

Annual Stormwater Report

Term III, Year 4: September 1, 2013 – August 31, 2014

for the

North Carolina Department of Transportation Highway Stormwater Program

For submittal to

NC Department of Environment and Natural Resources
Division of Energy, Mineral, and Land Resources

NC Department of Transportation
NPDES Permit No. NCS000250

November 2014



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Annual Stormwater Report

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Certification

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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."



Nick Tennyson
Chief Deputy Secretary
North Carolina Department of Transportation



Date



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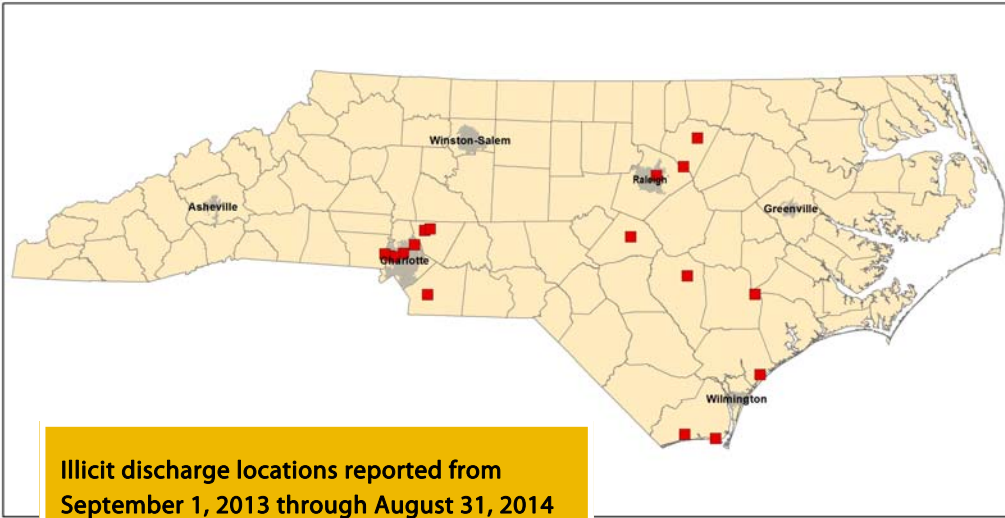
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Acronyms and Abbreviations

APWA	American Public Works Association	JLSLAT	Jordan/Falls Lake Stormwater Nutrient Load Accounting Tool
BFC	Biofiltration Conveyance	LOS	Level of Service
BMP	Best Management Practice	NCDENR	North Carolina Department of Environment and Natural Resources
BUA	Built-Up Area	NCDOT	North Carolina Department of Transportation
CFR	Code of Federal Regulations	NCSU	North Carolina State University
CMY	County Maintenance Yard	NPDES	National Pollutant Discharge Elimination System
DEMLR	Division of Energy, Minerals and Land Resources	NSAB	Nutrient Scientific Advisory Board
DLR	Division of Land Resources	ORW	Outstanding Resource Waters
DMV	Division of Motor Vehicles	PAM	Polyacrylamide
DREE	Division Roadside Environmental Engineer	PCSP	Post-Construction Stormwater Program
DWR	Division of Water Resources	PDEA	Project Development and Environmental Analysis
DWQ	Division of Water Quality	REU	Roadside Environmental Unit
EMC	Environmental Management Commission	RoF	Report of Findings
E&SC	Erosion and Sediment Control	ROW	Right-of-Way
ESM	Environmental Sensitivity Map	SCM	Stormwater Control Measure
FHWA	Federal Highway Administration	SCMS	Stormwater Control Management System
FIP	Field Inventory Protocol	SMP	Stormwater Management Plan
GIS	Geographic Information System	SPCC	Spill Prevention Control and Countermeasure
GPS	Global Positioning System	SPPP	Stormwater Pollution Prevention Plan
GREEN	Guided Reduction of Excess Environmental Nutrients	TIP	Transportation Improvement Project
HSB	Hazardous Spill Basin	TMDL	Total Maximum Daily Load
HSP	Highway Stormwater Program	TS4	Transportation Separate Stormwater Sewer System
HQW	High Quality Waters	US	United States
I&M	Inspection and Maintenance	VCER-1	Verification of Compliance with Environmental Regulations Checklist
IDDEP	Illicit Discharge Detection and Elimination Program		
IRMA	Industrial and Roadway Maintenance Activities		
IRVM	Integrated Roadside Vegetation Management		





Illicit discharge locations reported from September 1, 2013 through August 31, 2014

