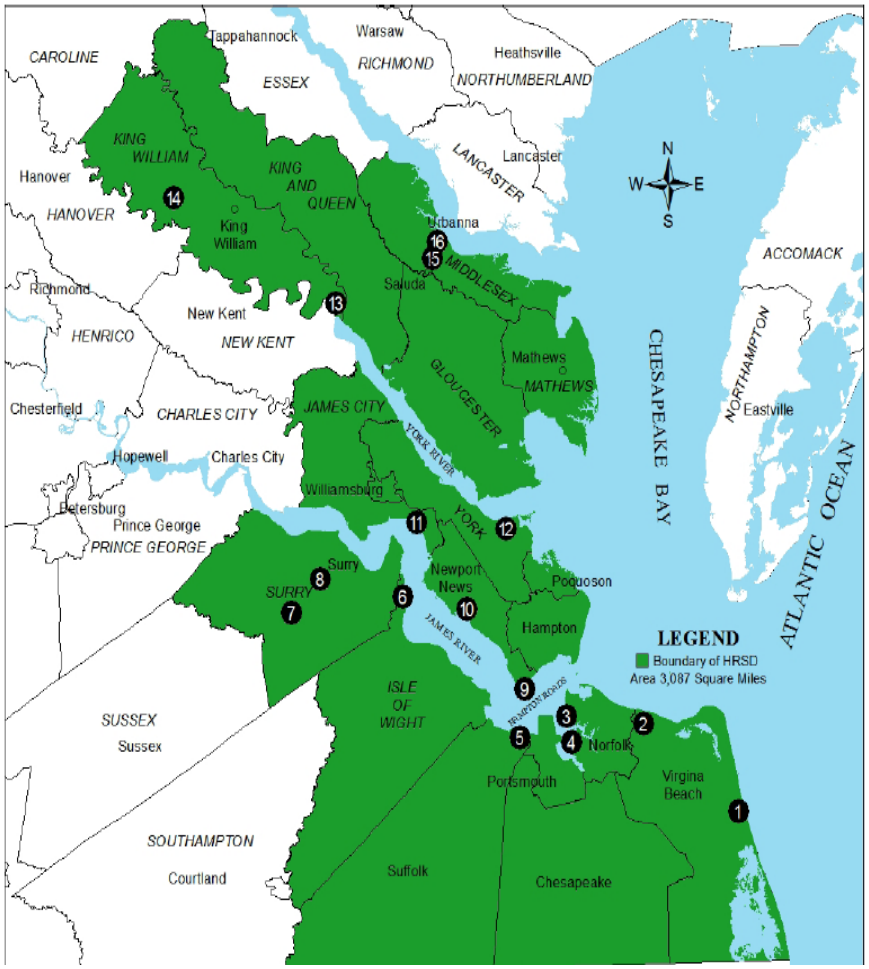
One Initiative – Many Benefits

Jamie S. Heisig-Mitchell
Chief of Technical Services,
HRSD

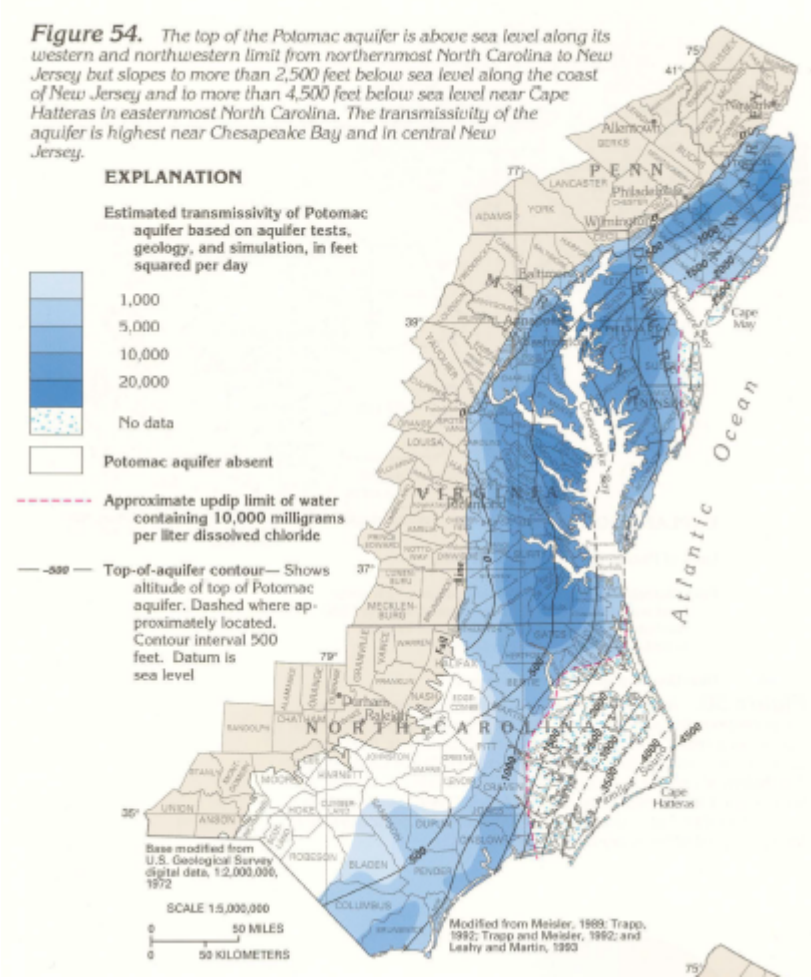
Who/What is HRSD?



- Provide wastewater treatment for 18 localities (250 mgd treatment capacity)
- Serve 1.7 million people (20% of all Virginians)
- Independent political subdivision with Governor appointed Commission

