Elimination of Discovered Nutrient Discharges From Grey Infrastructure

Findings: Expert Panel Final Report

Water Quality Goal Implementation Team

November 10, 2014

Outline of Today's Presentation

- The Process So Far
- Basics About Nutrient Discharges
- Review of the Available Science
- Advanced Program Credit
- Credits for Elimination of Individual Nutrient Discharges (Phase 6)

The Process So Far

- Panel deliberated for over two years
- Expert Panel report released in June
- 3 briefings with stormwater and wastewater workgroups in June and July
- July teleconference with EPA WPD
- 18 major comments received from numerous parties
- August 21 Co-Regulators meeting

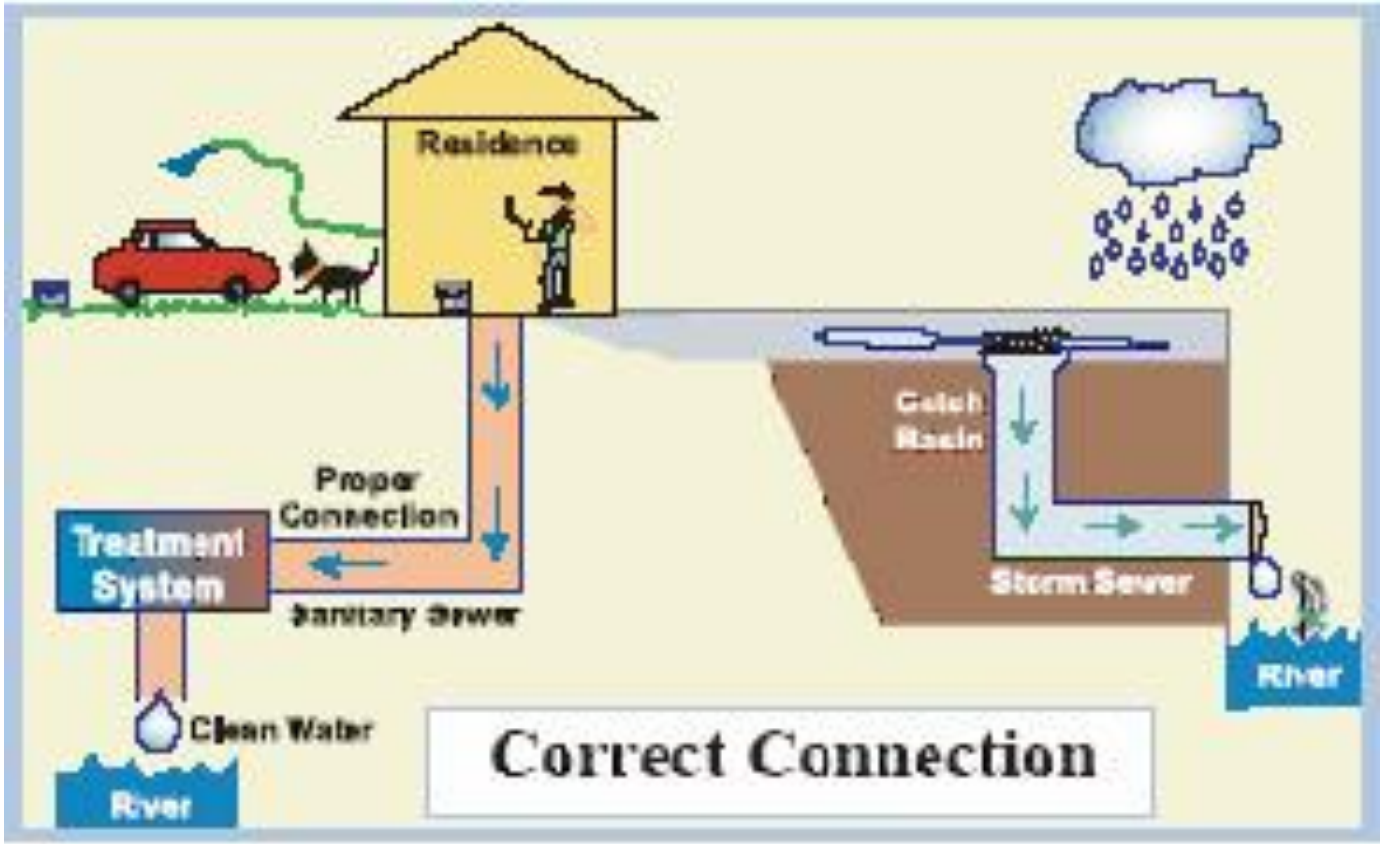
Process Continued

- Consolidated Response to Comments memo drafted in September, along with revised report
- Revised report conditionally approved at USWG meeting on 9/23, subject to October 3 comment deadline (MDE)
- October 2 briefing for WTWG
- Report and Scenario Builder appendix approved by WTWG 11/6

Expert Panel Roster

EXPERT BMP REVIEW PANEL Grey Infrastructure Upgrades	
Panelist	***Affiliation***
Marianne Walch	Delaware Department of Transportation
Megan Brosh	Baltimore County Department of Environmental Protection and Sustainability
Lori Lilly	Independent Consultant
Jenny Tribo	Hampton Roads Planning District Commission
June Whitehurst	City of Norfolk, VA
Barbara Brumbaugh	City of Chesapeake, VA
Diana Handy	Arlington County Department of Environmental Services
Mark Hoskins	Dewberry, VA
Kevin Utt	City of Fredericksburg, VA
Bob Pitt	University of Alabama
Tanya Spano	Metropolitan Washington Council of Governments
Whitney Katchmark	Hampton Roads Planning District Commission

Our Leaky Grey Infrastructure



Incorrect Connection

Residential sanitary pipe incorrectly connected to the storm drain system

Photo credit: Kent Count, Michigan

Inflow and Infiltration

Known as I/I, when excess flow from groundwater or other sources (runoff from storm events) enters the sanitary sewer system through cracks and joints in the pipes, thereby overwhelming the system's capacity to handle sewage flows and resulting in more overflow events

