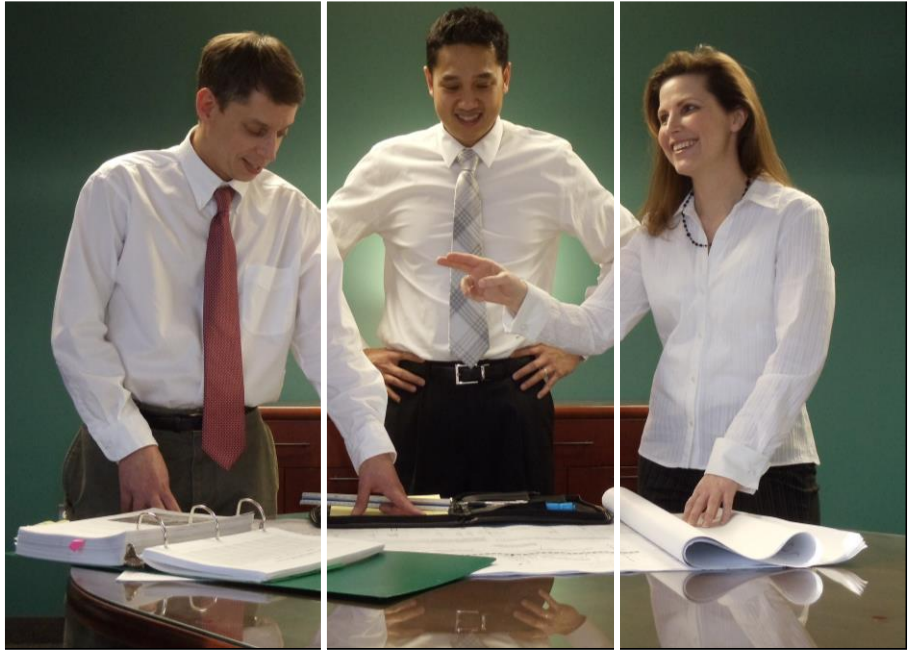



URS

Wastewater Treatment Work Group

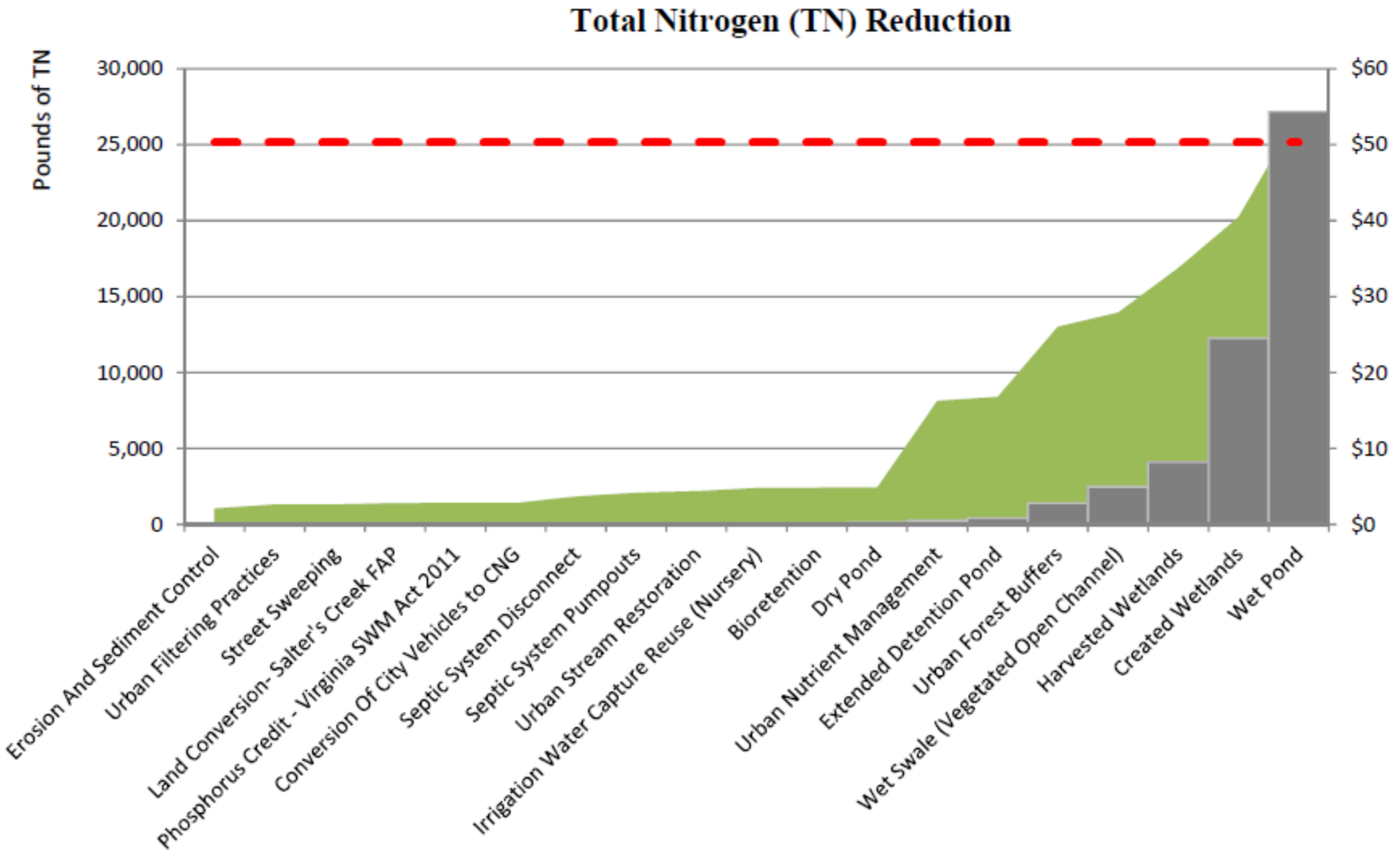
7 April 2015

Presentation on Behalf of the City of Virginia Beach

Petition for Boat Pump Outs in the Lynnhaven River No Discharge Zone as a Chesapeake Bay TMDL BMP

