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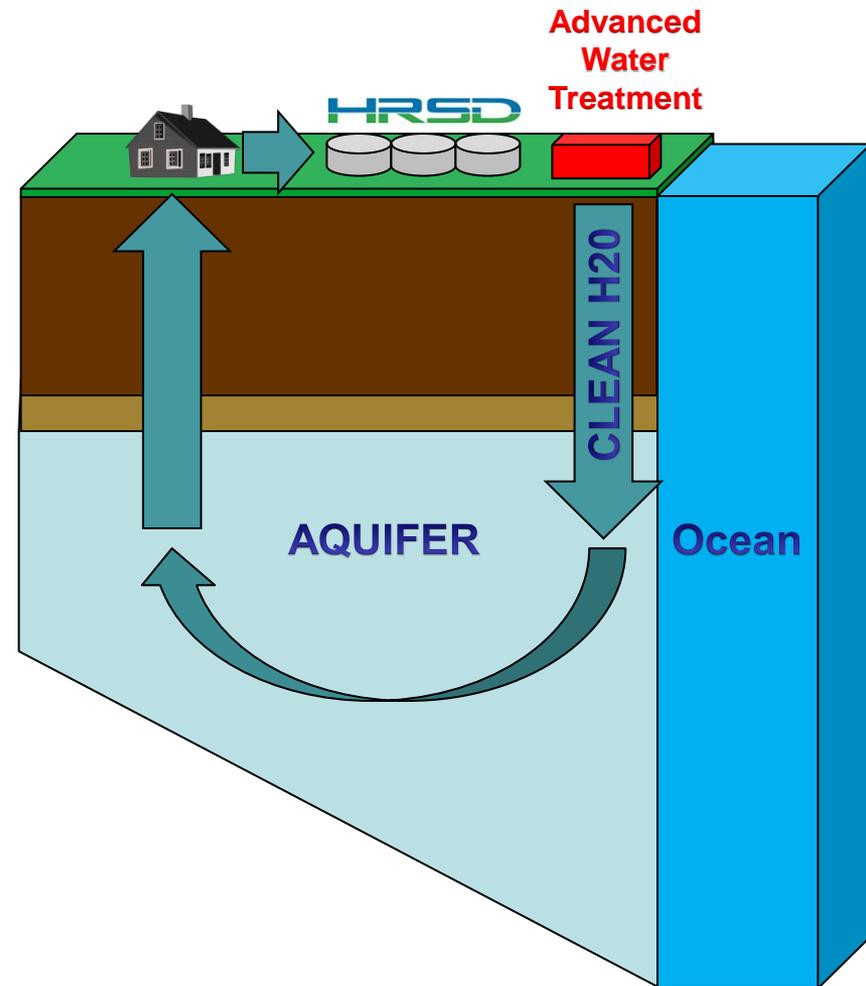
## Water issues challenging Virginia and Hampton Roads