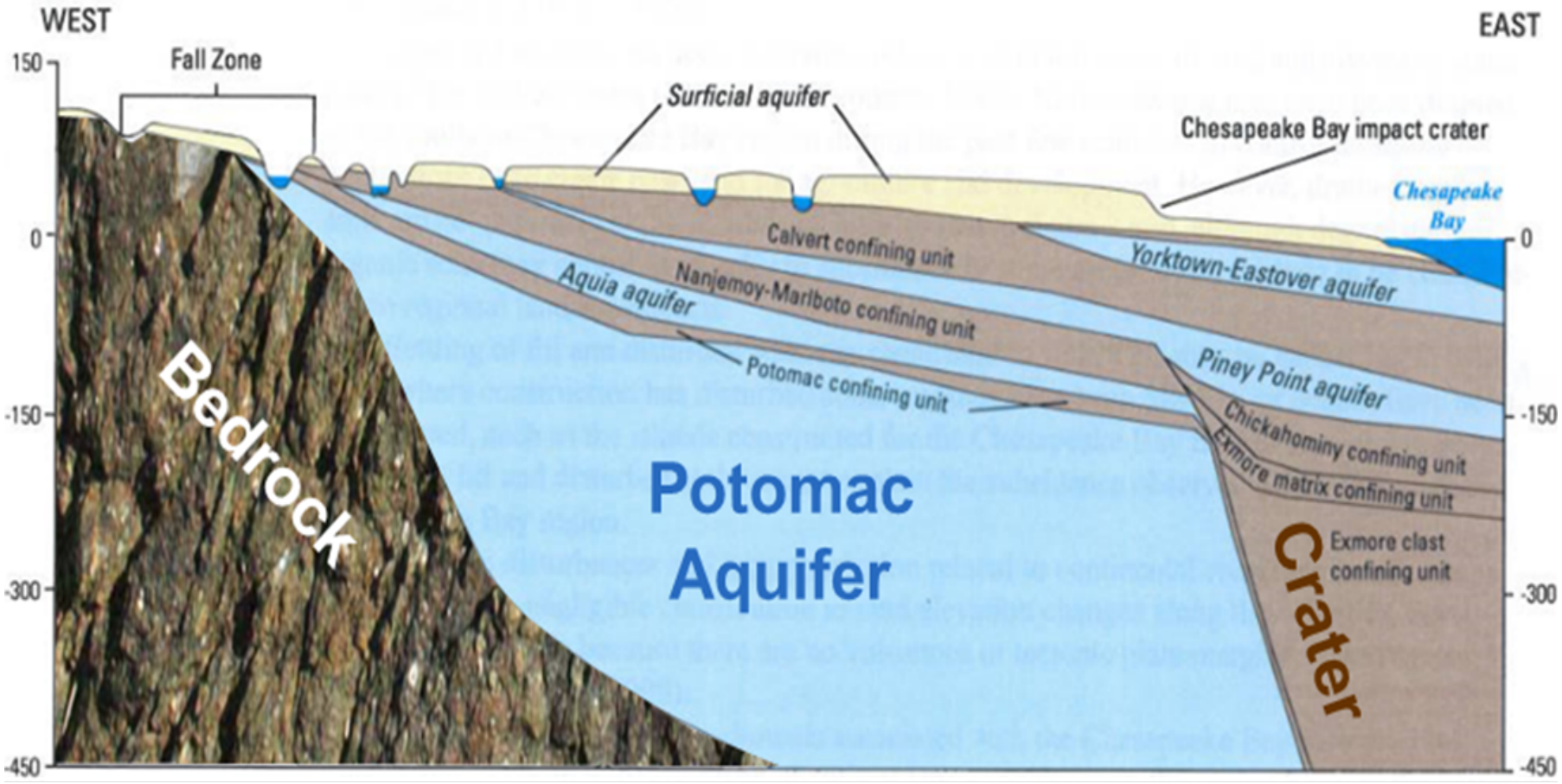
●HRSD Treatment Facilities

North Atlantic Coastal Plain: Potomac Aquifer



Source: USGS Groundwater Atlas of the US (Miller, 2000)

Cross section through Potomac Aquifer



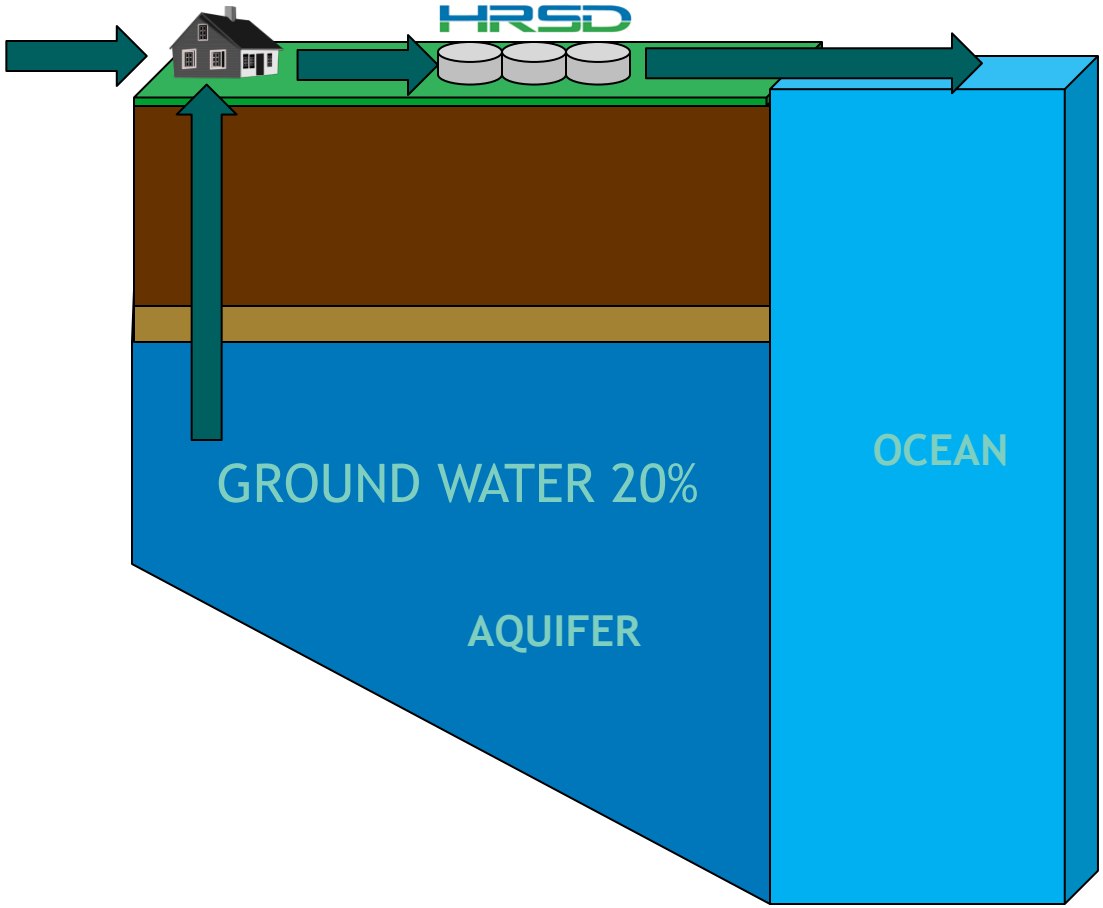
Water Issues Challenging Virginia and Hampton Roads

- Depletion of groundwater resources
  - Including protection from saltwater contamination
- Water quality concerns
  - Chesapeake Bay restoration
  - Local water quality issues
- Sea level rise
  - Compounded by land subsidence
- Wet weather sewer overflows (SSO)
  - Compliance with Federal enforcement action