Need for Cost-Effective BMPs

Chesapeake Bay TMDL



Phragmites Harvesting

US Army Corps of Engineers
Norfolk District

Technical Memorandum

Analysis of Harvested Wetlands Potential in Virginia Beach

December 2012

City of Virginia Beach, VA
Corps No. W91236-09-D-0034 0031
URS No. 11658362

US Army Corps of Engineers
Norfolk District

URS

Phragmites Harvesting

US Army Corps of Engineers
Norfolk District

Sanctuary Oyster Reefs

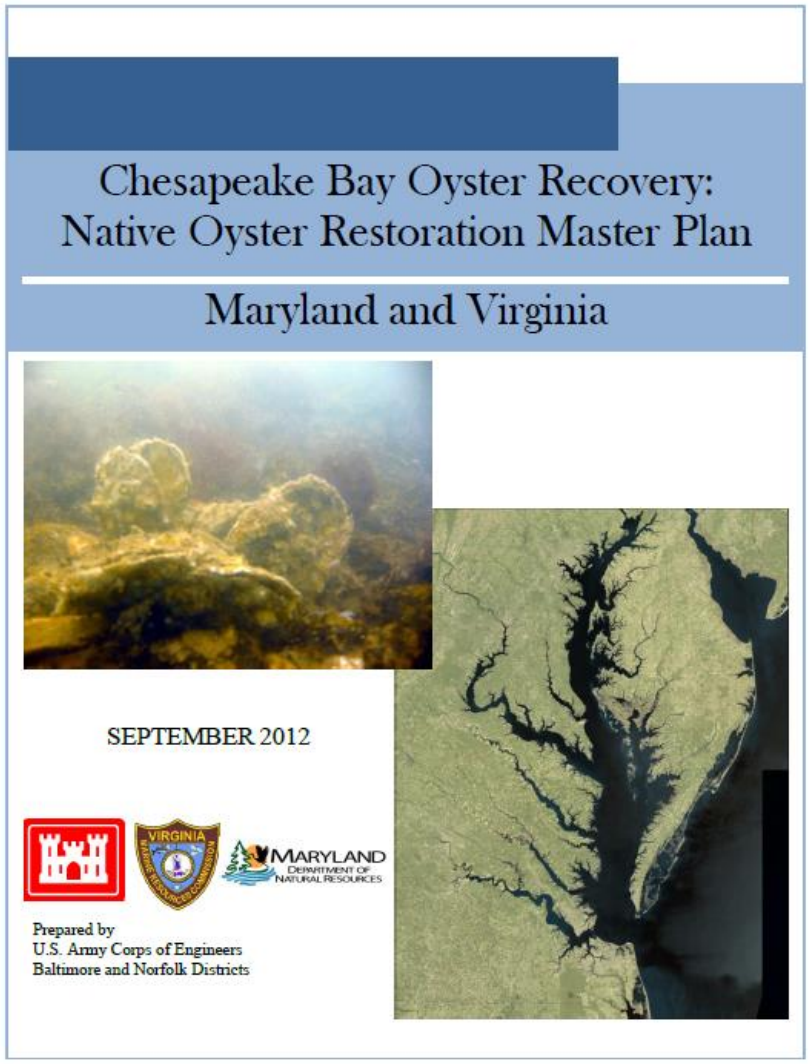


Table ES-1. Tier 1 Tributaries and Restoration Targets

Tier 1 Tributaries/Areas	*Restoration Target (Acres)*
Maryland	
Severn River	190 – 290
South River	90 – 200
Lower Chester River	500–1,100
Lower Eastern Bay	700 – 1,400
Upper Eastern Bay	800 – 1,600
Lower Choptank River	1,400 – 2,800
Upper Choptank River	400 – 800
Harris Creek	300 – 600
Little Choptank	400 – 700
Broad Creek	200 – 400
St. Mary's River	200 – 400
Lower Tangier Sound	800 – 1,700
Upper Tangier Sound	900 – 1,800
Manokin River	400 – 800
Virginia	
Great Wicomico River	100 – 400
Lower Rappahannock River	1,300 – 2,600
Piankatank River	700 – 1,300
