NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM

KENT COUNTY PHASE II MS4
PERMIT NO. DE 00511144

ANNUAL REPORT FOR 2013

Delaware Department of Transportation

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CERTIFICATION

I certify under penalty of perjury that this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. As to the identified portions of this document for which I cannot personally verify their truth and accuracy, I certify as Delaware Department of Transportation's official having responsibility for the persons who, acting under my direct instruction, made the verification that this information is true, accurate, and complete.

7/1/14

date

Brian Urbanek
Asst. Director, Statewide Support Services
Delaware Department of Transportation
800 Bay Road
Dover, DE 19903
(302) 760-2536

Program Summary and Projection

The objective of the Delaware Department of Transportation NPDES Program is to reduce stormwater pollutants from the MS4 (municipal separate storm sewer system) to the maximum extent practicable. This is accomplished through the implementation of a comprehensive stormwater pollution prevention and management program as contained in the NPDES Permit No. DE 0051144, effective July 1, 2003.

The purpose of this review and update is to summarize activities for 2013 and provide a projection of work for calendar year 2014. Table A summarizes the Minimum Control Measures, BMPs, Measurable Goals, and Status of Implementation for the entire permit term. Work projections for 2014 are provided at the end of this section in Table B.

2013 Program Summary

Public Education and Outreach

DelDOT's public education program includes the following accomplishments for calendar year 2013:

- Continued Agreement 1627 with the Delaware Nursery Landscape Association to manage the Delaware Livable Lawns program for the next two years.
- Completed final report of an education/outreach management plan through an agreement with the University of Delaware, Water Resource Agency, to investigate cost effective social marketing options.
- DelDOT is continuing the "Door hanger campaign," begun in 2006, as an educational tool to neighborhoods where illicit disposal are reported.
- DelDOT staff participated in the following public outreach events and distributed educational materials including bookmarks, brochures, calendars and promotional giveaways that carry a water quality message:
    - Make-a-Splash – Event for 700 4th graders to educate students on the diversity of estuary life and the importance of Delaware's water resources;
    - Delaware State Fair – we worked with the University of Delaware to produce a display demonstrating green, sustainable lawn care practices. The display also incorporated interactive educational games about stormwater pollution and lawn care.
- Served on the board of directors with the Delaware Association for Environmental Education (DAEE) and helped organize the annual statewide environmental education conference.

Public Involvement and Participation

DelDOT makes opportunities for members of the public to participate in program development and implementation through:

- Public participation in the DelDOT budget process.
- The Adopt-a-Highway program, a volunteer program to reduce litter along state roadways.
- DelDOT's annual "Imagine a Litter Free Delaware" cleanup day along roads, highways and community areas.
- DelDOT's door hanger campaign to solicit public participation to report illegal dumping and "neighborhood watch."

Illicit Discharge Detection and Elimination (IDDE)

DelDOT completed inventory, inspection and dry-weather screening of all parts of the DelDOT owned stormwater conveyance system in the Phase II urbanized area in 2007. These data are incorporated into the existing comprehensive GIS database that enables users to view the entire stormwater system, corresponding inspection data and photographs. KCI Technologies and Century Engineering continue to expand the inventory and inspection program to the rest of Kent and Sussex Counties and to update new structures that are added to the system. New outfalls are screened for dry weather flow or evidence of illicit discharges as they are inventoried and inspected.

Inventory and inspection of Kent County has been completed. Emphasis in 2013 was on completion of Sussex County. The MS4 database and map viewer are continually updated as the inspections are completed. A new mobile map viewer app was developed this year that will greatly assist field crews in tracking discharges through the storm sewer system.

DelDOT also continued a public education program to help eliminate improper disposal and dumping into storm drains. Whenever evidence of improper dumping is discovered, either through routine inspections or citizen complaints, the entire community is canvassed with educational door hangers. In addition, we helped publicize Delaware Solid Waste Authority (DSWA)'s Household Hazardous Waste Collection Program and DNREC's "TrashStoppers" Program.

Construction Site Stormwater Runoff Control

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. Satisfactory performance of the delegated responsibilities will be considered compliance with this component of the SWMP. This delegation was renewed for another three years through June 30, 2015.

Post-Construction Stormwater Management in Newly Developed Areas and in Redeveloped Areas

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. Satisfactory

performance of the delegated responsibilities will be considered compliance with this component of the SWMP. This delegation was renewed for another three years through June 30, 2015.

DelDOT continued to inspect all BMPs annually and to perform maintenance as required.

Pollution Prevention and Good Housekeeping

DelDOT has developed and implemented an operation and maintenance program with a goal of preventing and/or reducing discharges of pollutants associated with our operations through implementation of the following:

- Maintenance of the roadways and stormwater conveyance system.
- Continue to implement a 4:2:1 street sweeping frequency in the Phase II area and to track sweeping wastes for calculation of pollutant load reductions.
- Continue to upgrade the existing snow removal fleet with ground speed spreader controls, plow balance valves and apply the techniques of anti-icing and pre-wetting in an effort to reduce overall salt usage during the winter season. New trucks will be fully equipped with ground speed spreader controls and plow balance valves. To date, all DelDOT trucks are equipped with the latest snow fighting equipment.
- Litter pickup by Department maintenance staff, Department of Corrections crews, and the Adopt-a-Highway Program, and an annual "Imagine a Litter Free Delaware" cleanup day.
- Monitoring of stormwater outfalls at our maintenance yards per Pollution Prevention Plans.
- Continued implementation of the Stormwater Pollution Prevention Program (SWPPP) at all DelDOT maintenance facilities. Quarterly wet and dry weather inspections are conducted at each yard.
- Continue to implement Spill Prevention Control and Countermeasures (SPCC) plans for all maintenance yards.
- Continuation of a pilot study on alternative vegetation management strategies for guardrails to reduce pesticide usage.
- Conducted employee training through:
    - Training videos on the SWPPP's
    - Training videos on SPCC Plans
    - Maintenance bulletins posted at each maintenance facility.

2014 Work Projection and Plan:

Work projections for 2013 are provided at the end of this section in Table B (page xi).

Table A. Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

MCM #1: Public Education and Outreach Program		
BMP	**Measurable Goal**	**Status of Implementation**
A. Citizen Outreach / Educational Materials	Conduct citizen outreach using media and materials:	
Educational bookmark	Distribute 11,000 to 7th graders in public and private schools	Completed 2005
Stormwater brochures	Distribute at public events	Annually since 2002
Kid's activity booklet	a. Distribute 9,000 booklets to 4th graders in public and private schools statewide b. Distribute at public events	a. completed 2004, 2005 & 2006 b.continuous through permit at public events
Book cover	Distribute 4,000 at public events and per teacher request	Completed 2006
Restaurant placemat	Distribute 4,000 at public events and per teacher request	Completed 2005
Public Service Announcement	Air twenty 60-second PSA spots in spring on WSTW, 93.7 FM	Completed Spring 2005
Bags-on-Board	Distribute 4,000 units (2006), 7,200 units (2010), tipcards and follow-up surveys to vet clinics, dog groomer, dog trainer, animal rescue	2006 and 2010; annually thereafter at public events
Delaware Livable Lawns materials	Distribute at public events and on DLL website: commercial brochure, residential brochure, Livable Ecosystems booklet, Livable Lawns booklet, grass length ruler, DLL magnetic clip.	All materials developed and printed in 2012 and 2013; will be reprinted as needed.
B. Watershed Training Workshop	Present four 2 ½-hour watershed training course on basic watershed education and good-housekeeping measures to DelDOT and NCCo. employees	Completed 2002. New staff training modules to be developed in 2015.
C. Stormwater Web Page	Develop a website to educate the public on stormwater issues and good housekeeping measures; update as needed; track web-site visits	NCC; developed DelDOT hosted stormwater website in 2007-continuous through permit. Site to be updated in 2014-15.
D. Storm Drain Marking	Install water quality message markers on the estimated 4,500 storm drains	Completed June 2007; continuous with newly accepted subdivisions

Table A (cont.). Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

E. School Participation	Engage public and private schools statewide in stormwater education	
Statewide drawing contest	Coordinate "Clean Water Begins and Ends with You!" drawing contest for K-12 graders	Annually from 2004 - 2008; 1,500 participants in 2008, canceled due to budget cuts
Technology Students Asso.	Judge TSA competition for middle and high school students statewide; students develop restaurant placemat and coloring book cover	Annually since 2003, continuous through permit
F. Public Event Participation/Display	Develop display and interactive stormwater game for use at public events	Purchased 2002; updated continuous through permit; partnered with U of Del. computer science dept. to develop computer games - continuous since 2011
G. Promotional giveaways	Purchase items that display a water quality message for prizes and giveaways at public events	Annually since 2002, continuous through permit
H. Local Group Interaction	Partner with local non-profit groups in the development of education materials and outreach manuals, pet waste campaign and user surveys	Began 2005, continuous through 2013
I. Stormwater Video	Reprint "Protecing Our Water: Who's Got the Power" video. We will reprint the video into a DVD format and offer it as a teacher package at public events and watershed training for Tributary Action Team participants.	Completed September 2007
J. Newspaper Advertisements	Submit newspaper advertisements to increase public awareness on the importance water quality related to stormwater.	Completed October 2008
K. Storm System Inventory Brochure	Revise and distribute existing brochure for all residents in Phase II area	Completed February 2008
L. Delaware Livable Lawns	Promote program, launch website, develop brochures, certify qualified companies	Continuous since 2010
M. Chesapeake Bay WIP	Contribute to the activities of DNREC's Chesapeake Bay WIP Communications & Outreach Committee	Continuous since 2012. Attend meeting, assist with public events and outreach programs.

Table A (cont.). Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

MCM #2: Public Participation/Involvement		
BMP	**Measurable Goal**	**Status of Implementation**
A. Litter control programs		
Adopt-a-Highway	DelDOT will continue the Adopt-a-Highway program and document all participants and solicit new volunteers through newspaper ads and DelDOT website.	Continuous program since 2003
"Imagine a Litter Free Delaware" cleanup day.	Statewide public event for clean up along roads, highways and community areas.	Annually in autumn since 2005
Anti-litter education program	Education program for elementary students all across Delaware to educate kids about the harmful effects of littering and encourage participation in the Adopt-a-Highway program	2005-2006
B. Public workshop – maintenance organizations	Hold two public workshops for Kent and Sussex County maintenance organizations on stormwater pond maintenance and the NPDES program and solicit public comment through a survey and comment form.	Completed May 2007
C. Development of stormwater and watershed presentation/survey for community groups	Review and revise current watershed presentation.	Completed May 2008
D. Door hanger campaign	Distribute door hangers to all subdivision residents where illegal dumping was reported or discovered. Solicit public participation for future reporting.	Annually since 2005
E. Tributary Action Teams	Participate in TAT meetings of the Murderkill and St. Jones River watersheds to assist in the development of Pollution Control Strategies and to determine the effect of TMDL implementation on DelDOT projects.	2002-2007; participate as new TATs are formed
F. National Nonpoint Education for Municipal Officials (NEMO)	Serve on the Delaware NEMO steering committee and co-author a chapter on stormwater management.	2003-2006; promoted programin 2013 through the DE MS4 consortium.

Table A (cont.). Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

MCM #3: Illicit Discharge Detection and Elimination		
BMP	**Measurable Goal**	**Status of Implementation**
A. Storm Sewer System Map	Develop map showing location of all outfalls & names and location of all waters of the US receiving discharges from them	
Database and viewer application	a. Develop storm sewer system system inventory and inspection database application and GIS mapping viewer application for Kent County. b. Improvements to map viewer database	a. Completed 2003 b. 3rd iteration of map viewer
Inventory and inspection	Complete initial inventory and inspection of all storm sewer system components in the permitted area, at a rate of 20% each year,	Completed 2007
Database update	Update database at least annually to include inventory and initial inspection of all new system components within and outside the permitted area	Ongoing, annually
Expand inventory to rest of Kent & Sussex Counties	Expanded inspection database and mapping to include all of Kent and Sussex Counties	Ongoing, begun in 2007; Kent Co. completed in 2011; continuing in Sussex Co.
B. Dry Weather Outfall Screening	Screen 20% of known DelDOT outfalls in the permitted area per year	Completed 2007
Ongoing IDDE Program	Inventory and screen new outfalls; screen outfalls as part of MS4 reinspections; investigate reported PIDs	Continuous since 2007
New Outfalls	Conduct screening on new outfalls added to the system since the original inventory.	Ongoing, annually
C. Public Reporting and Education	Publicize phone number for reporting illicit discharges or dumping into the storm sewer system through all education and outreach materials and in public workshops.	Ongoing; added to new stormwater website in 2007
	Distribute educational door hangers to homes in all neighborhoods in which illicit dumping activities have been reported, found or suspected.	Completed 2006, and ongoing

Table A (cont.). Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

MCM #4 & #5: Construction Site Runoff Control/Post Construction Stormwater Management		
BMP	**Measurable Goal**	**Status of Implementation**
A. Delegated Agency	DelDOT is a delegated agency to administer its own Sediment and Storm Water Management Program per Delaware's Sediment and Stormwater Regulations. Review delegation every 3-years.	Annually since 1991; renewed in 2012.
B. Operations and Maintenance of BMPs	Annually inspect stormwater BMPs statewide.	All BMPs inspected annually since 2001
C. BMP maintenance contract	Maintain stormwater ponds in need of major repairs that are functioning below design standard for quantity and quality.	Annually or as required
D. Revise Standard Specification 110	Progressive step-wise approach to gaining compliance with approved plans, regulations, and laws towards enforcement of construction site erosion and sediment controls	Revised 2007
E. Third party CCR inspectors	Use third party consultant services to conduct erosion and sediment control inspections on DelDOT projects	Annually since 2011
F. Use numerical-based E & S form for evaluating projects	Contractors must receive 70 or greater to be eligible for monetary incentive	Implementation begun in 2013

Table A (cont.). Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

MCM #6: Pollution Prevention/Good Housekeeping for Municipal Operations		
BMP	**Measurable Goal**	**Status of Implementation**
A. Litter Control Programs		
Adopt-a-Highway	DelDOT will continue the Adopt-a-Highway program and document all participants and solicit new volunteers through newspaper ads and DelDOT website.	Continuous program since 2003
"Imagine a Litter Free Delaware"	DelDOT will continue the program and solicit new volunteers through newspaper ads and DelDOT website	Annually since 2005
DOC Crews	DelDOT will continue to utilize the inmate crew to assist current staff levels to reduce the floatables entering the storm sewer system.	Continuous program since 2002
B. Storm Water Pollution Prevention Plans	a. DelDOT developed SWPPPs at all maintenance facilities. b. Update as needed.	a. Completed 2004 b. Revision of maps and plans completed 2013
Quarterly Inspections	DelDOT maintenance facility staff will complete a Dry and Wet Weather inspection each quarter.	Quarterly since 2004
Annual Inspections	DelDOT NPDES staff will conduct annual compliance inspections at each maintenance facility	Annually since 2004
Outfall water quality monitoring	The Pollution Prevention Plans currently require wet weather stormwater monitoring at all maintenance facilities.	Semi-annually since 2003 for 4 facilities; beginning 2013, monitor all facilities
Purchase spill kits	a. The NPDES Section purchased wall mount spill kits for placement in vehicle shop buildings. b. Purchase as necessary	a. Completed 2003 b. Annually as needed following annual inspections
Security Fence	As part of the SWPPPs, DelDOT enclosed all maintenance facilities with security fences and gates.	Completed 2005
C. Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards	Treat all wash water through a treatment train prior to leaving the site.	Vehicle wash plan report completed and approved by DNREC July 2005
Dover, Magnolia, Cheswold maintenance facilities	Fully implement vehicle wash plan for three facilities within the Phase II permit area	Completed 2007

Table A (cont.). Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DelDOT Phase II NPDES.

D. Statewide Salt Best Management Practices for DelDOT Maintenance Yards	DelDOT developed a report that documents operational practices and strategies for salt delivery, stockpiling, and mixing.	Completed 2004
Construct salt barns	DelDOT constructed 3 salt barns	Completed 2005
Upgrade snow equipment	Ground-speed spreader controls, anti-icing, pre-wetting, plow balanced valves	Began 2004; continuous through permit
E. Spill Prevention and Response		
Spill Kits for Vehicles	DelDOT to purchase 450 vehicle spill kits for use on the roadway	Completed 2007
Spill Prevention, Control and Countermeasures Plans (SPCC)	a. DelDOT developed a SPCC plan for each maintenance facility. These plans include proper procedures for spill response. b. Update as necessary.	a. Completed 2007 b. Revision of maps and plans began 2012
Drainage Maintenance	DelDOT will maintain the system as issues are discovered through inspections and complaints.	Continuous program since 2001; reinspect on a 5/10 year schedule
Storm System Inventory and Inspection	DelDOT will perform a detailed inventory and inspection of the MS4 system.	Completed 2007
Inspection and Preventative Maintenance Program	DelDOT will determine the appropriate re-inspection schedule for the stormwater system	Completed 2007
	Inventory & inspect MS4 in Sussex County	Continuous since 2010
	DelDOT will begin the re-inspection program	Began 2009, ongoing
H. Sweeping Program	a. DelDOT upgraded the sweeping program to a full time operation with the addition of new sweepers. b. Install AVL units to track sweepers	a. Completed 2002, continuing through permit. b. Completed 2011; install on new equipment as needed.
I. Training	Develop a training program for DelDOT staff to educate staff on ways to prevent and reduce storm water pollution from their daily activities.	
PPP training videos	Develop 3 videos entitled (1) Facility and Vehicle Maintenance, (2) Stormwater Contamination and Spill Prevention, (3) Vegetative Control and Pollution Prevention on Public Roads.	Completed 2003; annual requirement for all maintenance staff
Maintenance Bulletins	Develop informative bulletins for District staff to educate them on stormwater management and pollution prevention BMPs	Continuous program since 2003
CCR Training	Train DelDOT staff through the DNREC course	Continuous, as needed
Spill Prevention and Response Videos	DelDOT to develop and use three training videos on Spill Prevention and response.	Completed 2007, annual requirement for all maintenance staff

Table B. Projection of Work to be performed during Calendar Year 2014.

Public Education and Outreach

- Participate and distribute education materials at outreach events: Delaware Rural Water Association Conference, DNREC's Make-a-Splash, Agriculture Day, and the Delaware State Fair.
- Place storm drain markers, carrying a water quality message, on DelDOT owned inlets.
- Routine updates to web site and make available all outreach material and training presentations.
- Network and coordinate educational efforts with other state and local organizations through participation in the Delaware Association for Environmental Education.
- Continue Phase I of the Delaware Livable Lawns project to commercial lawn care companies. Expand the residential outreach and education component of the program.

Public Involvement and Participation

- Solicit public participation for reporting illegal dumping through DelDOT's door hanger campaign.
- "Imagine a Litter Free Delaware" cleanup day.
- Begin development of Phase II of Delaware Livable Lawns, an educational/outreach campaign to reduce fertilizer application for home owners.

Illicit Discharge Detection and Elimination

- Continue inventory and inspection of outfalls and drainage structures in Sussex County, with goal of completion by 2015.
- Begin reinspection and IDDE evealuation/screening of system in the Dover urbanized area.
- Perform dry weather screening on newly inventoried outfalls and continue to investigate potential illicit discharges as they are discovered or reported.
- Continue door hanger campaign to residents where illegal discharges/dumping has occurred.

Construction Site Stormwater Runoff Control

- Delegation of the sediment and stormwater program is granted through the year 2015. DelDOT will comply with all state requirements.
- Use third party consultant services to conduct erosion and sediment control inspections on DelDOT projects. Renew agreements.

Post-Construction Stormwater Management in Newly Developed Areas and in Redeveloped Areas

- Delegation of the sediment and stormwater program is granted through the year 2015. DelDOT will comply with all state requirements.
- Inspect all stormwater ponds and BMPs in Kent and Sussex Counties; add collected data to the existing inventory database.
- Perform maintenance of BMPs as needed, and control invasive species.

Pollution Prevention and Good Housekeeping

- Update the Pollution Prevention Plans for DelDOT maintenance facilities.
- Continue requiring maintenance staff to view pollution prevention and spill prevention training videos annually.
- Continue to develop and distribute Stormwater Pollution Prevention Bulletins to each maintenance yard statewide.
- Collect semi-annual wet weather samples from maintenance yard outfalls, quarterly wet and dry weather inspections, and annual comprehensive site inspections, as required by the Pollution Prevention Plans.
- Continue 4:2:1 sweeping frequency.
- Continue implementation of the "Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards" plan.
- Continue implementation of the Integrated Roadside Vegetation Management (IRVM) manual developed in 2009.
- Continue to update the statewide guardrail inventory, as needed.
- Use data from the guardrail inventory to develop a strategy for continued reduction of pesticide use.
- Continue the guardrail vegetation management study initiated in 2008 through the growing season of 2014 to test new plots of zoysia grass and Flight Turf®.

SWPP&MP Assessment

This section is an annual review of the current SWPP&MP, which was revised in June 2007.

Public Education

Partnerships

Over the years, the NPDES Section has contracted with several non-profit organizations to assist with development of education and outreach programs. During the permit term, we have partnered with The Partnership for the Delaware Estuary, the Appoquinimink River Association (ARA), the Delaware Nature Society, and the Delaware Nursery Landscape Association (DNLA). They have specialties in watershed and water quality education. Partnering with these organizations has proven to be an effective means of expanding our limited staff resources in a cost effective manner.

With many watersheds facing TMDLs for nutrients and bacteria, we decided to pilot an outreach effort in a two-phased approach to commercial lawn care companies and property owners. In 2013, we continued an agreement with the DNLA to (1) promote a program called "Delaware Livable Lawns" that certifies commercial lawn care companies for their efforts that reduce fertilizer runoff through educating their clients on best practices, soil testing, and reporting fertilizer quantities while meeting homeowners needs. (2) In Phase II of the program, we will be targeting residential homeowners. We have an advisory committee consisting of 9 stakeholder groups from government and state agencies, University staff, private non-profit, plus a member of a commercial lawn care company. This diversity with varying perspectives has proven to be an effective combination to move this program forward quickly capturing a multitude of ideas without the idea of the government trying to regulate the commercial lawn care industry.

Our Phase I NPDES permit requires DelDOT to meet a minimum 250,000 "impressions" about stormwater quality to the general public. We completed an agreement with the University of Delaware in developing a plan to assist the co-permitees in achieving the education requirements of the permit and making these efforts more effective and meaningful for New Castle County. Using that recommendations report, we hired a consultant to develop a targeted approach education campaign in an effort to increase the knowledge of target communities regarding MS4s, impacts of urban runoff on receiving waters, and potential BMP solutions for the target audience; change the behavior of target communities; and decrease the discharge of pollutants to the MS4 by engaging the public.

Public Events

Part of our public outreach effort is participating in public events. Because we have limited budget and staff, we focus on large, multi-day events where there is substantial foot traffic. The biggest event each year is the Delaware State Fair, where we participate for 10 days serving over 30,000 visitors through our building. Our theme in 2013 focused on the "Delaware Livable Lawns" project to reduce fertilizer runoff through smaller lawns and

container growing. We landscaped the interior of the building to mimic the Delaware Livable Lawns concept. The landscape display was a popular hands-on approach.

Public Participation/Involvement

Door Hanger

Our door hanger campaign has brought awareness to the public and allows them to be proactive in reporting illicit discharges in their neighborhood. When illegal substances are found in storm inlets through DelDOT inspections or are reported by the public, we distribute door hangers to the surrounding neighborhood. We have found this to be a very effective program for generating public awareness and public involvement. This typically generates phone calls to our office where we explain the program and direct them to our web site. In 2013, we distributed 58 door hangers New Castle County, 150 in Kent and Sussex County Phase II areas.

Illicit Discharge Detection and Elimination

Outfall Screening

Following the recommendations of the Center for Watershed Protection's IDDE Guidance Manual (2004), we began last year to revise DelDOT's IDDE protocols. An assessment of the chemical data from our previous dry weather screening activities has suggested that some of the parameters that we have measured, such as phenols and chlorine, are of limited value in detecting illicit discharges in the Phase II area. Therefore, beginning in 2013, we modified our protocols to include a suite of parameters more closely aligned with those recommended by the Center for Watershed Protection. This is described in detail in Section 3 and Appendix B.

In assessing the dry weather data, we also uncovered last year a need for a database for the inspections that will allow querying on water quality data. In 2013, KCI Technologies developed an IDDE database and website for data entry and queries.

Pesticide, Herbicide, Fertilizer

DelDOT's Roadside Environmental section manages PHF applications applied by contractors and DelDOT staff. The NPDES Program has the responsibility to develop programs and implement controls through training, policy changes resulting from research, development of SOPs, education, etc. to reduce the pollutants associated with their application and to track trends that can document anomalous spikes in usage or declines in usage due to implementation of programs.

We have implemented several pesticide reduction programs as described below:

1. Guardrail pilot study – DelDOT currently treats approximately 310 miles of guardrail with herbicide. We developed a program in conjunction with the University of Delaware to investigate methods to reduce the use rates of pesticides and carriers used to treat guardrail vegetation without compromising safety and aesthetics. We selected and applied several treatment methods along

several guardrail sections to compare the effectiveness, ease of implementation, aesthetics, cost and longevity. Treatments included weed control barriers, low-growing vegetation (low-grow fescue, Flight Turf® and zoysia grass), and hand-cutting existing vegetation. Herbicides will be used on treatment plots as a measure against non-chemical treatments. Zoysia grass has shown promise in contained areas such as medians. We are continuing our research in 2014 adding additional plots of Flight Turf and zoysia grass.

2. Guardrail inventory – Treating guardrail accounts for a significant percentage of DelDOT's herbicide treatment program. The NPDES Program saw guardrails as a relatively simple way to reduce herbicide usage. Our consultant inventoried all guardrails statewide and collected attribute data that included material under guardrail and surrounding landscape and environmental features. Our objective is to locate areas where alternative treatment measures (e.g. hand control, weed barrier, low-grow fescues) can be used in lieu of herbicides.