NCDOT Continues Illicit Discharge Detection and Elimination Program

North Carolina Department of Transportation (NCDOT) continues to maintain its Illicit Discharge Detection and Elimination Program (IDDEP) to detect and eliminate illegal dumping, illegal drainage connections, and the illegal placement of hazardous waste materials along the state’s roadway system. NCDOT employees participate in training to help enable them to identify potential illegal discharges when performing other work on the NCDOT system and report them to the Highway Stormwater Program (HSP) IDDEP Manager, who acts as the primary point of contact for the program. From September 1, 2013, to August 31, 2014, NCDOT identified 17 new illegal discharges across the state, which makes 436 total illegal discharges reported since the initiation of the program in June 1999. Of those discharges reported over the past permit year, 53% were tractor trailer/ vehicle spills on NCDOT roadways, 35% were illegal discharges primarily gray water discharges from residential dwellings, and 12% were illegal dumping sites. One occurred within the Tar-Pamlico River Basin, with two each occurring in the Lumber and Neuse River Basins, and four each occurring within the Cape Fear, Catawba, and Yadkin-Pee Dee River Basins. NCDOT tracks these new discharges, along with past illegal discharge sites, in NCDOT’s internal database and reports them as appropriate to North Carolina Department of Environment and Natural Resources (NCDENR) Regional Offices within 30 days of each incident report date. The figure above displays the locations of all cases reported the past permit year.



Example of a typical spill response on NCDOT right-of-way (ROW) when fuel or antifreeze leaks from a tractor trailer as a result of an accident. Spill response measures are deployed (such as this containment pool used to capture the leak); NCDOT Division personnel record the spill following IDDEP procedures and subsequently notify NCDENR

Program Objectives

NPDES Permit Part II.A

Objectives

- i. Implement an Illicit Discharge Detection and Elimination Program to assure that the illicit discharges, spills, and illegal dumping into the NCDOT transportation separate storm sewer system (TS4) are detected and eliminated.
- ii. NCDOT shall implement appropriate procedures and actions to report illicit spills, discharges and illegal dumping for appropriate enforcement or other action by NCDENR.

Management Measures

- a. Provide illicit discharge identification training.
- b. Perform illicit discharge inspections.
- c. Maintain a standard point of contact.
- d. Report illicit discharges.
- e. Maintain a tracking database.

New Waste Disposal Contract

NCDOT Division staff can use the new waste disposal contract to cleanup illegal dumping activities or vehicle spills along NCDOT roadways (supporting NCDOT's IDDEP) and to remove waste from NCDOT industrial facilities (supporting NCDOT's Industrial Activities Program). In November 2013, NCDOT selected new waste disposal vendors under a new waste disposal contract. In past years NCDOT typically utilized a single vendor to handle the entire State. In order to improve efficiency and responsiveness to NCDOT's waste disposal needs, NCDOT divided the State into three regions and prequalified three vendors per region. NCDOT's Roadside Environmental Unit (REU) staff distributed waste disposal vendor contract information to Division staff during the 2014 annual spring training workshops and reviewed the critical aspects of the new waste disposal contract, including 24-hour emergency numbers for each regional vendor. Division staff can now obtain cost estimates from multiple vendors for non-time critical waste disposal jobs or can select a vendor immediately for emergency jobs.



IDDEP Contacts

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Illegal Dumping Flyer Insert Mailed to One Million Citizens

NCDOT developed an insert that was mailed out by the NC Department of Motor Vehicles (DMV) to approximately one million State residents that were renewing their vehicle registration in the month of August 2014. The insert contained the message to citizens that *"You Can Help! By reporting disposal sites along the roadside of oil, paint, containers with unknown contents, or discolored water...and to also report illegal roadside dumpsites of trash, tires, and demolition or construction debris."* The backside of the insert informed citizens about NCDOT's Swat-A-Litterbug program. To date, NCDOT has received five responses from NC citizens because of the insert, including three illegal discharges and one dumping site along NCDOT roadway. NCDOT staff investigated the complaints and followed up with the callers as well as with NCDENR, if appropriate. If outside NCDOT's jurisdiction, the complaints were referred to the appropriate state or municipal contact. This DMV mailing insert was a proactive step by NCDOT to inform NC citizens on how to report illegal dumping and reduce litter on NCDOT roadways.

Ongoing IDDEP Training

As required by Internal Education Program Management Measures (a) and (b) and IDDEP Management Measure (a), NCDOT HSP staff continues to provide training to NCDOT employees on how to recognize and report illicit discharges and illegal dumping activities. IDDEP training is provided in conjunction with other training events, including the annual spring training workshops for each Division, and during Division meetings. NCDOT continues to post Illegal Dumping educational posters at maintenance facilities. Hardcopies of NCDOT's IDDEP Field Report and the "Illegal Discharge: Know What to Do" brochure are handed out to NCDOT employees at various meetings.