Current state of wastewater in Hampton Roads

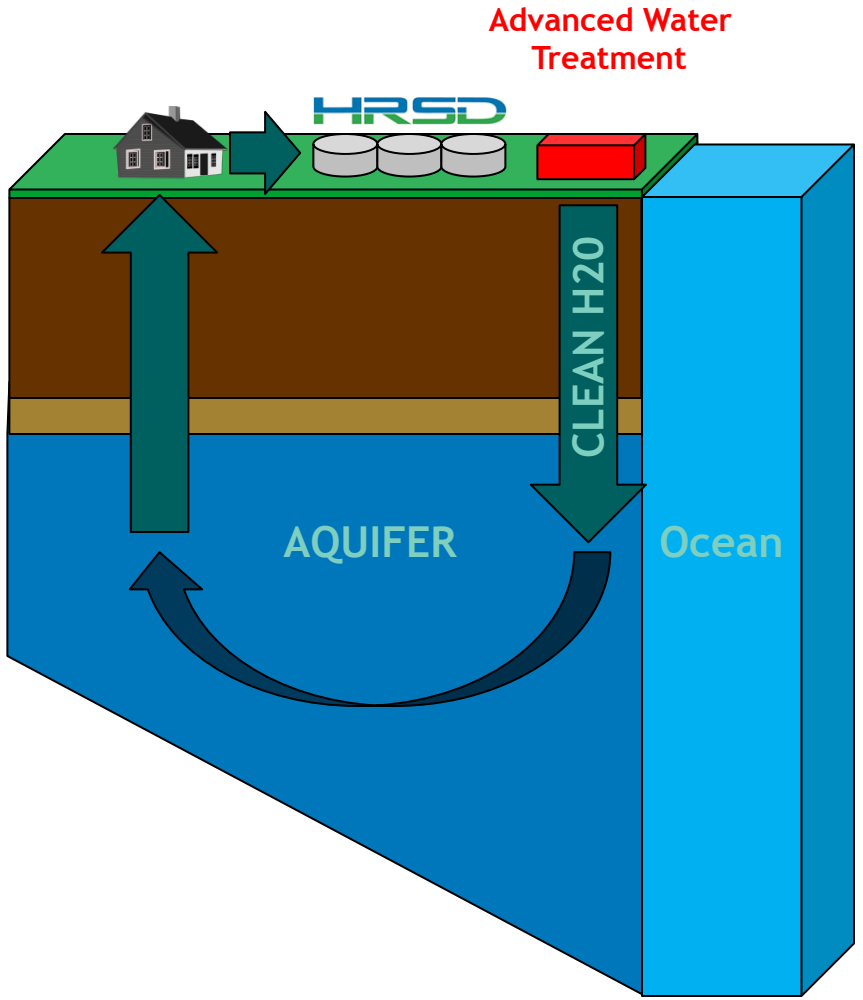
SURFACE WATER 80%

HRSD costs are rising to treat water to higher standards. Treated water currently discharged to area waterways – no beneficial use.

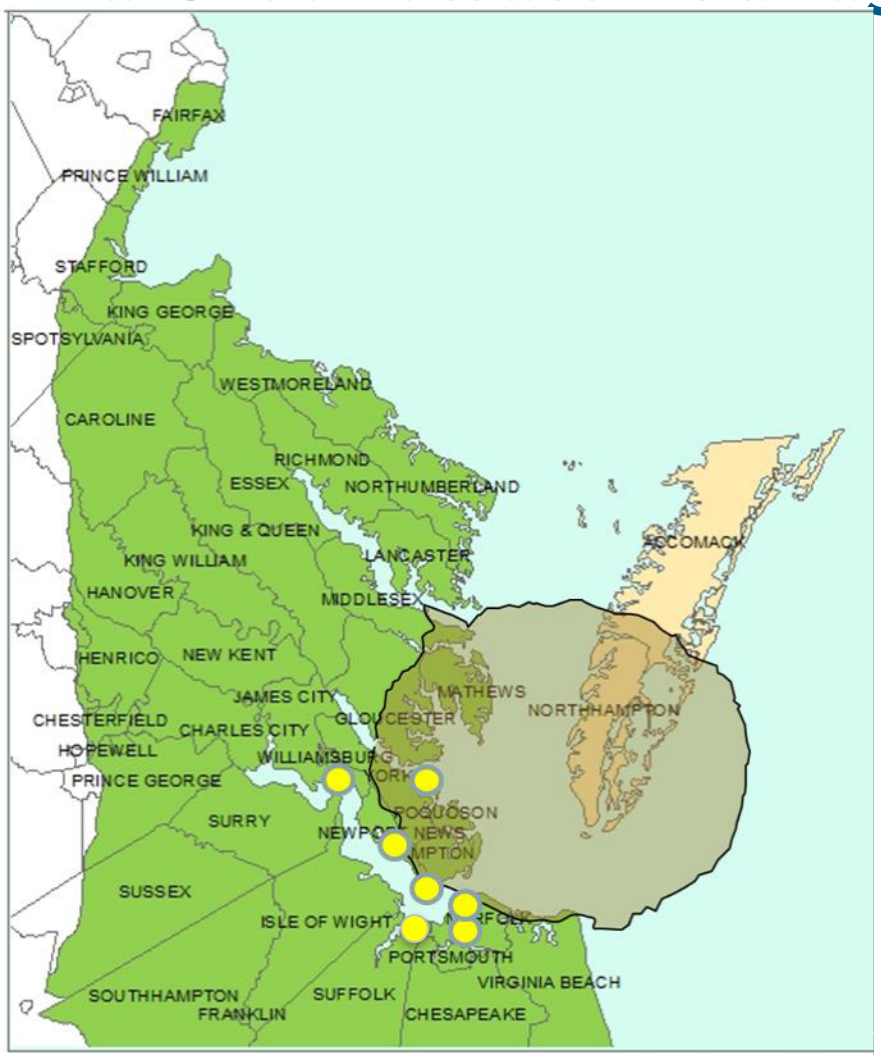


SWIFT – Sustainable Water Initiative for Tomorrow

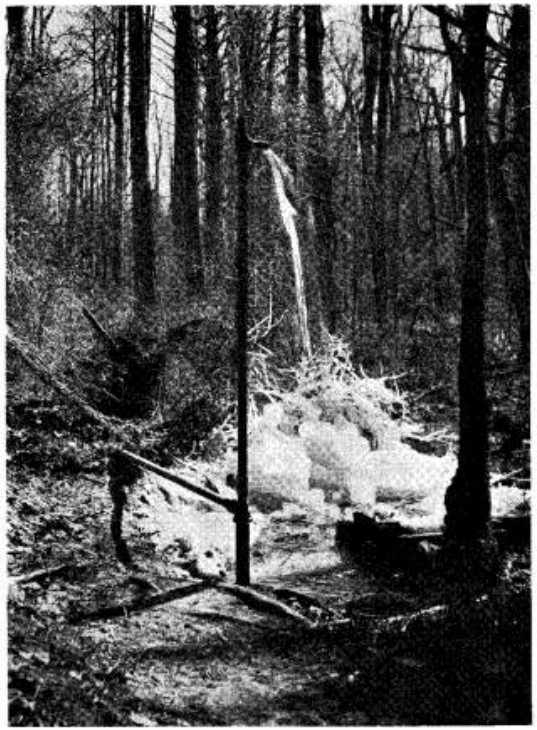
- Treat water to meet drinking water standards and replenish the aquifer with clean water to:
  - Provide regulatory stability for wastewater treatment
  - Provide a sustainable supply of groundwater
  - Reduce nutrient discharges to the Bay
  - Reduce the rate of land subsidence



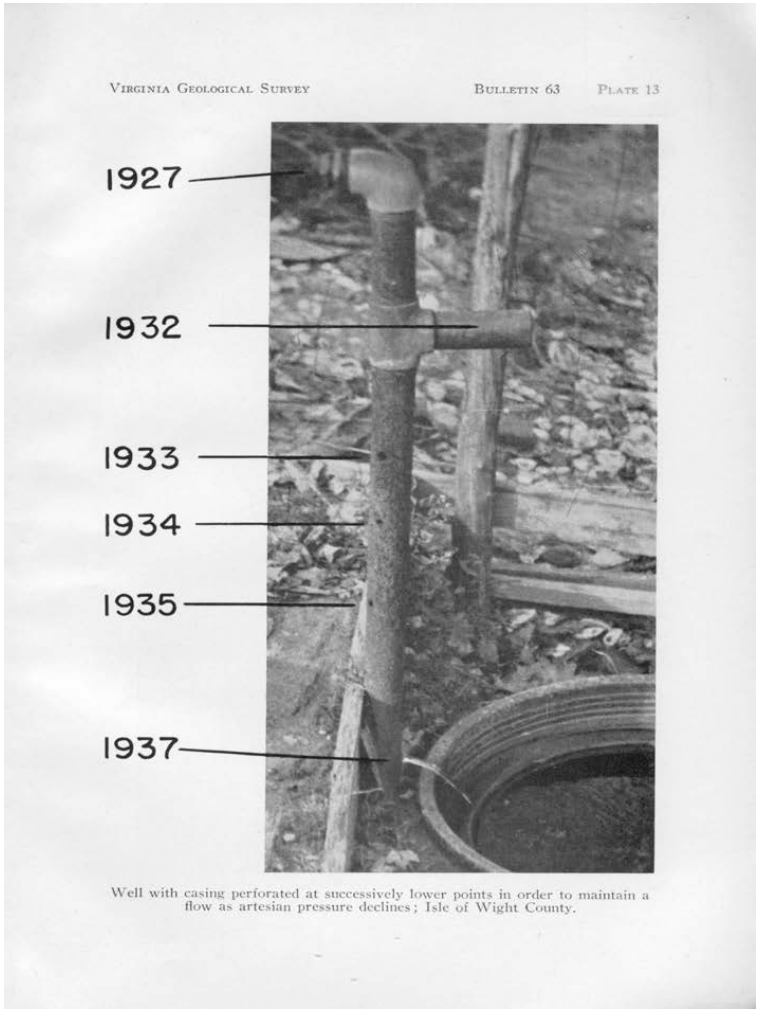
Eastern Virginia Groundwater Management Area