   We have an agreement with a consultant to maintain and update this statewide guardrail inventory. As we receive notification of new projects and review as-built plans for the addition of new guardrail, a list is compiled and sent to our guardrail consultant on a quarterly basis. This continuous process saves the department money by not having to repeat the entire statewide inventory every several years.

3. Record keeping – We are continuing to keep records of herbicide quantities to establish baseline herbicide usage. By tracking herbicide quantities we hope to be able to identify the cause of spikes or declines in usage and use the data to assess pesticide reduction programs we have implemented.

Construction Site Runoff

E & S Plan Compliance and BMP Performance

Erosion and sediment control at DelDOT construction sites falls under the purview of the Division of Transportation Solutions (DOTS). However, the NPDES Program, through its permit and consent decree, is responsible for ensuring E & S control compliance.

1. We are continuing to use consultant services to conduct the daily CCR construction duties in lieu of the contractor. This has improved compliance with the required weekly and rain event reporting. The consultant also has the authority to hire a third party contractor to correct E&S deficiencies if the prime contractor refuses.
2. DelDOT has developed an objective form for scoring E & S compliance on each construction project. Obtaining a passing score provides a monetary incentive to comply with the State regulations.
3. Sediment and Stormwater Regulations: The Governor's Surface Water Task Force recommended revision of the Sediment and Stormwater Regulations to address volume management, flooding, and plan review process improvement. Federal requirements for water quality improvement (e.g. TMDL) are being addressed as well. As a delegated agency, DelDOT is required to follow these regulations.

Pollution Prevention and Good Housekeeping for Municipal Operations

Street Sweeping Program

Under the current NPDES permit, DelDOT sweeps an annual 4:2:1 frequency on primary, secondary and tertiary roads. In order to assist DelDOT in quantifying the expected pollutant load reductions from all controls (e.g. sweeping) to meet the TMDL (Total Maximum Daily Load) and Waste Load Allocation goals, DelDOT tested the feasibility of using the AVLs to verify that the required sweeping frequency has been met, as well as obtain better estimates of pollutant load reductions resulting from sweeping activities. However, the AVL units failed to operate correctly.

In 2014, an alternative tracking method for street sweeping will be developed and implemented, using spreadsheets of streets to be swept and the Maximo work order system. The AVL data will be used for spot checks to ensure that the tracking tools are being used correctly. All DelDOT Maintenance Districts are now delivering sweeper wastes to DSWA landfills and keeping track of the amount of sweeper waste material delivered.

Vehicle Wash Plan

The use of the *Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards* manual, developed in July 2005, has resulted in designated locations for vehicle washing that are treated via a stormwater treatment train series of BMPs. We completed the last retrofit at the Harrington maintenance facility in summer 2010. We will update the plan in 2015.

Pollution Prevention Plans

To keep the PPPs current, we will begin doing an annual review of each plan to include new maps of facilities and drainage systems, new BMPs, and new staff responsible for PPP implementation.

Salt Plan

DelDOT's *Statewide Salt Best Management Practices for DelDOT's Maintenance Yards* has resulted in the purchase of salt structures to comply with storing salt under roof. Quarterly inspections and increased training through SWPP&MP videos and maintenance bulletin posters have also resulted in greater awareness of and compliance with the provisions of the salt plan by maintenance staff.

Storm sewer system inventory and inspection

Although not a permit requirement, we extended the storm sewer system inventory and inspection program to Kent and Sussex Counties. This program assists the Districts with maintenance and pollutant tracking statewide through the map viewer database.

Kent County is complete. We have one full time inspection team in Sussex County in an effort to complete the entire state on an accelerated schedule.

1. Public Education and Outreach

Requirement:

DelDOT shall implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of stormwater discharges on local water bodies and the steps that can be taken to reduce stormwater pollution. In addition, DelDOT shall determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

Performance/Measurable Goals:

- We continued our door hanger campaign to residents in subdivisions where an illicit discharge or illegal dumping activity was discovered or reported as part of our outreach program to residents. The front side of the door hanger lists the date and type of pollutant found and what water body affected. On the back, the door hanger describes stormwater pollution and guidelines to reduce pollution at the home or workplace (see Annual Report 2007, Volume 2 of 2, Figure 11- 3). In 2013 only one Potential Illicit Discharges was reported and investigated pertaining to dumping pet waste into the storm drain. 150 door hangers were distributed.
- Websites
  - DelDOT developed a stormwater quality website (www.deldot.gov/stormwater). A "Report a Problem" link allows the public to email or call to report illegal discharges or dumping and stormwater maintenance problems. We continually update the "Hot Topics" section on the home page. In 2013, Google Analytics reported an average of about 457 visits per month (range 324-648), up from 403 in 2012.
  - The Delaware Livable Lawns website had 949 visits in 2013.
- As part of the storm drain inventory and inspection, KCI Technologies is continuing to label each inlet with a storm drain marker that carries a water quality message.
- DelDOT distributed several hundred activity booklets to schools and the general public at public events that highlight stormwater pollution, the water cycle and watersheds.
- Delaware Livable Lawns

  Phase I of the Delaware Livable Lawns program targets commercial lawn care companies, recognizing them for environmentally friendly lawn care plans (e.g. soil tests, organic products, low or no nitrogen fertilizers, only fall applications, annual reporting, distribution of educational materials, etc.) while also meeting homeowners' needs and educating them on best practices. The goal of the Delaware Livable Lawns initiative is to reduce fertilizer runoff from residential lawns by changing watershed residents' lawn care practices. To date, six companies have applied for certification and have been accepted.

  Phase II of the program will target residential homeowners. Our intention is to hire a consultant in the summer of 2014 to conduct several education outreach programs per

our Phase I MS4 SWPP&MP including: pesticide, fertilizer, and herbicide reduction, pet waste, motor oil, and residential car washing.

- DelDOT partnered with the University of Delaware computer science lab and the art department in the development of interactive computer games. The computer science semester course consists entirely of students working in teams to develop interactive touch screen games with the 'Delaware Livable Lawns' theme for use at the Delaware State Fair.
- As part of the storm drain inventory and inspection in the Dover and Camden/Wyoming area of Kent County, KCI Technologies is continuing to label each inlet with a storm drain marker that carries a water quality message.
- We participated in and/or distributed educational materials including bookmarks, brochures, calendars and promotional give-a-ways, that carry a water quality message, at the following public events and conferences:
  - Make-a-Splash festival held in April 2013. More than 700 fourth grade students from ten elementary schools participated.
  - Delaware State Fair held in July 2013. NPDES staff participated for 10 days and evenings.
- Water Words that Work: Between now and 2016, DelDOT and New Castle County are required to carry out a variety of education and outreach activities to increase the knowledge of target communities regarding MS4s and attempt to change the behavior of these communities with the goal of decreasing the discharge of pollutants to the MS4.

  To satisfy this requirement, DelDOT and New Castle have elected to conduct an education and outreach effort using consultant services aimed at four targeted communities: 1) used motor oil; 2) household hazardous waste; 3) residential car washing; and 4) public reporting of illicit discharges. An education and outreach effort aimed at these four communities will be conducted using several types of strategies. A pre- and post-survey will be conducted to evaluate program effectiveness.
- DelDOT partnered with the University of Delaware computer science lab and the art department in the development of interactive computer games. The computer science semester course consists entirely of students working in teams to develop interactive touch screen games with the 'Delaware Livable Lawns' theme for use at the Delaware State Fair.
- DelDOT staff has been active participants in the founding and development of the Delaware Association for Environmental Education (DAEE). The DelDOT NPDES Environmental Scientist serves on the Board of Directors, assists the group with its communications and outreach, and serves on the planning committee for DAEE's annual statewide conference.
- The DelDOT Environmental Scientist also serves as a member of the Communications and Outreach committee of the Delaware Chesapeake Bay WIP Program. The

committee formed in 2012 and is providing water quality education in the Chesapeake watershed through social media and public events.

- NPDES staff served as judges in the Technology Students Association (TSA) April 2013 State Conference.

2. Public Participation/Involvement

Requirement:

DelDOT shall include the public in developing, implementing and reviewing the stormwater program. DelDOT shall make opportunities for members of the public to participate in program development and implementation and will comply with all applicable State, Tribal, and local public notice requirements. DelDOT shall determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

Performance/Measurable Goals:

A. Budget Process

As part of the DelDOT budget process the community has the opportunity to suggest projects for the following year.

B. Adopt-a Highway

Adopt-a-Highway is a cooperative program between DelDOT's Division of Public Relations and volunteers to reduce litter along State roadways and subsequent discharge to waters of the State. This program supplements efforts by DelDOT's maintenance forces to control litter. This has a water quality benefit because it reduces floatable debris entering streams. The volunteer groups are required to collect litter a minimum of twice per year and submit activity reports following each cleanup for inclusion in the program. Each group maintains approximately two miles of roadway. DelDOT maintains an Adopt-a-Highway website **(**www.deldot.gov/information/community_programs_and_services/) and submits press releases to solicit volunteers. There are currently 849 volunteer groups (577 in Kent and Sussex Counties) statewide maintaining 1,698 lane miles.

C. Litter Control Programs

DelDOT held its ninth annual "Imagine a Litter Free Delaware" cleanup day along roads, highways and community areas on October 19, 2013. Public participation was solicited via newspaper ads and DelDOT's website.

D. Door Hanger Campaign

Since it is often difficult or impossible to catch someone in the act of improperly disposing of yard waste, oil, paint, etc. into the storm drain, DelDOT began a door hanger campaign to residents in subdivisions where an illicit discharge or illegal dumping activity was discovered or reported as part of our outreach program to residents. This effort solicits public participation to anonymously report illegal dumping and serves as a "neighborhood watch."

The front side of the door hanger lists the date and type of pollutant found and what water body affected. On the back, the door hanger describes stormwater pollution and guidelines to reduce pollution at the home or workplace (See Annual Report 2006, Figure 2-1). In 2013 one Potential Illicit Discharges was investigated, and 150 door hangers were

distributed in Kent and Sussex County Phase II areas in response to pet waste in the storm sewer

E. Stream Watch

Delaware Stream Watch is a grassroots volunteer waterway protection program focusing on citizen involvement through monitoring, education, and advocacy. Stream Watch is co-sponsored by the Delaware Nature Society and DNREC, representing a unique partnership of government, environmental interests, and industry.

The Stream Adoption program allows people and groups of all ages to adopt and monitor a local water body of their own choosing. Typical assessments include visual, macroinvertebrate and chemical surveys. Interested participants can download a form from the Delaware Nature Society website.

F. Tributary Action Teams

The Delaware Department of Natural Resources and Environmental Control coordinate teams of citizens known as Tributary Action Teams (TAT), who develop strategies for reducing water pollution in impaired watersheds. DelDOT staff participated in TAT meetings of the Christina River and Appoquinimink River in New Castle County, St. Jones River and Murderkill River in Kent County, and the Nanticoke River, Broadkill River, and Inland Bays in Sussex County to assist in the development of Pollution Control Strategies (PCS) for those watersheds and to determine the effect of TMDL implementation on DelDOT projects.

G. Website

DelDOT developed a stormwater website (www.deldot.gov/stormwater). A "Report a Problem" link allows the public to email or call to report illegal discharges or dumping and stormwater maintenance problems (www.deldot.gov/stormwater/report_a_problem.shtml).

3. Illicit Discharge Detection and Elimination

Requirements:

- A storm sewer system map, showing the location of all outfalls and the names and locations of all waters of the United States that receive discharge from those outfalls.
- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal or local law) on non-storm water discharges into the MS4, and appropriate enforcement procedures and actions.
- A plan to detect and address non-storm water discharges, including illegal dumping into the MS4.
- The education of public employees, businesses and the general public about the hazards associated with illegal discharges and improper disposal of waste.
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

Performance/Measurable Goals:

During 2013, KCI Technologies, Inc., and their subconsultant Century Engineering, Inc. (CEI), performed MS4 inventory and inspection tasks for DelDOT throughout the state to ensure compliance with the NPDES Phase I and Phase II requirements for illicit discharge detection and elimination. This work was conducted under Agreement 1591. In 2013 much of the effort of this agreement was focused on completing system maps for Sussex County, as well as performing inspections of new structures, reinspections and screening of the MS4 in both the Phase I and Phase II permitted areas. These consultants also perform annual BMP inspections for DelDOT and conduct IDDE evaluation and dry-weather screening of outfalls. The IDDE screening and investigation work is conducted under Agreement 1613 with KCI Technologies.

Specific progress during calendar year 2013 included the following:

A. Inventory and Mapping

As reported in previous years, we completed the initial inventory and inspection of all parts of the DelDOT-owned stormwater conveyance system in the Phase II urbanized area in 2007. Stormwater ponds and other BMPs also have been inventoried and receive annual inspections. During the inspection process, each structure was opened and evaluated for material construction and condition, and physical measurements were made. Digital photographs of the structure and each associate pipe were taken and connectivity between structures verified. At the completion of the inspection process an *"Only Rain Down the Storm Drain"* marker was placed on each structure to encourage residents to not dispose of waste down the inlet. If a structure is found to have a material deficiency, a Maintenance Work Order (MWO) is generated and forwarded to DelDOT. All of these data are incorporated into a comprehensive GIS database, designed for DelDOT by KCI Technologies, which enables users to view the entire stormwater system, corresponding inspection data, plans and photographs.

In 2013, the teams inventoried and inspected DelDOT storm systems in one subdivision and along 512 miles of non-subdivision roadways, for a total of 17,576 structures in Kent and Sussex Counties (Table 3-1).

Table 3-1. 2013 inventory and inspection totals for the MS4 in Kent and Sussex Counties.

Month (2013)	Subdivisions	Non-Subdivision Roadway Miles	Structures
January	0	24.6	893
February	0	25.1	1,024
March	0	85.3	2,331
April	1	32.0	1,134
May	0	83.1	4,011
June	0	33.5	880
July	0	39.7	1,542
August	0	19.2	883
September	0	43.1	1,498
October	0	48.1	1,243
November	0	44.3	1,128
December	0	34.0	1,009
TOTAL	**1**	**512.0**	**17,576**

We are attempting to complete Sussex County mapping and inspections by mid-2015. A complete summary of work performed by KCI and CEI through the end of calendar year 2013 is included in this report as Appendix A.

The mapping requirements of the Phase II Permit are met through an existing GIS map viewer developed for the storm sewer system inventory statewide. The viewer is available to all DelDOT employees with access to the intranet. This satisfies the requirements of 40 CFR Part 122.21(f)(7) or Part 12.34.(b)(3)(i). This statewide map shows the location of all outfalls, the names and location of all waters of the United States that receive discharges from those outfalls, condition assessment data, and photographs.

In 2013, KCI developed a mobile application for the web-based map viewer. The DelDOT NPDES Mobile Application is compatible with Android/iOS mobile browsers and with Google Chrome on PC's (http://deldot.kci.com/mobile/). The mobile application assists DelDOT maintenance staff by allowing use of the phone's GPS function to see their location in relation to MS4 or BMP structures.

Updated maps of outfalls and BMPs in Kent and Sussex Counties (in Adobe Acrobat format) are included on the disk with this annual report.

B. Outfall Screening in Urbanized Areas of Kent County

Dry weather screening of all outfalls in the Phase II permitted area of the state was completed in 2007 (see the 2007 Annual Report). Thus we have fulfilled the permit requirements.

Each new outfall that is inventoried and inspected is screened for dry weather flow. In calendar year 2013, a total of 1,417 DelDOT-owned outfalls were evaluated through inventory, inspection and re-inspection tasks in Kent and Sussex Counties. Two illicit discharges were confirmed. Each was investigated by KCI crews, and follow-up action was taken where appropriate (Table 3-2). More details about the circumstances, location and investigation of each incident can be found KCI's 2013 Outfall Screening Report (Appendix B).

Table 3-2. Summary of illicit discharges found in New Castle Co. during calendar year 2013.

Incident ID No.	County	Source	Comment
2013-1	Kent	Dumping	Confirmed pet waste in MS4; door hangers distributed.
2013-70	Sussex	Illegal wash water hook-up	Notice of Violation sent to property owner.

C. Prevention of Illicit Discharges and Illegal Dumping

Since it is often difficult or impossible to catch someone in the act of improperly disposing of yard waste, oil, paint, etc. into the storm drain, DelDOT has for several years conducted a door hanger campaign to residents in subdivisions where an illicit discharge or illegal dumping activity was discovered or reported. This campaign is part of our outreach program to residents. It solicits public participation to anonymously report illegal dumping and serves as a "neighborhood watch."

The front side of the door hanger lists the date and type of pollutant found and what water body affected. On the back, the door hanger describes stormwater pollution and guidelines to reduce pollution at the home or workplace. In 2013, we distributed 150 door hangers in response to reports of pet waste dumping The Orchards subdivision in Kent County.

In an effort to encourage Delaware citizens to dispose of hazardous household materials properly, the DelDOT NPDES Section helps publicize Delaware Solid Waste Authority (DSWA)'s Household Hazardous Waste (HHW) Collection Program. A link to the DSWA's HHW collection events is posted on the DelDOT Stormwater website, and information about the dates and locations of collections is distributed at public events.

Another public outreach program aimed at eliminating illegal dumping of trash and hazardous wastes along the state's highways is the Delaware "TrashStoppers" Program: www.awm.delaware.gov/Enforcement/Pages/TrashStoppers.aspx. The public is asked to notify DNREC about any roadways or streets used for illegal dumping so the sites can be put under surveillance by digital cameras to aid in identifying trash dumpers. The public is

also asked to identify the trash dumpers who are caught in the act in photos posted on the DNREC web site as part of the TrashStoppers campaign. In addition to publicizing the program, DelDOT staff forward reports of illegal dumping along state roads to DNREC.

Hotline numbers for reporting illegal discharges or dumping into the MS4 are posted on our stormwater website, www.deldot.gov/stormwater/report_a_problem.shtml, as required by the permit. In addition, these numbers are included in other stormwater educational materials that are distributed.

4. Construction Site Stormwater Runoff Control

Requirement:

The permittee shall continue to implement and enforce a program to reduce, to the maximum extent practicable, the discharge of pollutants from construction sites.

Performance/Measurable Goals:

A. Delegated Agency

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. The delegation is reviewed every three years. DelDOT's current delegation from DNREC extends through June 30, 2015. The components of the Delaware Sediment and Stormwater Regulations delegated to DelDOT are: review and approval of construction plans, review of construction sites, and inspection and maintenance of completed stormwater management facilities. Satisfactory performance of the delegated responsibilities will be considered compliance with this component of the SWPP&MP (see Annual Report 2003, Appendix F).

Enforcement of construction site erosion and sediment controls is accomplished through each construction contract. Section 110, Erosion, Sediment Control and Water Pollution, of the Delaware Department of Transportation Standard Specifications lays out a progressive step-wise approach to gaining compliance with approved plans, regulations, and laws. This section was significantly rewritten to demonstrate positive movement toward improving the Erosion & Sediment Program (See Annual Report 2007, Appendix F). In 2013 we are continuing to use consultant services under agreement with two (2) firms, relieving the Contractor of CCR inspection duties.

1. Instead of the contractor providing the CCR, we executed agreements to hire two consulting firms to perform the weekly CCR inspections. This has improved compliance with the required weekly and rain event reporting. The consultant also has the authority to hire a third party contractor to correct E&S deficiencies if the prime contractor refuses.
2. Required pre-construction meeting specifically designed to address E&S compliance.
3. Better defined division of responsibilities among site reviewers, contractor engineer, project engineer, stormwater engineer.
4. Strengthened available actions to gain compliance.
5. Environmental Compliance Supervisor – This position at DelDOT has the responsibility to regularly track and review the construction site reviews submitted on a weekly basis from Notice of Intent (NOI) to Notice of Termination (NOT) and annually assess CCR's performance. The purpose of the Performance Evaluation Program is to better assure that CCRs considered for contract either possess, or will likely possess at the time

contract performance is set to begin, all qualifications necessary to successfully complete the project on time. Getting the contractor CCRs to submit timely reports to DelDOT had been inconsistent. We therefore determined that annual reviews may increase reporting compliance. The implementation of a mandatory, standardized system of evaluating CCR's performance is expected to yield consistency, objectivity, fairness, and accountability.

We executed an agreement with two consulting firms to perform the weekly CCR inspections in lieu of contractor provided CCRs as described in number 1 above. This has improved compliance with the required weekly and rain event reporting. The consultants also have the authority to hire a third party contractor to correct E&S deficiencies if the prime contractor refuses.

The CCR reporting form was changed as a result of our delegation review with DNREC. Added were slots for the plan expiration date, rain event box, and a page dedicated to Pollution Prevention. All uncorrected deficiencies must show a reason for remaining incomplete. A monetary incentive is offered to contractors who score a 70 or greater on the CCR reporting form.

DelDOT staff involved with erosion and sediment issues (E & S inspections, designing stormwater systems or review of stormwater plans) are required to complete DNREC's 3-day Certified Construction Reviewer (CCR) course.

B. Design and Construction of BMPs

DNREC delegates to DelDOT the initial plan review and approval of proposed designs for land disturbances greater than 5,000 square feet.

Approximately 300 design plans are reviewed each year by the Stormwater Section for their adherence to the Delaware Sediment and Stormwater Regulations. About a third of those projects are residential subdivision and commercial plans. DelDOT's subdivision manual regulates development in Delaware that will be turned over for State Maintenance. Before a subdivision street is accepted, DelDOT conducts a final inspection to ensure the structural integrity of the stormwater system. A pipe video inspection using Closed Circuit Television (CCTV) is performed.

5. Post-Construction Stormwater Management in Newly Developed Areas and in Redeveloped Areas

Requirement:

The permittee shall continue to implement and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb areas greater than or equal to one acre, including projects that disturb less than one acre that are part of a larger common plan of development, and that discharge to the storm sewer system.

Performance/Measurable Goals:

A. Delegated Agency

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. Satisfactory performance of the delegated responsibilities, through triennial reviews, will be considered compliance with this component of the SWMP.

B. Inspection and Maintenance of BMPs

DelDOT has an annual requirement to inspect its constructed best management practice (BMP) devices, structures and stormwater management facilities (Appendix F). 128 inspections were completed in 2013 in Kent and Sussex Counties.

The purpose of this statewide program is to:

- inventory, inspect, measure water quality performance and maintain functionality of DelDOT's stormwater;
- identify and treat noxious and/or invasive species;
- maintain a comprehensive database;
- coordinate with the Districts on the submittal of work orders as needed; and
- provide technical assistance and guidance to the Department regarding appropriate maintenance strategies for stormwater BMPs.

A field inspection manual and forms were developed to allow staff to perform effective field inspections, to evaluate BMP performance, and to identify maintenance requirements. The procedures outlined in this manual assist DelDOT with decisions on inspection, maintenance, repair and retrofit of BMP facilities. In calendar year 2013, 477 BMPs were inspected statewide. Please refer to Appendix F for a list of all DelDOT constructed facilities. 27 of these BMPs were in the Phase II permitted area (Table 5-1).

Overall performance and functionality are graded A-D (Table 5-2). Table 5-3 describes the 2013 rating summary by each maintenance district. 92% of the BMPs we inspected statewide in 2013 have an A or B rating, which indicates that there are no issues that affect water quality, and that maintenance above and beyond the routine mowing and trash removal is not necessary.

BMPs are evaluated and placed on contract for maintenance as needed and as annual funding permits. Maintenance is performed either by DelDOT District staff or through contractors (general contractors, contractors specializing in noxious and invasive species control, or in maintenance of specific manufactured BMP types). Noxious and invasive species are managed either through DelDOT Roadside Environmental or District staff, or placed under contract.

Table 5-1. BMPs inspected in the Phase II permit area in 2013.

BMP NO.	COUNTY	MAINT. DISTRICT	WATERSHED	BMP_TYPE	YEAR_BUILT	ADC_GRID
5	Kent	8 - Cheswold	St. Jones River	Wet Pond	2008/05/21	17B03
10	Kent	8 - Cheswold	Leipsic River	Dry Pond	1990/11/07	11F11
17	Kent	8 - Cheswold	Little Creek	Wet Pond	2003/04/30	18A04
18	Kent	8 - Cheswold	Little Creek	Wet Pond	2003/04/30	18B04
77	Kent	8 - Cheswold	St. Jones River	Wet Pond	2001/02/16	17A04
81	Kent	7 - Magnolia	St. Jones River	Wet Pond	2002/05/15	24A06
167	Kent	8 - Cheswold	Little Creek	Wet Pond	1991/11/19	17H01
176	Kent	8 - Cheswold	St. Jones River	Sand Filter	2002/09/11	17H03
177	Kent	8 - Cheswold	Leipsic River	Dry Pond	1990/11/07	11D09
197	Kent	8 - Cheswold	St. Jones River	Biofiltration	2001/04/03	10K12
203	Kent	7 - Magnolia	St. Jones River	Wet Pond	1997/10/05	17G09
204	Kent	7 - Magnolia	St. Jones River	Wet Pond	1997/10/05	17H08
205	Kent	7 - Magnolia	St. Jones River	Wet Pond	1997/10/05	17J08
206	Kent	7 - Magnolia	St. Jones River	Wet Pond	1997/10/05	17J08
207	Kent	7 - Magnolia	Little Creek	Wet Pond	1997/10/05	18A07
209	Kent	7 - Magnolia	Little Creek	Wet Pond	1997/10/05	18A07
210	Kent	8 - Cheswold	St. Jones River	Wet Pond	1997/09/12	17B02
211	Kent	8 - Cheswold	St. Jones River	Wet Pond	1997/09/12	11A13
212	Kent	8 - Cheswold	St. Jones River	Wet Pond	1997/09/12	11B12
216	Kent	8 - Cheswold	St. Jones River	Biofiltration	1998/09/08	11E13
312	Kent	8 - Cheswold	St. Jones River	Biofiltration	1998/09/08	11E13
328	Kent	8 - Cheswold	St. Jones River	Biofiltration	1998/09/08	11E13
401	Kent	8 - Cheswold	Little Creek	Filter Strip	2005/03/18	17J01
402	Kent	8 - Cheswold	Little Creek	Biofiltration	2005/03/18	17K01
403	Kent	8 - Cheswold	Little Creek	Biofiltration	2005/03/18	11H13
439	Kent	7 - Magnolia	Little Creek	Wet Pond	1990/11/07	18A04
487	Kent	8 - Cheswold	Little Creek	Filter Strip	2005/03/18	11H13

Table 5-2. DelDOT's stormwater BMP rating system.