Tracking and Reporting Illicit Discharges

NCDOT continues to maintain a web-based tracking system and database for identified illicit connections and illegal dump sites found along NCDOT roadways. When an illegal discharge is identified along NCDOT roadways, an IDDEP Field Report form is used to capture applicable information. The Division that identifies the discharge or dump site typically performs a preliminary investigation following NCDOT safety procedures to verify the identified illicit discharge or illegal dumped materials. Once the site has been investigated and verified, the Division notifies the IDDEP Manager, who then reports the discharge to the appropriate NCDENR Regional Office within 30 days of the illicit discharge identification date.

Stop Water Pollution

You can help!

By reporting disposal sites along the roadside of:

- Oil,
- Paint,
- Containers with unknown contents, or
- Discolored water that may be yellow, red, green, gray, or is sudsy, have an oily sheen or smell musty, rotten, or like sewage or gasoline.

Also report illegal roadside dumpsites of:

- Trash,
- Tires,
- Demolition or construction debris.

Carefully identify the specific site location, so it can be easily found.

If you find or see any one of these conditions along the state's roadsides, call **(919) 707-2920** to submit a report.

If you see someone in the act of actually dumping along the roadside, call the N.C. State Highway Patrol by dialing ***HP (*47)** on your cell phone.

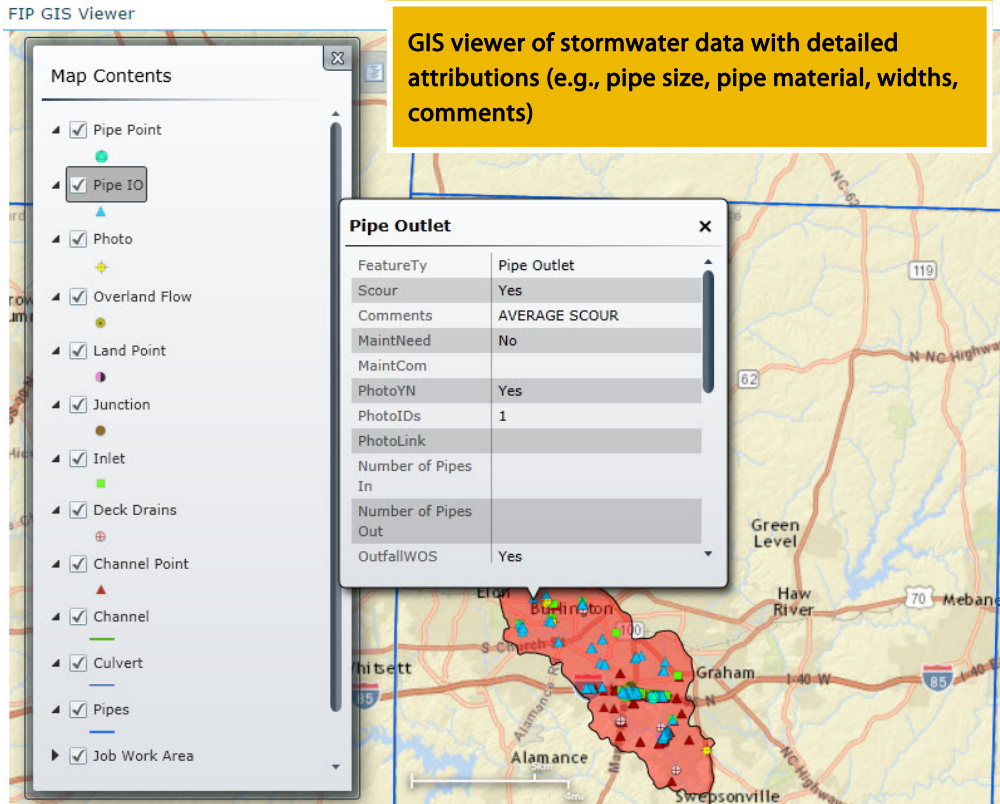
Do Not Remove pollutants from the site.

Please be sure not to remove or collect any of the pollutants because the material could be dangerous to your health.

The department will follow up on this report by contacting the North Carolina Division of Water Quality for the appropriate action.

Illegal dumping flyer insert mailed to one million NC citizens





GIS viewer of stormwater data with detailed attributions (e.g., pipe size, pipe material, widths, comments)

Program Objectives and Management Measures

NPDES Permit Part II.B.1

Objectives

- i. Maintain the statewide NCDOT stormwater system inventory for the purpose of supporting other permit programs.
- ii. Maintain a stormwater system Geographic Information System (GIS) to map and prioritize sensitive water crossings.
- iii. Maintain a field inventory procedure to be used for NCDOT/DWQ-identified priority areas.