Groundwater depletion has been rapid

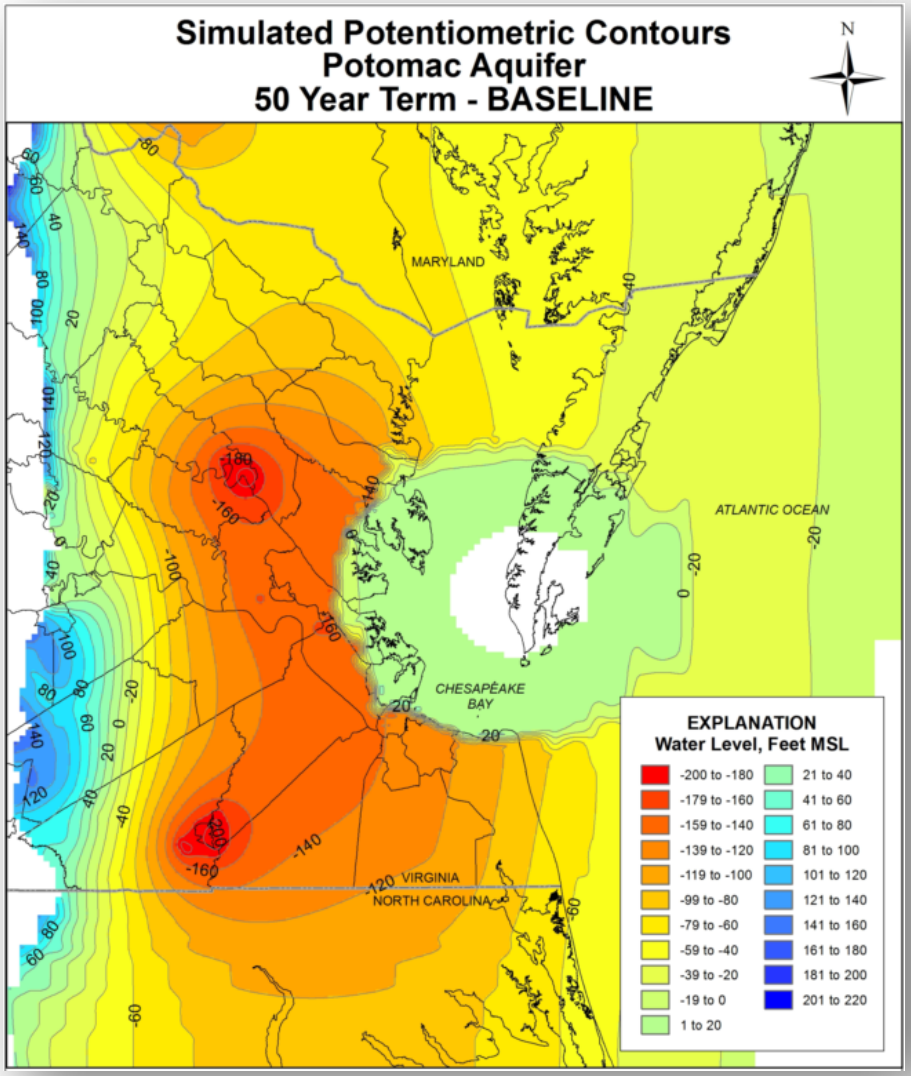


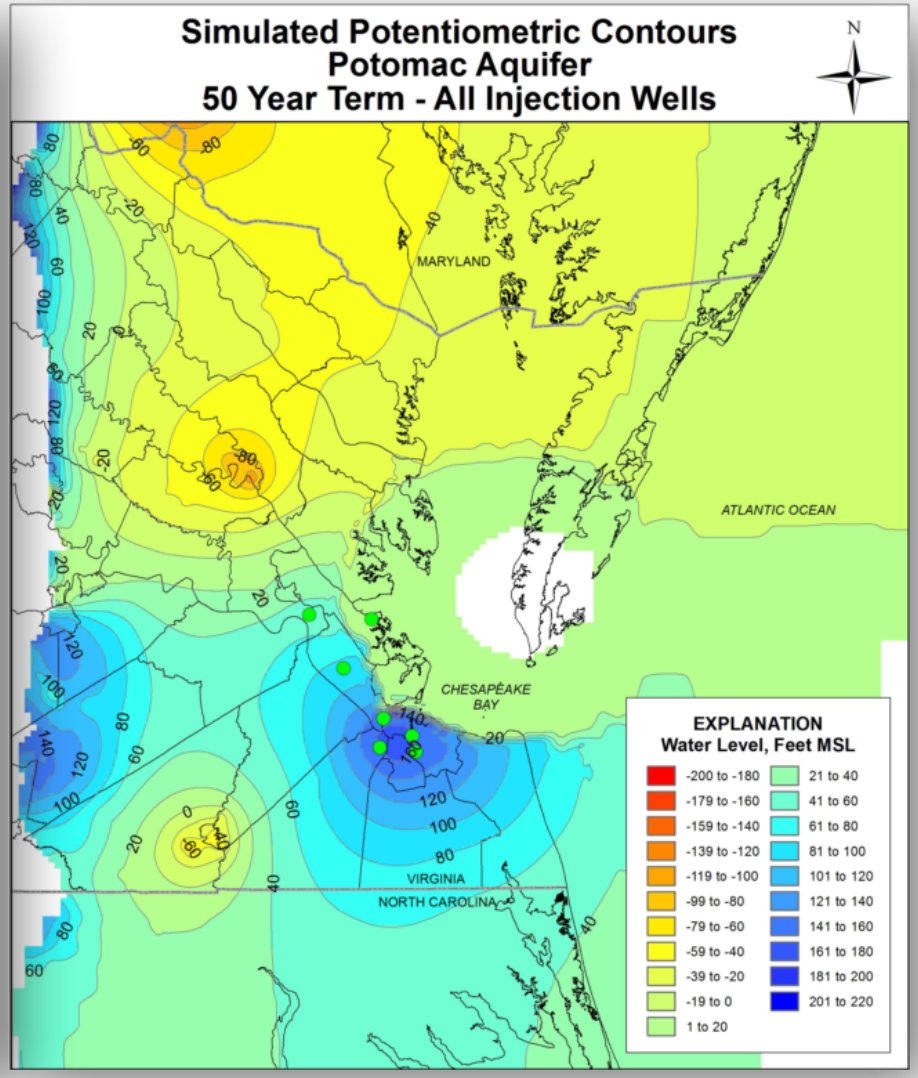
A, Overflow from artesian well in Isle of Wight County is wasted.