Mobjack Bay	800 – 1,700
Lower York River	1,100 – 2,100
Pocomoke/Tangier Sound	3,000 – 5,900
Lower James River	900 – 1,800
Upper James River	2,000 – 3,900
Elizabeth River	200 – 500
Lynnhaven River	40 – 150

Planting fossil shell for restoration in the Lynnhaven River, VA. Shell is blown from barges using high-powered water cannons. Photograph provided by USACE-Norfolk.

Sanctuary Oyster Reefs

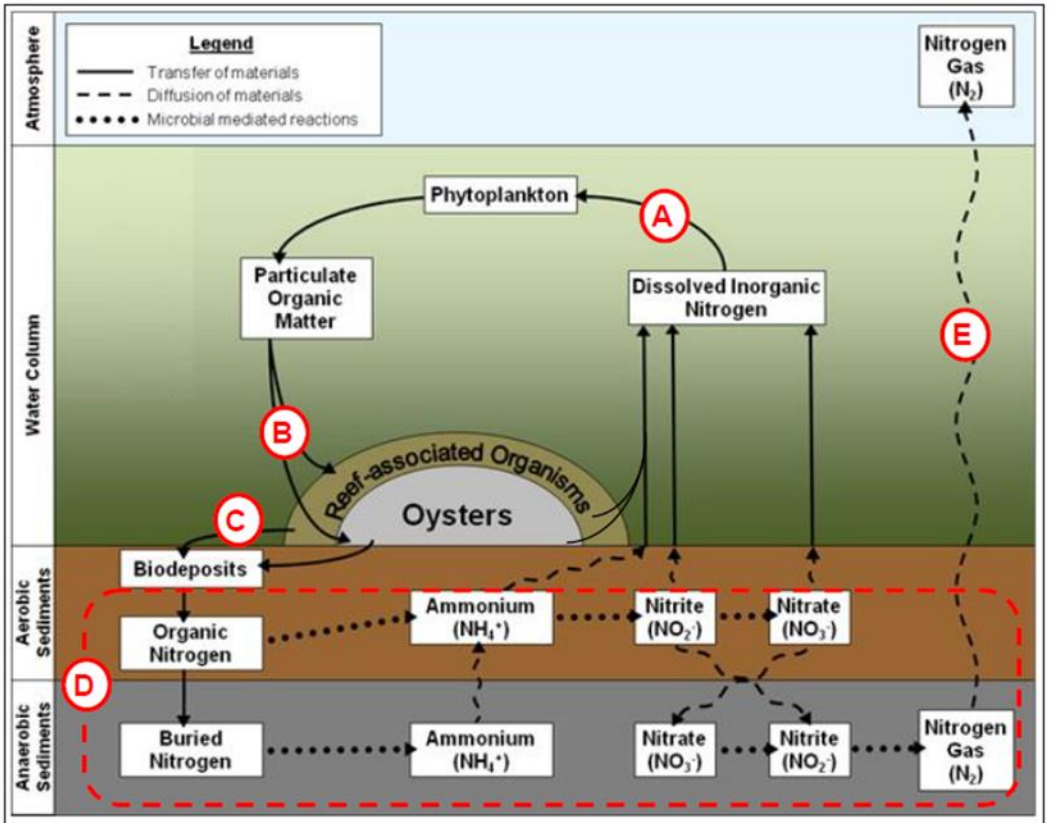


Figure I.1. Major nitrogen pathways on an oyster reef: phytoplankton use dissolved inorganic nitrogen for their growth (A), oysters and other reef associated organisms filter phytoplankton and other particulate organic matter from the water column (B), some of the associated nitrogen is incorporated into the tissues of the organisms and some is deposited on the surface of the sediments (C), and, given the right conditions, a portion of the nitrogen in these biodeposits is transformed into nitrogen gas (D) which diffuses out of the sediments back to the atmosphere (E) where it is no longer available to phytoplankton for growth (Diagram adapted from Newell et al. 2005).