Management Measures

- a. Maintain a stormwater system inventory of existing stormwater outfalls to sensitive waters.
- b. Include in the inventory outfalls from new construction projects to all surface waters and wetlands.
- c. Include outfalls for NCDOT industrial facilities in the inventory.
- d. Develop a field outfall inventory procedure for priority areas.

Field Inventory Protocol GIS Viewer Designed for SSIPP SharePoint Homepage

The North Carolina Department of Transportation Highway Stormwater Program (NCDOT HSP) has completed Field Inventory Protocol (FIP) collections in various locations throughout the state. The FIP is used to collect data on NCDOT's drainage system in areas identified by NCDOT and the Division of Energy, Minerals, and Land Resources (DEMLR). A GIS Viewer built using Esri™ technology was hosted on the home page of the project tracking website internal to the HSP to allow non-GIS users to locate where inventories have been conducted. This tool can also be utilized as a status map for current collections to measure completion and budget elements. The user can locate mapping grade GPS stormwater data that includes detailed attributes such as pipe size and material within a study area. This information along with system connectivity can assist in decision-making on new stormwater controls and to support the data needs of the total maximum daily loads (TMDL) program.

NCDOT Finalizes Key FIP Protocols

In the last permit year, NCDOT finalized a FIP Procedures Manual and an Outfall Identification Guidelines document. These documents describe program structure, roles and responsibilities, specific data collection protocols, and methods to identify outfalls to support implementation of the FIP.



Covers of the updated Field Inventory Program Procedures Manual and Outfall Identification Guidelines



NCDOT Maintains Its Stormwater System Inventory

NCDOT continues to maintain an inventory of outfalls which discharge into surface waters. The inventory includes outfalls from NCDOT roadway drainage and outfalls from new construction and industrial activities are updated annually. The inventory is maintained on a web-based GIS system for easy access by NCDOT staff. Among activities conducted this year was the completion of the Little Alamance inventory, which will be used to identify retrofit opportunities in the Jordan Lake Watershed.



GIS Topology Training for HSP-SSIP Staff

A GIS Topology training session was held on December 19, 2013 that involved NCDOT and contractor staff and was in preparation of the Little Alamance FIP collection data review. A topology is a collection of rules that, coupled with a set of editing tools and techniques, enables the geodatabase to more accurately model geometric relationships for point, line and polygon features.

Key parameters discussed in the training:

- Two types of Topologies: Map and Geodatabase
- Data structure must have feature classes within a common feature dataset in a geodatabase
- All data must share a common coordinate system
- A topology cannot be created using data stored in ArcSDE™
- The user must have access to ArcGIS™ Standard or Advanced license

The training focused on developing the topology in ArcCatalog™, becoming familiar with the many topology rules, and navigating the topology toolbar in order to locate and correct any entries that do not follow the topology rules.

Stormwater System Inventory and Prioritization Program Contacts



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Example ArcGIS™ geodatabase topology rules included in staff training





Bioretention basin retrofit for Buddy Phillips Bridge Replacement Project in the City of Jacksonville

NCDOT Partners with Local Municipalities for Retrofit Projects

North Carolina Department of Transportation (NCDOT) partnered with the City of Jacksonville to incorporate two BMP retrofits into the Buddy Phillips Bridge Replacement project over the New River on US 17 Business (Marine Boulevard). NCDOT originally planned to construct a dry detention basin at each end of the bridge to control and treat bridge stormwater runoff before discharging into the New River. Through the planning process, the City of Jacksonville requested one of the dry detention basins, which would be located adjacent to a park area, be changed to a bioretention basin. The bioretention basin would provide the same or potentially greater stormwater treatment as a dry detention basin while more aesthetically pleasing to be near the park. Bioretention basins are typically more shallow devices that incorporate landscaping elements in the design. The City agreed to fund the difference in costs for the upgrade and to take responsibility for long term maintenance of the bioretention basin. Since the long term maintenance costs of bioretention basins can be significant, the agreement with the City provided substantial cost savings to NCDOT. Jacksonville, which is located in a coastal county, has a history of working to improve the New River, and this project provided the City with an opportunity to expand upon its legacy and to educate the public on the importance of stormwater.

The dry detention basin and bioretention basin will improve bridge stormwater quality through processes that reduce peak discharges, promote sedimentation of suspended solids, and filter and retain pollutants. This project is an excellent example of collaboration between stakeholders that was a 'win-win' and ultimately resulted in improved water quality for the New River.

NCDOT also partnered with Mecklenburg County to implement a retrofit project. A dry detention basin will be constructed off of NC 16 (Providence Road) next to Briar Creek. Previously the site of the Dore Academy, the area is located within the floodplain of Briar Creek and frequently experienced flooding events. Mecklenburg County purchased the property and demolished existing structures to restore the area to open space. In addition, a dry detention basin was added to help attenuate peak flows and improve water quality. The dry detention basin was designed, constructed and will be maintained by Mecklenburg County.