- Artesian wells in early 1900s – groundwater wells required valves not pumps!
- In about 100 years have gone from water levels at 31 feet above sea level to 200± feet below.

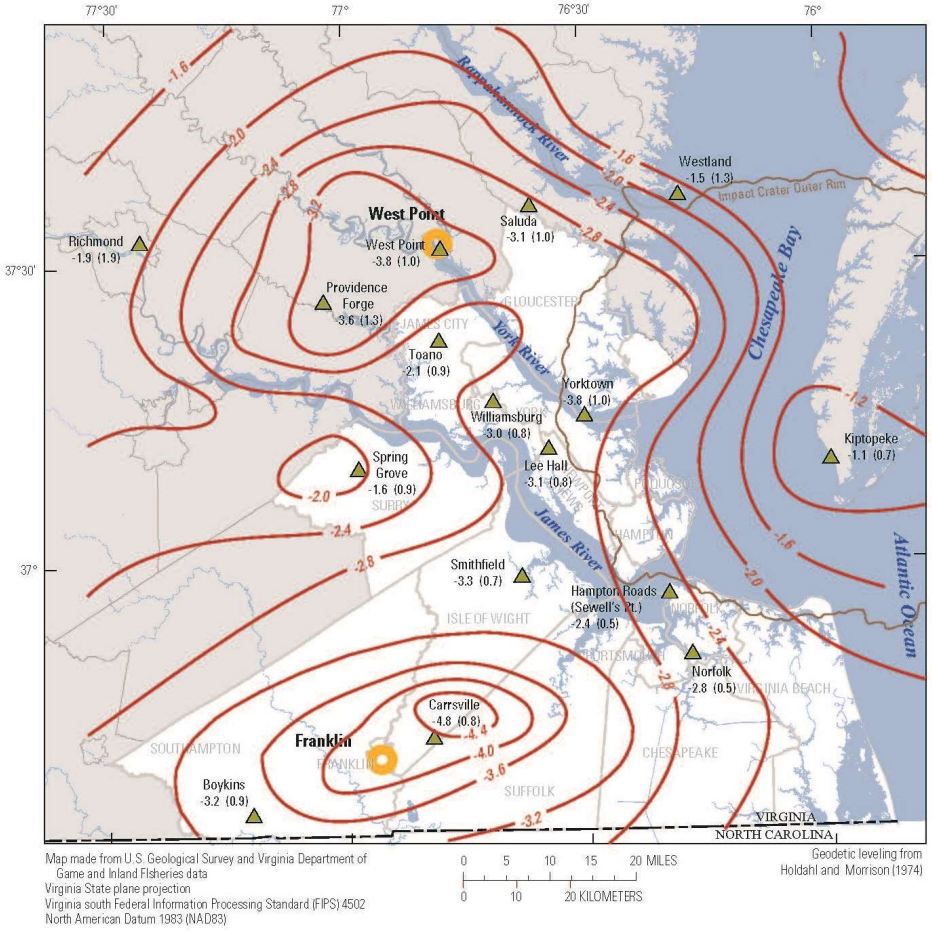
Modeled Potomac Aquifer water levels with and without SWIFT





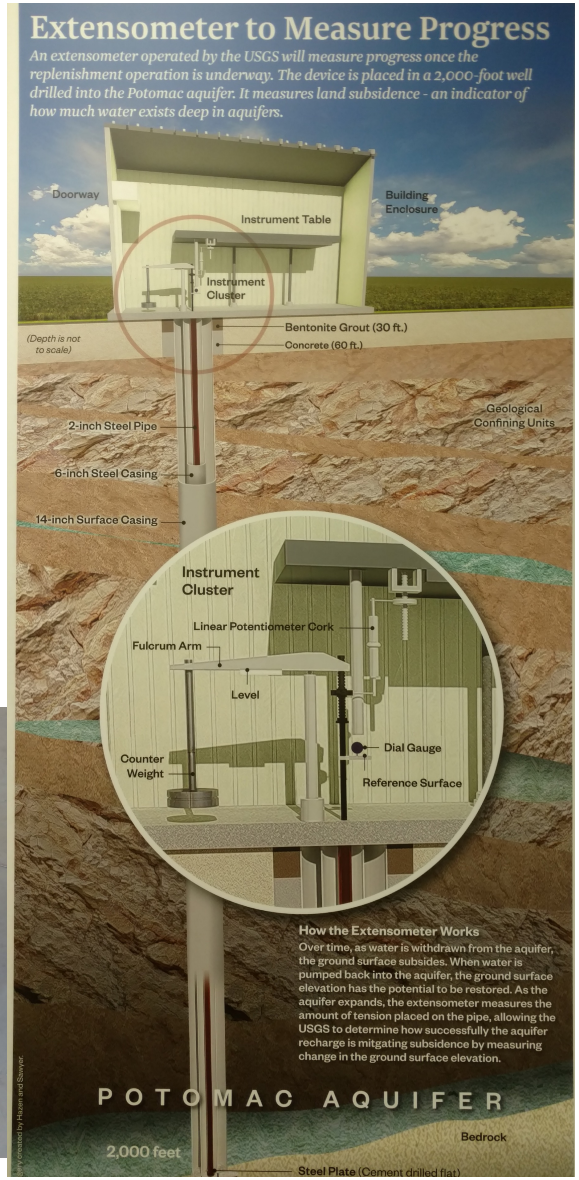
Land subsidence – *we are sinking*

- According to USGS
  - Up to 50% of sea-level rise may be due to land subsidence
  - **Up to 50% of land subsidence may be due to aquifer compaction**