Sanctuary Oyster Reefs

ASSESSMENT OF OYSTER REEFS IN LYNNHAVEN RIVER AS A CHESAPEAKE BAY TMDL BEST MANAGEMENT PRACTICE

Mac Sisson, Lisa Kellogg, Mark Luckenbach, Rom Lipcius,
Allison Colden, Jeff Cornwell, and Michael Owens

Final Report to the

U. S. Army Corps of Engineers, Norfolk District
and
The City of Virginia Beach

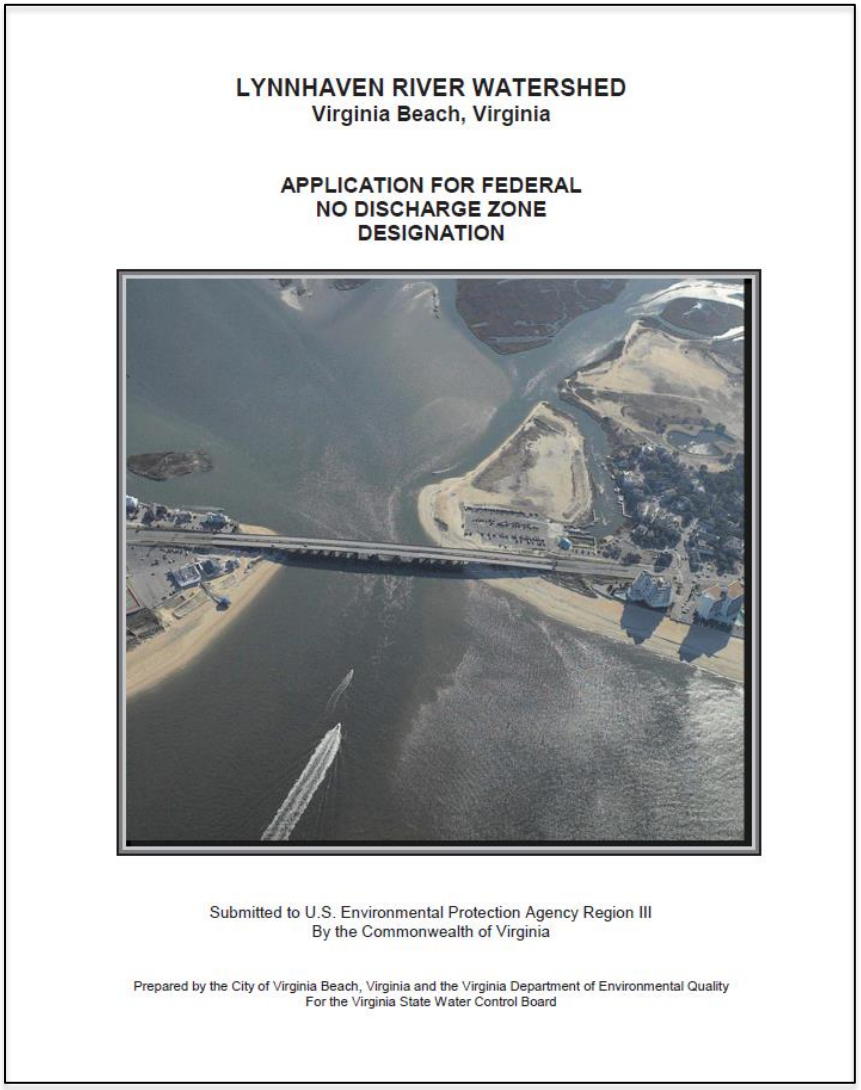
Special Report No. 429
In Applied Marine Science and Ocean Engineering

Virginia Institute of Marine Science
Department of Physical Sciences
Gloucester Point, Virginia 23062