Rating	Description
A	**No Performance Issues** BMP with no issues affecting performance.
B	**Minor Maintenance** BMP with minor maintenance required; repaired by DelDOT Maintenance District or third-party herbicide contractor.
C	**Major Maintenance** BMP with major maintenance required; repaired by third-party contractor, with oversight by DelDOT NPDES Engineer.
D	**Retrofit** BMP with retrofit requirements; BMP is failing; needs to be redesigned or rebuilt with input from DelDOT Stormwater Quality Program.

Table 5-3. 2013 BMP Inspection Ratings Summary.

	TOTAL NO.	A	B	C	D
NORTH DISTRICT	**162**	128	27	7	0
CANAL DISTRICT	**187**	89	77	21	0
CENTRAL DISTRICT	**29**	27	1	1	0
SOUTH DISTRICT	**99**	84	8	7	0
TOTAL NO.	**477**[1]	**328**	**113**	**36**	**0**

[1] *This table reflects annual routine inspections by KCI Technologies in 2013. BMPs with existing work orders or on contract for maintenance were inspected by DelDOT staff prior to contracted work.*

In addition to the BMPs identified for noxious and invasive species, DelDOT identified stormwater BMPs in need of maintenance. In 2013 eight BMPs in Kent & Sussex Counties identified as requiring work above and beyond the routine, preventive maintenance activities (Table 5-3). These are added to the log of BMPs that will be maintained by a Contractor and completed as funding is available. BMP maintenance is prioritized based on potential water quality impacts.

For the BMPs in the Phase II Area, a maintenance contract is in development to return the facilities to their original design condition. Many of the facilities have vegetation that has been unmanaged and needs to be cleared to improve access.

6. Pollution Prevention and Good Housekeeping

Requirement:

DelDOT shall develop and implement an operation and maintenance program with a goal of preventing and/or reducing discharges of pollutants associated with our operations as described in the Application page 13, Permit page 10, Part II.A.6.

Performance:

The following sections describe ways the Department practices source control at its facilities and how we manage and minimize transport of pollutants associated with road repair and maintenance activities.

A. Road Repair and Maintenance

There are various ways in which the Department maintains the roadways that help reduce the discharge of pollutants. Routine maintenance and improvements reduce the pollutants coming from the roadway in several ways. The patching of potholes and sealing of cracks reduces the amount of pavement that will break away and be transported into the nearest waterway. Repairing potholes also decreases the wear and tear on vehicles, thus reducing the fluids, miscellaneous sediments, and tire particles that could be dislodged from vehicles. Money for roadway maintenance activities is programmed into the District's Maintenance funds.

All road projects are required to follow the Delaware Sediment and Stormwater Regulations. Projects designated as minor, medium or major must have an approved sediment and stormwater management plan. Medium and major projects must also have a site reviewer who is a Certified Construction Reviewer (CCR).

DelDOT staff and contractors continue to implement the practices set forth in Section 110 of the Standard Specifications for Erosion, Sediment Control and Water Pollution, modified in 2007. This Section addresses practices to control stormwater runoff from soil disturbance activities, spill prevention, material management and good housekeeping practices. Details may be found in Section 4 of this report (Construction Site Stormwater Runoff Control).

DelDOT follows the manual of Standard Operating Procedures developed for responding to and managing spills on the roadways classified as **Category E, Type E-1** incidents (Traffic Hazards, Fuel, Oil or other HAZMAT spills on or near the roadway). Most DelDOT vehicles have been equipped with spill kits in the event of an accidental spill or as a first responder to a vehicle accident, and maintenance employees are trained annually on spill response and protection of water quality.

B. Sweeping Program

DelDOT's sweeping program reduces pollutants by maintaining the cleanliness of the roadway. The street sweeping program includes the roadways, shoulder, intersections, and toll plaza lanes on primary, secondary and tertiary roads. The roadways are swept on the following cycle: roads with ADT (Average Daily Traffic) greater than 20,000 are swept 4 times a year, roads with ADT between 5,000 and 20,000 are swept 2 times a year and roads with ADT less than 5,000 are swept once a year.

DelDOT has now installed automatic vehicle location (AVL) devices on all sweeper vehicles. This will assist the Department in verifying that the required sweeping frequency has been met. In addition, each Maintenance Area will be required, beginning in 2014, to document streets swept through spreadsheet check lists and/or the Maximo work order system.

To calculate pollutant removal rates from roadways, DelDOT weighs sweeping material. A total of 357 tons of street sweeping residuals were collected from Kent County roadways in 2013. Using the formulas recommended by the Chesapeake Urban Stormwater Group (memo "Street Sweeping/BMP Era Recommendations, dated 3/1/2011), the estimated pounds of nutrients removed from runoff in were calculated and are presented in Table 6-1.

Table 6-1. Estimates of nitrogen and phosphorus removed from Central District (Kent County) and South District (Sussex County) roadways by street sweeping. The weights reflect tons of material delivered to the DSWA landfill. Calculations are based on based on the recommendations published in the Chesapeake Urban Stormwater Workgroup memo, "Street Sweeping/BMP Era Recommendations," dated 3/1/2011. A factor of 0.7 was used to calculate dry weight.

	Tons of Waste Collected	TN Removed (lbs.)	TP Removed (lbs.)
Central District	357	1,250	500
South District	142*	497	199

** South District began landfill disposal of sweeper wastes in October 2013, so the data shown here represent only a partial year of sweeping in Sussex County.*

C. Litter Program

DelDOT's Litter Program reduces the discharge of floatables to the MS4.

<u>DelDOT maintenance staff and prison crews</u>

DelDOT's maintenance staff and Department of Corrections crews help reduce the discharge of floatables to the MS4 through routine pick up of trash and debris from the roadways, medians and right-of-way. DelDOT staff is also responsible for removal of dead animals and clean up of illegal dump sites from the roadside.

<u>Adopt-a-Highway</u>

Adopt-a-Highway is a cooperative program between DelDOT's Division of Public Relations and volunteers to reduce litter along State roadways and subsequent discharge to waters of the State. This program supplements effort by DelDOT's maintenance forces to control litter. The volunteer groups are required to collect litter a minimum of twice per year and submit activity reports following each cleanup for inclusion in the program. Each group maintains approximately two miles of roadway. DelDOT

maintains an Adopt-a-Highway website (www.deldot.gov) and submits press releases to solicit volunteers. There are currently 849 volunteer groups statewide (577 in Kent and Sussex Counties) maintaining 1,698 lane miles.

Roadside Clean-up

DelDOT held its eighth annual "Imagine a Litter Free Delaware" cleanup day along roads, highways and community areas on October 19, 2013.

TrashStoppers

DNREC's campaign is an outward appeal to the public for help in stopping illegal trash dumping along Delaware roadways to stop illegal dumping of garbage, debris, and hazardous wastes. The "TrashStoppers" program relies upon the placement of numerous surveillance cameras.

D. Snow and Ice Program

Effective salt management practices can help reduce the amount of road salt that enters the environment. This translates into savings for DelDOT, and minimization of impacts of salt on our environment. DelDOT has many practices in place, both for the roadway and all maintenance facilities.

DelDOT has developed and instituted advanced snow fighting practices that began during the 2004-2005 winter season to include ground speed spreader controls, anti-icing, pre-wetting, and plow balance valves. These advanced techniques in snow and ice removal help DelDOT meet its goal of improved service to customers, reduce the impact to the infrastructure, and conserve salt which helps meet the goals of the NPDES Program by reducing the impact on the environment:

- Ground speed spreader controls provide accurate control of material usage.
- Anti-icing is the application of liquid deicers (Salt Brine) to road surfaces prior to a precipitation event to prevent the formation or development of bonded snow and ice. The Department uses 6000 gallon tanker trucks and 1300- and 1800-gallon capacity units that slide into the bed of a dump truck.
- Pre-wetting adds moisture to salt to "jump start" the melting action of the salt and causes the salt to stick to the road and prevent scatter or bouncing.
- Plow balance valves decreases the amount of weight that the plow cutting edge bears on the road surface decreasing damage to the road surface.

Salt application rates can vary depending on storm conditions, but the goal is 100 - 400 pounds of salt per lane mile as recommended by AASHTO. The rate is achieved by calibrating the equipment annually. Maintenance staff received training by Certified Power on proper use of the ground speed spreader equipment.

All salt stored at the maintenance facilities is under roof. Only during loading and unloading does the potential exist for salt to enter the stormwater system. DelDOT is following the salt management practices established by the "Statewide Salt Best Management Practices for DelDOT Maintenance Yards" plan developed for area maintenance facilities (see Annual Report 2004, Appendix U).

E. Stormwater Conveyance Systems

Maintenance of the stormwater conveyance system ensures proper functioning of the stormwater system and BMPs and thereby reduces the pollutants that are carried to nearby waterways. Money for this is programmed into the Districts' Maintenance funds. The MS4 and BMP inspections performed for DelDOT by KCI Technologies and Century Engineering continually generate and prioritize maintenance work orders.

This maintenance work includes three components:

- *Open system drainage* – General work to control erosion, as well as cleaning and reshaping of ditches. Stabilization of ditches reduces the amount of sediment that enters the local stream and waterways.
- *Closed system drainage* - Work performed on the components themselves, including general maintenance or replacement. This includes tasks such as drainage pipe repair and cleaning, catch basin/manhole repair and maintenance, and general maintenance on stormwater detention ponds.
- *Ponding problems* - Draining water off the roadways. This is usually the result of calls from citizens after a rain event.

F. Roadside Vegetation Management

All herbicide applications that are applied to DelDOT rights-of-way by contract applicators are reviewed prior to the award to the lowest bidder to insure that selected herbicides are labeled for the intended use, and when feasible, an herbicide is selected that can be applied at a low-use rate. This review frequently reduces the total load of herbicide applied to DelDOT's rights-of-way.

DelDOT does not routinely fertilize its roadsides. The only nutrients applied to DelDOT's rights-of-way come as a result of leaving grass clippings on the ground after mowing. Degradation of this vegetative material results in the slow release of organic constituents, which are mineralized to plant nutrients by microorganisms and made available to turf grasses. This natural process results in minimal leaching of nutrients. Also this practice results in minimal surface runoff of nutrients from ground with a slope of 3 horizontal to 1 vertical or less.

Fertilizers are used in establishing turf grasses from seed on freshly prepared bare ground. This is generally done under contract with a firm using a hydroseeder. DelDOT's specifications require that 50% of the nitrogen product be a slow release form of ureaformaldehyde. The amount of nitrogen applied is 78 kg/ha. Phosphorous pentoxide is applied at 47 kg/ha of available P that is the sum of water soluble and citrate-soluble phosphate. Potassium oxide is applied at 31kg/ha of water soluble potash. In all cases areas that are seeded are covered with a recommended mulch.

Pesticides applied on DelDOT's rights-of-way are done according to label recommendations that are on the product and filed with EPA at the time of product registration. Pesticides applied on DelDOT's rights-of-way are done by contractors that are certified Delaware pesticide applicators. DelDOT employees that apply pesticides to DelDOT's rights-of-way are certified Delaware pesticide applicators or work under the supervision of a DelDOT

employee that is a certified Delaware pesticide applicator. Typically, the only pesticides applied by DelDOT fall under the category of herbicides. DelDOT, however, may use other pesticides such as insecticides under certain circumstances.

DelDOT employees take required training courses that serve as credit toward renewal of their Delaware pesticide applicators license. Roadside Environmental Specialists attend conferences and working sessions on pest control technologies that are open to all DOT employees. Opportunities to use reduced amount of pesticides by using new low rate pesticides, adjuvants or surfactants that can enhance efficacy of pesticides and thus reduce rate, or alternatives to chemicals that are cost effective and efficacious are often topics of various sessions these specialists attend.

The following are active programs being initiated as part of the NPDES pesticide reduction strategy:

- *Guardrail Inventory* – DelDOT has the responsibility of maintaining a 4' clear zone around the guardrail for both public safety and structural integrity via mowing, hand trimming and herbicides. We executed an agreement with Wallace Montgomery & Associates, LLP in May 2008 to inventory all guardrails statewide. The project was completed in June 2009 and inventoried 310 guardrail miles. Attributes collected included material under guardrail, guardrail type, surrounding environmental features and identification of sensitive/no spray zones. The inventory and attributes collected will be used in development of a pesticide reduction strategy to limit the use of herbicides, particularly around environmental sensitive areas (e.g. streams, wetlands, drinking supply, etc.).

  Since DelDOT is continually upgrading, replacing, or adding new guardrail, we executed a new agreement to update and maintain DelDOT's existing guardrail inventory database. The consultant will compile a field-verified inventory of the new and modified guardrail sections on all DelDOT-maintained roadways in Delaware, to include GPS location data for the beginning and end of each section. At least twice per year, DelDOT's NPDES Section will provide information to the consultant on the locations of new guardrail installations. These will be integrated into the existing guardrail inventory database.

- *Guardrail Vegetation Management study* – DelDOT and the University of Delaware developed a controlled research study to test the effectiveness of treatment types under guardrail for weed control. Two types of weed block material, asphalt, low-grow fescue, zoysia seed and sod, and natural growth with periodic trimming will be monitored against a control. The results of this study will determine if these materials are effective at reducing herbicide application and can be used in specific locations such as environmental sensitive areas and drinking water supply reservoirs. We have extended this study through at least the next growing season to collect additional data on weed block materials and to test new plots of zoysia grass. An article summarizing the study and major results to date was published in the April 2013 *Roads and Bridges* magazine and is included with this report as Appendix C.

- *Training* – In addition to the required training for pesticide license renewal, DelDOT holds or attends periodic training to further educate staff. In 2013, DelDOT Roadside Environmental staff attended the following workshops:
  - Annual Pesticide Conference
  - 2013 Arborist and Tree Care Seminar
  - Summer Turf and Nursery Expo
  - National Roadside Vegetation Management Association Annual Conference
- *Contract language* – Since DelDOT outsources most of the herbicide spraying, DelDOT has strengthened its herbicide contract language to reduce the environmental impact of herbicide treatment. We now require contractors to:
  a. Use an EPA-approved drift control agent as part of the mix.
  b. Use only formulations of glyphosate with a full aquatic label.
  c. Be aware of the locations of "Sensitive" or "No spray" zones and avoid applications within the limits of these areas. These zones will be identified through the guardrail inventory and made available to the contractor.
- *Record keeping and pesticide usage* – Contractors and DelDOT applicators are required to submit records of spraying activities to DelDOT's Environmental Roadside Section. The NPDES Program tracks and reports herbicide quantities to establish herbicide usage. By tracking herbicide quantities we will be able to identify the cause of spikes or declines in usage and use the data to assess pesticide reduction programs we have implemented. Pesticide quantities applied in 2013 are provided in Table 6-2.

G. Spill Prevention and Response on Roadways

DelDOT's Transportation Management Center (TMC) coordinates operations and shares information among its own personnel as well as various other transportation and public safety-related agencies, serving as the transportation interface among all such agencies in the state. They operate 24-hours per day/7 days per week. The TMC serves as the central communication point for DelDOT during major incidents, special events, and emergencies, and coordinates transportation management activities with other agencies. The TMC has special instrumentation that has been used to develop incident management capability.

The type of incident detected or called in has a direct effect on the notification process and steps that must be taken in order to be able to respond, assist, and document the incident in an expeditious manner. Incidents have been classified into one of seven categories, and then into sub-categories that further specify the type of incident that has occurred. These categories are listed below:

Category A: Accidents (Emergency)
Category B: Vehicle Fire (Emergency)
Category C: Disable Vehicles (Emergency)
Category D: Police Activity (Emergency)
Category E: Traffic Hazards (Emergency)
Category F: Roadway and Signal Operations (Traffic)
Category G: Delay or Congestion (Traffic)

Table 6-2. Total Pesticides Applied, Statewide 2013

Product Name	EPA Reg. No.	App. Method	Quantity	Unit of Measure
41-A	exempt	Land Based Sprayer	84.422	lbs.
AC820	Exempt	Land Based Sprayer	2.650	gals.
Aquaneat	228-365	Land Based Sprayer	458.841	gals.
Arsenal	241-346	Land Based Sprayer	1.70	gals.
Basal Oil	exempt	Land Based Sprayer	0.525	gals.
Bullseye	exempt	Land Based Sprayer	2.738	gals.
Diuron	34704-648	Land Based Sprayer	2,628.977	lbs.
Garlon 3A	67219-37	Land Based Sprayer	22.450	gals.
Garlon 4	62719-40	Land Based Sprayer	3.797	gals.
Gly-4	72693-2	Land Based Sprayer	0.314	gals.
Horsepower	228-313	Land Based Sprayer	6.043	gals.
Imazapic	71368-99	Land Based Sprayer	12.891	gals.
Krenite S	42750-247	Land Based Sprayer	325.00	gals.
Method 50SG	352-787	Land Based Sprayer	13.980	lbs.
MSO	Exempt	Land Based Sprayer	113.441	gals.
Milestone VM	62719-537	Land Based Sprayer	2.783	gals.
Nu-film	exempt	Land Based Sprayer	11.98	gals.
Oust Extra	352-622	Land Based Sprayer	.156	lbs.
Outrider	524-500	Land Based Sprayer	0.003	lbs.
Panoramic	66222-141-81927	Land Based Sprayer	22.426	gals.
Pathfinder II	67219-176	Land Based Sprayer	0.001	gals.
Payload	59639-120	Land Based Sprayer	5.664	lbs.
Pendulum	241-416	Land Based Sprayer	22.150	gals.
Polaris	228-534	Land Based Sprayer	9.526	gals.
Proclipse	228-434	Land Based Sprayer	486.655	lbs.
Pronto	2217-923	Land Based Sprayer	11.382	gals.
Razor Pro	228-366	Land Based Sprayer	12.000	gals.
Roundup Pro	524-475	Land Based Sprayer	11.418	gals.
Tahoe	228-520	Land Based Sprayer	2.367	gals.
Telar XP	352-654	Land Based Sprayer	1.493	lbs.
Thinvert	Exempt	Land Based Sprayer	255	gals.
Triplet	228-409	Land Based Sprayer	3.000	gals.
Trooper P+D	228-530	Land Based Sprayer	55.271	gals.

In June 2001, the TMC developed a manual of Standard Operating Procedures (SOP) that acts as a guideline for handling incidents and systems problems; as a training tool/resource for new employees and as a reference guide for the operations staff. *Category E: Traffic Hazards (Emergency)*, of the SOP describes the notification and documentation procedure involving fuel, oil or other HAZMAT spills on or near the roadway.

In the event of a spill such as fuel, oil, or HAZ-MAT, the TMC is required to notify the respective police agency since they are responsible for arranging for the particular traffic

hazard to be removed. Generally, the police will contact the following agencies: Fire Board, DNREC (Department of Natural Resources and Environmental Control), tow company, and all other agencies that are required to attend such incidents.

In the event of a non-hazardous materials spill DelDOT mobilizes, responds and directs the clean up effort to prevent the material from entering the storm drain system or receiving waters. If the spill is of questionable material, DelDOT uses procedures as describe for HAZ-MAT spills. Most DelDOT maintenance vehicles have been supplied with spill kits, and maintenance staff are regularly trained on their use.

In addition to the TMC's Standard Operating Procedures, the NPDES Program has completed the Spill Prevention Control and Countermeasures Plans for DelDOT facilities that met the above ground storage tank minimums. These are described in section H below.

H. Pollution Prevention at the Maintenance Facilities

Pollution Prevention Plans

DelDOT's NPDES Program continues to manage a Stormwater Pollution Prevention Program (SWPPP) at each of the 16 DelDOT maintenance facilities. Development, implementation, and maintenance of the SWPPP provides the maintenance yards with tools to reduce pollutants contained in stormwater discharges and comply with the requirements of Delaware's "Regulations Governing Storm Water Discharges Associated with Industrial Activity." The program includes a written plan, timeline for plan implementation, inspection schedules, training and monitoring requirements, and proper storage and housekeeping measures. Each SWPPP has a pollution prevention team with designated responsibilities to carry out the plan. Facilities were updated in December 2013.

Facility Inspections

Pollution Prevention Plan Team members are required to conduct quarterly inspections during dry and wet weather events to look for evidence of stormwater contamination. These inspections continued through the 2013 calendar year.

In addition, DelDOT NPDES Program staff annually conducts thorough SWPPP compliance inspections of each facility. Annual inspections were completed for all DelDOT maintenance facilities in Kent and Sussex Counties in 2013, on the following dates:

- June 10: Laurel, Seaford
- August 28: Cheswold, Dover
- December 16: Dagsboro, Ellendale, Georgetown, Gravel Hill
- December 18: Harrington, Magnolia

A "Summary of Action Items," if any, is noted on the inspection form and gives specific instructions to the facility team and supervisors for corrective action. Follow-up correspondence with District managers will be conducted to ensure the action items were corrected.

Spill Prevention Control and Countermeasures (SPCC)

Maintenance facilities that met the above ground storage minimums requiring a SPCC plan were developed in order to comply with EPA's Oil Pollution Prevention regulations (40 CFR 112) contained within the Clean Water Act. An SPCC Plan discusses how the maintenance facility conforms to oil spill prevention and containment procedures. Each SPCC Plan is unique to the facility. As reported previously, the initial plans were completed and distributed in 2007. Because of the addition of new above ground storage tanks at Harrington and Cheswold maintenance facilities, SPCC plans were also initially prepared for these areas in 2008 and updated in 2013.

Training

Training videos were developed for maintenance staff. The videos provide training on protection of stormwater quality in the following areas:

1. Facility and vehicle maintenance
2. Stormwater contamination and spill prevention
3. Vegetation control and pollution prevention on public roads and highways
4. The regulatory requirements of the Spill Prevention Control and Countermeasures (SPCC) plans developed for each maintenance yard
5. Spill response and emergency procedures
6. The proper procedures for responding to facility and non-facility (roadway) based emergency events.

Each maintenance facility has copies of the videos, and current DelDOT personnel and new hires are required to view them. In addition, the NPDES Program also prepares training posters ("Maintenance Bulletins") on elements of the PPP and SPCC Plans and distributes them to the yards at least twice per year. Two Maintenance Bulletins were distributed in 2013, and copies are included in this report as Appendix D.

Monitoring

DelDOT performs semi-annual wet weather monitoring at maintenance yard outfalls, in compliance with the state industrial general permit.

In prior years, the Pollution Prevention Plans required BMP outfall monitoring at only four maintenance facilities. (Kiamensi, Bear, Cheswold, and Harrington). In August 2013, however, DNREC required monitoring to begin at all permitted facility outfalls that discharge stormwater and conduct vehicle maintenance. In addition, DNREC requested that Oil and Grease (O&G) replace Total Petroleum Hydrocarbons in the list of monitoring parameters.

Table 6-3 lists the Kent and Sussex County maintenance yard outfalls that DelDOT monitored in 2013, along with the dates that samples were collected. The analytical data from first flush grab samples is presented in a spreadsheet that is attached to this report as Appendix E.

In each case that a benchmark is exceeded, DelDOT NPDES staff follow up with the Area supervisor and District Maintenance Engineer to investigate the source of the contaminant(s) and to correct the problem(s). Spot inspections are conducted afterward to confirm that the issues had been addressed.

Table 6-3. Outfall samples collected at Kent and Sussex County maintenance facilities in 2013.

Facility	No. of Outfalls	Sample Dates
Cheswold	1	3/12/13, 9/21/13
Dover	1	10/7/13
Magnolia	2	10/7/13
Harrington	1	3/12/13, 8/1/13
Ellendale	2	11/26/13
Seaford	1	10/7/13
Georgetown	1	10/7/13
Dagsboro	2	10/7/13
Gravel Hill	0	*
Laurel	0	*

**No stormwater runoff leaves these sites.*

Because so many facilities now are being monitored statewide, we will be implementing a new system in 2014 to report monitoring results to District management and document follow-up corrective actions taken.

Vehicle Wash Water Plan

In July of 2005, DelDOT received approval from DNREC for a plan entitled *Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards* (Section V, DelDOT NPDES Phase I MS4 Permit Stormwater Management Plan, revised September 2010). This plan outlined the Department's proposal for treating vehicle wash water on-site at our sixteen (16) maintenance facilities. Our goal was to develop options to treat vehicle wash water and stormwater to acceptable levels before it exits our site and enters receiving waters. To meet this objective we developed a stormwater "treatment train" at each maintenance facility. This method incorporates multiple Best Management Practices (BMPs) to treat wash water to the maximum extent practicable. In several cases, existing practices, together with proposed policy changes and employee training, were sufficient to treat the vehicle wash water. In other cases, there is a need to design and construct retrofits at the facilities. As part of the Phase I SWPP&MP, we will update the vehicle wash plan by May 2015.