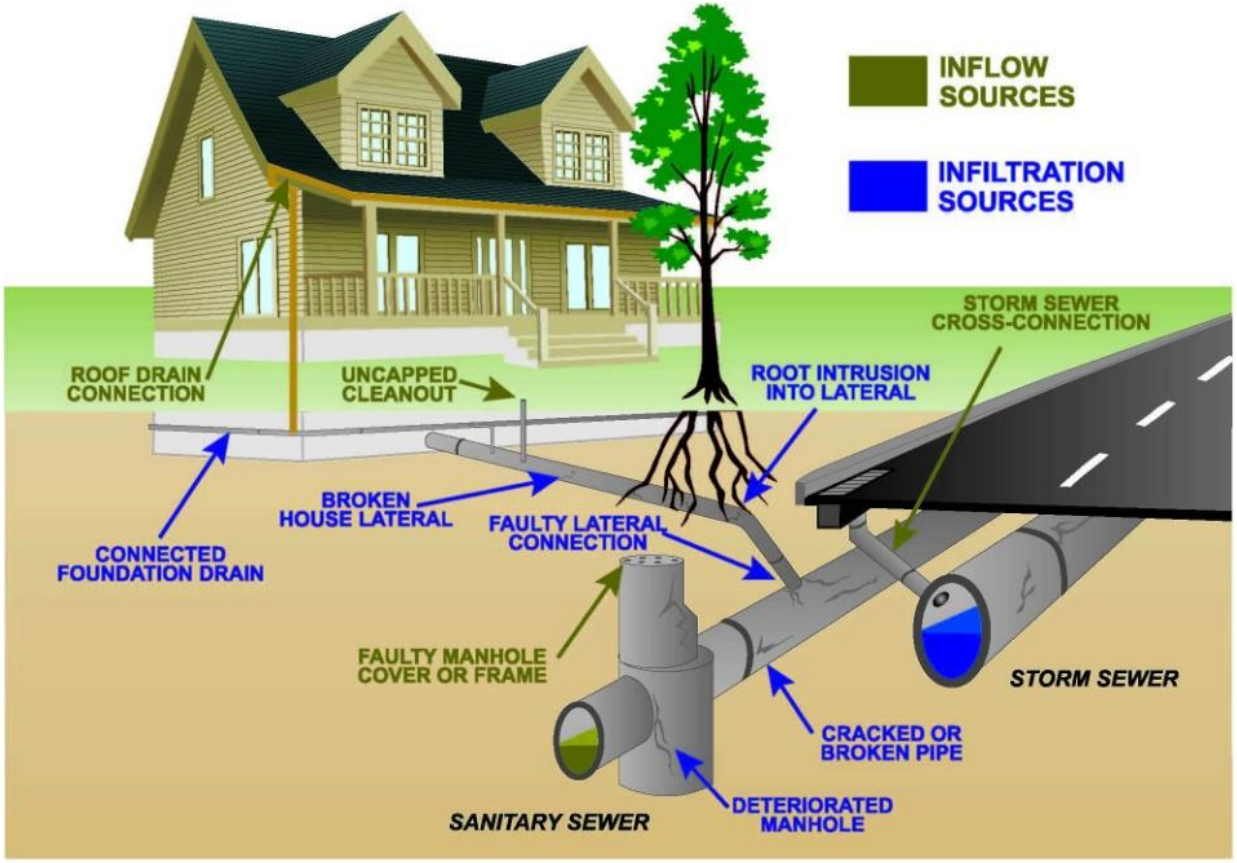


Photo credit:
City of Bryan, Texas

Exfiltration

The process that occurs when pipes are located above the water table and sewage leaks through pipe joints and cracks and migrates into adjacent storm drain pipes or into shallow groundwater

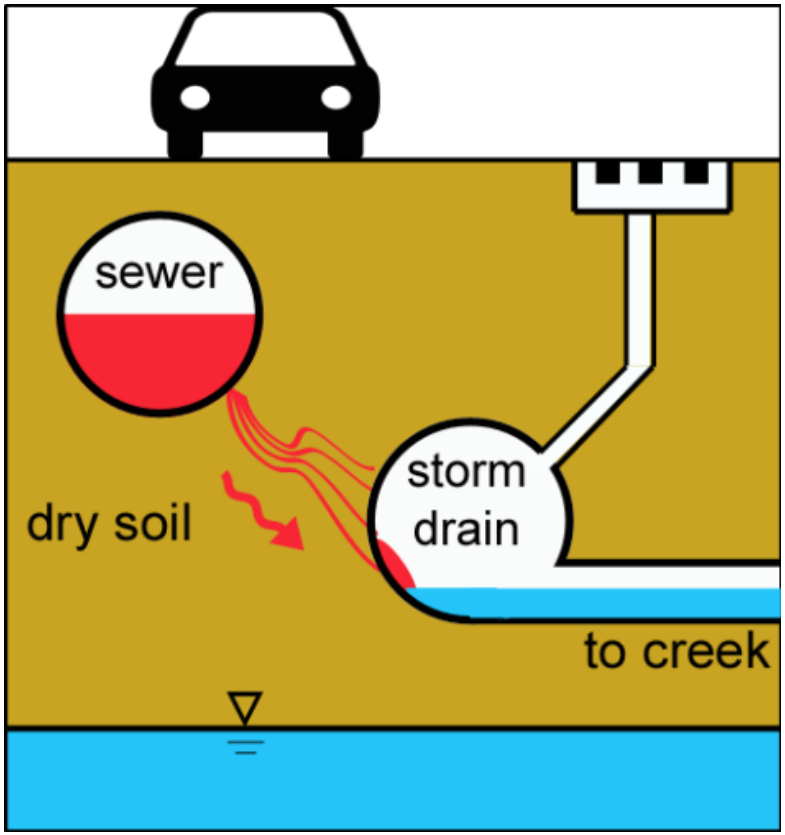


Photo credit: Sercu, 2011

Discovered versus Reported NDs

- **Discovered Nutrient Discharge:** An existing nutrient discharge that is found through systematic assessment of a catchment, sewershed or stream corridor by the designated MS4 permit agency or local sewer utility, using the screening, tracking and analysis methods described in this report.
- **Reported Nutrient Discharge**: Unexpected discharges from pipe breaks, spills, leaks and overflows that are reported to the local authority by the public or first responders and require immediate emergency repairs to stop the discharge. Most of these involve sudden pipe and/or infrastructure failure. NOT eligible for nutrient reduction credits.