Program Objectives and Management Measures

NPDES Permit Part II.B.2

Objectives

- i. Develop, implement, and support the NCDOT program to be consistent with National Pollutant Discharge Elimination System (NPDES) post-construction control measures.
- ii. Use retrofits to address pollutant loading from existing NCDOT activities.
- iii. Retrofits should not be associated with meeting the requirements of any other DWQ program, unless otherwise allowed.

Management Measures

- a. Identify appropriate retrofit sites.
- b. Implement/Install BMP retrofits.



Encroachment was granted by NCDOT to tie into their system to receive and treat drainage from the roadway through the basin before discharging to the creek. This project provides another example of a 'win-win' partnership with a local municipality where both stakeholders provide essential elements to bring a project to fruition with the ultimate benefit to water quality.



Dry detention basin retrofit under construction adjacent to Briar Creek, Mecklenburg County

Annual Retrofit Summary

NCDOT is required to implement management measures to meet the objectives of the BMP Retrofit Program including (1) identifying a minimum of 14 sites per year that are appropriate for retrofit installation and (2) implementing a minimum of five retrofits per year, with a total of 70 retrofits implemented over the 5-year period of the permit.

A total of five BMP retrofits were completed in Year 4 of this permit term, as required by the permit. NCDOT continues to maintain a list of potential retrofit locations for future implementation.

NCDOT Constructs BMPs to Reduce Erosive Conditions

In 2012, NCDOT received notification from NCDENR of severe erosion of an existing ditch through a cow pasture in Deep Gap, NC. Stormwater discharge from US 421 was significantly eroding and depositing large quantities of sediment downstream. Through an initial field investigation, it was determined that the cause of the issue was a large upstream drainage area contributing flow to an existing 24" storm culvert and the easily erodible native soils. A dry detention/water quality basin was constructed on the upstream side of US 421 to attenuate peak flows, while on the downstream side a piped stormwater conveyance was provided to divert flows away from the cow pasture. A vegetated swale with permanent rock check dams was installed at the discharge for velocity reduction and to improve water quality.

Permeable Pavers Installed at Rest Area

In 2014, NCDOT renovated an existing rest area facility located in Washington County, off of US 64. Permeable pavers were selected in lieu of traditional impermeable surfaces, such as concrete or asphalt for pedestrian plaza areas in front and behind the building. Concrete and asphalt count as built-upon area (BUA), which requires treatment of stormwater runoff. Conversely, permeable pavement is not considered BUA, and instead provides a surface that actually infiltrates stormwater, providing treatment directly. The infiltration facilitated by permeable pavement also inherently reduces pollutant loading and runoff rates and volume associated with stormwater runoff. Another advantage of permeable pavement, especially on project sites with limited area or right-of-way, is that it reduces land consumption by providing parking while reducing or eliminating the need for additional treatment at another location on the site.

Permeable pavers can be an attractive option in the appropriate areas, such as those with highly infiltrative soils. This is because they can reduce or eliminate new BUA while providing water quality benefits without the higher capital costs that are associated with traditional structural BMPs, such as collection and conveyance systems (piping) and outlet structures. Permeable pavement can have drawbacks related to maintenance, since it can be clogged by sediment reducing effectiveness. Therefore, routine maintenance is required. Retrofit projects provide value to the HSP by providing the opportunity to evaluate new or innovative approaches to stormwater treatment; this retrofit project may serve as a demonstration site to assess the maintenance burden and longevity of permeable pavers.



Permeable pavers installed at rest area in Washington County



BMP Retrofits Program Contacts

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NCDOT HSP Stormwater Management Plan form

SMP Form Updated

NCDOT had updated its stormwater management plan (SMP) used to document stormwater management decisions and the implementation of structural best management practices (BMPs) to the maximum extent practicable. This tool helps the design engineer evaluate potential stormwater impacts to surface waters during the design phase and to document NCDOT's stormwater management efforts. Users are instructed through the Toolbox that SMPs must be prepared for projects requiring structural BMPs. The SMP also serves to support the Post-Construction Stormwater Program (PCSP) to document decision making.

NCDOT has worked collaboratively with the Department on Environment and Natural Resources (NCDENR) to update the SMP. During a review of the draft SMP version 2 in September of 2013, NCDENR made recommendations to aid in streamlining NCDENR's review and approval process. To address NCDENR's comments and in anticipation of releasing the SMP upon approval of the updated BMP Toolbox, a field was added to document whether a BMP is used to meet buffer requirements. The updated SMP will prompt the user to add additional information explaining the methods used to meet buffer rules if the BMP is required due to these rules. Additional SMP revisions include provisions for documenting deck drain discharge configuration and describing minimization measures and/or justification for direct discharge to buffers or waters. These changes will allow reviewers to quickly determine if requirements have been met for the project.