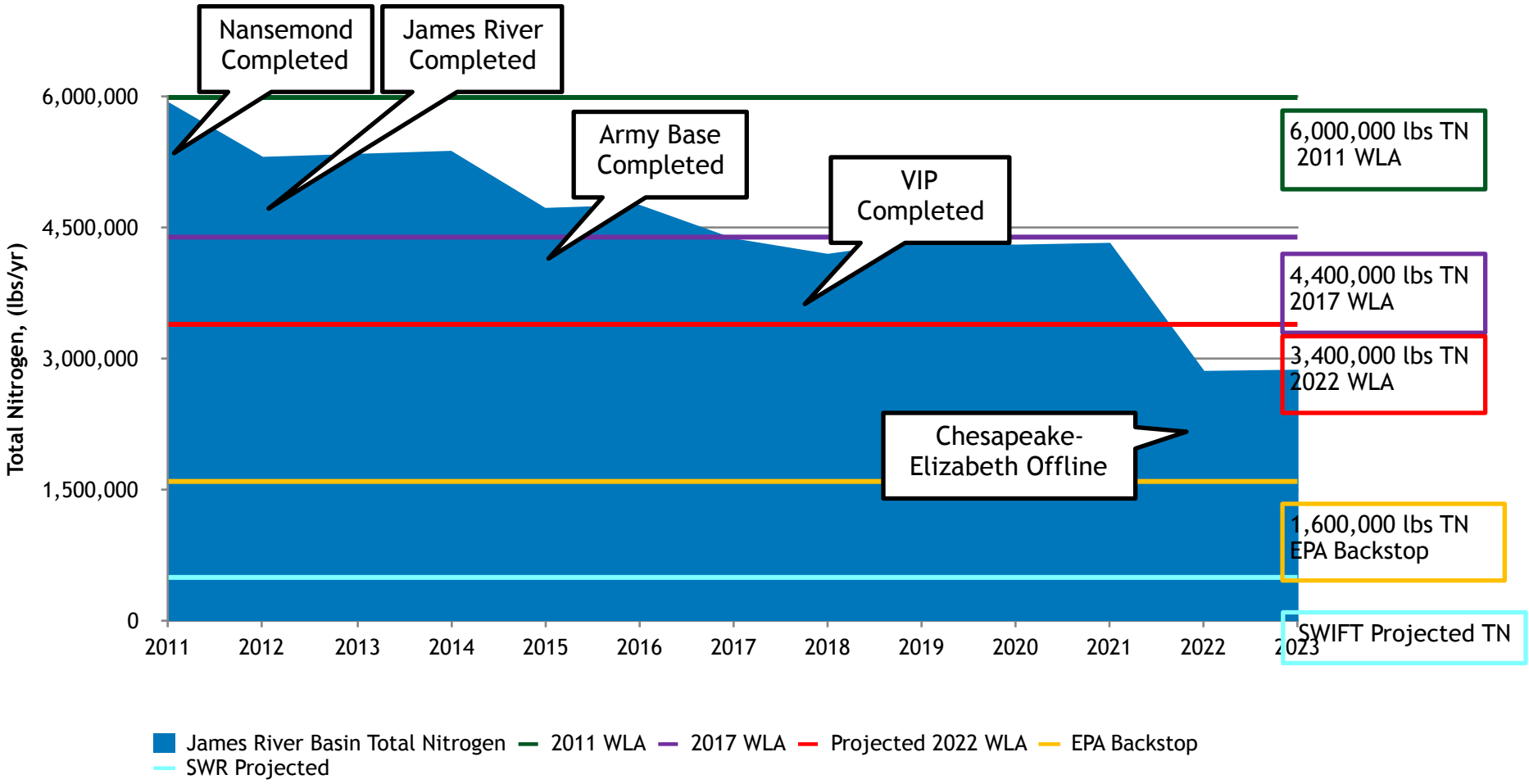


HAMPTON ROADS IS THE #2 LARGEST POPULATION CENTER AT RISK

- Received General Assembly funding for extensometer
  - Extensometer operational as of March 2018



Impact on nutrient reductions



James River Basin - TN Similar results with TP and TSS and in other river basins.

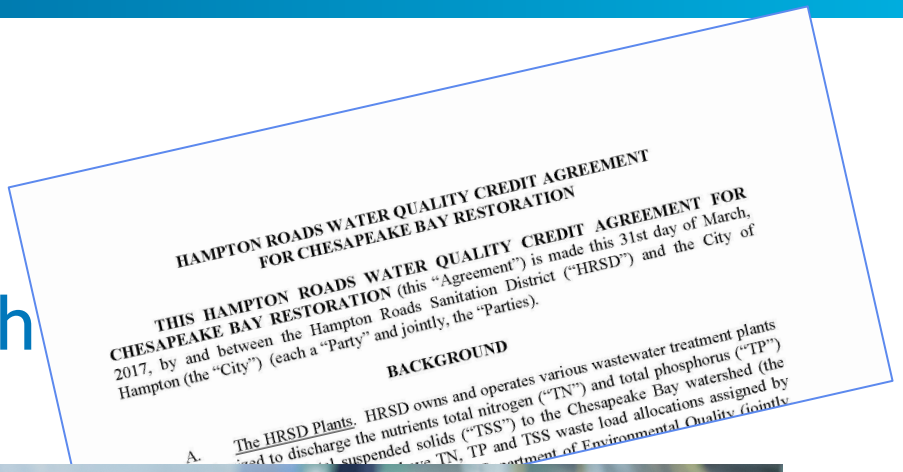
WLA – Nutrient Waste Load Allocation in lbs/yr

Potential to offset stormwater reductions

	Approximate total credits due to SWIFT	Regional Stormwater Reduction Needs*
Nitrogen		
James	2,900,000	63,039
York	250,000	19,114
Phosphorus		
James	250,000	13,088
York	16,000	3,887
Sediment		
James	13,300,000	5,269,142
York	1,300,000	1,413,762

* DEQ Regulated Stormwater w/o federal lands

- Executed nutrient trading agreements with 11 localities



HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 31st day of March, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Hampton (the "City") (each a "Party" and jointly, the "Parties").

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants ...ged to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") ...d suspended solids ("TSS") to the Chesapeake Bay watershed (the ...ve TN, TP and TSS waste load allocations assigned by ...rtment of Environmental Quality (jointly

Treating to drinking water standards

- Advanced treatment used throughout world, many locations in USA and even in Virginia to produce water that exceeds drinking water standards
  - Upper Occoquan Service Authority/Fairfax Water
  - Loudoun Water
  - Montebello Forebay, CA 1962
  - El Paso, TX 1985
  - Scottsdale, AZ 1999
  - Orange County, CA 2008
  - Arapahoe, CO 2009
  - ***San Diego, CA 2020***