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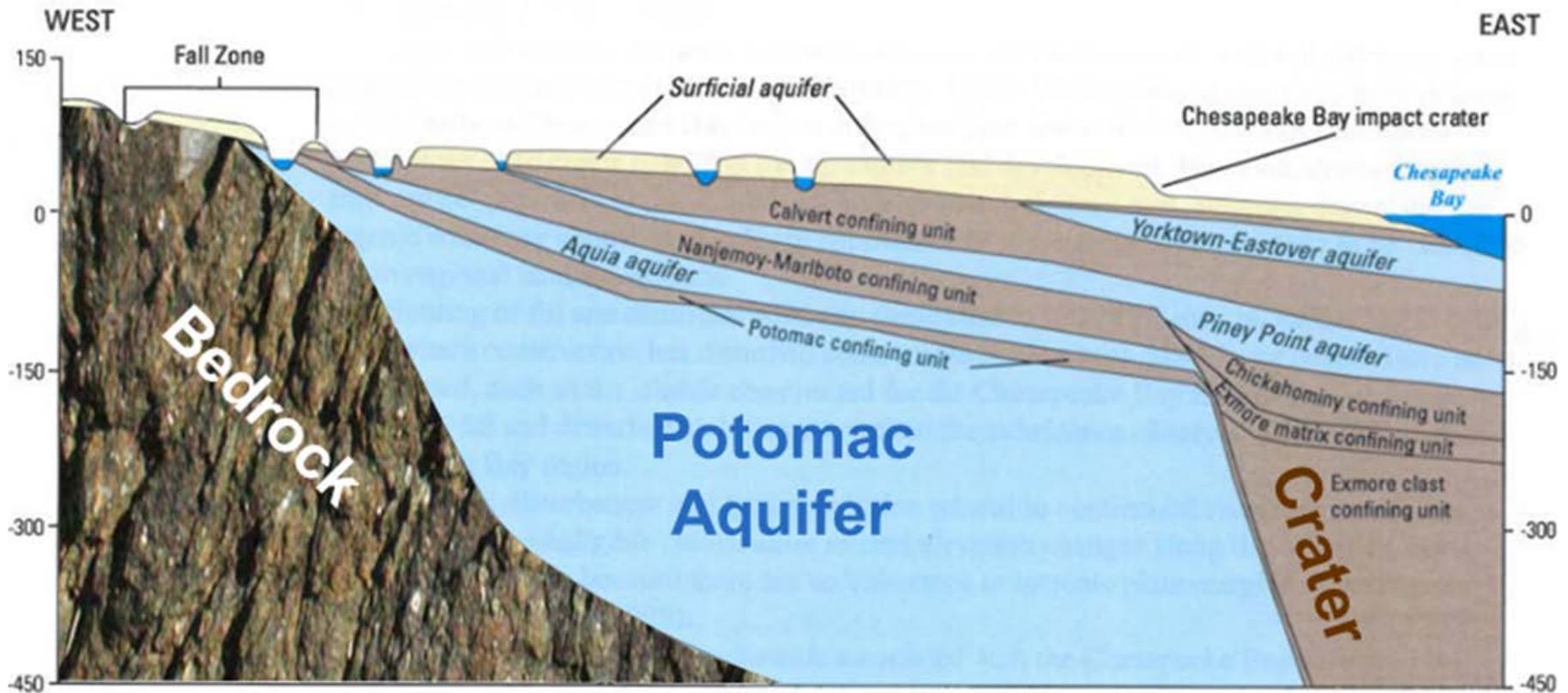
- Restoration of the Chesapeake Bay
  - Harmful Algal Blooms
  - Localized bacteria impairments
  - Urban stormwater retrofits (cost and complexity)
- Adaptation to sea level rise
  - Recurrent flooding
- Depletion of groundwater resources
  - Including protection from saltwater contamination
- Wet weather sewer overflows
  - Compliance with Federal enforcement action

