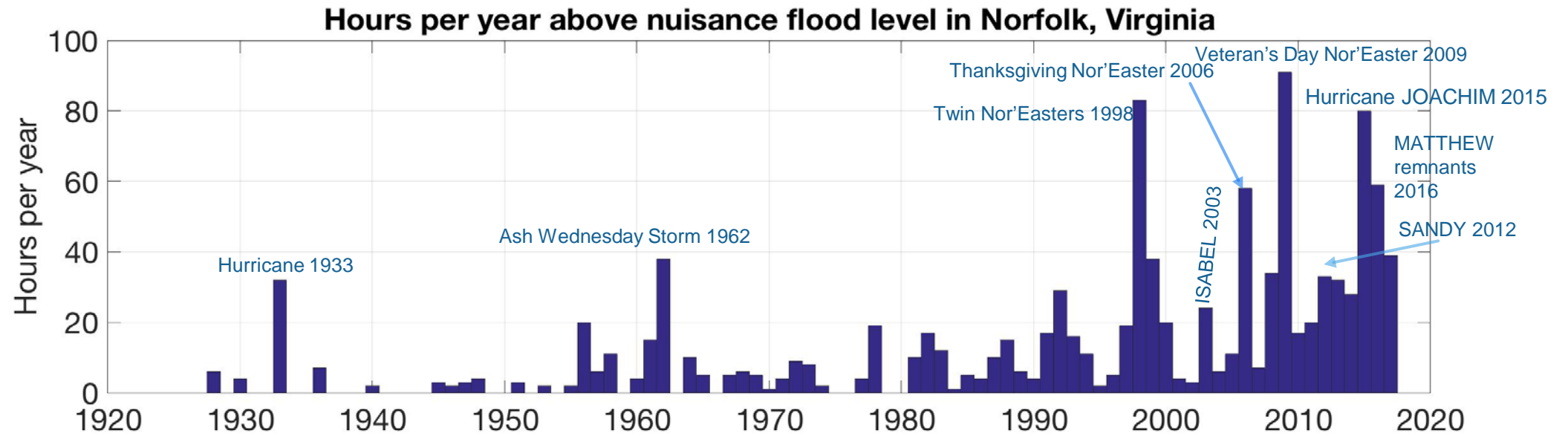


Elevations of Land Close to Sea Level

Elevations are above spring high water, which is the average high tide during new and full moons, and approximately the inland boundary of tidal wetlands. This map is a general graphical representation of elevations in the area depicted, not designed to estimate the precise elevations at specific locations. Actual elevations at specific locations may be 75 cm above or below the elevation shown.

Source: J.G. Titus and J Wang. 2008. "Maps of Lands Close to Sea Level along the Mid-Atlantic Coast". US Environmental Protection Agency.

Federal Facilities with Elevation . . . For Comparison



Impact Studies - National Asset: Military Shipbuilding and Repair

Regional downscaling and its applications to sea-level rise impacts

NORTHROP GRUMMAN

Impacts of Hurricane Isabel on the Northrop Grumman Ship Yard

Record high water level at the Shipyard

James River spilling into dry dock #1



Average Years Between Flooding Events		Sea Level Rise (Ft)			
Event Severity	Gauge Level				
Flood Stage		0	1	2	3
Action	4.50	0.70	0.15	0.09	0.08
Flood	5.00	1.71	0.33	0.10	0.08
Moderate	6.00	7.32	1.71	0.33	0.10
Major	7.00	26.83	7.32	1.71	0.33
Record	8.02	80.50	26.83	7.32	1.71
Disaster	9.00	~ 80.50	26.83	7.32	

NGSS (Now HII) presentation
to HRPDC
29 October 2009

- ▶ Risk Quantification for Sustaining Coastal Military Installation Asset and Mission Capabilities (RC-1701) SERDP (Focus: Naval Station Norfolk)
 - ▶ Sea level rise – threat multiplier to mission sustainability
 - ▶ Increased risk to infrastructure
 - ▶ Critical systems incapacitated if SLR above 1.0 m
 - ▶ Planning must consider a ‘tipping point’ at SLR of 0.5 m when damage probabilities increase dramatically.
 - ▶ This is prior to NOAA 2017 update adding 0.5 m to every curve!
- ▶ Installation Master Plan revisions
- ▶ NAVFAC Resiliency Planning Guide - 2017
- ▶ NASA/JB Langley-Eustis
 - ▶ Predictive Storm / Flooding Mapping Tool



FEDERAL

Flight Line 27th Fighter Squadron, Langley Air Force Base, Hampton, Virginia during Hurricane Isabel

- ▶ Adjoins or similar to Federal/DOD infrastructure so parts of DOD studies apply
- ▶ Port Resiliency Study 2017 w/Virginia Modeling Analysis and Simulation Center – ID vulnerabilities, dependencies, interdependencies – develop resilience planning processes
- ▶ DOT Hampton Roads Infrastructure Resiliency Quantification Initiative – in progress
- ▶ Tipping point (SERDP) will be an issue for both inside and outside the gate and the transportation infrastructure serving the sites: rail and road access also vulnerable.