I. Employee Training Program

The following is a list of training workshops and conferences attended by DelDOT staff and training material produced in calendar year 2013:

- All statewide district maintenance staff are required to view the following videos as part of Pollution Prevention Plans: Stormwater Contamination & Spill Prevention, Vegetative Control & Pollution Prevention, and Facility & Vehicle Maintenance.
- All maintenance staff are required to view videos as part of the Spill Prevention Control and Countermeasures Plans. The three topics include: SPCC regulatory requirements, spill response and emergency procedures and roadside events.
- NPDES staff are members of the Nonpoint Source Advisory Committee and attend the annual workshop.
- As part of the NPDES industrial permit, the NPDES Section issues training bulletins to each maintenance facility statewide. These bulletins support DelDOT maintenance staff in its efforts to achieve and maintain compliance with the stormwater pollution prevention regulatory requirements. The bulletins are placed in a visible location at each yard. During the 2013 calendar year, two issues, *Spill Prevention, Control and Countermeasures* and *Good Housekeeping – Waste Storage and Disposal*, were distributed and are included here as Appendix D.
- The following training/workshops were attended by NPDES or DOTS stormwater staff:

  Workshops

  - DelDOT Winter Workshop – included training on new permit requirements

  Webinars

  - "New recreational criteria to better protect public health" (U.S. EPA)
  - "Road salt pollution prevention strategies" (U.S. EPA)
  - "Using social indicators in watershed management projects" (U.S. EPA)
  - "National stormwater calculator" (U.S. EPA)
  - "Stormwater trading: markets or mayhem?" (Ctr. For Watershed Protection)
  - "Please come audit my MS4" (Ctr. For Watershed Protection)

  Conferences

  - Delaware Invasive Species Council Conference
  - Nutrient Neverland: The conundrum of improving water quality and the funding to make it happen – Delaware AWRA Annual Symposium
  - Delaware Wetlands Conference

  CCR Training

  In 2013, 37 DelDOT staff took either the Certified Construction Reviewer (CCR) or the CCR recertification course.

Roadside Environmental

In 2013, DelDOT Roadside Environmental staff attended four workshops:

- Annual Pesticide Conference
- 2013 Arborist and Tree Care Seminar
- Summer Turf and Nursery Expo
- National Roadside Vegetation Management Association Annual Conference

Appendix A. 2013 Inventory and Inspection Report from KCI Technologies, Inc.

DELDOT AGREEMENT 1591

STATEWIDE MS4 / BMP INVENTORY & INSPECTION

2013 ANNUAL REPORT

The following is a summary of work performed by KCI Technologies, Inc. (KCI) and Century Engineering, Inc. (CEI) from January 1 to December 31, 2013 for Delaware Department of Transportation (DelDOT) Agreement 1591. The KCI/CEI Team was awarded Agreement 1591 in November 2011.

A. PROJECT MANAGEMENT

In 2013, KCI submitted the *Agreement 1591 2012 Annual Report* and the *2012 Annual BMP Inventory & Inspection Report*.

KCI conducted seven project status meetings **(Table 1)** with DelDOT, KCI, and CEI to discuss work completed and outstanding issues. KCI distributed an agenda at least two days prior to each meeting and prepared meeting minutes for each meeting within 48 hours, including an Action Item List highlighting necessary actions, responsible parties, and target completion dates. These meetings have been highly effective in coordinating with DelDOT, identifying priority work, and resolving issues in a timely manner.

TABLE 1
PROJECT STATUS MEETINGS

Project Status Meetings	
Date	**No.**
01/31/13	48
03/14/13	49
05/10/13	50
06/20/13	51
08/29/13	52
10/11/13	53
11/22/13	54

Table 2 lists the deliverables transmitted to DelDOT in 2013. A majority of these deliverables related to BMP inspections and reports. Other deliverables pertinent to Agreement 1591 are included in the *Agreement 1613 Environmental and Water Quality Monitoring 2013 Annual Report*, which includes outfall screening and illicit discharge investigations, some of which originated from Agreement 1591 inventory and inspection.

TABLE 2
DELIVERABLES

Date	Deliverable
01/11/13	Before and After Photos of BMPs Maintained 2009-2011
01/18/13	BMPs collected Statewide for FOI request
01/28/13	NPDES data for Maximo
02/22/13	02/18/13 Map Viewer User List
02/22/13	2012 Agreement 1591 Annual Report
03/05/13	2012 Draft BMP Summary Tables by District
03/07/13	2012 Agreement 1591 Annual Report - Revised Table 4
03/11/13	2012 Annual BMP Inspection Report-District Binders
03/14/13	03/14/13 Map Viewer User List
03/20/13	2012 Annual BMP Inspection Report-District Maps
03/21/13	Notification that Map Viewer Mobile App testing site created and ready for test use
03/27/13	03/27/13 Invasive BMP List
03/29/13	Kent County Closed Drainage - The Orchards Subdivision MWO
04/10/13	April 2012 New Castle County BMP Master List
04/19/13	04/19/13 Map Viewer User List
04/29/13	04/17/13 Master Inventory KCI WORKING COPY 03-15-13 with Drainage Areas
04/30/13	2013 Canada Thistle Maps and Spreadsheet posted to KCI ftp
04/30/13	2013 Spray List BMP CAT PHRAG Summary
05/01/13	2013 Cattail and Phragmite Maps posted to KCI ftp
05/07/13	05/07/13 Odessa National Tweedsmere BMP Memo
05/13/13	BMPs Maintained in 2012 for 2013 Inspection Schedule Spreadsheet
05/14/13	Phase II Area
05/15/13	05/15/13 Map Viewer User List
05/20/13	2012 BMP Inspection Schedule for EPA
05/21/13	2013 BMP 38 Inspection Report for EPA
05/23/13	DelDOT 2013 Canada Thistle Spray List posted to KCI ftp
05/28/13	DelDOT 2012 BMP Inspection Reports posted to KCI ftp
05/30/13	Odessa National Drainage Issues Map
06/05/13	BMPs Intersecting Phase II Area Spreadsheet
07/15/13	07/15/13 Map Viewer User List
07/17/13	Construction Plan Sheets from Map Viewer associated with BMP Nos. for Maximo Upgrade via KCI FTP
07/17/13	Copy of Database with Maintenance Area Field for each BMP
08/05/13	Draft Map Viewer Version 2.0 Mass Email for DelDOT Review
08/14/13	Updated 2013 Spray List CAT and PHRAG Maps via KCI FTP
08/19/13	Map Viewer Version 2.0 Mass Email with updated User Guide attachment
08/19/13	BMP Maintenance Manual Sample BMP Fact Sheet for DelDOT Review
08/21/13	Updated 2012 Delaware Aerial Imagery (from 2007) on Map Viewer
09/03/13	08/19/13 Map Viewer Version 2.0 Mass Email Delivery Failures

Date	Deliverable
09/05/13	NPDES database and related documents posted to KCI FTP for Versar use
09/23/13	Agr 1591 Project Brief
09/27/13	New NPDES assets acquired since last delivery for LG to load into MAXIMO
09/27/13	Latest batch of Work Orders
10/07/13	10/07/13 Map Viewer User List
10/08/13	Immediate action work order in Silverwood subdivision; Manhole between 27 and 29 Ridgewood Turn
10/11/13	DelDOT NPDES Draft Mobile Application User Guide
10/11/13	Sample BMP Inspection Report for Maintained C-rated BMP
10/11/13	Sample DSF BMP Inspection Report
10/17/13	DelDOT NPDES Mobile Application User Guide
10/18/13	10-18-13 Draft BMP Maintenance Fact Sheets
10/22/13	DelDOT NPDES GIS data to DNREC (Sandra Goodrow)
10/25/13	Map Viewer Mobile Application User Guide Mass Email
10/31/13	Annual DNREC BMP Submission in XML format to DelDOT (Jay Rajagopal)
11/04/13	Draft BMP Maintenance Manual
11/04/13	Annual DNREC BMP Submission in XML format to DNREC (Marcia Fox)
11/06/13	BMP 47 Inspection Issues-Structure 520080522132819-major erosion-potential roadway issues
11/20/13	Map and list of roads not yet completed in CBW portion of Sussex
11/21/13	BMP Layer with link to REST endpoint; URL can be utilized directly into DelDOT ArcGIS Online map
11/26/13	(Revised) Annual DNREC BMP Submission in XML format to DNREC (Marcia Fox)
11/27/13	DelDOT BMP layer and BMP drainage area layer in DropBox .zip file; including both file geodatabase and shapefile formats

B. NPDES DATABASE MANAGEMENT

In 2007, KCI's Technology Services division developed a field application using advanced hardware, redesigned the existing NPDES Database structure to allow for re-inspections, migrated all existing data into the new NPDES Database design, and began development of a new field application to fit the new NPDES Database design.

In 2008, KCI's Technology Services division completed the development of the Field Application, Version 2 and developed a Web-based Map Viewer to replace and upgrade DelDOT's existing Map Viewer. In 2009, DelDOT expressed a desire for KCI to simplify the Map Viewer, especially the querying capabilities.

In 2010, KCI completed the refinements to the Map Viewer including simplifying querying and report creation for BMPs, conveyances and structures, and adding a drainage area layer for BMPs and Major Outfalls. In addition, KCI developed a *Map Viewer User's Guide* to assist with the use of the viewer.

In 2011, KCI assisted DelDOT in formal training sessions to educate DelDOT design and maintenance staff on the use of the Map Viewer.

In 2011/2012, KCI updated the Map Viewer by migrating the ArcGIS Server 9.3.1 webADF codebase to ESRI's ArcGIS Server 10.0 SP2 Javascript API in preparation for the ESRI's webADF deprecation at ArcGIS Server 10.1. KCI and DelDOT developed a method for conducting desktop inventory for new drainage structures along roadway improvement projects, by overlaying electronic construction plans on the DelDOT NPDES Database.

In 2013, KCI developed a Mobile Application for the Web-based Map Viewer. The DelDOT NPDES Mobile Application is compatible with Android/iOS mobile browsers and with Google Chrome on

desktops/laptops. http://deldot.kci.com/mobile/.

The Mobile Application assists DelDOT Maintenance Staff by allowing use of the phone's GPS function to see their location in relation to the MS4 or BMP structure.

C. BEST MANAGEMENT PRACTICE (BMP) INVENTORY AND INSPECTION

In early 2014 under separate cover, KCI will submit the *2013 Annual BMP Inventory & Inspection Report*. The 2013 Annual Report will summarize the 2013 inspections for each BMP and provide recommended actions for BMPs in four categories:

- BMPs requiring **MAINTENANCE** by DelDOT maintenance staff (Maintenance Work Orders),
- BMPs requiring **INVASIVE SPECIES** to be treated by third party contractor,
- BMPs requiring **CONTRACTED WORK** by a third party contractor, and
- BMPs requiring **RETROFIT** evaluations by DelDOT's Stormwater Quality Program staff.

BMPs are assigned a summary rating based on the recommended actions identified during the inspections. These ratings are defined in **Table 3**. In 2013, KCI inspected all BMPs located in New Castle County. In Kent and Sussex Counties, KCI inspected BMPs that were rated A in 2012, as well as recently accepted BMPs. **Table 4** summarizes the BMP inspections conducted in 2013. The ratings shown in **Table 4** are preliminary at this stage, and will be reviewed and finalized during DelDOT's review and completion of the *2013 Annual BMP Inventory & Inspection Report.*

TABLE 3
OVERALL BMP RATING SYSTEM

Rating	Description
A	**NO PERFORMANCE ISSUES** BMP with No Issues affecting performance.
B	**MINOR MAINTENANCE** BMP with Minor Maintenance required; repaired by DelDOT maintenance district or third party invasive spray contractor.
C	**MAJOR MAINTENANCE** BMP with Major Maintenance required; repaired by third party contractor.
D	**RETROFIT** BMP with Retrofit requirements; BMP is failing; needs to be redesigned or re-built with input from DelDOT Stormwater Quality Program.

TABLE 4
2013 BMP INSPECTIONS AND RATINGS

District	Total BMPs Inspected	BMP Performance Rating			
		A	B	C	D
North	**162**	128	27	7	0
Canal	**187**	89	77	21	0
Central	**29**	27	1	1	0
South	**99**	84	8	7	0
TOTAL	**477**	**328**	**113**	**36**	**0**

D. NEW CASTLE COUNTY MS4 RE-INSPECTION

KCI began re-inspection of DelDOT's MS4 in New Castle County subdivisions in February 2008, based on KCI's Subdivision Re-inspection Schedule **(Table 5)**. The re-inspection schedule is based on a 5- and 10-year re-inspection cycle for subdivisions according to the acceptance date of the subdivisions. In October 2010, DelDOT requested that KCI dedicate both KCI field crews to Kent County Initial Inventory and Inspection work. In 2012, KCI assigned one field crew to New Castle County to continue re-inspecting the 1966-1980 subdivisions, which was completed in January 2013. KCI began re-inspecting the 1981-1995 subdivisions in 2013. **Table 6** summarizes the re-inspection work performed by one KCI field crew in 2013.

TABLE 5
2013 SUBDIVISION RE-INSPECTION SCHEDULE

Year	Subdivisions	Cycle	Re-inspect?	Date Completed
1	Database Re-design	--	--	December 2007
2	1935-1950	5	Yes	December 2008
3	1951-1965	5	Yes	May 2010
4	1966-1980	5	Yes	January 2013
5	1981-1995	10	Yes	In Progress (40% complete)
5	1996-2005	10	No	--

TABLE 6
2013 NEW CASTLE COUNTY MS4 RE-INSPECTION TOTALS

Month (2013)	Subdivisions	Non-Subdivision Roadway Miles	Structures
January	9	0	455
February	15	0	143
March	3	0	603
April	3	0	441
May	6	0	660
June	6	0	192
July	11	0	300
August	6	0	136
September	12	0	693
October	16	0	479
November	17	0	314
December	14	0	177
2013 Total	**118**	**0**	**4,593**

E. NEW CASTLE COUNTY MS4 INITIAL INVENTORY AND INSPECTION

In 2013, KCI's field crew performed limited initial inventory and inspection work for 257 structures in 10 recently accepted subdivisions. In 2013, a Desktop methodology was used to inventory DelDOT's MS4 on non-subdivision roads that were recently improved; 3.2 miles of roadway and 200 structures were inventoried in 2013 using this Desktop process. **Table 7** summarizes the New Castle County initial inventory and inspection work in 2013

TABLE 7
2013 NEW CASTLE COUNTY MS4 INITIAL INSPECTION TOTALS

Type	Subdivisions	Non-Subdivision Roadway Miles	Structures
Field Inventory/ Inspection	10	0	257
Desktop Inventory	0	3.2	200
2013 Total	**10**	**3.2**	**457**

F. KENT / SUSSEX COUNTIES MS4 INITIAL INVENTORY AND INSPECTION

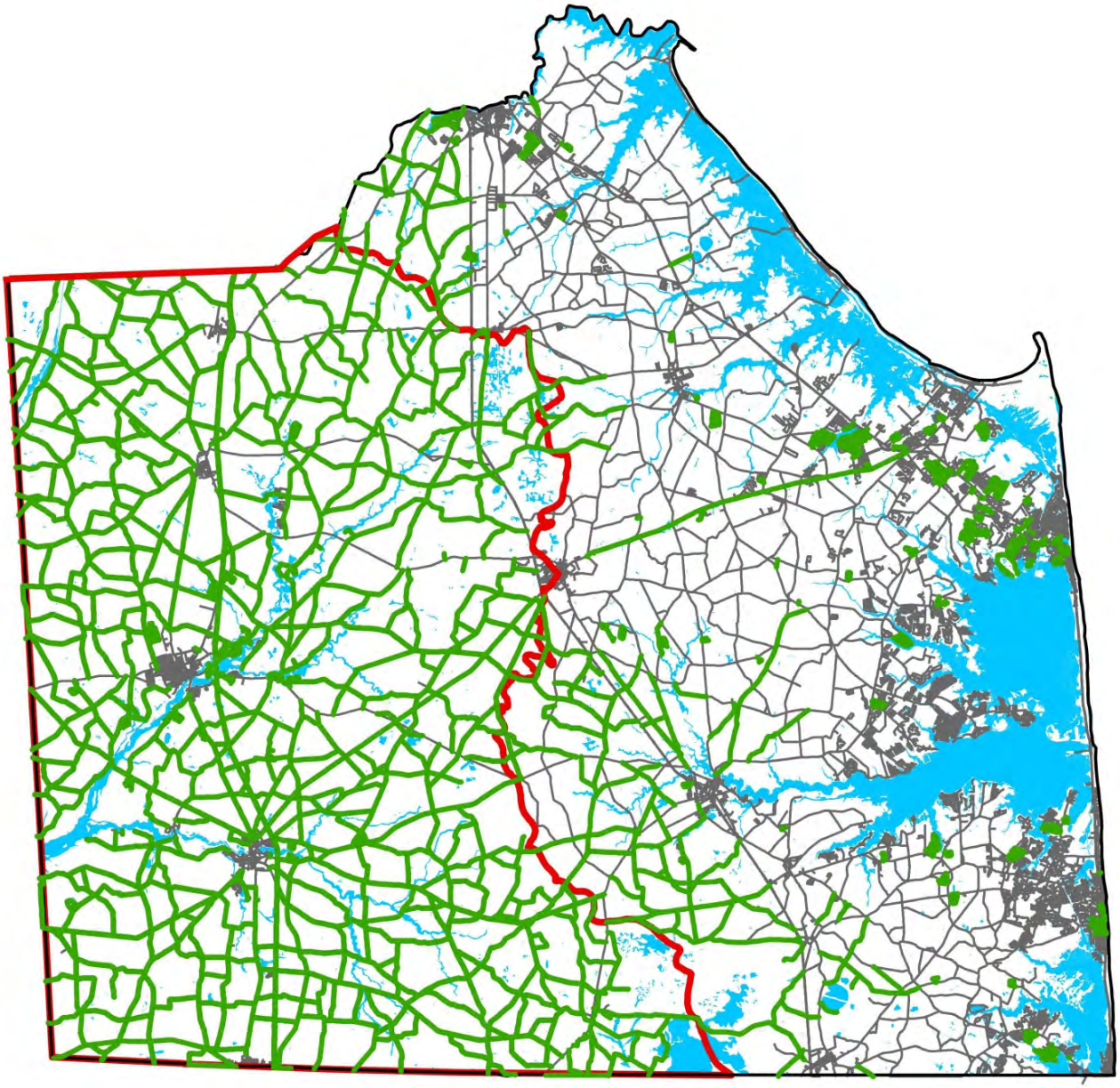
In 2013, KCI and CEI field crews inventoried/inspected a total of 17,576 storm drain structures in Kent/Sussex County **(Table 8)**. The storm drain system in one recently accepted subdivision was inventoried in Kent; the remaining work along 512 miles of non-subdivision roadways was conducted in Sussex County.

TABLE 8
2013 KENT/SUSSEX COUNTY MS4 INITIAL INVENTORY / INSPECTION TOTALS

Month (2013)	Subdivisions	Non-Subdivision Roadway Miles	Structures
January	0	24.6	893
February	0	25.1	1,024
March	0	85.3	2,331
April	1	32.0	1,134
May	0	83.1	4,011
June	0	33.5	880
July	0	39.7	1,542
August	0	19.2	883
September	0	43.1	1,498
October	0	48.1	1,243
November	0	44.3	1,128
December	0	34.0	1,009
2013 Total	**1**	**512.0**	**17,576**

The goal is to complete Sussex County by the end of Agreement 1591 (December 2014), beginning with the storm drain system in the Chesapeake Bay Watershed. **Figure 1** shows the Sussex County roadway drainage system that has been inventoried/inspected through the end of 2013 (green) versus not completed (gray). The Chesapeake Bay Watershed is outline in red.

FIGURE 1
MS4 COMPLETED IN SUSSEX COUNTY



G. 2013 MAINTENANCE WORK ORDERS

During the MS4 Inventory and Inspection process, storm drain system deficiencies identified by KCI are submitted to DelDOT for upload to their Maintenance Work Order system, MAXIMO. MAXIMO delivers the work order to the appropriate maintenance district, lists the concern, identifies a remedial action, and rates the concern (minor to severe).

Table 9 lists the MS4 maintenance work orders submitted to DelDOT and completed by DelDOT in 2013. Some issues related to safety (i.e., missing or broken catch basin grate) are considered Immediate Action concerns, and the appropriate maintenance district staff is notified as soon as these safety issues are identified. In 2013, KCI continued to submit NPDES structure assets for loading into MAXIMO, allowing the work orders in DelDOT's NPDES Database to correlate to the work orders in DelDOT's MAXIMO system.

TABLE 9
2013 MS4 MAINTENANCE WORK ORDERS (NO.)
NEED #S FROM DELDOT

Type	North District	Canal District	Central District	South District
Submitted to DelDOT	121	136	198	166
Completed by DelDOT				

H. STATEWIDE INVENTORY SUMMARY

Tables 10, 11 and **12** summarize the number of BMPs, Structures and Conveyances contained in the DelDOT NPDES Database.

TABLE 10
STATEWIDE STRUCTURES (NO.)

Category	New Castle	Kent	Sussex
Inlet	44,407	19,552	10,401
Outfall	8,415	11,475	8,360
Manhole	5,278	789	92
Swale End	3,998	2,754	1,105
TOTAL	**62,098**	**34,570**	**19,958**

TABLE 11
STATEWIDE CONVEYANCES (LF.)

Type	New Castle	Kent	Sussex
Open	2,361,085	8,367,748	7,271,888
Closed	4,806,279	1,557,309	595,870
TOTAL	**7,167,364**	**9,925,057**	**7,867,758**

TABLE 12
STATEWIDE BMP (NO.)

Type	New Castle	Kent	Sussex
BaySaver	1	0	0
Check Dam	6	0	0
Bioswale	87	23	88
Bioretention	23	4	2
Dry Pond	49	6	3
Filter Strip	5	2	15
Infiltration Basin/Trench	0	0	0
Sand filter	67	1	1
Sediment Forebay	4	0	3
Wet Pond	90	23	9
Wet Pond/Wetland	2	0	0
Infiltration Trench	9	0	0
Infiltration Basin	0	1	0
Underground Storage/ Infiltration	5	0	0
Shallow Marsh	2	0	0
TOTAL	**350**	**60**	**121**

Appendix B. 2013 Illicit Discharge Detection and Elimination Program Annual Report from KCI Technologies, Inc.

DELDOT AGREEMENT 1613
ENVIRONMENTAL AND WATER QUALITY MONITORING

ILLICIT DISCHARGE DETECTION & ELIMINATION PROGRAM
2013 ANNUAL REPORT

As part of the Delaware Department of Transportation's (DelDOT) National Pollutant Discharge Elimination System (NPDES) General Permit Program Regulations Governing Stormwater Discharge, KCI Technologies, Inc. (KCI) was contracted to conduct work in support of DelDOT's Illicit Discharge Detection and Elimination (IDDE) Program. Responsibilities included DelDOT-owned municipal separate storm sewer system (MS4) outfall evaluation, dry weather field screening, potential illicit discharge (PID) investigations, and data input to DelDOT's NPDES IDDE field screening website. DelDOT's IDDE Program consists of two major components:

- **IDDE Evaluation**
  - Targeted Desktop Evaluation
  - Statewide MS4 Field Evaluation
  - Miscellaneous PID Reports
- **IDDE Dry Weather Field Screening**
  - Field Screening (confirm flow/no flow, sample collection)
  - Follow Up and Elimination of Potential Illicit Discharge

Phase I of the NPDES Permit requires that 20% of all DelDOT-owned outfalls are evaluated annually. In 2013, KCI created a revised IDDE Plan that included Targeted Desktop Evaluation, revised sampling parameters, and revised protocol, for inclusion in DelDOT's Storm Water Pollution Prevention and Management Plan (SWPP&MP).

A. IDDE EVALUATION

1. <u>Targeted Desktop Evaluation</u>

In 2012, KCI developed an IDDE Targeted Desktop Evaluation for the Pike Creek Watershed (PCW) in New Castle County. This process followed the Center for Watershed Protection's 2004 guidance manual, *Illicit Discharge Detection and Elimination, Chapter 5: Desktop Assessment of Illicit Discharge Potential*. The purpose of the desktop evaluation was to use available mapping and data to determine the potential for illicit discharges within a watershed. Using DelDOT's MS4/ BMP database and other available data, KCI used GIS software to target outfalls in the PCW for field screening based on the following targeted evaluation factors:

- **Past Discharges:** Outfalls with Ammonia/Detergents.
- **Proximity to Sanitary Sewer:** Outfalls Close to Old Sanitary Sewer Lines.
- **Proximity to Potential Discharges:** Outfalls Intersecting Commercial/Industrial Land Use and Private Sanitary Sewer.
- **Proximity to Previous MS4 Deficiencies:** Outfalls within 100 feet of DelDOT MS4 Environmental Work Orders.
- **Age of MS4:** Outfalls in Subdivisions Built Prior to 1962.

In 2013, KCI performed an IDDE Targeted Desktop Evaluation for the Appoquinimink River Watershed (ARW). In addition to integrating lessons learned from the Pike Creek Watershed to better target potential illicit discharges (PIDs), KCI added "contributing structures" to the analysis.

Instead of targeting only outfall structures, KCI also evaluated non-outfall structures (e.g., inlet structures) and referred to these as "contributing structures". As an example, **Figure 1** depicts the targeted buffer zone around an automotive repair business in the ARW. The targeted structures (i.e., blue dots) located within the buffer are all non-outfall structures (i.e., inlets), and the outfall to this system is located outside the buffer. In this case, KCI identified the inlets within the buffer as "contributing structures", and conducted dry weather field screening at these inlets, in addition to the outfall. KCI's previous IDDE dry weather field screening experience has determined that illicit discharges are often found in non-outfall structures, and that the discharge is not evident at the outfall.

For the ARW analysis, KCI customized the targeted evaluation factors (i.e., criteria) used in the Pike Creek Watershed analysis for the characteristics of the AWR. The PCW is located in the densely developed northern half of New Castle County, where suburban development has occurred since the 1930s. The ARW is located in the southern portion of New Castle County, characterized by farmlands and wetlands, where suburban sprawl has occurred since 1990. **Table 1** summarizes the criteria used to target structures for field screening in the ARW, and the number of contributing structures and outfalls targeted for each criterion. Many of these structures were targeted by multiple criteria.

