

Estimated Impact of Reducing Sanitary Sewer Overflows Relative to the Required Urban Nutrient Reductions

In response to an HRPDC request in March 2011, the Chesapeake Bay Program is considering the impact of reductions in illicit discharges, including sanitary sewer overflows (SSOs), to urban nutrient loads. The Bay Program's Wastewater Treatment Workgroup and Urban Stormwater Workgroup have been directed to explore this issue beginning in early 2012. HRPDC staff asked HRSD to develop an order of magnitude estimate of the pounds of nitrogen attributable to past overflows. HRSD used SSORS data from 2006 to 2011 to estimate the average annual volume of SSOs in the region and calculate the regional nutrient load associated with SSOs.

The assumptions used in the estimate are listed below:

- It is assumed that all reported overflows in the region are located in the Chesapeake Bay watershed. It is acknowledged that significant portions of the southern areas of Virginia Beach, Chesapeake and Suffolk are not within the Bay watershed.
- It is assumed that all SSOs can be eliminated. This assumption is unrealistic, as the majority of SSOs are caused by storm events that cause flows to exceed the system's level of service.
- It is assumed that reported spill volumes represent only 10% of the actual spill volumes. Therefore, to provide a conservative estimate, the 2006 to 2011 average annual spill volume was increased by a factor of 10.
- It is assumed that the nutrient concentrations in SSOs are the same as daily average concentrations of flows entering HRSD wastewater treatment plants. This assumption provides a conservative estimate of nutrient load; it is acknowledged that the nutrient concentrations in SSOs are highly diluted due to the association with wet-weather events.

The following results were presented to the HRPDC Directors of Utilities Committee (November 2, 2011) and the Chesapeake Bay TMDL Regional Steering Committee (November 3, 2011):

- The estimated regional annual average volume of SSOs is 45.0 million gallons per year.
- The amount of nitrogen associated with 45.0 million gallons per year of SSOs is estimated to be 15,000 pounds per year.

HRPDC estimates that 15,000 pounds of nitrogen per year translates to approximately 12.7% of the required urban load nutrient reductions for the Hampton Roads portions

of the James and York River basins (the difference between the 5.3.2 model data for 2009 progress loads and 2025 goals for the Hampton Roads PDC).

For perspective, Mr. Henifin noted that HRSD’s discharge allocation from one wastewater treatment plant to the James River currently permits a maximum of 6 million pounds of nitrogen annually, which will be reduced to 3.2 million in 2021. Mr. Henifin clarified that the Special Order of Consent is an enforcement issue and not a water quality initiative, as sanitary sewer overflows are prohibited by the Clean Water Act.

The data and analysis are summarized in the tables below:

Year	Number of Spill Reports in Region	Total Gallons Reported	Number of "Unknown Quantity" Reports	Percentage of "Unknown Quantity" Reports	Significant Storm Event
2006	589	2,431,263	127	22%	Alberto/Ernesto
2007	303	951,021	12	4%	
2008	365	497,392	6	2%	
2009	599	11,367,451	193	32%	Nov noreaster
2010	539	7,742,579	88	16%	Sep 30 storm
2011	393	4,021,964	79	20%	Irene
Average Annual Reported Spill Volume:		4,501,945			
Estimated Average Annual Spill Volume:		45,019,450	Increase by factor of 10		
Say (million gallons (MG)):		45.02			

	Nitrogen	Phosphorus
2011 average influent load (lbs per day)	49,800	7,000
2011 average plant flow (MGD)	144.4	144.4
2011 average plant flow nutrient concentration (lbs/MG)	344.9	48.5
Total nutrients in SSOs volumes lost to waterways (lbs/yr)	15,526	2,182