Membrane based

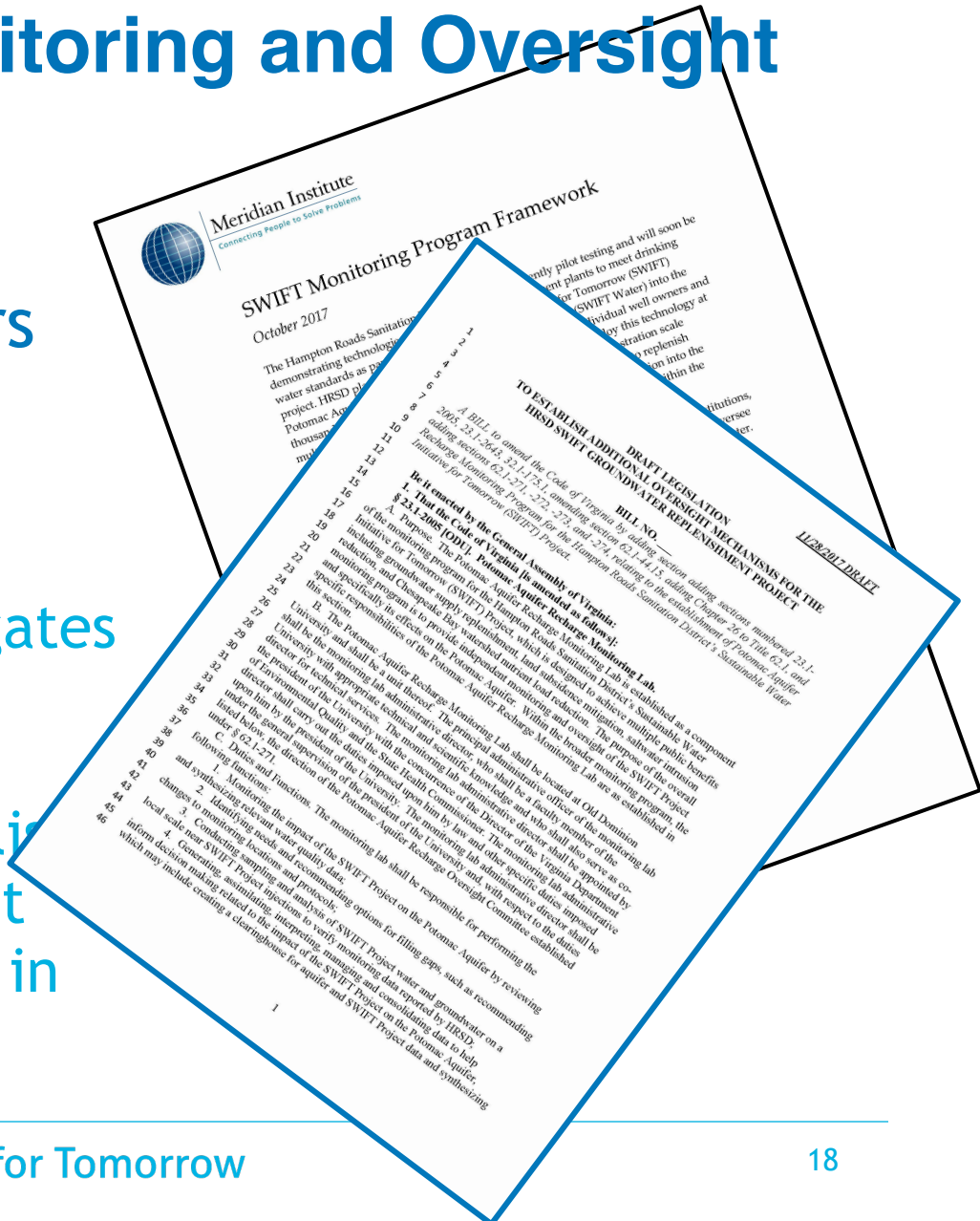
Carbon based

Protecting the Underground Sources of Drinking Water

- Meet all primary Maximum Contaminant Levels (MCLs) regulated by the USEPA in the SDWA
- Provide multiple barriers to pathogens and organics (including chemicals)
- Ensure aquifer compatibility
- Conduct hazard analysis and establish critical control points (HACCP) for treatment processes
  - Action level exceedance will prevent water from entering the recharge well

Independent Monitoring and Oversight

- Developed oversight framework in collaboration regulators and key stakeholders
  - Legislation passed unanimously through Virginia's House of Delegates but stalled as results of budget impasse
  - Moving forward to establi through letter agreement
  - Will resubmit legislation in 2019



Financing

- Completed Integrated Plan and submitted to EPA
  - Plan integrates HRSD obligations under federal consent decree to minimize wet weather overflows with SWIFT to prioritize projects that achieve greatest environmental benefits (i.e., SWIFT)

Water Quality Benefits of SWIFT

	Pre-SWIFT Annual Load	Estimated Post SWIFT Annual Load
Flow (MG)*	41,391 (MG)	4,140 (MG)
BOD (LBS)*	1.66 M	166 K
TSS (LBS)*	1.81 M	181 K
TP (LBS)	318 K	32 K
TN (LBS)	3.5 M	500 K

* Calendar year 2016 averages

Water Quality Impacts of SSOs

- Water quality impacts have proven to be short-lived for non-chronic spills (temporally and spatially diverse)

- Post-overflow monitoring consistently demonstrates rapid return to background conditions and compliance with recreational standard when applicable

Water Quality Impacts of SSOs - Examples

- Shingle Creek – 2011
  - Loss of >18 million gallons in headwater stream
  - Returned to background within 5 days of cessation of leak
- Linkhorn – 2016
  - Loss of > 2 million gallons in headwater stream
  - Sample results complied with recreational standard within 24 hours of cessation of leak

SSO Volume in Perspective

DC Water Clean River Program - $2.6 Billion investment

- CSO volume reported in 2016 1963 MG
- CSO Target at program completion 138 MG/yr

HRSD Wet Weather Management Plan - $1.8 Billion investment

- SSO volume reported in 2016 6.2 MG
- SSO volume at program completion 1.2 MG/yr*

*Modeled overflow volume reduced by 5 MG/yr on average for the 50 year simulation

Nutrient Impact CSO - SSO

DC Water Clean River Program

- CSO volume at program completion 138 MG/yr
  - TN 9 mg/ L x 138 MG = 10.4K lbs/year
  - TP 1.9 mg/L x 138 MG = 2.2K lbs/year

Delay of HRSD Wet Weather Program

- SSO volume during delay +5 MG/yr
  - TN 39 mg/L x 5 MG = 1.6K lbs/year
  - TP 5.5 mg/L x 5 MG = 230 lbs/year

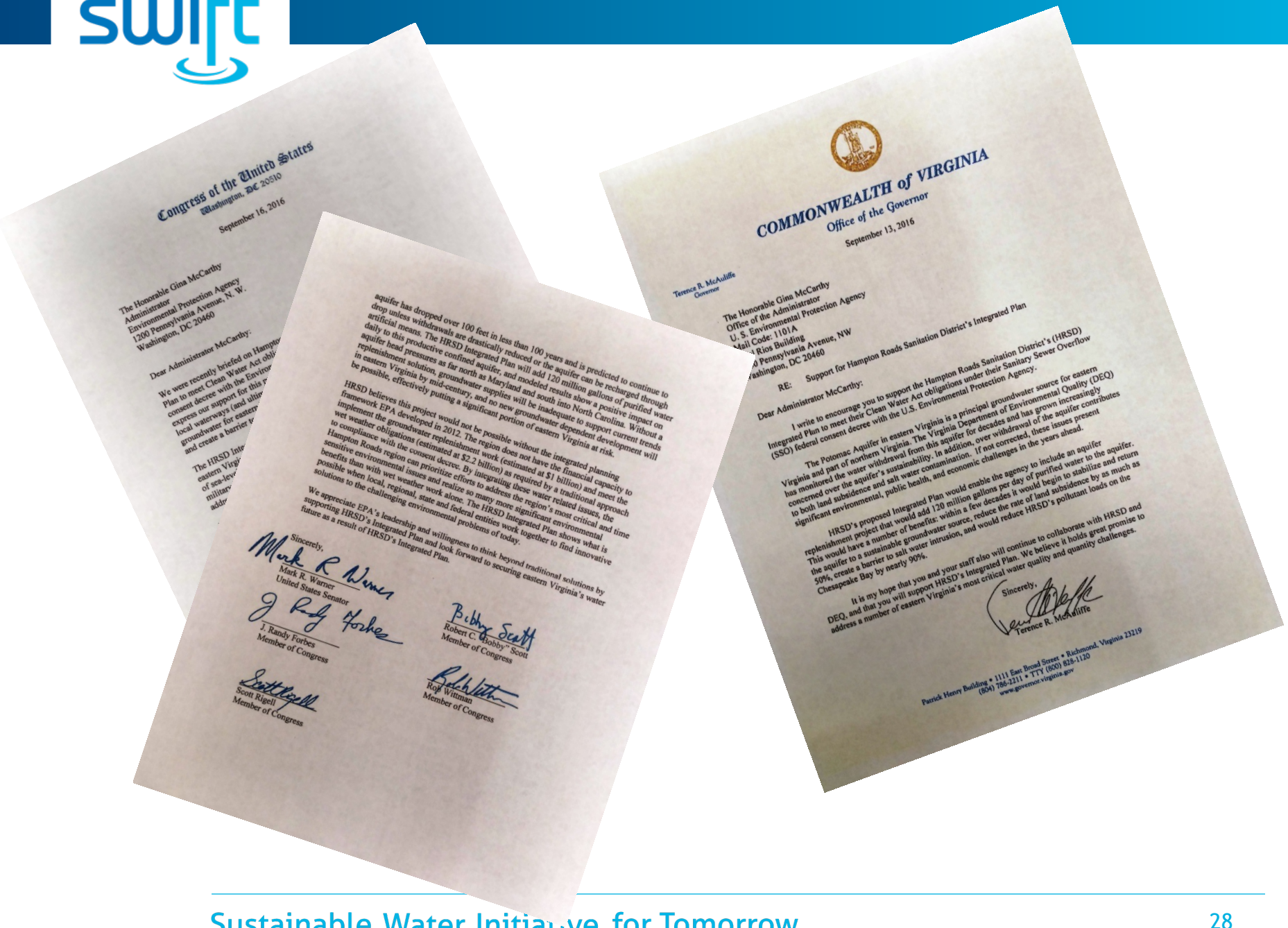
Next Steps

- Establish Monitoring and Oversight Program
  - Support legislation to be reintroduced in 2019
- Conduct outreach to private well owners in partnership with the Virginia Extension Service
- Commence operations at Research Center
  - Producing 1 million gallons per day of SWIFT Water and pumping into the thirsty Potomac Aquifer in northern Suffolk
- Begin extensive data gathering at Research Center