Review of the Available Science

- Panel reviewed more than 60 papers and reports
- Conclusive evidence that ND's increase N and P levels in dry weather urban stream flow
- Dry weather NDs collectively account for as much as 20 to 40% of the annual nutrient load in urban watersheds, depending on the age and condition of its grey infrastructure.
- NDs comprise 1 to 2% of the total urban wet weather load, particularly during intense or extreme storms.

Discharge Detectives

- Need to use nutrient-based indicators during routine outfall screening
- Once a discharge is found, other discovery methods are needed to track it back to its source

Discharge Detective Work

- Trained Sewage Sniffing Dogs
- Flow Chart Method to Screen Small Diameter Pipes
- GIS Analysis of Storm and Sewer Pipe Interactions
- Sewer pipe flow metering
- Continuous tracers in sewers
- Nitrate Isotopes
- Human Markers (e.g., caffeine)
- Smoke and Dye Testing
- CCTV Pipe Investigation

Credit for Advanced MS4 Nutrient Discovery Programs

Program Credit Defined

Annual credit equivalent to a maximum of 1% of the dry weather nutrient load within the jurisdiction, which in turn, is defined as 20% of the total annual N and P load discharged from the urban pervious land in which advanced nutrient reduction programs are targeted.

= a 0.2% percent reduction in annual nutrient load discharged from urban pervious land targeted by the programs.

Qualifying Criteria for Advanced Programs

The locality will provide justification to indicate that they are operating at an advanced level. At a minimum, they will document the following in their annual MS4 permit report:

- Methods used to analyze dry weather stream monitoring data to prioritize the catchments and/or sewer-sheds with the highest risk for nutrient and bacteria discharge that warrant targeted investigation.
- Number of outfalls in the priority catchments/sewer-sheds identified during the Outfall Reconnaissance Inventory (ORI) as described in (Brown et al 2004).
- Number of outfalls in the priority catchments/sewer-sheds that were subject to nutrient testing, using the Flow Chart Method (Brown et al 2004) or equivalent. The testing must focus on outfalls of all diameters. Nutrient testing should be conducted on at least 10% of flowing outfalls (as determined during the ORI) annually.
- Specific methods and techniques they use to track a suspect illicit discharge to its source in the storm drain network (Table 3).
- Number and type of illicit discharges that were discovered and actually eliminated each year.

Qualifying Criteria (Cont.)

In addition, localities will need to document that they are conducting **at least two** of the following activities to discover and or prevent nutrient discharges to receive credit:

- GIS assessments of storm and sanitary sewer network to identify high risk segments for cross-connections or exfiltration
- Dry weather stream monitoring is used to prioritize the stream segments with the highest nutrient and bacteria levels that warrant further investigation
- CCTV inspections, dye testing or other methods to investigate for sewer leaks in problem storm drain systems.
- Targeted inspection and outreach to businesses and/or industrial facilities subject to high risk for illicit discharges or sewer clogging (e.g. restaurants, car rental agencies, etc.)
- Detailed field assessments of the sewer network to identify segments with high risk of nutrient discharge due to exfiltration and/or dry weather overflows (i.e., sewer modeling and metering tools).