FIGURE 1
APPOQUINIMINK RIVER WATERSHED TARGETED EVALUATION

TABLE 1
APPOQUINIMINK RIVER WATERSHED TARGETED EVALUATION

Criteria	Targeted Contributing Structures [1]	Targeted Outfall Structures [1]
Within 100' of Sanitary Sewer built before 1990	155	45
Within 100' of Industrial Stormwater Area	1	0
Has an Environmental Work Order	0	0
Within 200' of a Stream	44	68
Communities built before 1990 and intersect a Sanitary Sewer	25	13
Communities without a Sanitary Sewer but are within 200' of Sewer	652	300
Within 300' of Commercial, Industrial, Retail Sales/Wholesale/Professional Services Land Use	313	90

[1] Structures may be included in multiple criteria

Overall, KCI evaluated all 2,697 MS4 structures in the ARW, including 370 outfalls. The evaluation targeted 1,436 of the MS4 structures, including 177 outfalls, for field screening. Non-targeted outfalls were field screened if contributing structures leading to that outfall were targeted. A summary of the field screening results based on the Targeted Desktop Evaluation is located in **Section B.3**

2. Statewide MS4 Field Evaluation

In 2013, 2,298 outfalls (402 in New Castle County, 5 in Kent County and 1,891 in Sussex County) were evaluated through inventory, inspection and re-inspection tasks as part of DelDOT's MS4 Statewide Inventory and Inspection Program (Agreement 1591). Three full time field crews inventoried and inspected DelDOT's MS4 statewide. The 2,298 outfalls represent outfalls that these field crews inventoried/inspected and noted if flow was present (yes/no). If the flow appeared to be illicit (e.g., strong odor, odd color, etc.), the KCI inventory/inspection crew immediately contacted the KCI IDDE field screening crew, the latter of which mobilized to conducted a thorough screening analysis and discharge sourcing.

If the flow did not appear to be illicit, the outfall was added to a dry weather flow list, which was provided weekly to the IDDE field screening crew. These outfalls were re-visited after a 72-hour dry period to confirm dry weather flow and to conduct dry weather field screening.

Table 2 lists the number of outfalls that were field evaluated by the MS4 crews each month in the three counties. A summary of the field screening results based on the statewide MS4 field evaluation is contained in **Section B.3**.

TABLE 2
MS4 OUTFALL FIELD EVALUATION BY COUNTY

Month (2013)	New Castle County	Kent County	Sussex County
January	31	0	108
February	15	0	86
March	28	5	80
April	26	0	98
May	38	0	84
June	26	0	54
July	45	0	108
August	32	0	257
September	47	0	237
October	54	0	302
November	39	0	293
December	21	0	184
2013 Total	**402**	**5**	**1891**

3. Miscellaneous PID Reports

In 2013, DelDOT received 11 reports of PIDs or dumping from the public and/or DelDOT maintenance staff. After notification by DelDOT, a KCI IDDE field screening crew conducted a follow-up evaluation and field screening for dry weather flow and other traces of illicit discharge. A summary of the field screening results based on Miscellaneous PID Reports is contained in **Section B.3**.

4. 2013 IDDE Program Evaluation Summary

Table 3 summarizes the IDDE Program for 2013.

TABLE 3
2013 IDDE PROGRAM EVALUATION SUMMARY

IDDE EVALUATION TYPE	COUNTY			TOTAL
	New Castle County	Kent County	Sussex County	
Targeted Desktop Evaluation	370	0	0	**370**
MS4 Evaluation	402	5	1,891	**2,293**
Miscellaneous Reporting	8	3	0	**11**
2013 TOTAL EVALUATED	**780**	**8**	**1,891**	**2,679**

B. IDDE DRY WEATHER FIELD SCREENING

1. Revised IDDE Sampling Parameters

In 2013, DelDOT and KCI revised the Standard Operating Procedures for IDDE Dry Weather Field Screening. In previous years, IDDE field crews primarily performed chemical field testing on outfalls with dry weather flow.

In March 2013, KCI conducted detailed research into the most effective chemical tests used to identify PIDs. Subsequently, the tests for Phenols, Chlorine and Copper were replaced by Fluoride and Potassium **(Table 4)**.

Field Screening
09/19/13

In October 2013, Fluoride was removed from the Agreement 1613 list of standard testing parameters. The majority of outfalls sampled to that point had a Fluoride level >0.025 mg/L, which made it difficult to distinguish a natural water source from a tap/irrigation source. Because tap/irrigation water sources are categorized as clean water discharges (*Source Verification of Inappropriate Discharges to Storm Drainage Systems*, Robert Pitt, et al., 2004), Fluoride is currently being tested on an "as needed" basis for more targeted testing.

TABLE 4
IDDE SAMPLING PARAMETERS

Parameters	Pre-March 2013	March 2013	October 2013
Ammonia	X	X	X
Chlorine	X		
Copper	X		
Detergents	X	X	X
Fluoride		X	
Phenols	X		
Potassium		X	X

2. Revised IDDE Sampling Protocol

The revised sampling parameters made it necessary to utilize laboratory analysis instead of field testing. This modification occurred in May 2013. In conjunction with the new parameters and subsequent laboratory analysis, KCI revised the flow source determination procedure for illicit discharges. The new protocol included using the flow chart for Residential or Light Commercial Land Uses to categorize discharges **(Figure 2)**.

The flow chart for Residential or Light Commercial Land Uses distinguishes sources of dry weather flow using the following categories:

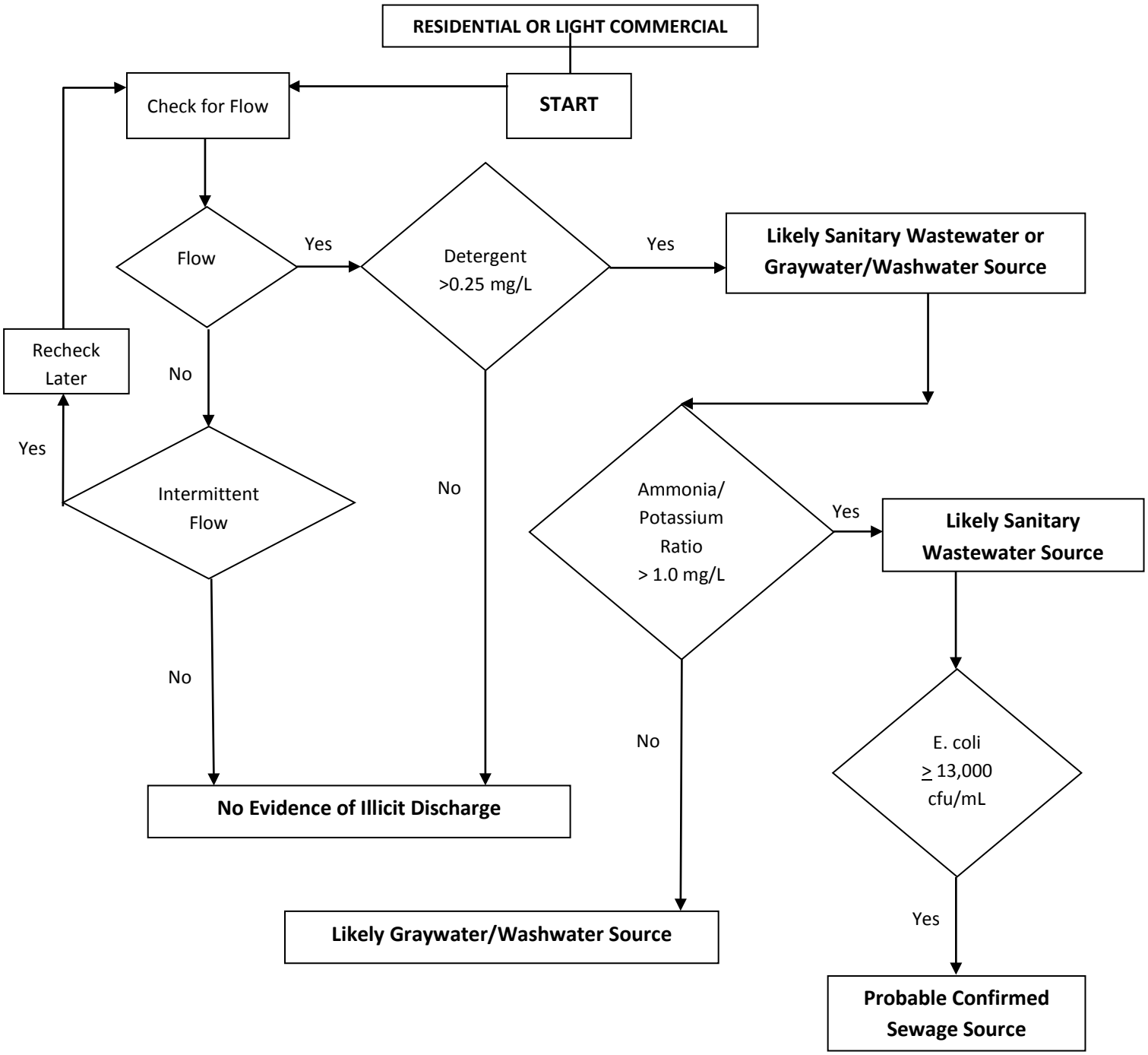
- No Evidence of Illicit Discharge
- Likely Graywater/Washwater Source
- Likely Sanitary Wastewater or Graywater/Washwater Source
- Likely Sanitary Wastewater Source
- Probable Confirmed Sewage Source

Source Verification of Inappropriate Discharges to Storm Drainage Systems, Robert Pitt, et al., Water Environmental Federation Technical Exhibition and Conference, September 2004.

Rolling Meadows

Chapel Hill

FIGURE 2
FLOW SOURCE DETERMINATION:
RESIDENTIAL OR LIGHT COMMERCIAL



Robert Pitt, et al., *Source Verification of Inappropriate Discharges to Storm Drainage Systems*, Water Environmental Federation Technical Exhibition and Conference, September 2004.

3. 2013 Field Screening Results

Dry Weather Field Screening was conducted by the KCI IDDE field crew as a result of the IDDE Evaluation Process (i.e., Targeted Desktop Evaluation, MS4 Field Inventory/Inspection, and Miscellaneous Reports). **Table 5** lists the 2013 field screening results organized by county. In 2013, there were 71 structures with dry weather flow (see yellow highlighting). An Incident ID No. was assigned according to the order in which the flow was reported to the IDDE Field Crew; therefore Incident ID Nos. range from 2013-1 to 2013-71.

TABLE 5
FIELD SCREENING RESULTS BY COUNTY

County	Total Field Screened	Illicit Discharge	No Evidence of Illicit Discharge	No Flow	Stream/Tax Ditch [1]
New Castle	140	6	61	66	7
Kent	3	1	1	1	0
Sussex	13	1	1	6	5
TOTAL	**156**	**8**	**63**	**73**	**12**

[1] MS4 Inventory/Inspection Crew flow determined to be Stream or Tax Ditch by IDDE Field Crew

There were eight confirmed illicit discharges in 2013, which are summarized in **Table 6** and described in more detail in **Appendices A, B and C**. The contents of the **Appendices** are described in more detail on the next page.

TABLE 6
ILLICIT DISCHARGES SUMMARY

Incident ID No.	County	Reported By	Source	Comment
2013-2	New Castle	Miscellaneous	Car Wash Waste Water	Notice of Violation sent to property owner
2013-4	New Castle	Miscellaneous	Dumping	Confirmed pet waste in MS4; door hangers distributed
2013-59	New Castle	Miscellaneous	Grease Trap	Notice of Violation and Correction Order sent to property owner
2013-65	New Castle	MS4 Field	Dumping	Confirmed pet waste in MS4; door hangers distributed
2013-68	New Castle	Targeted	Oil	Property owner contacted
2013-69	New Castle	MS4 Field	Dumping	Confirmed pet waste in MS4; door hangers distributed
2013-1	Kent	MS4 Field	Dumping	Confirmed pet waste in MS4; door hangers distributed
2013-70	Sussex	MS4 Field	Illegal Washwater Hook-Up	Notice of Violation sent to property owner

The 2013 IDDE Program documentation has been organized into the following Appendices:

APPENDIX A 2013 Potential Illicit Discharge Investigations – Summary Table

- Summary Table for all 2013 PID Investigations.

APPENDIX B 2009-2012 Potential Illicit Discharge Investigations with Ongoing Issues

- Documentation for 2009-2012 Illicit Discharges with Ongoing Issues

APPENDIX C 2013 Outfalls with Flow

- **Tabs 1-71**: Field screening results for all structures with dry weather flow and miscellaneous reports of dumping. An Incident ID No. was assigned according to the order in which the incident was reported to the IDDE Field Crew (i.e., 2013-1 to 2013-71. Documentation included for each Incident ID includes a Tracking Form, Map, Field Sheet and the original QC Laboratories Analytical Reports and Chain of Custody. This information was also uploaded to the DelDOT NPDES SharePoint Website.

APPENDIX D 2013 Outfalls with No Flow

- Field Screening Documentation Via Compact Disc
- Outfalls identified with dry weather flow by the MS4 Inventory & Inspection Field Crew; however no flow was observed during the IDDE Field Crew inspection. Outfalls without flow were not given an Incident ID No., and are organized electronically by County and Structure No. on the attached CD.

C. NPDES FLYER AWARENESS

The distribution of NPDES flyers (door hangers) is an important component of DelDOT's education outreach campaign to remind the public about the importance of proper pollutant disposal. The front of a typical door hanger identifies the type of pollutant found, the field investigation date, and the water body potentially affected. The back of the door hanger describes stormwater pollution and guidelines to reduce pollution at home or at work.

Wood Creek Subdivision
Pet Waste in Catch Basin 11/05/13

In 2013, reports of illegal dumping originated from the public and the KCI MS4 Inventory/Inspection Field Crews. There were five separate incidents requiring door hanger distribution. For each report received, a GIS map was created identifying the specific neighborhood or location, the structure where pollutants were found, and the houses labeled for door hanger distribution. A total of 425 door hangers were distributed in New Castle and Kent Counties in 2013.

Four of the five incidents reported involved pet waste disposal in catch basins. In Windy Hills, Wood Creek, The Orchards, and Weldin Farms subdivisions, pet waste was found in or on top of the catch basins. The Windy Hills inspection also noted that trash and ashes were discarded in the catch basin. The fifth incident was a report of motor oil dumped into the storm sewer system. In all 5 cases, door hangers were distributed to residences surrounding the affected structures, noting what pollutants were found, and the recommended control measures to reduce stormwater pollution. **Table 7** summarizes the 2013 Door Hanger Distribution. **Appendix C** contains the door hanger distribution map and a copy of the door hanger distributed for each of the five investigations.

TABLE 7
2013 DOOR HANGER DISTRIBUTION

Incident ID No.	Date	Neighborhood	County	Waste Reported	Water Body	Doorhangers Distributed
2013-1	09/04/13	The Orchards	Kent	Pet Waste	Voshell Pond	150
2013-4	04/18/13	Windy Hills	New Castle	Ashes, Pet Waste, Trash	White Clay Creek	28
2013-61	10/18/13	Brookside Park	New Castle	Motor Oil	White Clay Creek	43
2013-65	11/15/13	Wood Creek	New Castle	Pet Waste, Paint	White Clay Creek	174
2013-69	12/16/13	Weldin Farms	New Castle	Pet Waste	Shellpot Creek	30
2013 TOTAL						**425**

D. NPDES IDDE FIELD SCREENING WEBSITE

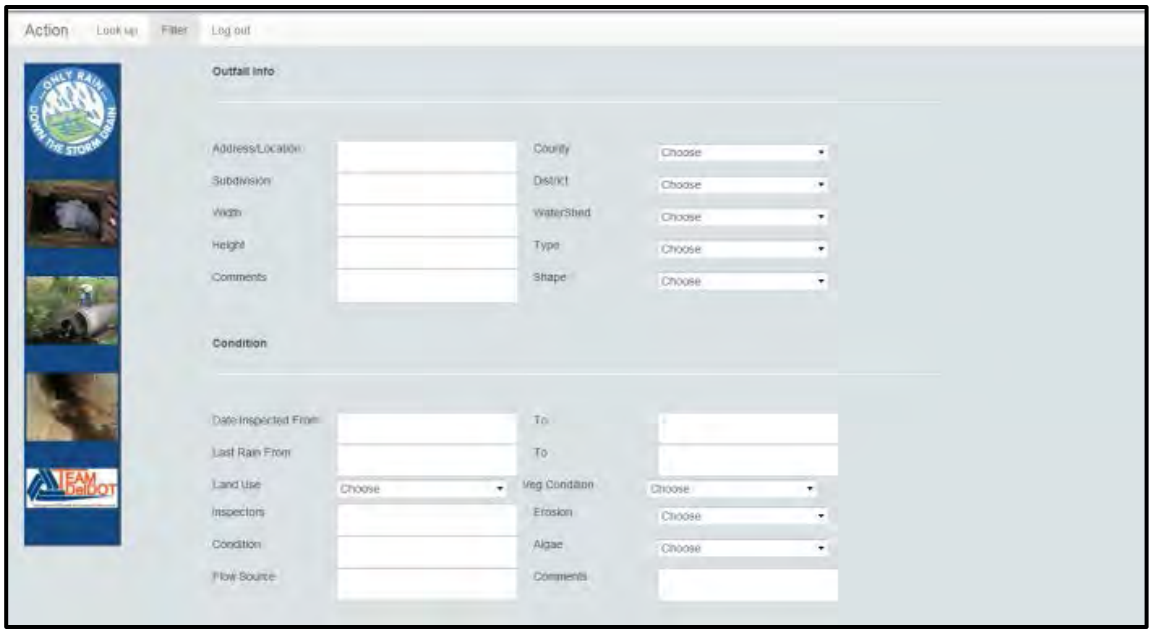
In 2013, the DelDOT NPDES IDDE Field Screening Website was created. It was designed to function as an online database for the IDDE Program, and contains outfall screening data from 2007–2013. The website is the final step in DelDOT's IDDE Program documentation process.

The NPDES IDDE Field Screening Website contains the following documentation:

- Incident ID Numbers
- Location and Structure Information (from NPDES Map Viewer)
- Structural Condition
- Photos
- Field Testing and Laboratory Analysis Data
- Final Determination (e.g., Illicit Discharge, No Evidence of Illicit Discharge, etc.).

Outfalls can be searched or "filtered" by the following features:

- **Outfall Information**
  - Address/Location, Subdivision, Width, Height
  - County, District, Watershed, Type, Shape
- **Condition**
  - Flow Rate, Flow Source (if known)
  - Land Use, Erosion, Algae
- **Flow Characteristics**
  - Color, Floatables, Odor, Deposits/Stains
- **Testing Parameters (Historical and Current)**
  - Water Temp, pH
  - Chlorine, Copper, Turbidity, Potassium, Phenol, Detergent, Ammonia, Fluoride, Oil & Grease, Bacteria_Entero, Bacteria_Fecal



ILLICIT DISCHARGE & ELIMINATION PROGRAM

2013 ANNUAL REPORT

APPENDIX A

2013
POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS

- **SUMMARY TABLE**

APPENDIX A

POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS
2013 SUMMARY TABLE

Field Visit Date	Reported By	Investigation Results	Determination	Action
Incident ID 2012-1				
Structure 420121101135958 **32772 Bi-State Blvd, Sussex County** **Possible Sanitary Sewer Connection into Catch Basin**				
12/04/12	CEI	No flow from 4" illegal connection; discharge ponded in bottom catch basin smelled like sewage, had disintegrated paper, and field-tested high for turbidity, detergents and ammonia; 4 hour re-test: high turbidity, ammonia and detergents.	Notified DelDOT; requested KCI sent Illicit Discharge Notice.	Mailed Illicit Discharge Notice via 2-day FedEX 12/12/12; will revisit site in 30 days.
01/09/13	DelDOT	--	DNREC (Jim Cassidy) to follow-up and coordinate with homeowner to re-route pipes. DNREC will notify DelDOT when fixed so DelDOT can plug pipe.	
05/15/13	DNREC	Meeting with Mr. Pete Massey (Homeowner). Confirmed washing machine and kitchen sink connected to Structure 420121101135958.	Mr. Massey requested 6 week period to re-route washing machine and kitchen sink to existing system.	Mr. Massey informed after 07/01/13 pipe connection into structure 420121101135958 may be sealed.
05/29/13	KCI	Standing water in catch basin. Sample collected for lab analysis.	--	--
06/13/13	Lab Results	Sample tested high for detergents. The Ammonia/Potassium Ratio > 1.	Using the IDDE Flow Chart, the lab results confirm the discharge source = non sanitary wastewater source.	Waiting to hear from DNREC.
Incident ID 2013-1				
Structure 820130328104258 **Orchard Grove Drive, Kent County** **Pet Waste Dumped into Catch Basin**				
03/28/13	Resident	Agr 1591 KCI staff observed pet waste bag on top grate at Structure 820130328104258 while performing MS4 inspection.	Contacted DelDOT NPDES Manager.	Referred to DelDOT.
09/06/13	Resident	DelDOT requested KCI distribute doorhangers.	KCI distributed 150 doorhangers.	No further action.
Incident ID 2013-2				
Structure 61710 **Concord Pike Auto Spa, New Castle County** **Car Wash Discharging into MS4**				
04/04/13	Neighbors via DNREC	KCI observed no washing; Standing water in catch basin.	Sample was field tested = parameters within allowable limits	Coordinate with DelDOT and County; Re-visit as appropriate.

APPENDIX A

POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS
2013 SUMMARY TABLE

Field Visit Date	Reported By	Investigation Results	Determination	Action
04/17/13	Neighbors via DNREC	KCI observed no washing; Standing water in catch basin.	Sample 1 and Sample 2 field-tested = parameters within allowable limits.	Coordinate with DelDOT and County; Monitor DelDOT Traffic Camera to identify washing; re-visit during washing.
04/30/13	New Castle County	Jim Smith (NCCo) informed Mr. Staffieri (owner 202 Auto Spa) that it is illegal to dump vehicle wash water in storm sewer.	--	--
08/22/13	DelDOT	KCI observed car washing on 202 Auto Spa driveway.	Sample of road runoff collected for lab analysis.	Pending Lab Results.
	DelDOT	Lab Results.	Lab results = high concentration of detergents; ammonia/potassium ratio < 1 mg/L. IDDE Flowchart = wastewater.	Results forwarded to DelDOT. NCC to take further action.
12/03/13	KCI/DelDOT	Auto Spa NOV.	KCI received verification of NOV.	No further action.
Incident ID 2013-3				
Structure 120130404090402 **30739 Sussex Highway R&R Grill/Hardees, Sussex County** **Gray Water & Film in Catch Basin**				
04/18/13	CEI	KCI to investigate.	--	--
04/23/13	KCI	WQ parameters tested within allowable limits; other items rating =5.	Re-Visit	Re-Visit.
04/24/13	KCI	WQ parameters tested within allowable limits; other items rating =1.	Re-Visit	Re-visit.
05/21/13	KCI	Sample sent to lab to test for Potassium, Fluoride, Oil and Grease, Fecal Bacteria and E.Coli. 2 PVC pipes discovered flowing into discharge pipe.	Contact the Hardees restaurant and conduct dye testing/investigate the source of the discharge.	Re-visit.
05/31/13	KCI	No elevated hits on any parameters.	Contact the Hardees restaurant and conduct dye testing/investigate the source of the discharge.	Re-visit
07/18/13	KCI	Verified groundwater heat pumps were installed and functioning. Discharge was higher than normal due to hot temperatures. Sample sent to lab to test for Ammonia, Surfactants, Potassium, Fluoride, Enterococci, Fecal, and Metals.	Wait for lab results to verify discharge is clean.	Pending lab results.
07/26/13	KCI	No elevated hits on any parameters.	Lab results showed no elevated hits on any parameters. It was determined the source of the discharge is from a groundwater heat pump with an open loop system using the open discharge method.	No further action.

APPENDIX A

POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS
2013 SUMMARY TABLE

Field Visit Date	Reported By	Investigation Results	Determination	Action
Incident ID 2013-70				
Structure 220131216135651 **Webbs Road, Sussex County** **Gray Water in Catch Basin that Smells Like Fabric Softener**				
12/16/13	1591 Field Crew	During routine 1591 inspections, a KCI field crew noticed a catch basin with a non DelDOT connection that smelled like fabric softener and had a gray coloring.	KCI Agr 1613 to investigate.	KCI Agr 1613 to investigate.
12/17/13	1613 Field Crew	A sample was collected and brought to QC Laboratories to be tested for ammonia, potassium and surfactants.	--	Waiting for lab results.
12/31/13	Lab Results	Lab results = 17.7 mg/L surfactants; .340 mg/L ammonia; 2.26 mg/L potassium.	According to IDDE Flow Chart, water is likely from a graywater/washwater source.	Structure will be re-sampled with 72 hour dry period.
01/20/14	1591 Field Crew	1591 collected a follow up sample from standing water in catch basin. PVC pipe was not actively flowing. Sent to lab for Potassium, Ammonia, Surfactants analysis.	--	Waiting for lab results.
01/29/14	Lab Results	Lab resutls = 15.0 mg/L Surfactants; 3.65 mg/L Ammonia; 20.3 mg/L Potassium.	According to IDDE Flow Chart, water is likely from a graywater/washwater source.	Send homeowner illicit discharge notice.
01/31/14	KCI	--	Certified illicit discharge notice mailed to homeowner.	Estimated delivery date = 02/01/14.
Incident ID 2013-71				
Smyna Swim Club **214 South Carter Road, Kent County** **Pool Discharge Running Off into DelDOT Roadway Work Area**				
10/04/13	DelDOT	DelDOT crew observed possible chlorinated pool discharge entering Carter's Road work area.	Location is outside Phase I and Phase II NPDES permitted area. No sample collected.	DelDOT to Contact DNREC.
	DNREC	DNREC contacted Town of Smyrna to advise that all water must be dechlorinated prior to discharge.	No enforcement action will be taken.	No further action.