December 2011

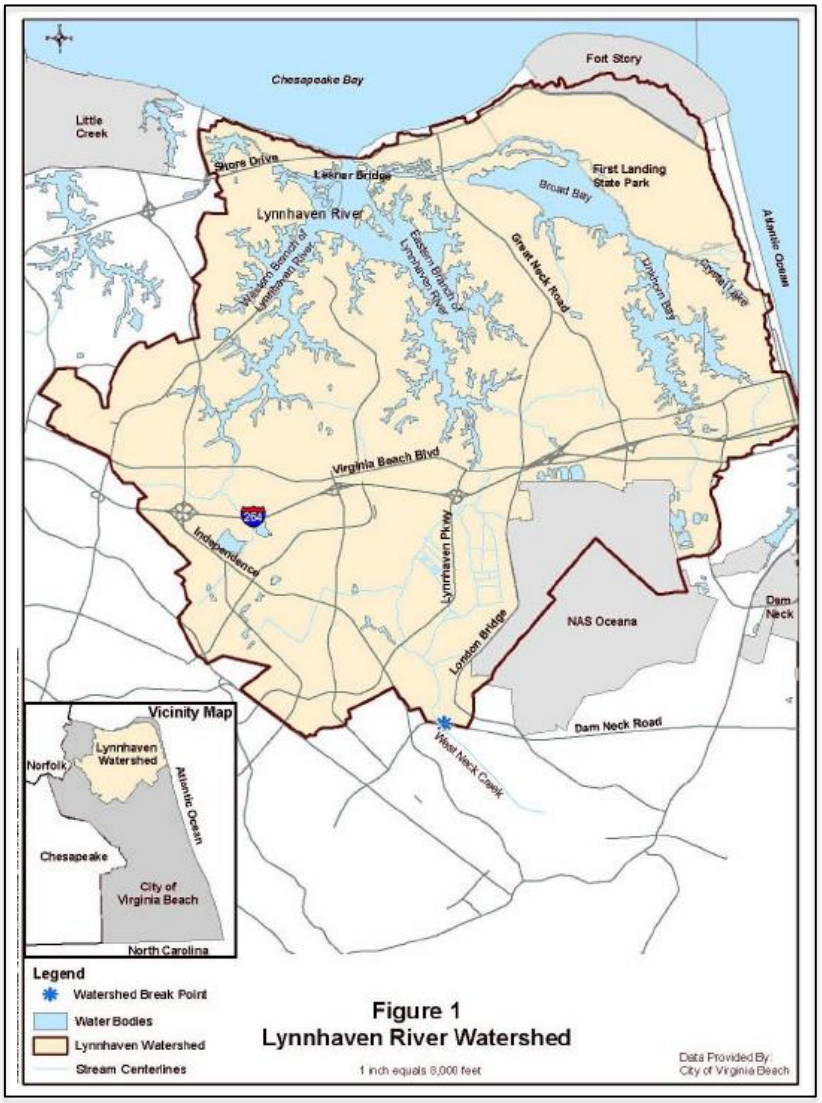
Boat Pump Outs in the Lynnhaven River No Discharge Zone

Boat Pump Outs in the Lynnhaven River No Discharge Zone



- **Since the 1970s, the City of Virginia Beach has spent considerable time, effort and money to reduce bacteria levels in the Lynnhaven River watershed.**
- **Currently almost all lots within the watershed are connected to the City's sanitary sewer system.**
- **Despite the City's efforts, increased bacteria levels continued to result in poor water quality.**
- **In 2004, the EPA approved a TMDL for shellfish harvest impairment.**
- **In 2006, the City and Virginia DEQ applied to have the Lynnhaven River Watershed designated as a Federal No Discharge Zone.**
- **The Lynnhaven River's No Discharge Zone Designation was approved by the EPA in 2007.**