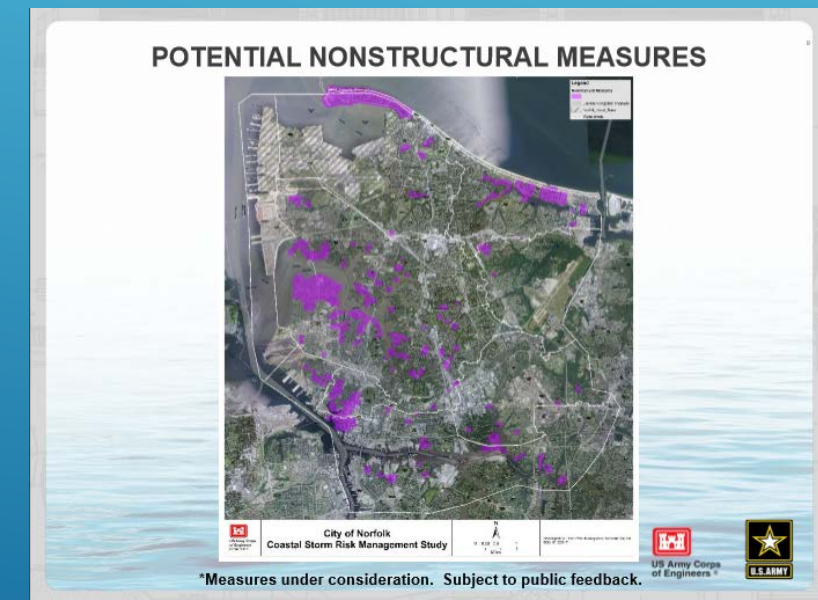
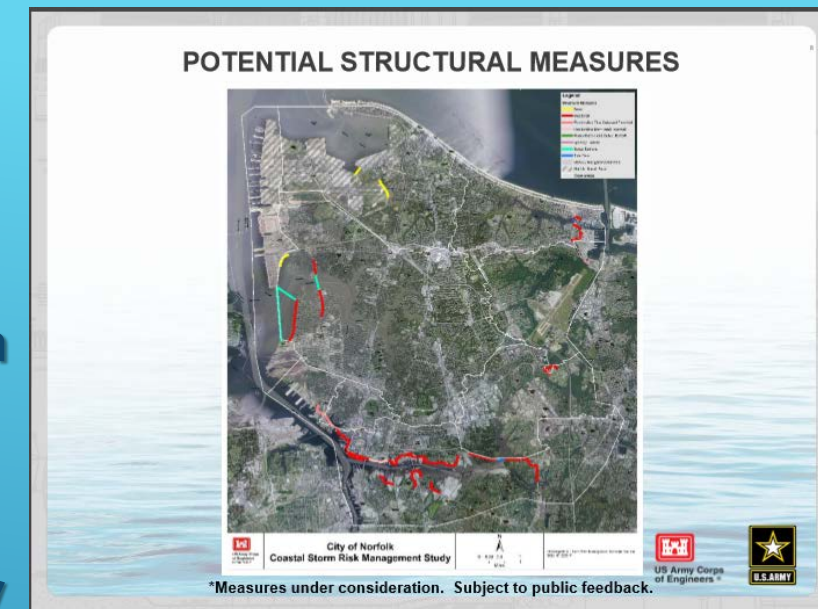


PORT OF VIRGINIA



- ▶ Norfolk USACE CSRM \$1.8 B (released 27 Oct 2017)
- ▶ Virginia/Norfolk NDRC grant Chesterfield Heights
- ▶ Va Beach 4\$M SLR and Recurrent Flooding Response Plan and Precipitation Analysis – in progress
- ▶ Hampton Urban Water Plan (post Dutch Dialogues)
- ▶ JLUS Studies Norfolk/Va Beach followed by Chesapeake/Portsmouth, plus ongoing Hampton
- ▶ Intergovernmental Pilot Project – 2014-2016
- ▶ Bluemoonfund Watershed Study – 2017-2018