Appendix C. Article on guardrail vegetation management alternatives published in April 2013 issue of Roads & Bridges magazine.

By Susan Barton
Contributing Author

Guards lose cover

Study finds most effective way to treat guardrails

For the past 50 years or more, mowing and herbicides have been the predominant methods used to manage nationwide roadside vegetation.

New environmental laws, reduced budgets and increased public interests necessitate finding more environmentally sensitive methods, incorporating new technologies, incurring lower maintenance costs and finding cost-effective alternatives to today's methods of management of roadside vegetation. The Delaware Department of Transportation (DelDOT) is committed to reducing pesticide use in their transportation rights-of-way and therefore funded a study to look at various options for controlling vegetation under guardrails while maintaining functionality.

A variety of ways

The area adjacent to the guardrail must be kept clear of vegetation to allow clear visibility of the barrier. Robert Moosmann of Maine DOT explained that control of vegetation under and behind guardrails would restrict the buildup of debris, which includes sand and sediment that prevent proper sheet flow of water off the road surface. With unmanaged vegetation, rills develop behind the guardrail as water channels to points of least resistance and results in erosion. But low-growing grasses planted under guardrails can increase biofiltration of storm-water runoff.

Some states use mowing and hand trimming (mechanical control) as their primary management tool. Mowing, while evaluated as the most cost efficient currently available option in a California study, is often not

Left to right: U-Teck WeedEnder standard cut, U-Teck WeedEnder custom cut, Universal Weed Cover, TrafFix. All are guardrail treatments studied in Delaware.

feasible because of mower size and the inability to maneuver the mowing head around and under the guardrails. Hand trimming is time consuming and labor intensive as well as dangerous because of operator exposure working between traffic and the barriers.

With cultural control, a plant species is established that will compete with and suppress growth of the unwanted brush. A dense stand of low-growing plants is referred to as living mulch. White clover was tested as living mulch but did not establish successfully enough to compete with weeds. Where maintenance with residual herbicides has been practiced over a number of years, the lingering presence of residual herbicides may limit desirable plant growth, favoring the most aggressive and often undesirable species. Creating and encouraging stable, low-maintenance vegetation is a more permanent vegetation-management strategy and should be the goal for all rights-of-way. Weed-control mats (fiber and rubber) have been tested in some states, and concerns about joint sealing and molding around guardrail posts providing an opportunity for weed growth have been identified. Washington state tested several weed barriers and found a need for annual cleaning to remove accumulation of organic and inorganic debris. Without this debris removal, the organic buildup starts to grow grass and weeds. Although prohibitively expensive for normal guardrail locations, on sites where herbicide use is restricted, weed barriers may provide a viable option.

Herbicides are considered to be the cheapest and most efficient method of vegetation control. Two applications of herbicide are often sufficient to effectively treat weeds for a season. There also are many environmental, health and logistical problems with herbicide use. Herbicide spray trucks hamper traffic flow, often requiring a lane closure and causing traffic delays. Herbicide application is sensitive to weather conditions—herbicides cannot be applied on rainy or windy days. Human health risk is a concern, and protective equipment must be used

> **In Delaware, zoysiagrass** appears to be competitive enough to prevent weed incursion, at least in the first year of establishment.

Table 1. DelDOT Treatments Under Guardrails

Three herbicide formulations
Formulation 1 - standard DelDOT New Castle County formulation comprised of DuPont Karmex DF Herbicide (diuron), BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate), BASF Pendulum (pendimethalin)
Formulation 2 - sensitive areas formulation comprised of BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate), BASF Pendulum (pendimethalin)
Formulation 3 - Dow AgroSciences Accord XRT (glyphosate)
Four weed-control barriers
U-Teck WeedEnder standard installation (a permeable recycled fiber material)
U-Teck WeedEnder custom installation (a product designed to reach the road edge and accommodate variances in post width)
Universal Weed Cover (a semi-rigid panel made of 100% recycled plastic)
TrafFix (a rubber mat with three punched guardrail cutouts for flexible installation)
Competitive vegetation
Low fescue
Zoysia seed
Zoysia sod
Hand trimming
Pavement under guardrail

Irregular edge between herbicide-treated guardrail zone and median vegetation.

Table 2. DelDOT Suitability Rating and Weeds Rating Summarized by Treatments for 2011

Treatment	DelDOT suitability	Weeds
U-Teck WeedEnder standard cut	3.38	2.75
U-Teck WeedEnder custom cut	4.87	4.58
TrafFix	4.20	3.93
Low fescue	4.20	3.45
Zoysiagrass sod	4.93	4.47
Zoysiagrass seed	4.00	2.27
Hand trim	3.73	2.78

by applicators. Dead vegetation after the use of herbicides can be unsightly. Bare-ground herbicides can increase the risk of erosion and usually results in an uneven line between bare ground and living vegetation, which is unsightly. Herbicides are a tool in integrated vegetation management, but high ecological costs, high sociological costs and short-term, temporary benefits are prompting vegetation managers to look for alternatives.

Plotting for improvement

Most states use a mixture of vegetation-control methodologies. Site-specific procedures are selected rather than policy that applies to the entire state. The department of transportation can then utilize a geographic information system (GIS) to map populations and preserve desirable roadsides while managing undesirable vegetation. The first step is to decide if vegetation control is required based on surface-drainage issues; subsurface drainage issues; storm-water management; pavement breakup; visibility for safety; worker safety; fire starts; landscape design; wildlife road kill; and structural deterioration of guardrails. If control is required, feasibility of alternatives (mechanical, cultural, biological and chemical) is considered. Finally, criteria can be developed to identify highly sensitive areas that warrant finding workable alternatives to conventional maintenance even if costs increase.

In April 2008, 24 guardrail plots were selected on Delaware roadsides based on the presence of guardrail with low-growing existing vegetation, as well as accessibility for treatment and data collection. Treatments included three formulations of herbicide, four weed barriers, hand trimming, pavement, low fescue turf, zoysiagrass and a control (Table 1). There were three replications of each treatment located at different sections of guardrail and split between the two sites.

Low fescue plots were established using a low fescue blend (Silverlawn Creeping Red Fescue [34.46%]), Discovery Hard Fescue (27.34%), Rescue 911 Hard Fescue (27.32%) and Annual Ryegrass (9.98%), and were

hand trimmed as needed to meet DelDOT's safety requirements. Low fescue plots were spot-treated with herbicides as needed in order to reduce competition during the establishment period. Zoysiagrass plots were seeded with Compadre zoysiagrass. Zoysiagrass sod plots were prepped by raking out debris and digging out the soil so the sod could be installed level with the road surface and surrounding median turf. Hand-trimmed plots were trimmed as needed to maintain vegetation below the top of the guardrail. Hand trimming varied from year to year based primarily on rainfall. There was no vegetation-management strategy employed on the control treatment.

Plots were observed monthly during the growing season, and were assessed for compliance with DelDOT guardrail standards and the weed level present. A DelDOT acceptability rating was taken as an assessment of how well the plot conformed to DelDOT's requirement of a clear guardrail on a scale of 1-5 (1 = guardrail completely obscured; 2 = vegetation covering most of guardrail; 3 = vegetation taller than guardrail in spots; 4 = vegetation starting to grow taller than guardrail in spots; 5 = no vegetation near guardrail). A weeds rating was assigned on a scale of 1-5 (1 = completely overgrown with weeds; 2 = a high level of weeds present; 3 = moderate weeds present; 4 = a few weeds present; 5 = no weeds present).

FACT FINDER

When you consider amortization over a 10-year lifespan, weed-control barriers are still the most expensive vegetation-control option under guardrail.

Optimal options

Vegetation management of some kind is necessary to keep guardrails from being obstructed. Guardrails were still visible for the first year with no treatment, but early in the growing season of the second year they were obstructed.

Herbicides have been the traditional method of vegetation control in Delaware. The standard DelDOT guardrail formulation (DuPont Karmex DF Herbicide [diuron]), BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate) and BASF Pendulum (pendimethalin) is used in most places, and an alternative formulation of BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate) and BASF Pendulum (pendimethalin) is used in sensitive areas. Both provided adequate vegetation control when applied once a year. A third formulation (Dow AgroSciences Accord XRT [glyphosate]) did not adequately control vegetation. Herbicide treatments result in bare ground for most of the year. Erosion can be a problem when bare ground is maintained. After treatment, a brown zone of vegetation exists below the guardrail and can be unsightly, especially when spray drift or misapplication results in an uneven treatment edge.

We know that herbicides will prevent roadside vegetation from interfering with the guardrail and provide an inexpensive control option (Table 3). The goal of this project was to find a more environmentally satisfactory alternative to herbicide

Table 3. Cost Comparison of Guardrail Treatments in Delaware (per 100 linear ft of guardrail)

Treatment	Installation cost	Yearly maintenance cost	Installation cost (amortized over 10 years)	Total yearly cost (incl. amortized installation cost)
Standard herbicide formulation (1)	0	$44.92	0	$44.92
Sensitive site herbicide formulation (2)	0	$44.20	0	$44.20
Accord (glyphosate)-only formulation (3)	0	$38.58	0	$38.58
U-Teck WeedEnder standard cut	$1789.52	$24.00[1]	$178.95	$202.95
U-Teck WeedEnder custom cut	$2197.54	$8.00[2]	$219.75	$227.75
Universal Weed Cover	$2607.00	0	$260.70	$260.70
TrafFix	$2537.17	$24.00[1]	$253.72	$277.72
Low fescue	$444.33	$47.02[3]	$44.43	$75.34
Hand trimming	0	$24.00[1]	0	$24.00
Zoysia sod	$1,582.28	0	$158.23	$158.23
Zoysia seed	$345.28	$16.00[4]	$34.53	$50.53
FlightTurf	$541.93	TBD	$54.19	$54.19
Control	0	0	0	0

[1] Includes 1.5 hand trims/100 linear ft, no herbicide treatment.
[2] Includes .5 hand trims/100 linear ft, no herbicide treatment.
[3] Includes 1.5 hand trims/100 linear ft, and 1.25 herbicide treatments/100 linear ft. (The herbicide treatment for low fescue is assumed to be required for three years until the low fescue stand becomes thick enough to outcompete other vegetation.)
[4] Includes 1 hand trim/100 linear ft. (This is based on only one year of data and assumed to be at least 1.5x in future years.)

Strip between weed barrier and pavement allowing weed growth.

use, so alternative control measures must compare favorably with herbicide use in terms of effectiveness, cost, environmental impact and aesthetics.

Weed-control barriers are difficult to retrofit in existing sites where the weed barrier cannot be laid true to the side of the road and on a perfectly flat surface. They are more appropriate in new road situations where grading and consistent distance between guardrail and road surface can be controlled. Vegetation growing over the surface of the barrier is not a problem, since the plants that grow over the surface are low. Deposition of organic material on the barrier surface that supports weed growth may result in taller weed growth and is more likely to happen the longer the barrier stays in place on the roadside. Caulk is the weakest portion of the barrier and may degrade faster than the barrier fabric, resulting in breakthrough vegetation. Installation error also is a cause of barrier breakthrough. Expertise (possibly by vendors themselves) is required for installation.

Vegetation grows in open soil between the road surface and barrier when the barrier cannot abut the road surface. The U-Teck WeedEnder custom cut product was designed to address this issue. In some guardrail situations this product can abut or overlap the road surface, but in some cases the guardrail is located too far away from the road surface to make this feasible.

Low fescue turf is used under guardrail to provide a solid low-growing ground cover that competes with other weedy plants that will grow taller and disturb the integrity of the guardrail. In 2009 and 2011, selective herbicides were used to reduce the broadleaved weed and annual grass competition. Low fescue did not establish a dense enough cover to outcompete weeds during the course of this study. Plots required hand trimming, but the low fescue plots were superior in appearance to the hand-trimmed plots, because they contained a larger percentage of desirable turf.

Zoysiagrass did not establish from seed in 2012, but zoysiagrass sod established within one month and provided a competitive cover under the guardrail. Zoysiagrass sod was competitive enough to prevent significant weed incursion during the first year after planting. It did not require mowing during the first year. Since zoysiagrass is a warm-season grass, it went dormant and turned brown in Delaware after the first frost.

Hand-trimmed plots required trimming twice a year for the first two years

The picture above shows Bermuda grass growing around guardrail beam where caulk malfunctioned.

The study revealed that zoysiagrass sod provided a competitive, low maintenance vegetative cover under guardrail.

of the study, when they were trimmed in May and September. By waiting until mid-June for the first trimming, most plots were maintained at an appropriate height for guardrail function with one hand trimming per year. On average over the four years of data collection these plots were trimmed 1.5 times a year. Hand trimming results in relatively solid vegetation under the guardrail, which reduces erosion potential and is more attractive than bare-ground treatment.

When you consider amortization over a 10-year life span, weed-control barriers are still the most expensive vegetation-control option under guardrail. They may be warranted in highly sensitive areas where herbicide use is unacceptable or other conditions warrant the complete lack of vegetation under guardrail.

Low fescue, if it is established within three years, provided a competitive enough mat of vegetation such that selective herbicides were no longer needed and competes favorably in cost per 100 linear ft with herbicide treatments. Herbicide use has not been eliminated for the first three years, but the herbicide use is selective rather than a nonselective burn-back of all existing vegetation. So, erosion is not a problem and the guardrail treatment is more aesthetically pleasing than bare ground, especially compared with an uneven treatment edge that often exists between the guardrail zone and the median vegetation with bare-ground herbicide treatment.

Hand trimming is the least expensive control method employed in this study (other than the control). This was true when DelDOT crews performed the hand trimming. If outside contractors were hired to hand trim, the cost per year would be approximately double the herbicide and low fescue treatments.

Since zoysiagrass did not establish from seed during the first year, this does not appear to be a viable establishment protocol on the roadside. Zoysiagrass sod appears to be an effective vegetative cover. North Carolina has reported that centipedegrass and zoysiagrass can provide a stable competitive vegetation under guardrail.

In Delaware, zoysiagrass appears to be competitive enough to prevent weed incursion, at least in the first year after establishment. It will be interesting to continue observation of zoysiagrass sod plots to see how frequently hand trimming is required and if it remains competitive under the guardrail. Based on the performance of zoysiagrass in lawns in Delaware, it is expected to start to grow into the adjacent median. R&B

Barton is an associate professor and extension specialist at the University of Delaware.

For more information about this topic, check out the Maintenance Channel at www.roadsbridges.com.

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Write in 771

Appendix D. Maintenance bulletins provided as training for District staff in 2013.

Stormwater Pollution Prevention Bulletin

For DelDOT Maintenance Staff

Issue 19 / February 2013

SPILL PREVENTION, CONTROL & COUNTERMEASURES

SPCC Plans

To comply with federal regulations and laws regarding the storage of and use of fuels and materials stored in quantities that pose a risk to nearby surface waters, Spill Prevention, Control and Countermeasures Plans were developed for each of the Maintenance Yard in 2008. Every five years these plans must be evaluated and reviewed. The NPDES Section has reviewed the plans and in 2013 the plans and training materials will be updated.

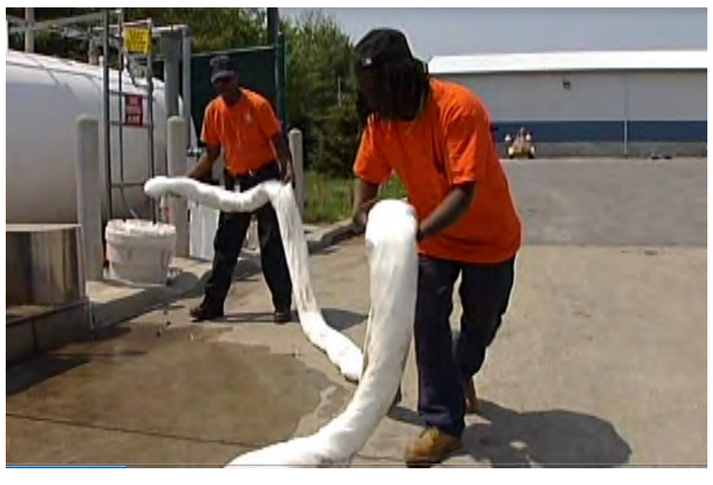
Guidelines for when a SPCC is required

Any facility (boating or storage) that has a total aboveground petroleum capacity greater than 1,320 gallons must have an SPCC plan.

The SPCC shall be reviewed every five years. If any changes in facility design, construction, operation, or maintenance that could affect the facility's potential to discharge oil happens prior to that review, an amendment must be made to the SPCC within 6 months of the change occurring. Please notify the NPDES Section if any changes occur at your facility.

Prevention Techniques

Including secondary containment and positioning aboveground storage tanks away from travel paths limits the possibility of damage to storage containers by vehicles. Keeping spill response kits fully stocked and in the proper areas aids crews to respond quickly to spills.



In Case of a Spill

If a spill were to occur the steps to secure the site and limit environmental impacts are:

- Identify the source
- Stop the flow
- Contain the spill
- Contact the appropriate regulatory agencies

In or On Navigable Waters

For vessels or work within or near a navigable waters (any stream, creek or river) the Federal Water Pollution Control Act (Clean Water Act) applies.

Threshold	Agency	Contact Information
Visible Sheen	U.S. Coast Guard NRC	1-800-424-8802
Visible Sheen	DNREC Emergency Response	1-800-662-8802
Visible Sheen	DNREC Tank Management	1-800-424-8802

Contact the Agencies below

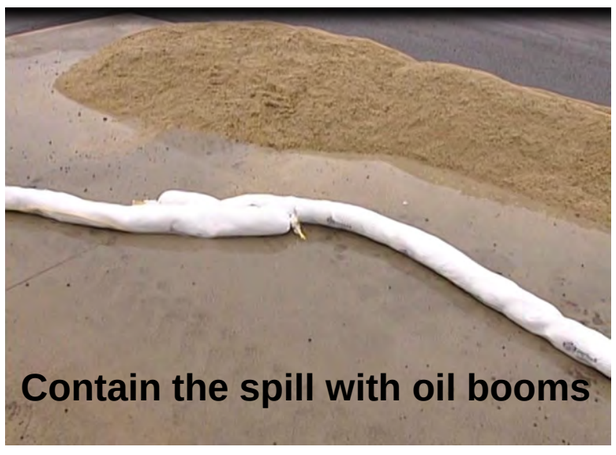
On land (the spill does not reach a waterway)

Threshold	Agency	Contact Information
25 gallons (fuel)	DNREC Emergency Response	1-800-424-8802
150 gal (oils/fluids)	DNREC Emergency Response	1-800-662-8802
1000 gallons (any)	Environmental Protection Agency	(See Reporting Section)

Containment

To contain the spill, use oil booms and absorbent pads to absorb the spill or leak.

If the spill or leak is large the use of sand or soil to contain the spill until other absorbents can be brought to the site is acceptable.



Contain the spill with oil booms

The disposal of used oil absorbent materials depends on what type of fluid was absorbed and how the absorbent was used.

Clean up and Disposal

Standard absorbents that are saturated with *gasoline* or *hazardous waste* should be disposed of by contacting an environmental firm that specializes in hazardous waste disposal.

TEAM DelDOT
Transparent Efficient Accountable Measured

Stormwater Quality Program

Oil booms placed to absorb fuel

Oil booms and pads used to absorb *oil and diesel fuel* can be wrung out over *oil recycling bins and disposed of in the trash.*

If the response is larger than the crew can handle, contact an Emergency Response Contractor. (See your facilities' SPCC Plan for contact information.)

Reporting

Reporting of a spill or leak must occur within 24 hours.

Less than 25 gallons of petroleum (fuel) or 150 gallons of other petroleum product (hydraulic oil), internal reporting only. More than these quantities , the report must be made to DNREC.

If more than 1000 gallons at one time or Two (2) greater that 42 gallon discharges within 12 months, the incident must be reported to EPA Region 3 within 60 days.

Additional information is available from the DelDOT NPDES Section.
Questions or comments may be directed to Randy Cole, NPDES Program Manager, (302) 760-2194 or Randy.Cole@state.de.us.
www.deldot.gov/stormwater

Stormwater Pollution Prevention Bulletin

For DelDOT Maintenance Staff

Issue 20/ August 2013

GOOD HOUSKEEPING - WASTE STORAGE AND DISPOSAL

Waste Management

With maintaining the states right of way, the responsibility of storing and disposal of the waste that is purposely or inadvertently left along our highways falls on the shoulders of our maintenance staff. Keeping our roadways safe and free of debris has the potential to cause other environmental impacts when stockpiled and stored at our facilities. The following guidelines provide several options that decrease the possibility of stormwater and groundwater contamination.

Stockpile Areas

Using concrete barrier or upright concrete curb are efficient ways to redirect stormwater runoff away from stockpile areas.

Keeping material stockpiles separated and marked will keep disposal costs down and reduce the opportunities for waste to be mobilized in stormwater or tracked off site.

Plan your stockpile area to include room for trash, sweeper waste, compost (dead animals), millings, stone and other materials frequently stored on site.

Although not necessary, an impervious pad can decrease disturbance of the subsoil during removal for transfer to a landfill or other site.

For stockpiles that are larger and frequently added to or removed from, such as topsoil, hotmix millings, etc., these materials can be protected with silt fence to prevent stormwater runoff in these areas from leaving the site.

Dead Deer Disposal

Disposal of Dead Deer and other animals killed on our roadways can be dealt with in several different ways. Animal Mortality Handling is regulated under the US Department of Agriculture's Natural Resources Conservation Service (NRCS Code 317) and some of the disposal methods are regulated by DNREC.

There are several disposal options, but many of these are not feasible or available in Delaware.

To remain consistent throughout the state, keep costs to a minimum and prevent possible stormwater and groundwater contamination, ***composting dead deer is the preferred option***. The compost pile should be placed on an impervious surface and protected from stormwater runoff with barrier or curb and requires a carbon source. Wood chips, leaf litter or sawdust debris resulting from roadside maintenance is free and readily available.

Oil, Batteries, Metals, Tires & Trash

Temporary storage of these items at our area yards is necessary. To avoid stormwater contamination proper storage and routine disposal is key.

Arrange for pickup or disposal of wastes as the stockpile area fills up or on a monthly basis, whichever comes first.

Stormwater Quality Program

For materials that can be recycled (batteries, waste oil, metals, etc.) keep these materials separated and under cover to prevent stormwater contamination until they are picked up.

Whenever possible use **covered dumpsters** to contain trash and metal debris is the preferred option. The dust from metals stockpiled on site is easily mobilized in stormwater. Storing trash in covered dumpsters also prevents vermin from scattering trash on site.

The most successful Best Management Practice is to **Minimize Exposure**. Minimizing exposure prevents pollutants from coming into contact with stormwater. This also reduces the need to install stormwater treatment BMPs.

Useful Websites:

http://dda.delaware.gov/nutrients/D17762BestMgmtbklt.pdf

http://www.epa.gov/npdes/pubs/sector_ab_transport.pdf

Additional information is available from the DelDOT NPDES Section.
Questions or comments may be directed to Randy Cole, NPDES Program Manager, (302) 760-2194 or Randy.Cole@state.de.us.
www.deldot.gov/stormwater

Appendix E. Semi-annual wet weather monitoring results from DelDOT maintenance facility outfalls.