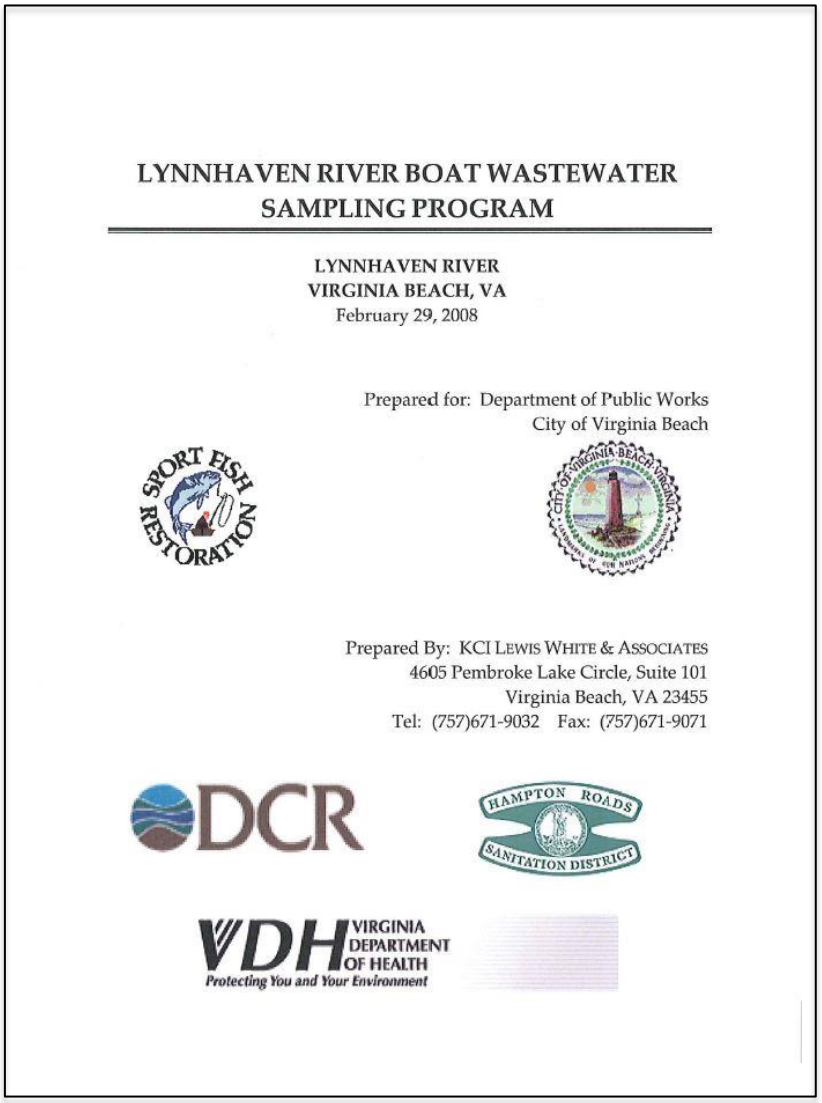
Boat Pump Outs in the Lynnhaven River No Discharge Zone



The Lynnhaven River Watershed:

- Includes:
  - Eastern Branch Lynnhaven River
  - Western Branch Lynnhaven River
  - Broad Bay
  - Linkhorn Bay
- Encompasses approximately 64 Sq. Mi.
- Has almost 150 miles of shoreline.
- Contains more than 90% of the City's approximately 13,000 documented or registered boats.

Boat Pump Outs in the Lynnhaven River No Discharge Zone



LYNNHAVEN RIVER BOAT WASTEWATER SAMPLING PROGRAM

LYNNHAVEN RIVER
VIRGINIA BEACH, VA
February 29, 2008

Prepared for: Department of Public Works
City of Virginia Beach

Prepared By: KCI Lewis White & Associates
4605 Pembroke Lake Circle, Suite 101
Virginia Beach, VA 23455
Tel: (757)671-9032 Fax: (757)671-9071

DCR

Hampton Roads Sanitation District

VDH Virginia Department of Health
Protecting You and Your Environment

- Shortly after the No Discharge Zone designation, the City and HRSD provided free vessel pump outs using a City-funded boat pump out team.
- Pump outs were provided on weekends between Memorial Day and Labor Day.
- Over 1,000 gallons of marine sewage was collected the first year.
- As of 2012, the City had collected almost 9,000 gallons of sewage.

- To understand the effects of vessel discharges in the Lynnhaven, the City took samples of vessel wastewater between June and August 2007, and sent them to an HRSD lab for analysis.
- Samples were tested for:
  - Biochemical Oxygen Demand (BOD)
  - Chemical Oxygen Demand (COD)
  - Total Nitrogen
  - Total Phosphorus
  - Fecal Coliform

Boat Pump Outs in the Lynnhaven River No Discharge Zone

Boat Wastewater Sampling Results

BOAT WASTE POLLUTANT CONCENTRATIONS COMPARED TO RAW AND TREATED SEWAGE AT THE CHESAPEAKE ELIZABETH WASTE WATER TREATMENT PLANT

	POLLUTANT LEVEL				
	BOD mg/l	COD mg/l	Total Nitrogen mg/l	Total Phosphorus mg/l	Fecal Coliform #/100ml
Boat Wastewater Average	3,172	11,136	1,662	117	7,500,000
Raw Sewage to Chesapeake-Elizabeth Treatment Plant	242	463	38	5.7	ND
Treated Effluent from Chesapeake – Elizabeth Treatment Plant	1.5	ND	3.1	1.4	4
Ratio Boat Waste to Raw Sewage	13.11	24.05	43.74	20.53	ND

ND – Data not available

- **Nitrogen concentrations were approximately 44 times higher than raw sewage to treatment plant.**
- **Phosphorus concentrations were approximately 20 times higher than raw sewage to treatment plant.**
- **There were also very high levels of Fecal Coliform, BOD and COD.**

Boat Pump Outs in the Lynnhaven River No Discharge Zone

Since the Lynnhaven River's No Discharge Zone designation and the implementation of the City's Boater Pump Out program, there have been noticeable improvements in the Lynnhaven's water quality.