# SWIFT – Sustainable Water Initiative for Tomorrow

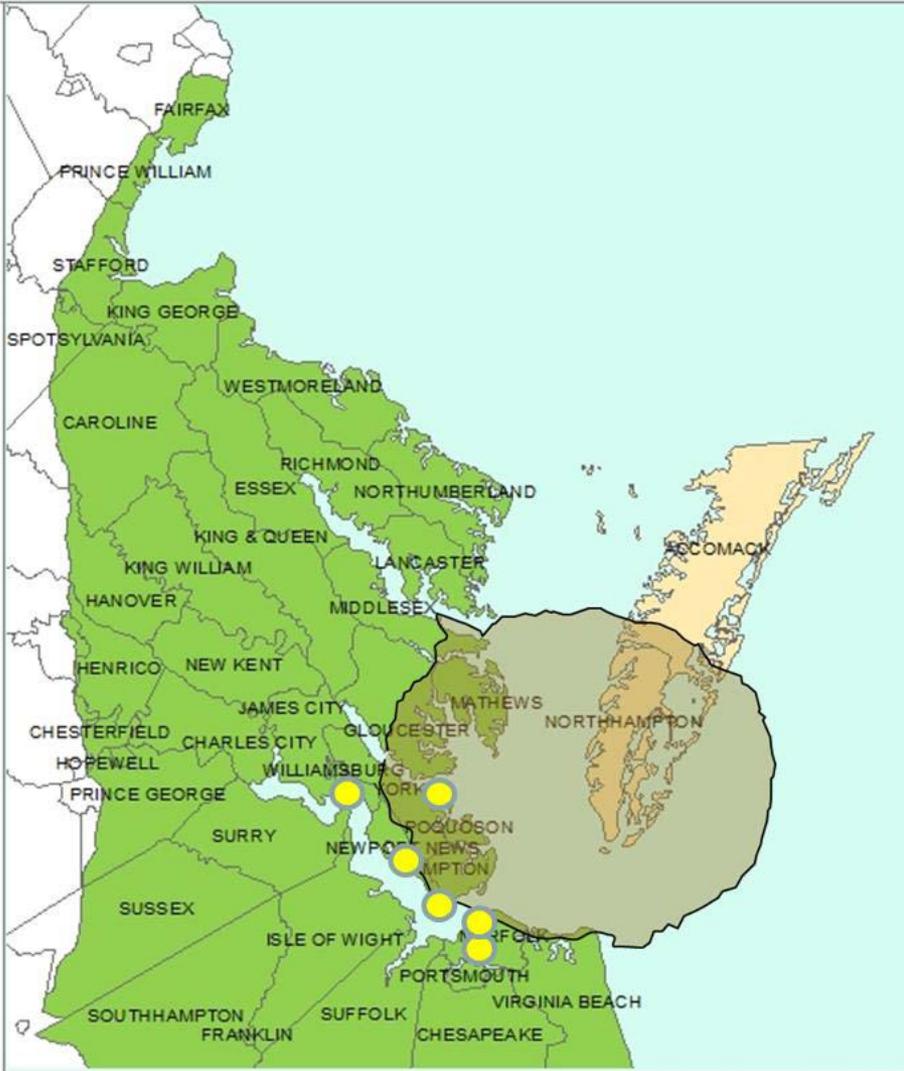
- Treat water to meet drinking water standards and replenish the aquifer with clean water to:
  - Provide regulatory stability for wastewater treatment
  - Reduce nutrient discharges to the Bay
  - Reduce the rate of land subsidence
  - Provide a sustainable supply of groundwater
  - Protect the groundwater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



# Cross section through Potomac Aquifer



# Eastern Virginia Groundwater Management Area



## Advanced water treatment – 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



Membrane based



Carbon based

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## Groundwater replenishment

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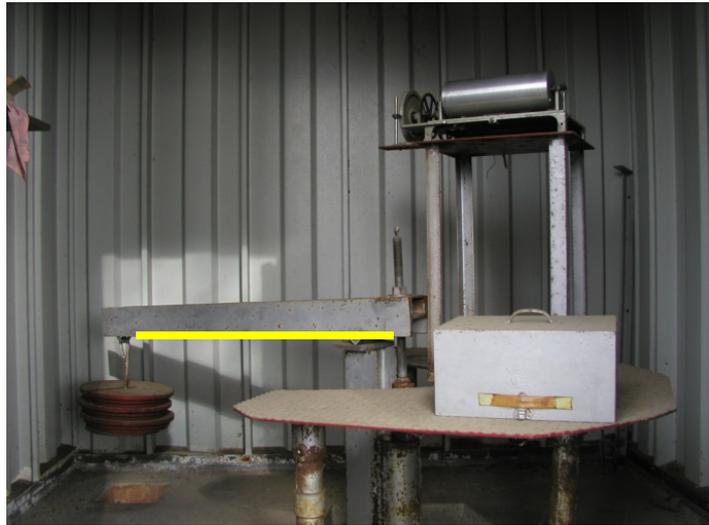


- Aquifer replenishment also done in many places including Virginia
  - City of Chesapeake Aquifer Storage and Recovery system – over 2.8 billion gallons pumped to date

Water must meet human health criteria and match existing groundwater geochemistry.