SWIFT Research Center

Summary of Status

- SWIFT continues to move forward without major impediments
- Support and cooperation of all stakeholders continues to be amazingly strong
- Still on track to apply for full-scale permits in late 2018/early 2019 and begin construction on first full-scale facility in 2020
- Still on track to be pumping 100+ million gallons per day of SWIFT Water into the Potomac Aquifer by 2030, ensuring a sustainable water future for eastern Virginia



Congress of the United States
Washington, DC 20510

September 16, 2016

The Honorable Gina McCarthy
Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N. W.
Washington, DC 20460

Dear Administrator McCarthy:

aquifer has dropped over 100 feet in less than 100 years and is predicted to continue to drop unless withdrawals are drastically reduced or the aquifer can be recharged through artificial means. The HRSD Integrated Plan will add 120 million gallons of purified water daily to this productive confined aquifer, and modeled results show a positive impact on aquifer head pressures as far north as Maryland and south into North Carolina. Without a replenishment solution, groundwater supplies will be inadequate to support current trends in eastern Virginia by mid-century, and no new groundwater dependent development will be possible, effectively putting a significant portion of eastern Virginia at risk.

HRSD believes this project would not be possible without the integrated planning framework EPA developed in 2012. The region does not have the financial capacity to implement the groundwater replenishment work (estimated at $1 billion) and meet the wet weather obligations (estimated at $2.2 billion) as required by a traditional approach to compliance with the consent decree. By integrating these water related issues, the Hampton Roads region can prioritize efforts to address the region's most critical and time sensitive environmental issues and realize so many more significant environmental benefits than with wet weather work alone. The HRSD Integrated Plan shows what is possible when local, regional, state and federal entities work together to find innovative solutions to the challenging environmental problems of today.

We appreciate EPA's leadership and willingness to think beyond traditional solutions by supporting HRSD's Integrated Plan and look forward to securing eastern Virginia's water future as a result of HRSD's Integrated Plan.

Sincerely,

Mark R. Warner
United States Senator

J. Randy Forbes
Member of Congress

Robert C. "Bobby" Scott
Member of Congress

Scott Rigell
Member of Congress

Rob Wittman
Member of Congress

COMMONWEALTH of VIRGINIA
Office of the Governor

September 13, 2016

Terence R. McAuliffe
Governor

The Honorable Gina McCarthy
Office of the Administrator
U. S. Environmental Protection Agency
Mail Code: 1101A
Rios Building
Pennsylvania Avenue, NW
Washington, DC 20460

RE: Support for Hampton Roads Sanitation District's Integrated Plan

Dear Administrator McCarthy:

I write to encourage you to support the Hampton Roads Sanitation District's (HRSD) Integrated Plan to meet their Clean Water Act obligations under their Sanitary Sewer Overflow (SSO) federal consent decree with the U.S. Environmental Protection Agency.

The Potomac Aquifer in eastern Virginia is a principal groundwater source for eastern Virginia and part of northern Virginia. The Virginia Department of Environmental Quality (DEQ) has monitored the water withdrawal from this aquifer for decades and has grown increasingly concerned over the aquifer's sustainability. In addition, over withdrawal of the aquifer contributes to both land subsidence and salt water contamination. If not corrected, these issues present significant environmental, public health, and economic challenges in the years ahead.

HRSD's proposed Integrated Plan would enable the agency to include an aquifer replenishment project that would add 120 million gallons per day of purified water to the aquifer. This would have a number of benefits: within a few decades it would begin to stabilize and return the aquifer to a sustainable groundwater source, reduce the rate of land subsidence by as much as 50%, create a barrier to salt water intrusion, and would reduce HRSD's pollutant loads on the Chesapeake Bay by nearly 90%.

It is my hope that you and your staff also will continue to collaborate with HRSD and DEQ, and that you will support HRSD's Integrated Plan. We believe it holds great promise to address a number of eastern Virginia's most critical water quality and quantity challenges.

Sincerely,

Terence R. McAuliffe

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www.governor.virginia.gov


The Virginian-Pilot
Can your sinks and toilets fight sea-level rise?
Virginia GOP asks state to cancel "loyalty oath"
HRSD doesn't want to waste wastewater
By Dave Mayfield
The Virginian-Pilot
SEAFORD
Ted Henifin crouched next to a floor drain at the Hampton Roads Sanitation District's York County treatment plant. Into his palm ran a soft stream of clear water – clean enough, probably, to drink. But the lab results aren't back to confirm that. So, Henifin will hold off before he sips.
Waiting isn't exactly Henifin's style these days. He has dived into a project to prove that HRSD can turn what Hampton Roads flushes down
recycled
The sanitation district wants to launch a $1 billion, decadelong project that would refill the region's aquifers with treated wastewater.
See WASTE, PAGE 10
Daily Press
SUNDAY, OCTOBER 11, 2015
GROUNDWATER DRAIN: A BIG-DOLLAR DILEMMA
PENINSULA CITIES IN ECONOMIC DOLDRUMS
Facing sluggish job growth, defense cuts, region fares poorly in national rankings
Groundwater water level decreases
NO WASTING WATER
Following the lead of other regions, local plant tries treating wastewater
By Dave Ress
Online
See more photos and video at dailypress.com.
Sip shape
Hampton Roads Sanitation District's treated sewage water tastes great, say officials, and could shore up the area's sea level rise and bay cleanup issues
By Dave Mayfield
The Virginian-Pilot
YORK COUNTY
Ted Henifin, Hampton Roads Sanitation District general manager, vowed to take the first gulp of HRSD's treated wastewater. He made good on his promise Thursday.
STEVE EARLEY | THE VIRGINIAN-PILOT

Hopes that wastewater can conserve land in coastal Va.

BY DARRYL FEARS

SEAFORD, VA. — It looks like a mad scientist's lab, something straight out of a sci-fi novel. Valves turn in every direction. Tubes are stacked halfway to the ceiling. Tiny bubbles dance in large vats of water.

But what's happening in a hangar of the York River Treatment Plant is real, part of a grand experiment that could help keep this coastal region from continuing to subside and eventually being claimed by the rising sea. Over the next 15 months, tests will determine whether millions of gallons of wastewater can be purified to drinking water quality and injected into the ground.

If successful, the project of the Hampton Roads Sanitation District could start to replenish a giant aquifer that thousands of industries and half a million households in the area are sucking dry. Over the past five decades, they have collectively pumped out so much water that land here is falling 4 millimeters a year — or more than 1½ inches by 2026.

Ted Henifin's jaw-dropping, eyebrow-raising idea was proposed in 2015, and last month the sanitation district general manager kicked off the pilot phase to stop what some scientists have called a nightmare in super slow motion.

Aquifers big and small exist under Hampton Roads in muddy

AQUIFER CONTINUED ON A16

SWIFTVA.com