In its 2012 State of the River Report the Lynnhaven River NOW citizens group reported that:

- **42% of the river is now open for shellfish harvesting**
- **90% of the river meets the fishable/swimmable bacteria standard**

The Lynnhaven's No Discharge Zone designation and the City's promotion of the boater pump out program has not only reduced the amount of bacteria entering the river, but also the levels of nitrogen and phosphorus.

Based on the results of its boat wastewater sampling, and the volumes of vessel waste pumped out each year from its boat pump out program, the City estimates that approximately 1,150 pounds of nitrogen and 80 pounds of phosphorus is no longer directly discharged into the Lynnhaven River from vessel wastewater each year.

The City would like to receive credit for those nutrient reductions towards meeting its Chesapeake Bay TMDL requirements, and has asked that Boat Pump Outs within the Lynnhaven River's No Discharge Zone be considered as a nutrient reducing BMP.

Boat Pump Outs in the Lynnhaven River No Discharge Zone

Boat Pump Outs as a BMP

- **Because the Lynnhaven's No Discharge Zone designation and the City's boat pump out program eliminate the direct discharge of boat sewage after treatment by a Type I or Type II marine sanitation device (MSD) into the Lynnhaven River, this BMP should be treated as a direct load reduction resulting from a treatment process (boat pump outs) within the No Discharge Zone.**
- **This BMP applies to the reductions of nitrogen and phosphorus only. No reduction is requested for total suspended solids.**
- **This BMP would not apply to the sewage collected at the City's six dump stations for marine sanitation devices (MSDs). The dump stations collect waste from Type III MSDs, which were not allowed to be discharged into the Lynnhaven before the No Discharge Zone designation, and are therefore excluded from the nutrient reduction credit proposed by this BMP.**
- **There are six pump out facilities located within the Lynnhaven River watershed. In order to accurately quantify the nitrogen and phosphorus reductions, the City proposes to sample the primary holding tanks at the facilities.**
- **The City also proposes metering the pumps to accurately determine effluent volumes during pump outs.**

Proposed Sampling Protocol

- Sampling parameters would be identical to those of the 2008 "Lynnhaven River Boat Wastewater Sampling Program" report.
- All samples will be tested for:
  - BOD (mg/l)
  - COD (mg/l)
  - NO2,3 (mg/l)
  - TKN (mg/l)
  - TP (mg/l)
  - Fecal Coliform (#/100 ml)
  - Enterococcus (#/100 ml)

- Samples would be drawn during daylight hours from the holding tanks at each of the six pump out facilities according to the following schedule:
  - Two samples per month for the first year
  - One sample per month for the second and third years
  - One sample per quarter for the fourth and fifth years

- A time-weighted average flow concentration using the metering data will be calculated for each of the sampling parameters.

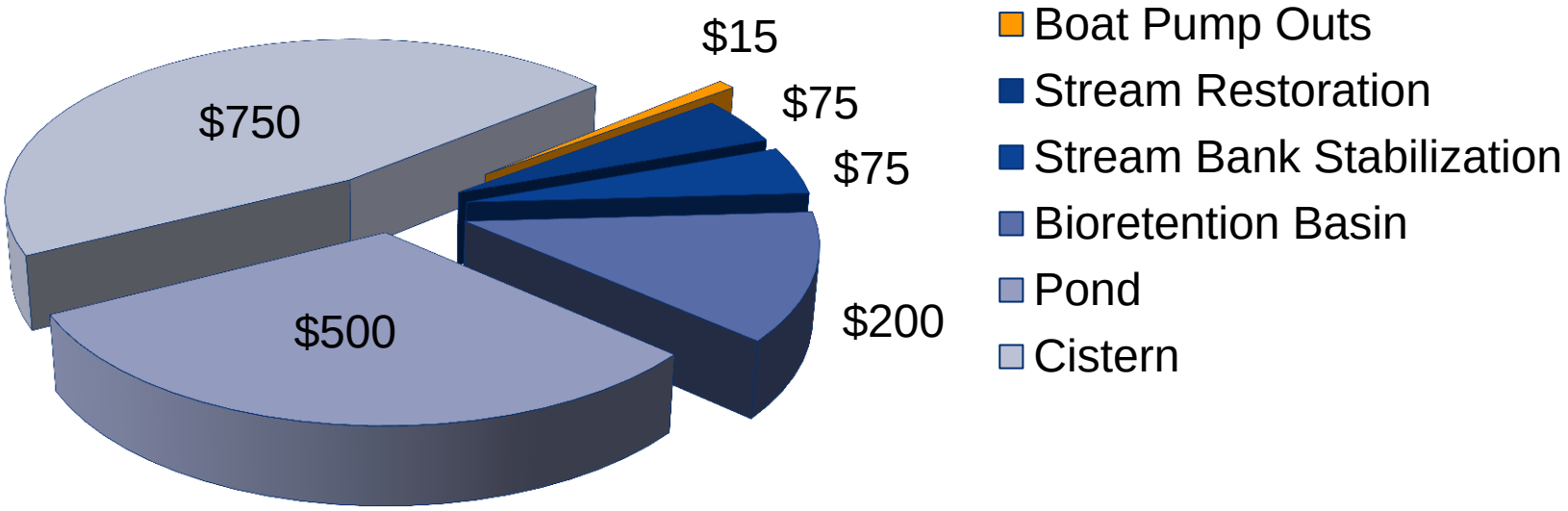
Boat Pump Outs in the Lynnhaven River No Discharge Zone