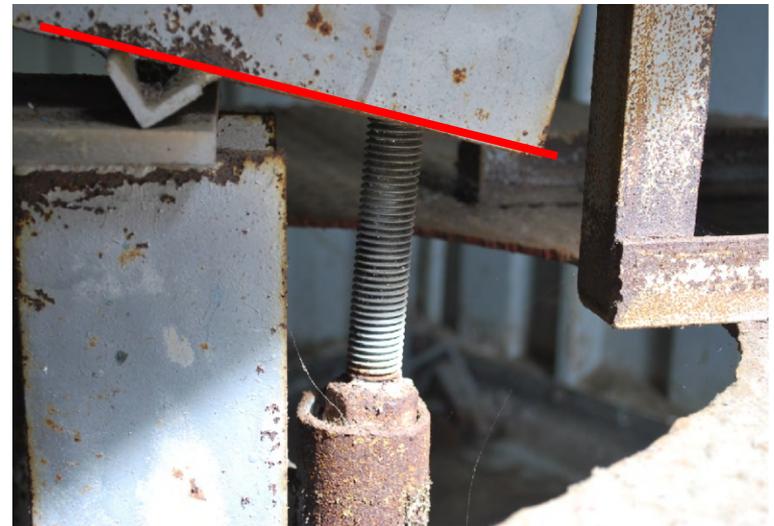
# Evidence of groundwater impacts on subsidence

**2002**



USGS found ground level rose 32 mm between 2002 and 2015 coinciding with reduced groundwater withdrawal by Franklin paper mill.