Zero Credit for Basic IDDE Program

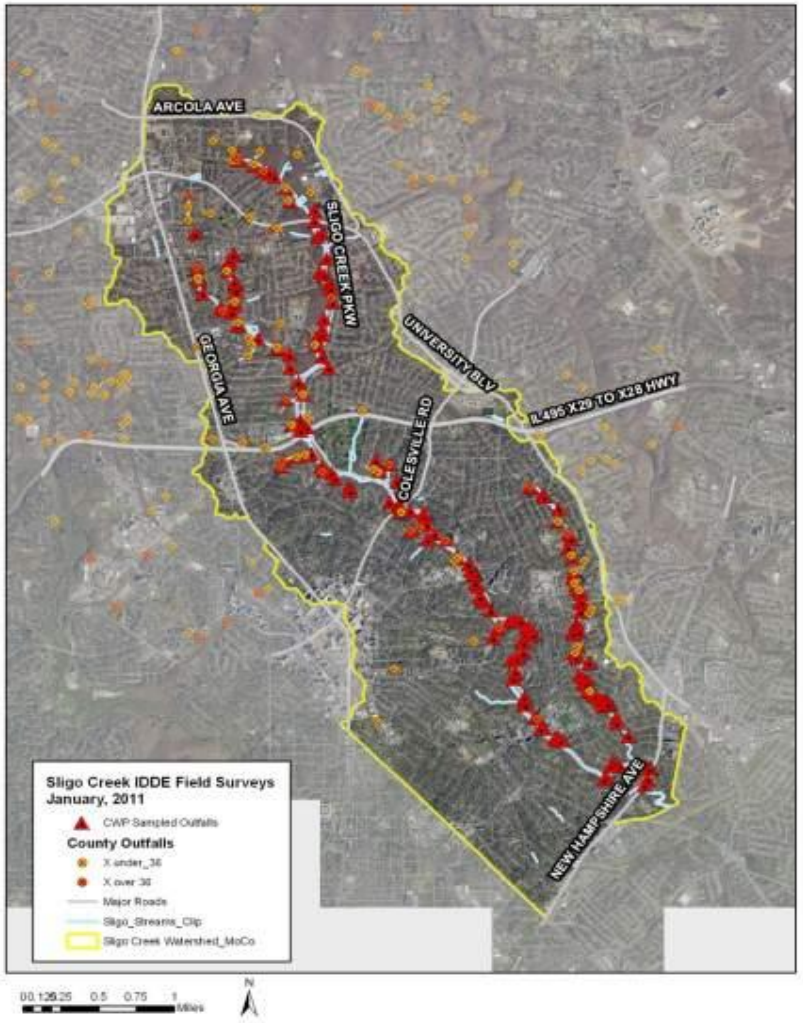
MS4s that are currently in compliance with their minimum control measure for illicit discharge detection and elimination (IDDE) in their current stormwater NPDES permit get no credit

- Adopt a local ordinance to prohibit illicit discharges to the storm drain system
- Develop a storm drain map, including all outfalls 36 inches in diameter or larger
- Provide IDDE education and outreach to public employees, businesses and the general public
- Use visual indicators to screen outfalls for presence of illicit discharges
- Develop and implement appropriate enforcement procedures to correct illicit discharge when they are discovered.

Programmatic Credit Design Example

Bay Village elects to transition to a nutrient based outfall screening program in two priority catchments within its jurisdiction -- Icky Creek and Filthy Run. Together, the two catchments are 3,600 acres in size, and average 64% urban pervious land.

Bay Village documents in its annual MS4 report that it has met or exceeded the program metrics outlined in Table 7 of the report. The nutrient reduction credit for modifying their program is computed as follows.



Programmatic Credit Design Example

***Step 1:* Determine the unit area nutrient load for pervious land from CAST or state equivalent, and multiply by 0.20.**

Staff determine unit area TN and TP loads are 10.43 and 0.43 lbs/acre/year, respectively, within their jurisdiction.
These are multiplied by the dry weather baseline multiplier of 0.2, which yields 2.09 lbs TN/ac/yr and 0.086 lbs TP/ac/yr.

***Step 2:* Multiply these unit loads by the qualifying acres of pervious land in Icky Creek and Filthy Run (3,600 acres*64% = 2,304 ac), which yields:**

4815 lbs/yr of TN and 198.1 lbs/yr of TP

Step 3: Multiply these loads by the 0.01 to determine final nutrient reduction credit for the program change.