THE CITIES



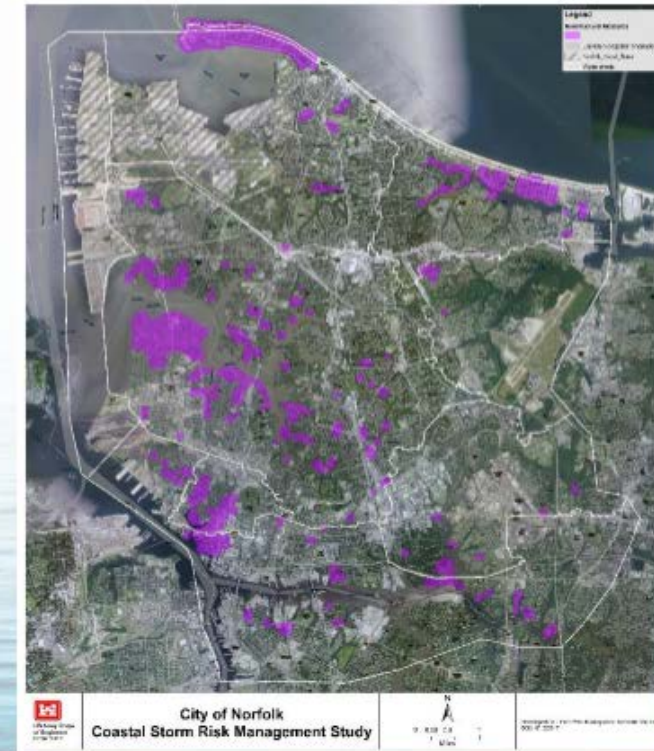
POTENTIAL STRUCTURAL MEASURES



*Measures under consideration. Subject to public feedback.

USACE CSRMR PROPOSAL

POTENTIAL NONSTRUCTURAL MEASURES



*Measures under consideration. Subject to public feedback.

- **ODU/HRPDC/VA Sea Grant Adaptation Forums**
- **Intergovernmental Pilot Project (though outcomes not publicly presented)**
- **Joint Land Use Studies in progress - with SLR as an encroachment.**
- **City collaboration at the Manager / Director level**
- **Public/Public/Private partnerships (Federal /City)**

SUCCESSES

CHALLENGES

- Federal-Local partnerships 'outside the fence'
- Facing an existential threat – it will take decades to plan and adapt to increased flooding: far beyond political time scales.
- Anticipatory planning/governance
- Regional approach critical– 'federal funding requires regional approach - not city by city'

Technical

- ▶ **Standard Vertical Datum / GIS attributes**
- ▶ **Topography bathymetry survey upgrade**
- ▶ **Consistent measurements and standards between cities**
- ▶ **NOAA gauges - more of them**
- ▶ **Cities - USGS gauges to improve inundation predictive modeling**

Human

- **Citizens' Education – “Invest in the Truth”**
- **Citizens Engagement – Demand action**
- **Flood Insurance in SFHA**
- **Community Rating System participation**

SHORT TERM ACTIONS INVESTMENTS CORE AREAS AND ACTIVITIES

- ▶ How to collaboratively determine, plan and fund “Outside the Fence” issues
- ▶ Quantification of impact to Transportation:
 - ▶ Rail and air links to port and Federal facilities
 - ▶ Major vulnerable critical infrastructure - roads, tunnels, rail, air
- ▶ Identify critical and vulnerable infrastructure /assets
- ▶ Determine regional whole of society solution options
- ▶ Prioritize and order solution strategy
- ▶ Broad level data management
- ▶ Integrated or interoperable data, GIS attributes
- ▶ Determine financial instruments / Federal/State/Local/Private

LONGER TERM ACTION/INVESTMENT

- ▶ Specify Federal/Maritime future floodplain mapping standards
- ▶ Specify Standardization of geospatial data for infrastructure and critical asset mapping - especially with regard to elevation (buildings, first floor elevations, freeboard of infrastructure, sea level rise scenario curves) for Federal/Local projects
- ▶ Develop Risk assessment scenarios, data content and methods or protocols for *ports, marine terminals and intermodal transport operators*
- ▶ Develop Risk assessment scenarios, data content and methods or protocols for *Federal Asset long term strategic planning*
- ▶ Develop Dependency/Interdependency quantification modeling
- ▶ Determine Points of failure and/or points of cascading failure.

WHAT IS APPROPRIATE FOR MARINE BOARD TO CONSIDER?

- ▶ On the 50 to 100 year time scale there is an existential threat to the commercial and government infrastructure of the Hampton Roads Region. This is a threat to our National Security.
- ▶ The roads, rails, airports, and cities that serve the Maritime / Federal infrastructure are equally under threat.
- ▶ The Hampton Roads region understands and accepts the fact of increased flooding. The need for long term “revisioning” less so.
- ▶ Realistic but stove-piped planning is proceeding at some levels.
- ▶ Waiting the next big flooding event to stimulate funding is not an acceptable planning or adaptation methodology.

SUMMARY