**2015**

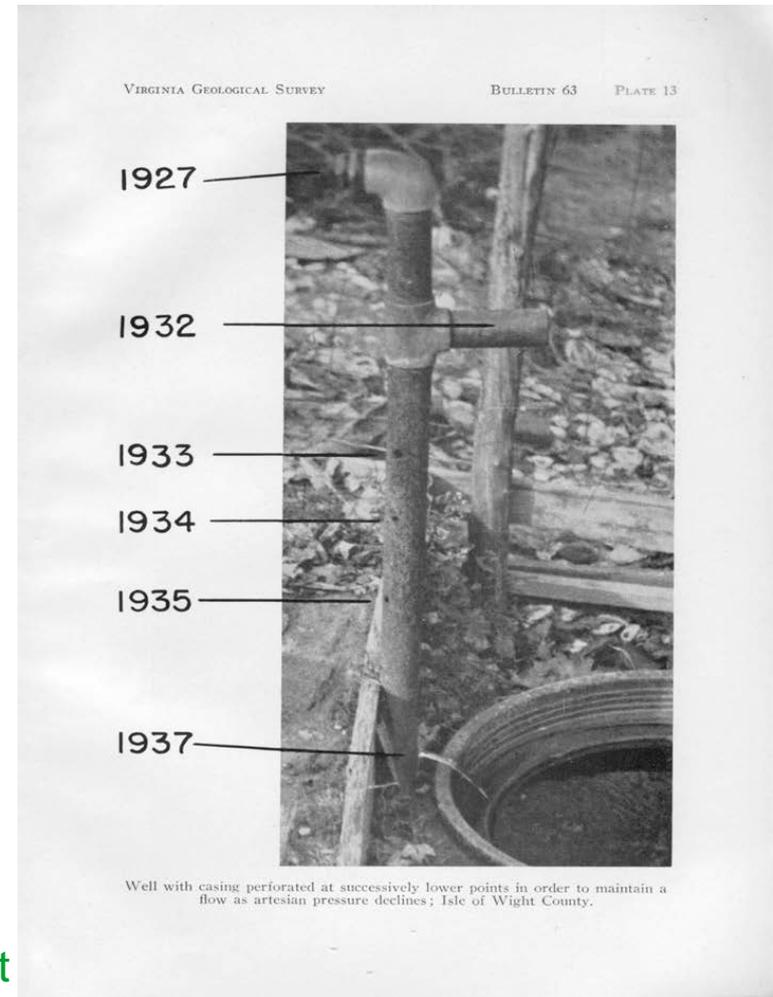


# Groundwater depletion has been rapid



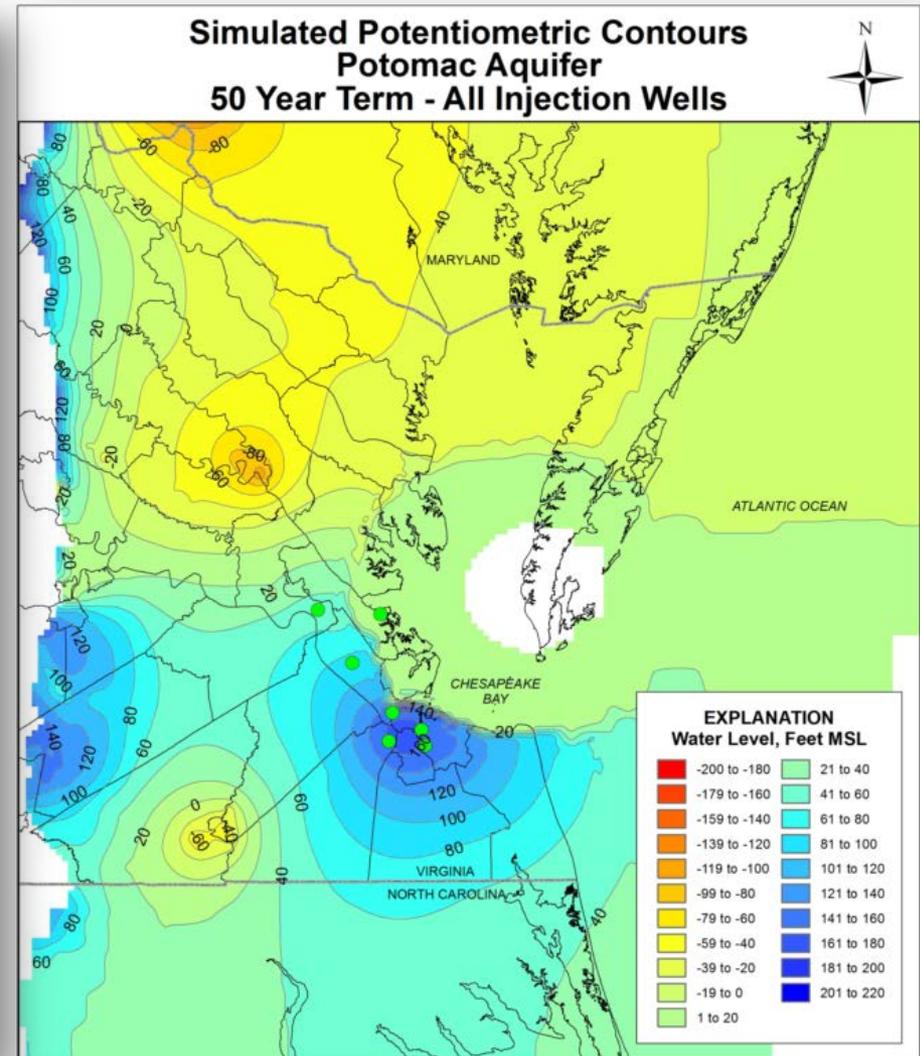
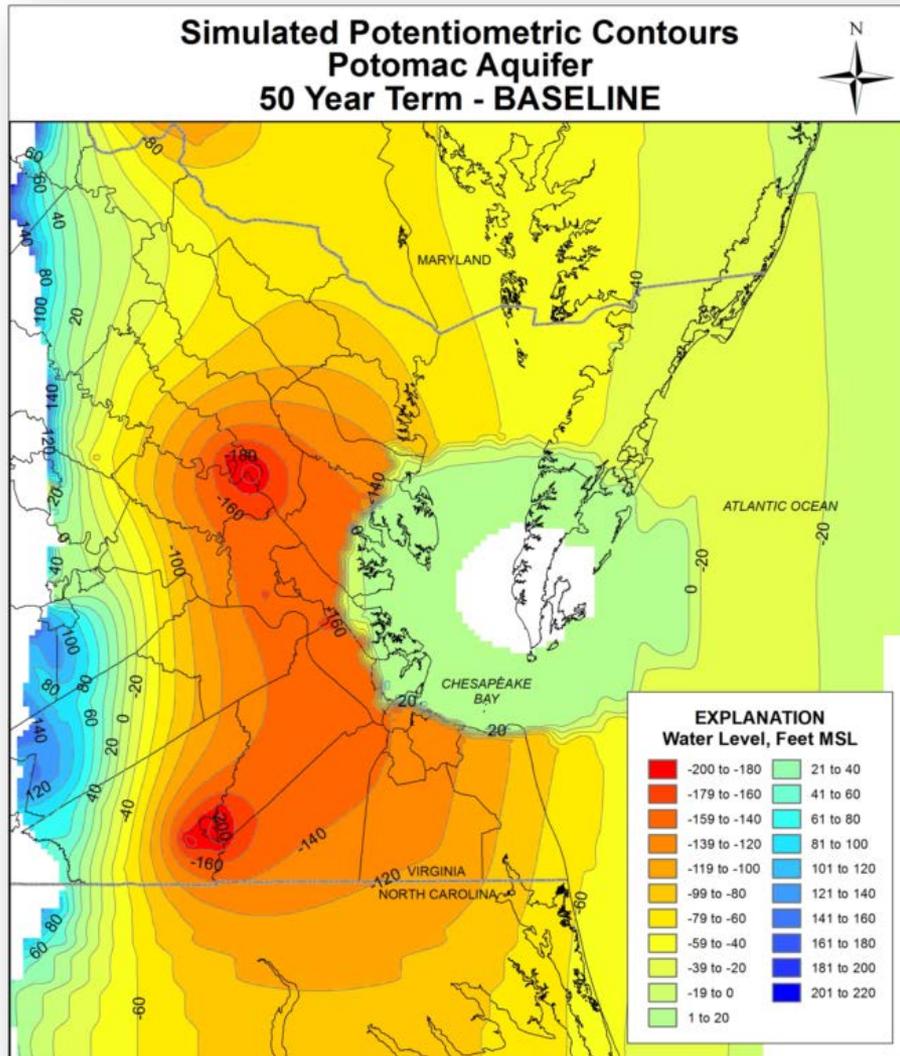
A, Overflow from artesian well in Isle of Wight County is wasted.