48.2 lbs/yr of TN and 1.98 lbs/yr of TP

Reporting, Tracking and Verification of Advanced Program Credit

- Localities Typically Submit to States in MS4 Permit Annual Reports
- Appendix E Outlines the NEIEN Reporting Information
- Localities eligible for credit in 2015, assuming they meet qualifying conditions (most MS4's won't immediately qualify)
- The acres subject to the program credit lapse five years after the first year in which they are reported
- Additional acres in succeeding years if they elect to target additional storm/sewersheds for intensive nutrient discovery
- Eventual shift to reporting individual nutrient discharge credits in 2018
- Cannot take credit for program and individual credits at same time

8 Individual Nutrient Discharges Credited

No.	Discharge Type
N-1	Laundry Wash Water
N-2	Commercial Car Wash
N-3	Floor Drains
N-4	Misc. High Nutrient Discharges
N-5	Sanitary Direct Connection
N-6	Sewer Pipe Exfiltration
N-7	Drinking Water Transmission Loss
N-8	Dry Weather Sanitary Sewer Overflows


06/02/2011


Tudor Arms Ave. & 39th Street
Potable Water Problem
Storm Drain Outfall discharging potable water (high chlorine reading)
Potable Water Gushing from Storm Drain Seam

Non-Eligible Nutrient Discharges

- Unexpected nutrient discharges from pipe breaks, spills, leaks and overflows that are reported to the local authority by the public or first responders and require immediate emergency repairs to stop the discharge.
- Residential car washing
- Transitory illicit discharges associated with power-washing, dumpster juice, transport accidents, and illegal sewage disposal by boats and RVs.
- Wet Weather Sanitary Sewer Overflows
- Catastrophic wet weather sanitary sewer overflows that exceed the sewer design capacity
- Combined Sewer Overflows *
- Septic field discharges caused by system failure *

The Crediting Approach

The guiding principle is that elimination of a discovered nutrient discharge could only be considered as a urban BMP, if they:

- Are detected and physically eliminated
- On-site sampling of the discharge that has been eliminated to define one or more of the following parameters -- nutrient concentration, flow rate and duration
- Subsequent inspections and/or monitoring verify or otherwise confirm that discharge no longer exists

Data Requirements to Compute the Credits

Table 5 Data Requirements to Compute Reduction Credits					
No.	Discharge Type	Method	Nutrients	Flow Volume	Flow Duration
N-1	Laundry Wash Water	1	S or D	E or M	E
N-2	Commercial Car Wash	1	S	E or M	E
N-3	Floor Drains	1	S	E or M	E
N-4	Misc. High Nutrient Discharges	1	S	E or M	E
N-5	Sanitary Direct Connection	1	S or D	E or M	E
N-6	Sewer Pipe Exfiltration	2	S or D	M	E
N-7	Drinking Water Transmission Loss	2	S or D	M	E
N-8	Dry Weather SSOs	3	D	E	M
N-9	Chronic Wet Weather SSOs	3	D	E	M
KEY: S= SAMPLE, D=Use DEFAULT VALUE, E=ESTIMATE, M= MEASURE					

Reporting, Tracking and Verification of Individual Credit

- MS4 Record-keeping Requirements for Individual Discharges that Are Eliminated
- Appendix A Outlines Reporting Info for Each Type of Discharge
- Appendix E Spells Out NEIEN/Scenario Builder Requirements
- Localities can submit credits beginning in 2018
- Individual credits lapse ten years after the first year in which they are eliminated
- Verification Method depends on the type and size of nutrient discharge, can be as simple as a confirmation inspection that the discharge was physically eliminated

Management Significance

- More than a thousand Bay communities are required to have an IDDE program (although very few have nutrient-based outfall screening)

- Thousand of dry weather overflows occur each year across the Bay but no local incentives to reduce the systematic causes of the problem

- Enlisting potential new partners in reducing nutrients from the urban sector

Questions