Finally, the waterbody section was expanded to allow the user to document details on up to 49 waterbodies. This expansion creates greater flexibility for projects spanning multiple waterbodies, as is common for linear systems.

Program Objectives and Management Measures

NPDES Permit Part II.B.3

Objectives

- i. Maintain and update (as necessary) a BMP Toolbox to aid in the siting, design, and construction of stormwater quality BMPs with guidance on the suitability of each for NCDOT applications.
- ii. Evaluate BMPs for applicability to a linear highway system.
- iii. Implement new and innovative technology on an experimental basis in keeping with the current DWQ policy on new stormwater treatment technologies.

Management Measures

- a. Maintain a BMP Toolbox.
- b. Evaluate design-related BMPs.
- c. Submit proposed BMP Toolbox revisions to DWQ for approval.

Back Slope (H:1)	Drainage Area (ac)	Recommended Treatment Length (ft)	Actual Length (ft)	Longitudinal Slope (%)	G2 (cfs)	V2 (ft/s)	G10 (cfs)	V10 (ft/s)	Rock Checks Used	BMP Associated with Buffer Rules?
2.0	1.0	100	100	0.30%	4.0	0.2	5.1	0.2	No	Yes
2.0	1.5	150	150	0.40%	6.0	0.4	7.6	0.4	No	Yes

Dropdown menus remind the user to provide additional information if the BMP is associated with buffer rules



Training Program Developed for Toolbox and SMP Form Version 2.0

The NCDOT BMP Toolbox and Stormwater Management Plan form both have undergone significant changes since their previous versions were released in March 2008 and September 2011, respectively. In anticipation of the release of the updated materials, NCDOT developed training programs to assist users in identifying and understanding the new material.

The target audience for the initial training is Hydraulics Unit personnel and Division staff. In addition to dispersing information to NCDOT personnel, this initial NCDOT internal training will be used to identify any gaps or additional needs before training materials are released to NCDOT's contractors and the general public. The initial training will be given onsite by a live instructor using a slide presentation and instructor notes, and example material that have been developed. It is anticipated that the presentation will later be used to develop on-demand, narrated video modules that will be available on the web for public use. The training programs are intended to be launched closely following the release of the updated Toolbox and SMP, which were approved by NCDENR in September 2014.

The Toolbox and SMP updates will be addressed in separate training modules, each lasting approximately two hours. The Toolbox training addresses some of the minor and miscellaneous changes that are scattered throughout the document as well as the significant changes in Chapter 2 - NCDOT Stormwater BMPs, Chapter 9 - Bridge BMPs, and the new chapters associated with the four new BMPs (Media Filters, Wet Detention Basins, Stormwater Wetlands, and Filter Strips).

The SMP training addresses the following major changes:

- Removal of the Environmental Summary sheet
- Addition of Filter Strips sheet
- Level Spreader, Forebay, Hazardous Spill Basin moved to separate sheets
- Media Filter, Stormwater Wetland, and Wet Detention Basin added to the "Other BMPs" sheet
- New sheet to document bridge to culvert avoidance and minimization efforts

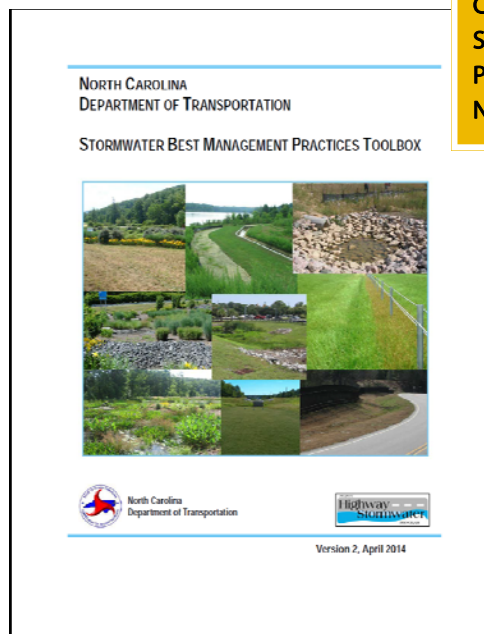
The instructor will also give a sheet-by-sheet discussion that point out the major changes. Areas where specific attention and detail is required will also be pointed out based on past projects with deficient SMPs. The SMP training concludes with two real world example bridge projects. These include a simple project where the majority of the SMP-related content can be captured on the General Project Information sheet as well as a complex project that requires multiple BMPs and a more comprehensive SMP.