- 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  $200 \pm$  feet below.



Well with casing perforated at successively lower points in order to maintain a flow as artesian pressure declines; Isle of Wight County.

# Potomac Aquifer water levels before and after SWRI



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## Benefits to the Commonwealth

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- Initiative produces benefits to Virginians well beyond Hampton Roads
  - “Wireless” solution to provide water for economic development throughout Eastern Virginia
  - Chesapeake Bay nutrient reductions frees up allocation for other uses regionally and helps Virginia meet state obligations under TMDL
    - Minimizes need for Hampton Roads localities to use WQIF funds to meet stormwater related TMDL obligations
  - Slowing rate of land subsidence extends the productive use of low lying coastal lands that provide state tax revenues

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## Despite wide reaching benefits – costs borne locally

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- Currently costs borne by HRSD customers
  - With wide reaching benefits, some level of state participation would be appropriate
  - Ask for FY17 is \$1.3 million for USGS installed extensometer
    - Installed at HRSD Nansemond Facility in Northern Suffolk
    - Provides on-going data for subsidence monitoring
    - Extensometer supports regional sea-level rise research
    - Extensometer valuable to Commonwealth upon completion (CY17) and regardless of HRSD initiative moving forward

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Questions?

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*Future generations will inherit clean waterways and  
be able to keep them clean.*

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<http://www.hrsd.com/SWR.shtml>