Reporting

- **Results from the holding tank sampling would be used to reduce the City's Chesapeake Bay TMDL pollutant loads for nitrogen and phosphorus accordingly.**
- **The annual nutrient reductions will be reported by the City using a discharge monitoring report (DMR) format.**
- **Annual loading reports will be prepared and included with the City's MS4 annual reports.**
- **The City's pump out facilities will be inspected on an annual basis and maintained as necessary. Inspection and maintenance documentation will be included in the annual reports.**
- **Boat pump outs within the Lynnhaven River's No Discharge Zone will be tracked and reported as a BMP for nitrogen and phosphorus under the City's MS4 Program Plan, and will subject to the City's VPDES stormwater permit.**

Boat Pump Outs in the Lynnhaven River No Discharge Zone

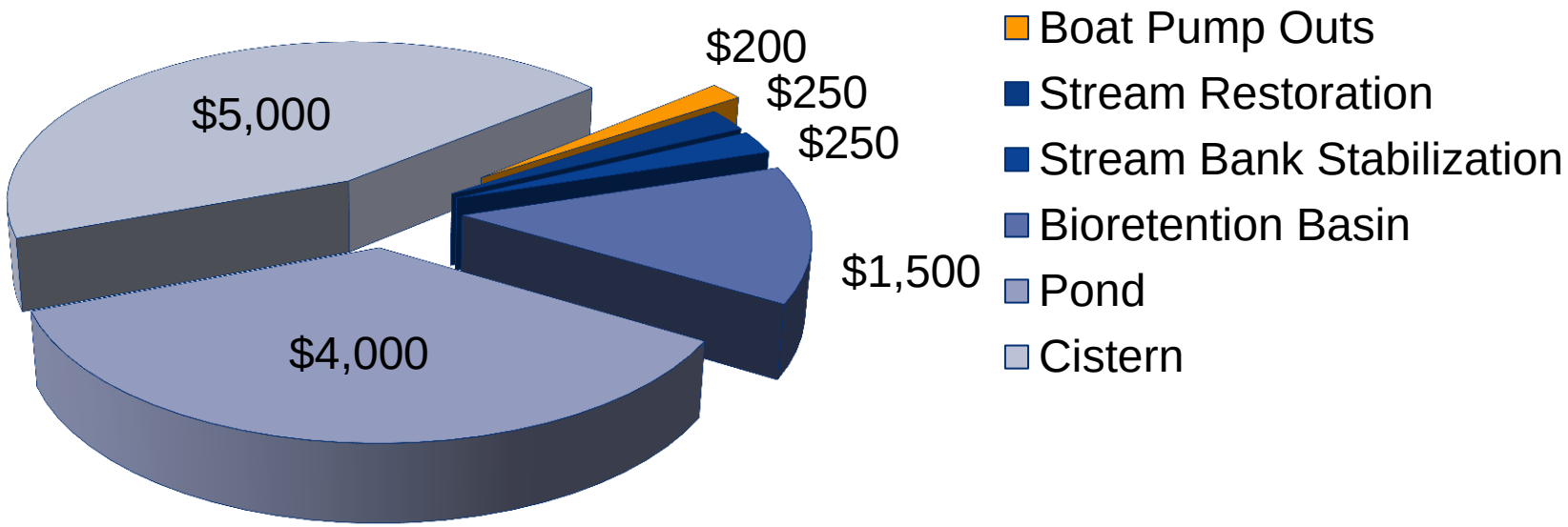
Comparative Annual Cost to Remove One Pound of Total Nitrogen*



*Using low end of Virginia Beach cost estimate data

Boat Pump Outs in the Lynnhaven River No Discharge Zone

Comparative Annual Cost to Remove One Pound of Total Phosphorous*



*Using low end of Virginia Beach cost estimate data

Thank You!

7 April 2015