A mock training presentation was given to a small group of Hydraulics Unit engineers on March 4, 2014. The training was well received with few minor comments regarding the training materials that were subsequently addressed.



New material for BMP Toolbox training programs

Cover of the updated Stormwater Best Management Practices Toolbox approved by NCDENR in September, 2014

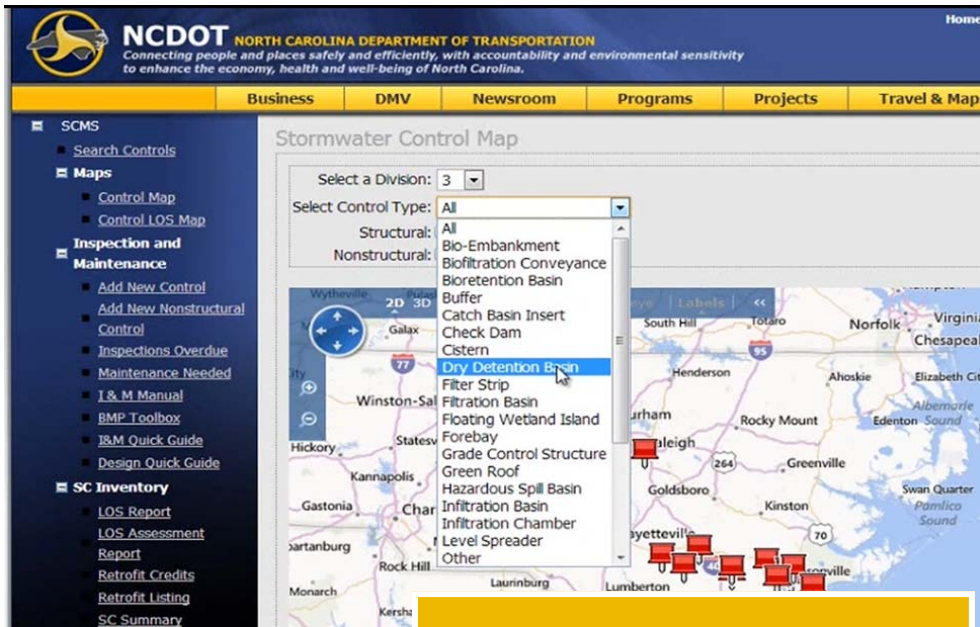


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A snapshot of SCMS training videos with verbal instructions on how to find a NCDOT-maintained Dry Detention Basin in Division 3

SCMS Training Videos Distributed

NCDOT developed and implemented a Stormwater Control Management System (SCMS) website to manage its stormwater control measures (SCMs, also known as best management practices or BMPs). The SCMS website allows NCDOT personnel to maintain an inventory of and to record inspections and maintenance of the SCMs. To ensure effective use of the website by the Division Roadside Environmental Engineers (DREE) and other users, the HSP has provided hands-on training. In December 2013, videos were developed and distributed to these staff as an additional resource in order to provide point-of-use training (see the Internal Education section for more details).

The series of videos instruct the user on how to retrieve information from SCMS as well as how the website operates, including:

- Adding a new control
- Adding an Inspection Report
- Running an Inspections Overdue Report
- Creating a map showing SCMs within a specified area, and
- Searching the database for an existing control

The next step is to obtain feedback, which can be incorporated into the next upgrade of SCMS.

Program Objectives and Management Measures

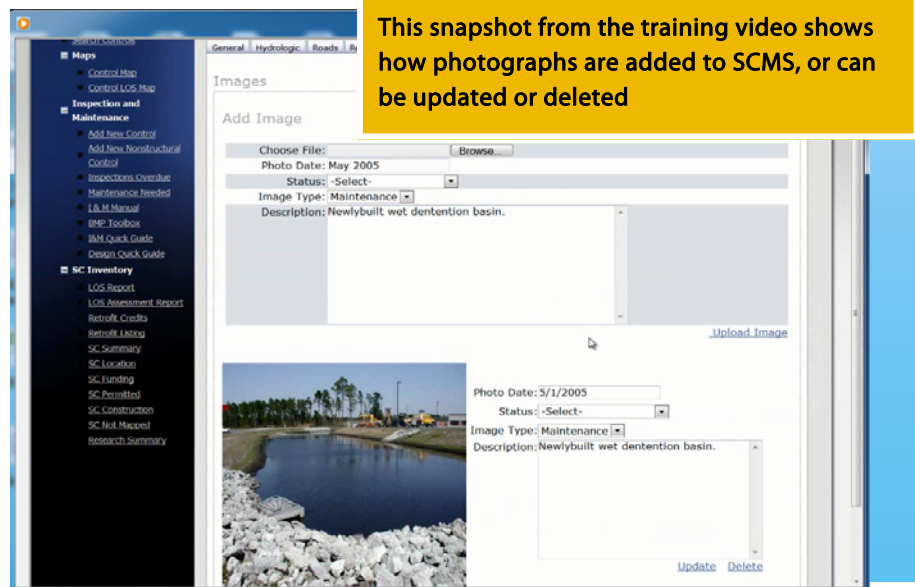
NPDES Permit Part II.B.4

Objectives

- Maintain a BMP Inspection and Maintenance Program to aid in the inspection, operation, and maintenance of BMPs.
- Maintain and update as necessary the BMP Inspection and Maintenance Manual.