DelDOT Maintenance Facilities
Semi-annual Wet Weather Grab Samples

CHESWOLD		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
		11/4/04	12/7/04			1/14/06	9/1/06	1/5/07	8/20/07	1/11/08	9/6/08	4/3/09	9/11/09	1/17/10	8/12/10	1/18/11	9/6/11	4/22/12	9/18/12	3/12/13	9/21/13
TOTAL SUSPENDED SOLIDS	mg/L	525	39			47	45	6	469	717	51	33	171	36	548	372	36	163	221	60	65.5
SURFACTANTS, MBAs	mg/L	0.49	0.03			0.09	0.29	0.21	0.43	0.28	1.6	0.25	0.15	0.16	0.42	0.16	0.19	0.35	0.233	0.17	0.298
CHLORIDE	mg/L	346	13.6			1993	242	457	443	471	107	603	50.5	7460	90.4	9170	258	1050	45.4	545	67.4
TPH-GASOLINE RANGE ORGANICS	mg/L	<0.05	<0.10			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.100	<0.100	
TPH-DIESEL RANGE ORGANICS	mg/L	0.96	<0.10			0.18	0.14	<0.1	0.22	0.1	3.62	0.23	0.18	1.70	0.40	0.66	0.39	1.13	<0.500	<0.500	
OIL & GREASE																					ND
pH	s.u.	7.62	6.59			7.96	7.22	8.24	7.68	8.11	7.13	7.43	7.33	8.28	8.19	7.42	7.52	6.94	7.80	7.75	7.74

DOVER, OUTFALL #2		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
																					10/7/13
TOTAL SUSPENDED SOLIDS	mg/L																				167
SURFACTANTS, MBAs	mg/L																				0.05
CHLORIDE	mg/L																				13.4
TPH-GASOLINE RANGE ORGANICS	mg/L																				
TPH-DIESEL RANGE ORGANICS	mg/L																				
OIL & GREASE																					5.3
pH	s.u.																				7.85

MAGNOLIA, OUTFALL #1		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
																					10/7/13
TOTAL SUSPENDED SOLIDS	mg/L																				98.9
SURFACTANTS, MBAs	mg/L																				<0.040
CHLORIDE	mg/L																				197
TPH-GASOLINE RANGE ORGANICS	mg/L																				
TPH-DIESEL RANGE ORGANICS	mg/L																				
OIL & GREASE																					<5.00
pH	s.u.																				7.05

MAGNOLIA, OUTFALL #2		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
																					10/7/13
TOTAL SUSPENDED SOLIDS	mg/L																				670
SURFACTANTS, MBAs	mg/L																				0.964
CHLORIDE	mg/L																				120
TPH-GASOLINE RANGE ORGANICS	mg/L																				
TPH-DIESEL RANGE ORGANICS	mg/L																				
OIL & GREASE																					11.8
pH	s.u.																				7.55

HARRINGTON		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
		11/4/04	12/7/04			1/14/06	9/1/06	1/5/07	9/11/07	2/1/08	9/6/08	4/3/09	9/11/09	1/17/10	10/14/10	1/8/11	9/6/11	4/22/12	11/7/12	3/12/13	8/1/13
TOTAL SUSPENDED SOLIDS	mg/L	320	2130			195	15	106	9	60	48	21	161	37	11	6	5	17.2	<4.00	14	ND
SURFACTANTS, MBAs	mg/L	<0.02	<0.02			0.22	0.27	0.1	0.23	0.16	0.69	0.2	0.22	0.1	0.05	0.07	0.08	0.11	0.088	0.112	0.123
CHLORIDE	mg/L	195	504			1453	186	83.2	96.6	1870	331	644	51	9000	98.8	143	68.2	1130	37.1	408	48.2
TPH-GASOLINE RANGE ORGANICS	mg/L	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.100	<0.100	0.112
TPH-DIESEL RANGE ORGANICS	mg/L	0.14	0.15			<0.10	0.20	<0.1	<0.1	<0.13	0.24	0.11	0.23	0.70	0.10	0.11	0.16	<0.5	<0.500	<0.500	ND
OIL & GREASE																					
pH	s.u.	7.67	6.80			6.90	6.84	7.24	7.59	6.97	7.26	7.34	7.17	8.33	7.47	7.50	8.93	7.39	7.27	7.52	7.64

DelDOT Maintenance Facilities
Semi-annual Wet Weather Grab Samples

ELLENDALE, OUTFALL #2		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013
																				11/26/13
TOTAL SUSPENDED SOLIDS	mg/L																			5070
SURFACTANTS, MBAs	mg/L																			ND
CHLORIDE	mg/L																			38.7
TPH-GASOLINE RANGE ORGANICS	mg/L																			
TPH-DIESEL RANGE ORGANICS	mg/L																			
OIL & GREASE																				3.9
pH	s.u.																			7.31

ELLENDALE, OUTFALL #3		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013
																				11/26/13
TOTAL SUSPENDED SOLIDS	mg/L																			175
SURFACTANTS, MBAs	mg/L																			0.272
CHLORIDE	mg/L																			90.3
TPH-GASOLINE RANGE ORGANICS	mg/L																			
TPH-DIESEL RANGE ORGANICS	mg/L																			
OIL & GREASE																				5.00
pH	s.u.																			8.27

SEAFORD		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013
																				10/7/13
TOTAL SUSPENDED SOLIDS	mg/L																			324
SURFACTANTS, MBAs	mg/L																			0.45
CHLORIDE	mg/L																			229
TPH-GASOLINE RANGE ORGANICS	mg/L																			
TPH-DIESEL RANGE ORGANICS	mg/L																			
OIL & GREASE																				<5.00
pH	s.u.																			8.04

GEORGETOWN		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013
		11/4/04	12/7/04	1/18/06	9/1/06	1/7/07	8/20/07													10/7/13
TOTAL SUSPENDED SOLIDS	mg/L	17	39	47	36	17	19													27
SURFACTANTS, MBAs	mg/L	<0.02	0.03	0.09	0.13	0.08	0.17													0.15
CHLORIDE	mg/L	12.2	13.6	1993	15.9	8.87	17.3													11.7
TPH-GASOLINE RANGE ORGANICS	mg/L	<0.05	<0.10	<0.05	<0.05	<0.05	<0.05													
TPH-DIESEL RANGE ORGANICS	mg/L	<0.10	<0.10	0.18	<0.10	<0.1	0.14													
OIL & GREASE	mg/L																			ND
pH	s.u.	7.19	6.59	7.96	6.92	7.38	6.9													7.41

DAGSBORO, OUTFALL #1		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013
																				10/7/13
TOTAL SUSPENDED SOLIDS	mg/L																			43.8
SURFACTANTS, MBAs	mg/L																			0.129
CHLORIDE	mg/L																			136
TPH-GASOLINE RANGE ORGANICS	mg/L																			
TPH-DIESEL RANGE ORGANICS	mg/L																			
OIL & GREASE																				2.6
pH	s.u.																			7.62

DelDOT Maintenance Facilities
Semi-annual Wet Weather Grab Samples

DAGSBORO, OUTFALL #2		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013
																				10/7/13
TOTAL SUSPENDED SOLIDS	mg/L																			30
SURFACTANTS, MBAs	mg/L																			0.124
CHLORIDE	mg/L																			58.2
TPH-GASOLINE RANGE ORGANICS	mg/L																			
TPH-DIESEL RANGE ORGANICS	mg/L																			
OIL & GREASE																				2.7
pH	s.u.																			7.66

Benchmark Values:

TSS – 100 mg/L
Surfactants – 1.0 mg/L
Chlorides – no benchmark
Oil and Grease – 15 mg/L
pH – 6 to 9 s.u.

Appendix F. List of all DelDOT BMP facilities.

Facility Number	Road Name	District	County	Facility Type
1	Fieldsboro Rd	Canal	New Castle	Bioretention
2	Fieldsboro Rd	Canal	New Castle	Bioretention
3	Church Rd	Canal	New Castle	Dry Pond
4	I-95 Service Plaza	North	New Castle	Bioretention
5	Walker Road	Central	Kent	Wet Pond
6	#324 - Ebenzer Church Rd, #13 - Paper Mill Rd	North	New Castle	Wet Pond
7	SR 1	Central	Kent	Wet Pond
8	Sr 1 NB off-ramp to south Smyrna	Central	Kent	Wet Pond
9	#80 - Sr 1, #1 - US 13	Canal	New Castle	Wet Pond
10	SR 1	Central	Kent	Dry Pond
11	Bayview Rd (423), Vance Neck Rd (37), US 13 (22)	Canal	New Castle	Wet Pond
12	US 13 (22), SR1 (82), Pole Bridge Rd (420)	Canal	New Castle	Wet Pond
13	SR1 (82), Pole Bridge Rd (420), US 13 (22)	Canal	New Castle	Wet Pond
14	Hyetts Corner Rd (413)	Canal	New Castle	Wet Pond
15	SR1 (82), Lorewood Grove Rd (412)	Canal	New Castle	Wet Pond
16	SR1 (82), Lorewood Grove Rd (412)	Canal	New Castle	Wet Pond
17	SR 1	Central	Kent	Wet Pond
18	SR 1	Central	Kent	Wet Pond
19	Lorewood Grove Rd (412), US 13 (34), SR1 (82)	Canal	New Castle	Dry Pond
20	Lantana Square	North	New Castle	Dry Pond
21	Paper Mill Rd (13), Possum Park Rd (314)	North	New Castle	Wet Pond
22	Naamans Rd	North	New Castle	Dry Pond
23	Naamans Rd	North	New Castle	Dry Pond
24	Naamans Rd	North	New Castle	Dry Pond
25	Naamans Rd	North	New Castle	Dry Pond
26	Cauffied Estate Connector (24)	North	New Castle	Biofiltration Swale
27	Cauffied Estate Connector (24)	North	New Castle	Biofiltration Swale
28	#324 - Ebenezer Church Rd, #13 - Paper Mill Rd	North	New Castle	Dry Pond
29	South Carter's Rd	Central	Kent	Wet Pond
30	Naamans Rd	North	New Castle	Dry Pond
31	Naamans Rd	North	New Castle	Wet Pond
32	Cauffied Estate Connector (24)	North	New Castle	Biofiltration Swale
33	Naamans Rd	North	New Castle	Dry Pond

Facility Number	Road Name	District	County	Facility Type
34	Cauffied Estate Connector (24)	North	New Castle	Biofiltration Swale
35	Naamans Rd	North	New Castle	Sediment Forebay
36	Walther Road	Canal	New Castle	Biofiltration Swale
37	Sr 273	North	New Castle	Biofiltration Swale
38	Sr 273	North	New Castle	Dry Pond
39	Sr 273	Canal	New Castle	Wet Pond
40	Sr 273	Canal	New Castle	Wet Pond
41	Sr 273	Canal	New Castle	Wet Pond
42	Sr 273	Canal	New Castle	Wet Pond
43	Sr 273	Canal	New Castle	Wet Pond
44	Sr 273	Canal	New Castle	Wet Pond
45	Walther Road	Canal	New Castle	Biofiltration Swale
46	273	Canal	New Castle	Sand Filter
47	Sr 54	South	Sussex	Biofiltration Swale
48	Talley Rd	North	New Castle	Baysaver
49	Lancaster Pike	North	New Castle	Infiltration Trench
50	301 weigh station	Canal	New Castle	Biofiltration Swale
51	Cauffied Estate Connector (24)	North	New Castle	Biofiltration Swale
52	Lancaster Pike	North	New Castle	Sand Filter
53	Patriots Way	South	Sussex	Infiltration Trench
54	Lancaster Pike	North	New Castle	Sand Filter
55	Lancaster Pike	North	New Castle	Sand Filter
56	Lancaster Pike	North	New Castle	Sand Filter
57	Lancaster Pike	North	New Castle	Sand Filter
58	Lancaster Pike	North	New Castle	Sand Filter
59	Lancaster Pike	North	New Castle	Sand Filter
60	Lancaster Pike	North	New Castle	Sand Filter
61	Lancaster Pike	North	New Castle	Sand Filter
62	Lancaster Pike	North	New Castle	Sand Filter
63	Lancaster Pike	North	New Castle	Sand Filter
64	Lancaster Pike	North	New Castle	Sand Filter
65	Lancaster Pike	North	New Castle	Sand Filter
66	Lancaster Pike	North	New Castle	Sand Filter
67	Lancaster Pike	North	New Castle	Sand Filter
68	Lancaster Pike	North	New Castle	Sand Filter
69	Lancaster Pike	North	New Castle	Sand Filter
70	Lancaster Pike	North	New Castle	Sand Filter
71	Lancaster Pike	North	New Castle	Sand Filter
72	Lancaster Pike	North	New Castle	Sand Filter
73	Lancaster Pike	North	New Castle	Sand Filter
74	US 113	South	Sussex	Biofiltration Swale
75	Lancaster Pike	North	New Castle	Biofiltration Swale
76	Kiamensi	North	New Castle	Wet Pond

Facility Number	Road Name	District	County	Facility Type
77	#104 - Kenton Rd, #157 - Walker Rd	Central	Kent	Wet Pond
78	Chapman	North	New Castle	Wet Pond
79	Valley Road	North	New Castle	Dry Pond
80	Valley Road	North	New Castle	Biofiltration Swale
81	Magnolia yard	Central	Kent	Wet Pond
82	Valley Road	North	New Castle	Dry Pond
83	South Carter's Rd	Central	Kent	Wet Pond
84	Sr 896	Canal	New Castle	Dry Pond
85	Sr 896	Canal	New Castle	Dry Pond
86	Sr 896	Canal	New Castle	Dry Pond
87	Sr 896	Canal	New Castle	Wet Pond
88	Sr 896	Canal	New Castle	Wet Pond
89	Porter Rd	Canal	New Castle	Wet Pond
90	St Annes Church Rd	Canal	New Castle	Wet Pond
91	Porter Rd	Canal	New Castle	Wet Pond
92	Cedar Lane Rd	Canal	New Castle	Dry Pond
93	Fleming's Landing Bridge Rd.	Canal	New Castle	Biofiltration Swale
94	Harrington yard	Central	Kent	Dry Pond
95	SR 1	Canal	New Castle	Wet Pond
96	SR 1	Canal	New Castle	Wet Pond
97	SR 1	Canal	New Castle	Wet Pond
98	SR 1	Canal	New Castle	Wet Pond
99	SR 1	Canal	New Castle	Wet Pond
100	SR 1	Canal	New Castle	Wet Pond
101	SR 1	Canal	New Castle	Wet Pond
102	Middletown	Canal	New Castle	Dry Pond
103	Sand Hill Rd	South	Sussex	Biofiltration Swale
104	Lancaster Pike	North	New Castle	Biofiltration Swale
105	Lancaster Pike	North	New Castle	Wet Pond
106	Rt 15	Central	Kent	Infiltration Basin
107	Salem Church Rd	North	New Castle	Biofiltration Swale
108	273	Canal	New Castle	Wet Pond
109	301 weigh station	Canal	New Castle	Biofiltration Swale
110	301 weigh station	Canal	New Castle	Biofiltration Swale
111	US 13	Canal	New Castle	Wet Pond
112	SR 1	Central	Kent	Bioretention
113	SR 1	Central	Kent	Bioretention
114	SR 1	Central	Kent	Bioretention
115	SR 1	Central	Kent	Bioretention
116	SCR 357 & SCR 360	South	Sussex	Bioswale
117	Sr 54	South	Sussex	Wet Pond
118	SR 1	Canal	New Castle	Dry Pond
119	SR 1	Canal	New Castle	Infiltration Trench

Facility Number	Road Name	District	County	Facility Type
120	SR 1	Canal	New Castle	Dry Pond
121	SR 1	Canal	New Castle	Dry Pond
122	SR 1	Canal	New Castle	Dry Pond
123	SR 1	Canal	New Castle	Dry Pond
124	SR 1	Canal	New Castle	Dry Pond
125	SR 1	Canal	New Castle	Dry Pond
126	Anchorage Ave., Sr 1	South	Sussex	Sediment Forebay
127	SR 1	Canal	New Castle	Wet Pond
128	SR 1	Canal	New Castle	Wet Pond
129	SR 1	Canal	New Castle	Dry Pond
130	SR 1	Canal	New Castle	Wet Pond
131	SR 1	Canal	New Castle	Wet Pond
132	SR 1	Canal	New Castle	Dry Pond
133	SR 1	Canal	New Castle	Dry Pond
134	SR 1	Canal	New Castle	Dry Pond
135	SR 1	Canal	New Castle	Dry Pond
136	SR 1	Canal	New Castle	Dry Pond
137	Churchman's Rd	Canal	New Castle	Wet Pond
138	SR 1	Canal	New Castle	Dry Pond
139	#56 - Airport Rd	Canal	New Castle	Wet Pond
140	SR 1	Canal	New Castle	Dry Pond
141	SR 1	Canal	New Castle	Wet Pond
142	Sears Blvd.	North	New Castle	Wet Pond
143	SR 141	North	New Castle	Wet Pond
144	Skyline Drive	North	New Castle	Sand Filter
145	Vaughn Rd	South	Sussex	Dry Pond
146	Vaughn Rd	South	Sussex	Dry Pond
147	Sr 896	Canal	New Castle	Biofiltration Swale
148	Sr 896	Canal	New Castle	Biofiltration Swale
149	Sr 896	Canal	New Castle	Biofiltration Swale
150	Sr 896	Canal	New Castle	Biofiltration Swale
151	Sr 896	Canal	New Castle	Biofiltration Swale
152	Sr 896	Canal	New Castle	Biofiltration Swale
153	Sr 896	Canal	New Castle	Biofiltration Swale
154	Sr 896	Canal	New Castle	Biofiltration Swale
155	Sr 896	Canal	New Castle	Biofiltration Swale
156	Sr 896	Canal	New Castle	Biofiltration Swale
157	Sr 896	Canal	New Castle	Biofiltration Swale
158	Sr 896	Canal	New Castle	Biofiltration Swale
159	Sr 896	Canal	New Castle	Biofiltration Swale
160	Sr 896	Canal	New Castle	Biofiltration Swale
161	Sr 896	Canal	New Castle	Biofiltration Swale
162	Sr 896	Canal	New Castle	Biofiltration Swale
163	Sr 896	Canal	New Castle	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
164	Sr 896	Canal	New Castle	Biofiltration Swale
165	Sr 896	Canal	New Castle	Biofiltration Swale
166	Sr 896	Canal	New Castle	Dry Pond
167	SR 1	Central	Kent	Wet Pond
168	Rehoboth Park-n-Ride	South	Sussex	Sand Filter
169	School Bell Road	Canal	New Castle	Wet Pond
170	School Bell Road	Canal	New Castle	
171	Rt 40	Canal	New Castle	Wet Pond
172	Holland Glade Rd	South	Sussex	Filter Strip
173	Rt 40	Canal	New Castle	Wet Pond
174	Sr 26	South	Sussex	Biofiltration Swale
175	Middletown Maintenance Yard	Canal	New Castle	Biofiltration Swale
176	White Oak Road (66)	Central	Kent	Wet Pond
177	SR 1	Central	Kent	Dry Pond
178	SR 1	Central	Kent	Dry Pond
179	Christiana Mall	Canal	New Castle	Wet Pond
180	Sr 404	South	Sussex	Wet Pond
181	US 301	Canal	New Castle	Wet Pond
182	Sr 7	North	New Castle	Wet Pond
183	Sr 7	North	New Castle	Dry Pond
184	Sr 7	North	New Castle	Biofiltration Swale
185	SR1, Pine Tree Rd (25), South Frontage Rd	Canal	New Castle	Wet Pond
186	SR1, Noxontown Rd. (38), South Frontage Rd	Canal	New Castle	Wet Pond
187	South Frontage Rd., Noxontown Rd. (38)	Canal	New Castle	Wet Pond
188	US 13 (1), Old State Rd (441)	Canal	New Castle	Dry Pond
189	US 13, South Frontage Rd, Old State Rd (441)	Canal	New Castle	Wet Pond
190	US 13 (1), Sycamore Lane	Canal	New Castle	Dry Pond
191	SR1, US 13 (1), Sycamore Lane	Canal	New Castle	Wet Pond
192	Lancaster Pike	North	New Castle	Bioretention
193	US 40	Canal	New Castle	Dry Pond
194	Naamans Rd	North	New Castle	Wet Pond
195				
196	College Ave	Canal	New Castle	Dry Pond
197	Dennys Road	Central	Kent	Bioswale
198	Sr 7	North	New Castle	Wet Pond
199	Sr 7	North	New Castle	Wet Pond
200	US 113	South	Sussex	Wet Pond
201	US 113	South	Sussex	Wet Pond
202	Sr 71	Canal	New Castle	Wet Pond
203	US 13 (3), Puncheon Run Connector	Central	Kent	Wet Pond

Facility Number	Road Name	District	County	Facility Type
204	Puncheon Run Connector	Central	Kent	Wet Pond
205	Puncheon Run Connector	Central	Kent	Wet Pond
206	Puncheon Run Connector	Central	Kent	Wet Pond
207	US 113 (7), Puncheon Run Connector	Central	Kent	Wet Pond
208	Puncheon Run Connector, SR1	Central	Kent	Wet Pond
209	Puncheon Run Connector, US 113 (7), SR1 (150)	Central	Kent	Wet Pond
210	Scarborough Rd	Central	Kent	Wet Pond
211	Scarborough Rd	Central	Kent	Wet Pond
212	Scarborough Rd	Central	Kent	Wet Pond
213	Virginia Ave.	South	Sussex	Wet Pond
214				
215	Cedar Grove Road	South	Sussex	Infiltration Basin
216	College Rd	Central	Kent	Biofiltration Swale
217	Lancaster Pike	North	New Castle	Wet Pond
218	Lancaster Pike	North	New Castle	Wet Pond
219	#34 - US 13, #356 - Sr 72 (Wrangle Hill Rd)	Canal	New Castle	Wet Pond
220	Sr 141	North	New Castle	Wet Pond
221	Summit Bridge Rd	Canal	New Castle	Wet Pond
222	Bear Yard	Canal	New Castle	Wet Pond
223	Sr 7	North	New Castle	Wet Pond
224	Sr 7	North	New Castle	Wet Pond
225	Sr 7	North	New Castle	Dry Pond
226	Sr 54	South	Sussex	Wet Pond
227	Sr 54	South	Sussex	Biofiltration Swale
228	Sr 54	South	Sussex	Biofiltration Swale
229	Cauffied Estate Connector (24)	North	New Castle	Biofiltration Swale
230	Cauffied Estate Connector (24), Philadelphia Pike	North	New Castle	Dry Pond
231				
232	Claymont Rail Station	North	New Castle	Filter Strip
233	Claymont Rail Station	North	New Castle	Sediment Forebay
234	Lancaster Pike	North	New Castle	Wet Pond
235	Sr 7	Canal	New Castle	Wet Pond
236	SR 1	South	Sussex	Wet Pond
237	Sr 9	Canal	New Castle	Biofiltration Swale
238	Sr 9	Canal	New Castle	Biofiltration Swale
239	Sr 7	Canal	New Castle	Wet Pond
240	Sr 7	Canal	New Castle	Wet Pond
241	Sr 7	Canal	New Castle	Wet Pond
242	Porter Rd	Canal	New Castle	Wet Pond
243	Ransom Lane, Kent Street	Central	Kent	Dry Pond
244	I-497	North	New Castle	Wet Pond

Facility Number	Road Name	District	County	Facility Type
245	New Linden Hill Rd	North	New Castle	Bioretention
246	North Street	Central	Kent	Wet Pond
247	Sr 24	South	Sussex	Wet Pond
248	Sr 18	South	Sussex	Bioretention
249	Roxana Road	South	Sussex	Wet Pond
250	Burbage Rd	South	Sussex	Wet Pond
251	Sr 26	South	Sussex	Sediment Forebay
252	Sr 26	South	Sussex	Wet Pond
253	I-95	North	New Castle	Shallow Marsh
254	I-95	North	New Castle	Shallow Marsh
255	Sr 26	South	Sussex	Biofiltration Swale
256	Sr 26	South	Sussex	Biofiltration Swale
257	Sr 26	South	Sussex	Biofiltration Swale
258	Sr 26	South	Sussex	Biofiltration Swale
259	Sr 26	South	Sussex	Biofiltration Swale
260	Sr 26	South	Sussex	Biofiltration Swale
261	Sr 26	South	Sussex	Biofiltration Swale
262	Sr 26	South	Sussex	Biofiltration Swale
263	Sr 26	South	Sussex	Biofiltration Swale
264	Sr 26	South	Sussex	Biofiltration Swale
265	Sr 26	South	Sussex	Biofiltration Swale
266	Sr 26	South	Sussex	Biofiltration Swale
267	Sr 26	South	Sussex	Biofiltration Swale
268	Sr 26	South	Sussex	Biofiltration Swale
269	Sr 26	South	Sussex	Biofiltration Swale
270	Sr 26	South	Sussex	Biofiltration Swale
271	Sr 26	South	Sussex	Biofiltration Swale
272	Sr 26	South	Sussex	Biofiltration Swale
273	Sr 26	South	Sussex	Biofiltration Swale
274	Sr 26	South	Sussex	Biofiltration Swale
275	Sr 26	South	Sussex	Biofiltration Swale
276	Sr 26	South	Sussex	Biofiltration Swale
277	Sr 26	South	Sussex	Biofiltration Swale
278	Sr 7	North	New Castle	Wet Pond
279	Sr 7	North	New Castle	Wet Pond
280	Choptank Rd	Canal	New Castle	Biofiltration Swale
281	Choptank Rd	Canal	New Castle	Biofiltration Swale
282	Choptank Rd	Canal	New Castle	Biofiltration Swale
283	Choptank Rd	Canal	New Castle	Biofiltration Swale
284	Choptank Rd	Canal	New Castle	Wet Pond
285	Choptank Rd	Canal	New Castle	Biofiltration Swale
286	Choptank Rd	Canal	New Castle	Biofiltration Swale
287	Choptank Rd	Canal	New Castle	Biofiltration Swale
288	Choptank Rd	Canal	New Castle	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
289	Choptank Rd	Canal	New Castle	Biofiltration Swale
290	Choptank Rd	Canal	New Castle	Biofiltration Swale
291	Choptank Rd	Canal	New Castle	Bioretention
292	Choptank Rd	Canal	New Castle	Filter Strip
293	Choptank Rd	Canal	New Castle	Filter Strip
294	Choptank Rd	Canal	New Castle	Filter Strip
295	Sr 1, #268 - Kings Highway	South	Sussex	Sediment Forebay
296	SR 1	South	Sussex	Sediment Forebay
297	Tweeds Park			
298	Tweeds Park			
299	Tweeds Park			
300	#315 - Tower Hill Rd	Central	Kent	Biofiltration Swale
301	#314 - Farmington Rd, #315 - Tower Hill Rd	Central	Kent	Biofiltration Swale
302	#314 - Farmington Rd	Central	Kent	Biofiltration Swale
303	#314 - Farmington Rd	Central	Kent	Biofiltration Swale
304	#314 - Farmington Rd	Central	Kent	Biofiltration Swale
305	East Service Road	South	Sussex	Biofiltration Swale
306	East Service Road	South	Sussex	Biofiltration Swale
307	East Service Road	South	Sussex	Wet Pond
308	Business 404	South	Sussex	Biofiltration Swale
309	Rt 404	South	Sussex	Biofiltration Swale
310	Rt 404	South	Sussex	Biofiltration Swale
311	Fleming's Landing Bridge Rd.	Canal	New Castle	Biofiltration Swale
312	College Rd	Central	Kent	Biofiltration Swale
313	Naamans Rd	North	New Castle	Sediment Forebay
314	Naamans Rd	North	New Castle	Sediment Forebay
315	I-95	North	New Castle	Wet Pond
316	I-95	North	New Castle	Bioswale
317	I-95	North	New Castle	Wet Pond
318	I-95	North	New Castle	Wet Pond
319	Levels Road	Canal	New Castle	Infiltation Trench
320	US 113	South	Sussex	Filter Strip
321	Harrington Truck Rt	Central	Kent	Biofiltration Swale
322	Harrington Truck Rt	Central	Kent	Biofiltration Swale
323	Harrington Truck Rt	Central	Kent	Biofiltration Swale
324	Harrington Truck Rt	Central	Kent	Biofiltration Swale
325	Harrington Truck Rt	Central	Kent	Biofiltration Swale
326	Harrington Truck Rt	Central	Kent	Biofiltration Swale
327	Harrington Truck Rt	Central	Kent	Biofiltration Swale
328	College Rd	Central	Kent	Biofiltration Swale
329	Cheswold Yard	Central	Kent	Dry Pond
330	Sr 26	South	Sussex	
331	Sr 26	South	Sussex	

Facility Number	Road Name	District	County	Facility Type
332	Sr 26	South	Sussex	
333	Sr 26	South	Sussex	
334	Sr 26	South	Sussex	
335	US 301	Canal	New Castle	Biofiltration Swale
336				
337	US 301	Canal	New Castle	Biofiltration Swale
338				
339	US 301	Canal	New Castle	Biofiltration Swale
340	US 301	Canal	New Castle	Infiltration Trench
341	US 301	Canal	New Castle	Wet Pond
342	US 301	Canal	New Castle	Biofiltration Swale
343	US 301	Canal	New Castle	Infiltration Trench
344	US 301	Canal	New Castle	Biofiltration Swale
345	US 301	Canal	New Castle	Infiltration Trench
346	US 301	Canal	New Castle	Biofiltration Swale
347	US 301	Canal	New Castle	Biofiltration Swale
348	US 301	Canal	New Castle	Infiltration Trench
349	US 301	Canal	New Castle	Biofiltration Swale
350	US 301	Canal	New Castle	Infiltration Trench
351	US 301	Canal	New Castle	Biofiltration Swale
352	US 301	Canal	New Castle	Biofiltration Swale
353	US 301	Canal	New Castle	Infiltration Trench
354	I-95	North	New Castle	check dam
355	I-95	North	New Castle	check dam
356				
357	I-95	North	New Castle	check dam
358	I-95	North	New Castle	check dam
359	I-95	North	New Castle	check dam
360	I-95	North	New Castle	check dam
361	Sr 8	Central	Kent	Biofiltration Swale
362	Carpenters Pit Rd	Central	Kent	Filter Strip
363				
364	Kennett Pike	North	New Castle	Sand Filter
365	Kennett Pike	North	New Castle	Sand Filter
366	Kennett Pike	North	New Castle	Sand Filter
367	Kennett Pike	North	New Castle	Sand Filter
368	Kennett Pike	North	New Castle	Sand Filter
369	Kennett Pike	North	New Castle	Sand Filter
370	Kennett Pike	North	New Castle	Sand Filter
371	Kennett Pike	North	New Castle	Sand Filter
372	Kennett Pike	North	New Castle	Sand Filter
373	Kennett Pike	North	New Castle	Sand Filter
374	Kennett Pike	North	New Castle	Sand Filter
375	Kennett Pike	North	New Castle	Sand Filter

Facility Number	Road Name	District	County	Facility Type
376	Kennett Pike	North	New Castle	Sand Filter
377	Kennett Pike	North	New Castle	Sand Filter
378	Kennett Pike	North	New Castle	Sand Filter
379	Kennett Pike	North	New Castle	Sand Filter
380	Kennett Pike	North	New Castle	Sand Filter
381	Kennett Pike	North	New Castle	Sand Filter
382	Kennett Pike	North	New Castle	Sand Filter
383	Kennett Pike	North	New Castle	Sand Filter
384	Kennett Pike	North	New Castle	Sand Filter
385	Kennett Pike	North	New Castle	Sand Filter
386	Kennett Pike	North	New Castle	Sand Filter
387	Kennett Pike	North	New Castle	Sand Filter
388	Kennett Pike	North	New Castle	Sand Filter
389	Kennett Pike	North	New Castle	Sand Filter
390	Kennett Pike	North	New Castle	Sand Filter
391	Kennett Pike	North	New Castle	Sand Filter
392	Kennett Pike	North	New Castle	Sand Filter
393	Kennett Pike	North	New Castle	Sand Filter
394	Kennett Pike	North	New Castle	Sand Filter
395	Kennett Pike	North	New Castle	Sand Filter
396	Kennett Pike	North	New Castle	Sand Filter
397	Kennett Pike	North	New Castle	Sand Filter
398	Marl Pit Road	Canal	New Castle	Dry Pond
399	Marl Pit Road	Canal	New Castle	Dry Pond
400	Marl Pit Road	Canal	New Castle	Dry Pond
401	SR 1	Central	Kent	Filter Strip
402	SR 1	Central	Kent	Bioswale
403	SR 1	Central	Kent	Bioswale
404	SR 1	Central	Kent	Bioswale
405	Rd 534	South	Sussex	Bioswale
406	Rd 534	South	Sussex	Bioswale
407	Rd 534	South	Sussex	Bioswale
408	Rd 534	South	Sussex	Bioswale
409	Rd 534	South	Sussex	Bioswale
410	Rd 534	South	Sussex	Bioswale
411	Rd 534	South	Sussex	Bioswale
412	Rd 534	South	Sussex	Bioswale
413	Rd 534	South	Sussex	Bioswale
414	Rd 534	South	Sussex	Bioswale
415	Rd 534	South	Sussex	Bioswale
416	Choptank Rd	Canal	New Castle	Filter Strip
417	Rt 42	Central	Kent	Filter Strip
418	Rt 42	Central	Kent	Filter Strip
419	Rt 42	Central	Kent	Filter Strip

Facility Number	Road Name	District	County	Facility Type
420	Talley Rd	North	New Castle	Filter Strip
421	Kennett Pike	North	New Castle	Sand Filter
422	Kennett Pike	North	New Castle	Sand Filter
423	Kennett Pike	North	New Castle	Sand Filter
424	Kennett Pike	North	New Castle	Sand Filter
425	Kennett Pike	North	New Castle	Sand Filter
426	Kennett Pike	North	New Castle	Sand Filter
427	Kennett Pike	North	New Castle	Sand Filter
428	Kennett Pike	North	New Castle	Sand Filter
429	Kennett Pike	North	New Castle	Sand Filter
430	Kennett Pike	North	New Castle	Sand Filter
431	SR-1	Canal	New Castle	Dry Pond
432	Smyrna Rest Area	Canal	New Castle	Bioswale
433	141	North	New Castle	Bioretention
434	141	North	New Castle	Wet Pond
435	141	North	New Castle	Bioretention
436	141	North	New Castle	Wet Pond
437	141	North	New Castle	Bioretention
438	141	North	New Castle	Wet Pond
439	SR-1	Central	Kent	Wet Pond
440	Rd 443	Central	Kent	Filter Strip
441	Rd 443	Central	Kent	Filter Strip
442	Rd 443	Central	Kent	Filter Strip
443	Rd 443	Central	Kent	Filter Strip
444	Rd 371	Central	Kent	Infiltation Trench
445	Rd 371	Central	Kent	Filter Strip
446	Rd 371	Central	Kent	Filter Strip
447	Rd 371	Central	Kent	Filter Strip
448	Rd 371	Central	Kent	Filter Strip
449	Eden Square Connector	Canal	New Castle	Bioretention
450	Eden Square Connector	Canal	New Castle	Bioretention
451	Eden Square Connector	Canal	New Castle	Infiltration Basin
452	Carpenters Pit Rd	South	Sussex	Filter Strip
453	Carpenters Pit Rd	South	Sussex	Filter Strip
454	Carpenters Pit Rd	South	Sussex	Biofiltration Swale
455	SR1	Central	Kent	Wet Pond
456	SR1	Central	Kent	Wet Pond
457	Bowers Beach Road	Central	Kent	Wet Pond
458	East Service Road	Central	Kent	Wet Pond
459	SR1	Central	Kent	Wet Pond
460	Old Barratt's Chapel Road	Central	Kent	Biofiltration Swale
461	Barratt's Chapel Road	Central	Kent	Biofiltration Swale
462	Barratt's Chapel Road	Central	Kent	Biofiltration Swale
463	Barratt's Chapel Road	Central	Kent	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
464	Middletown	Canal	New Castle	Bioretention
465	I-95	North	New Castle	Bioretention
466	I-95	North	New Castle	Bioretention
467	I-95	North	New Castle	Bioretention
468	I-95	North	New Castle	Bioretention
469	I-95	North	New Castle	Bioretention
470	I-95	North	New Castle	Bioretention
471	I-95	North	New Castle	Bioretention
472	I-95	North	New Castle	Bioretention
473	I-95	North	New Castle	Bioretention
474	I-95	North	New Castle	Bioretention
475	I-95	North	New Castle	Bioretention
476	I-95	North	New Castle	Bioretention
477	I-95	North	New Castle	Bioretention
478	I-95	North	New Castle	Bioretention
479	I-95	North	New Castle	Bioretention
480	Levels Road	Canal	New Castle	Biofiltration Swale
481	Levels Road	Canal	New Castle	Biofiltration Swale
482	Levels Road	Canal	New Castle	Biofiltration Swale
483	Levels Road	Canal	New Castle	Biofiltration Swale
484	Levels Road	Canal	New Castle	Biofiltration Swale
485	Levels Road	Canal	New Castle	Biofiltration Swale
486	Hercules Road	North	New Castle	Wet Pond
487	SR 1	Central	Kent	Filter Strip
488	SR 1	Central	Kent	Dry Pond
489	Sand Hill Road	South	Sussex	Biofiltration Swale
490	Sand Hill Road	South	Sussex	Biofiltration Swale
491	Sand Hill Road	South	Sussex	Biofiltration Swale
492	Sand Hill Road	South	Sussex	Biofiltration Swale
493	Sand Hill Road	South	Sussex	Biofiltration Swale
494	Sand Hill Road	South	Sussex	Biofiltration Swale
495	Sand Hill Road	South	Sussex	Biofiltration Swale
496	Sand Hill Road	South	Sussex	Biofiltration Swale
497	Sand Hill Road	South	Sussex	Biofiltration Swale
498	Sand Hill Road	South	Sussex	Biofiltration Swale
499	Sand Hill Road	South	Sussex	Biofiltration Swale
500	Sand Hill Road	South	Sussex	Biofiltration Swale
501	Sand Hill Road	South	Sussex	Biofiltration Swale
502	Sand Hill Road	South	Sussex	Biofiltration Swale
503	Sand Hill Road	South	Sussex	Biofiltration Swale
504	Sand Hill Road	South	Sussex	Biofiltration Swale
505	Sand Hill Road	South	Sussex	Biofiltration Swale
506	Sand Hill Road	South	Sussex	Biofiltration Swale
507	Sand Hill Road	South	Sussex	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
508	Sand Hill Road	South	Sussex	Biofiltration Swale
509	Sand Hill Road	South	Sussex	Biofiltration Swale
510	Sand Hill Road	South	Sussex	Biofiltration Swale
511	Sand Hill Road	South	Sussex	Biofiltration Swale
512	SR-1	Central	Kent	Biofiltration Swale
513	SR-1	Central	Kent	Biofiltration Swale
514	SR-1	Central	Kent	Biofiltration Swale
515	SR-1	Central	Kent	Biofiltration Swale
516	I-95	North	New Castle	Bioretention
517	I-95	North	New Castle	Bioretention
518	I-95	North	New Castle	Bioretention
519	Jamison Corner Road	Canal	New Castle	Wet Pond
520	Jamison Corner Road	Canal	New Castle	Wet Pond
521	Dyke Branch Rd	Central	Kent	Filter Strip
522	Dyke Branch Rd	Central	Kent	Filter Strip
523	Elkton Road	Canal	New Castle	Biofiltration Swale
524	I-95	North	New Castle	Wet Pond
525	I-95	North	New Castle	Wet Pond
526	Newport Road	North	New Castle	Bioretention / Dry Pond
527	Rehoboth Park-n-Ride	South	Sussex	Bioretention
528	202	North	New Castle	Wet Pond
529	Milford Neck Road/SR1	Central	Kent	Wet Pond
530	Tub Mill Pond Road	Central	Kent	Infiltration Basin
531	Tub Mill Pond Road	Central	Kent	Infiltration Basin
532	Tub Mill Pond Road/ SR1	Central	Kent	Wet Pond
533	SR1	North	New Castle	Wet Pond
534	SR1	North	New Castle	Wet Pond
535	SR1 & SR 30	South	Sussex	Infiltration Basin
536	SR1 & SR 30	South	Sussex	Infiltration Basin
537	SR1 & SR 30	South	Sussex	Infiltration Basin
538	Greenbank Road	North	New Castle	sandfilter
539				
540	Zoar Rd	South	Sussex	Filter Strip
541	Zoar Rd	South	Sussex	Biofiltration Swale
542	Zoar Rd	South	Sussex	Filter Strip
543	Zoar Rd	South	Sussex	Biofiltration Swale
544	Zoar Rd	South	Sussex	Filter Strip
545	Zoar Rd	South	Sussex	Biofiltration Swale
546	Zoar Rd	South	Sussex	Biofiltration Swale
547	Zoar Rd	South	Sussex	Filter Strip
548	Zoar Rd	South	Sussex	Filter Strip
549	Zoar Rd	South	Sussex	Filter Strip
550	Zoar Rd	South	Sussex	Filter Strip
551	Zoar Rd	South	Sussex	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
552	Zoar Rd	South	Sussex	Filter Strip
553	Zoar Rd	South	Sussex	Filter Strip
554	Zoar Rd	South	Sussex	Biofiltration Swale
555	Pennsylvania Ave	South	Sussex	Biofiltration Swale
556	Pennsylvania Ave	South	Sussex	Biofiltration Swale
557	Pennsylvania Ave	South	Sussex	Biofiltration Swale
558	Pennsylvania Ave	South	Sussex	Biofiltration Swale
559	Pennsylvania Ave	South	Sussex	Biofiltration Swale
560	Pennsylvania Ave	South	Sussex	Biofiltration Swale
561	Beaver Dam Rd	South	Sussex	Biofiltration Swale
562	Beaver Dam Rd	South	Sussex	Biofiltration Swale
563	Beaver Dam Rd	South	Sussex	Biofiltration Swale
564	Zoar Rd	South	Sussex	Biofiltration Swale
565	Washington St	North	New Castle	Sand Filter
566	Washington St	North	New Castle	Sand Filter
567	Washington St	North	New Castle	Sand Filter
568	Dagsboro Road	South	Sussex	Biofiltration Swale
569	US 113	South	Sussex	Biofiltration Swale
570				
571	US 113	South	Sussex	Biofiltration Swale
572	US 113	South	Sussex	Biofiltration Swale
573	Dagsboro Road	South	Sussex	Filter Strip
574	US 113	South	Sussex	Filter Strip
575	US 113	South	Sussex	Filter Strip
576	Dagsboro Road	South	Sussex	Filter Strip
577	Dagsboro Road	South	Sussex	Filter Strip
578	Handy Road	South	Sussex	Filter Strip
579	Handy Road	South	Sussex	Filter Strip
580	Handy Road	South	Sussex	Filter Strip
581	US 113	South	Sussex	Filter Strip
582	US 113	South	Sussex	Filter Strip
583	US 113	South	Sussex	Filter Strip
584	Dagsboro Road	South	Sussex	Biofiltration Swale
585	Naamans Rd	North	New Castle	Biofiltration Swale
586	Carter Rd	Central	Kent	Sediment Forebay
587	Sunnyside Rd	Central	Kent	Bioretention
588	Sunnyside rd	Central	Kent	Dry Pond
589	Carter Rd	Central	Kent	Bioretention
590	Carter Rd	Central	Kent	Diverter Box
591	US 13	South	Sussex	Biofiltration Swale
592	US 13	South	Sussex	Biofiltration Swale
593	Gravel Hill Road	South	Sussex	Sediment Forebay
594	Sweetbriar Road	South	Sussex	Infiltration Trench
595	Sweetbriar Road	South	Sussex	Infiltration Trench

Facility Number	Road Name	District	County	Facility Type
596	Log Cabin Hill Road	South	Sussex	Infiltration Trench
597	Hudson Road	South	Sussex	Infiltration Basin
598	Bridgeville Maintenance yard	South	Sussex	Biofiltration Swale
599	Bridgeville Maintenance yard	South	Sussex	Filter Strip
600	Bridgeville Maintenance yard	South	Sussex	Wet Pond
601				
602				
603				
604	301	Canal	New Castle	Wet Pond
605	301	Canal	New Castle	Dry Pond
606	Strawberry Lane	Canal	New Castle	Wet Pond
607	301	Canal	New Castle	Dry Pond
608	301	Canal	New Castle	Dry Pond
609	301	Canal	New Castle	Wet Pond
610	Warwick Road	Canal	New Castle	Infiltration Basin
611	301	Canal	New Castle	Wet Pond
612	301	Canal	New Castle	Wet Pond
613	301	Canal	New Castle	Wet Pond
614				
615	Warwick Road	Canal	New Castle	Dry Pond
616	Warwick Road	Canal	New Castle	Wet Pond
617	301	Canal	New Castle	Dry Pond
618	301	Canal	New Castle	Wet Pond
619	Strawberry Lane	Canal	New Castle	Dry Pond
620	301	Canal	New Castle	Infiltration Basin
621	301	Canal	New Castle	Biofiltration Swale
622				
623				
624	301	Canal	New Castle	Infiltration Trench
625	301	Canal	New Castle	Filter Strip
626				
627				
628	301	Canal	New Castle	Biofiltration Swale
629				
630	301	Canal	New Castle	Filter Strip
631				
632				
633				
634				
635				
636	Warwick Road	Canal	New Castle	Filter Strip
637				
638				
639				

Facility Number	Road Name	District	County	Facility Type
640				
641	Warwick Road	Canal	New Castle	Biofiltration Swale
642	Warwick Road	Canal	New Castle	Biofiltration Swale
643	301			
644	301			
645	301			
646	301			
647	301			
648	301			
649	301			
650	301	Canal	New Castle	Infiltration Basin
651	301	Canal	New Castle	Infiltration Basin
652	301	Canal	New Castle	Infiltration Basin
653	301	Canal	New Castle	Biofiltration Swale
654	301	Canal	New Castle	Biofiltration Swale
655	301	Canal	New Castle	Biofiltration Swale
656	301	Canal	New Castle	Biofiltration Swale
657	301	Canal	New Castle	Biofiltration Swale
658	301	Canal	New Castle	Infiltration Basin
659	301	Canal	New Castle	Infiltration Basin
660	301	Canal	New Castle	Wet Pond
661	301	Canal	New Castle	Biofiltration Swale
662	301	Canal	New Castle	Biofiltration Swale
663	301	Canal	New Castle	Infiltration Basin
664	301	Canal	New Castle	Infiltration Basin
665	301	Canal	New Castle	Infiltration Basin
666	301	Canal	New Castle	Wet Pond
667				
668	301	Canal	New Castle	Biofiltration Swale
669				
670	301	Canal	New Castle	Infiltration Basin
671	301	Canal	New Castle	Infiltration Basin
672	301	Canal	New Castle	Dry Pond
673				
674				
675				
676	301	Canal	New Castle	Wet Pond
678				
679				
680				
681	301	Canal	New Castle	Biofiltration Swale
682				
683	301	Canal	New Castle	Wet Pond

Facility Number	Road Name	District	County	Facility Type
684	301	Canal	New Castle	Wet Pond
685	301	Canal	New Castle	Biofiltration Swale
686	301	Canal	New Castle	Wet Pond
687	301	Canal	New Castle	Wet Pond
688	301	Canal	New Castle	Biofiltration Swale
689	301	Canal	New Castle	Biofiltration Swale
690	301	Canal	New Castle	Wet Pond
691	301			
692	301			
693	301			
694	301			
695	301			
696	301			
697	301			
698	301			
699	301			
700	301	Canal	New Castle	Wet Pond
701	301	Canal	New Castle	Infiltration Trench
702	301	Canal	New Castle	Infiltration Trench
703	301	Canal	New Castle	Infiltration Trench
704	301	Canal	New Castle	Dry Pond
705	301	Canal	New Castle	Dry Pond
706	301	Canal	New Castle	Infiltration Trench
707	301	Canal	New Castle	Infiltration Trench
708	301	Canal	New Castle	Infiltration Trench
709	301	Canal	New Castle	Infiltration Trench
710	301	Canal	New Castle	Infiltration Trench
711	301	Canal	New Castle	Wet Pond
712	emergency access ramp to 301	Canal	New Castle	Infiltration Trench
713	emergency access ramp to 301	Canal	New Castle	Infiltration Trench
714				
715				
716				
717				
718				
719				
720	301	Canal	New Castle	Wet Pond
721	301	Canal	New Castle	Biofiltration Swale
722	301	Canal	New Castle	Wet Pond
723	301	Canal	New Castle	Wet Pond
724	301	Canal	New Castle	Biofiltration Swale
725	301	Canal	New Castle	Wet Pond
726	301	Canal	New Castle	Infiltration Trench
727	301	Canal	New Castle	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
728	301	Canal	New Castle	Biofiltration Swale
729	301	Canal	New Castle	Biofiltration Swale
730	301	Canal	New Castle	Biofiltration Swale
731	301	Canal	New Castle	Wet Pond
732	301	Canal	New Castle	Biofiltration Swale
733	301	Canal	New Castle	Wet Pond
734	301	Canal	New Castle	Wet Pond
735	301	Canal	New Castle	Biofiltration Swale
736	301	Canal	New Castle	Biofiltration Swale
737	301	Canal	New Castle	Wet Pond
738	301	Canal	New Castle	Biofiltration Swale
739	301	Canal	New Castle	Biofiltration Swale
740	301	Canal	New Castle	Biofiltration Swale
741	301	Canal	New Castle	Biofiltration Swale
742	301	Canal	New Castle	Biofiltration Swale
743	301	Canal	New Castle	Biofiltration Swale
744	301	Canal	New Castle	Infiltration Trench
745	301	Canal	New Castle	Infiltration Trench
746	301	Canal	New Castle	Biofiltration Swale
747	301	Canal	New Castle	Biofiltration Swale
748	301			
749	301			
750	301			
751	301			
752	301			
753	301			
754	301			
755	301			
756	US 13 Northbound	Canal	New Castle	Infiltration Basin
757	US 13 Southbound	Canal	New Castle	Infiltration Basin
758	US 13 Southbound	Canal	New Castle	Wet Pond
759	US 13 Southbound	Canal	New Castle	Biofiltration Swale
760	US 13 Southbound	Canal	New Castle	Biofiltration Swale
761	301			
762	301			
763	301			
764	301			
765	301			
766	301			
767	301			
768	301			
769	301			
770	301			
771	301			

Facility Number	Road Name	District	County	Facility Type
772	301			
773	301			
774	301			
775	301			
776	301			
777	301			
778	301			
779	301			
780	301			
781	301			
782	301			
783	301			
784	301			
785	301			
786	301			
787	301			
788	301			
789	301			
790	301			
791	301			
792	301			
793	301			
794	301			
795	301			
796	301			
797	301			
798	301			
799	301			
800	301			
801	301			
802	301			
803	301			
804	301			
805	301			
806	301			
807	301			
808	301			
809	301			
810	301			
811	301			
812	301			
813	301			
814	301			
815	301			

Facility Number	Road Name	District	County	Facility Type
816	301			
817	301			
818	301			
819	301			
820	301			
821	301			
822	301			
823	301			
824	301			
825	Lorewood Grove	Canal	New Castle	Biofiltration Swale
826	Hyetts Corner Road	Canal	New Castle	Biofiltration Swale
827	Sorghum Mill Road	Central	Kent	Filter Strip
828	Boyd's Corner Rd	Canal	New Castle	Wet Pond
829	Jamison Corner Rd	Canal	New Castle	Bioretention
830	Jamison Corner Rd	Canal	New Castle	Bioretention
831	Jamison Corner Rd	Canal	New Castle	Bioretention
832	US 13 At Carpenter Bridge Road	Central	Kent	Biofiltration Swale
833	US 13 At Carpenter Bridge Road	Central	Kent	Biofiltration Swale
834	SR 71	Canal	New Castle	Filter Strip
835	Holland Glade Rd	South	Sussex	Filter Strip
836	Holland Glade Rd	South	Sussex	Filter Strip
837	Holland Glade Rd	South	Sussex	Filter Strip
838	Holland Glade Rd	South	Sussex	Filter Strip
839	Holland Glade Rd	South	Sussex	Filter Strip
840	Holland Glade Rd	South	Sussex	Filter Strip
841	Holland Glade Rd	South	Sussex	Filter Strip
842	Holland Glade Rd	South	Sussex	Filter Strip
843	Holland Glade Rd	South	Sussex	Filter Strip
844	Holland Glade Rd	South	Sussex	Filter Strip
845	Holland Glade Rd	South	Sussex	Filter Strip
846	Holland Glade Rd	South	Sussex	Filter Strip
847	Holland Glade Rd	South	Sussex	Filter Strip
848	West Park Drive	North	New Castle	Wet Pond
849	West Park Drive	North	New Castle	Wet Pond
850	West Park Drive	North	New Castle	Wet Pond
851	East Park Drive	North	New Castle	Wet Pond
852	East Park Drive	North	New Castle	Wet Pond
853	East Park Drive	North	New Castle	Wet Pond
854	202	North	New Castle	Wet Pond
855	141	North	New Castle	Wet Pond
856	202	North	New Castle	Wet Pond
857	Business 404	South	Sussex	Biofiltration Swale
858	Business 404	South	Sussex	Biofiltration Swale
859	US 13 SB	South	Sussex	Biofiltration Swale

Facility Number	Road Name	District	County	Facility Type
860	Rt 404	South	Sussex	Biofiltration Swale
861	East Service Road	South	Sussex	Biofiltration Swale
862	US 13 SB	South	Sussex	Biofiltration Swale
863	US 113	South	Sussex	Biofiltration Swale
864	US 113	South	Sussex	Biofiltration Swale
865	US 113	South	Sussex	Biofiltration Swale
866	Hopkins Road	North	New Castle	Filter Strip
867	Hopkins Road	North	New Castle	Filter Strip
868	Hopkins Road	North	New Castle	Filter Strip
869	Mid-County DMV facility	Canal	New Castle	Filter Strip