Management Measures

- Evaluate new BMP inspection and maintenance needs.
- Evaluate BMP Inspection and Maintenance Manual.
- Implement a BMP Inspection and Maintenance Program.
- BMP Inspection and Maintenance information.



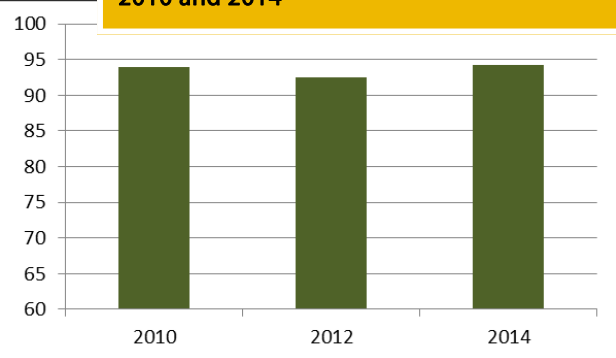
This snapshot from the training video shows how photographs are added to SCMS, or can be updated or deleted

Level of Service Improvements

NCDOT's inventory of SCMs continues to expand with new devices added at the completion of construction or retrofit projects. The current number of controls inventoried in SCMS totals 1656. Of these, the Highway Stormwater Program performs inspection and maintenance of approximately 741 devices annually. These devices are assigned a level of service (LOS) in accordance with NCDOT's *Stormwater Control Inspection and Maintenance Manual* (2010). The LOS indicates the level of structural deterioration or maintenance needs, if any, and ranges from an A (some aging and wear has occurred) to an F (device is no longer functional). Each type of SCM in the manual has a different checklist to help the inspector determine the LOS. The average LOS for inspected devices in 2014 was 94.4 on a 100 point scale. In 2012, the average LOS was 92.5. This increase is contributed, in part, to the increasing number of controls inspected. NCDOT adds approximately 100 to 150 new controls a year.

Additionally, there are 626 Preformed Scour Holes (PSH), 157 pet waste stations, and 132 other devices that either do not require annual inspection or are maintained by another entity, such as a municipality with which the NCDOT has a memorandum of understanding (MOU). See the Retrofit section for an example. Pet waste stations are generally located at rest areas or ferry terminals and are maintained by staff on site. Preform scour holes are inspected the first year of service. Research has shown that if they are functioning properly at that time, they generally function well for many years with no maintenance.

Average Level of Service ratings between 2010 and 2014



Current SCM Ratings

Division	Score	# Devices
Division 1	A	62
Division 2	B	167
Division 3	B	101
Division 4	B	207
Division 5	B	566
Division 6	A	48
Division 7	B	108
Division 8	A	118
Division 9	A	34
Division 10	B	59
Division 11	A	41
Division 12	A	48
Division 13	B	72
Division 14	A	25
Total		1656

Average Level of Service ratings by Division for devices inspected in 2014. Number of devices in each division includes structural, pet waste stations, and those maintained by others



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Repair of a Hazardous Spill Basin in Gaston County

The NCDOT's Highway Stormwater Program replaced a sluice gate, a major component of Hazardous Spill Basin (HSB) due to vehicle accident in 2013. The HSB is located in Division 12 at the intersection of NC-16 and NC-16 Business in Gaston County. This sluice gate was completely removed from the head wall as a result of the collision. The installation of the new sluice gate was conducted by the county bridge maintenance staff at a cost of approximately \$6,000.

This incident shows the typical challenges associated with the BMPs in a highway environment including the repair and maintenance costs.

Hazardous Spill Basin at NC-16 (Division 12) damaged during a vehicle accident (left) was repaired with a new sluice gate (right)





An example where NCDOT has utilized natural features and drainage pathways in roadway design



Program Objectives and Management Measures

NPDES Permit Part II.B.5

Objective

- i. In cooperation with NCDENR, implement a PCSP to regulate stormwater from new NCDOT development and redevelopment for new built-upon area (BUA) by requiring structural and non-structural best management practices to protect water quality, reduce pollutant loading, and minimize post-construction impacts to water quality.

Management Measures

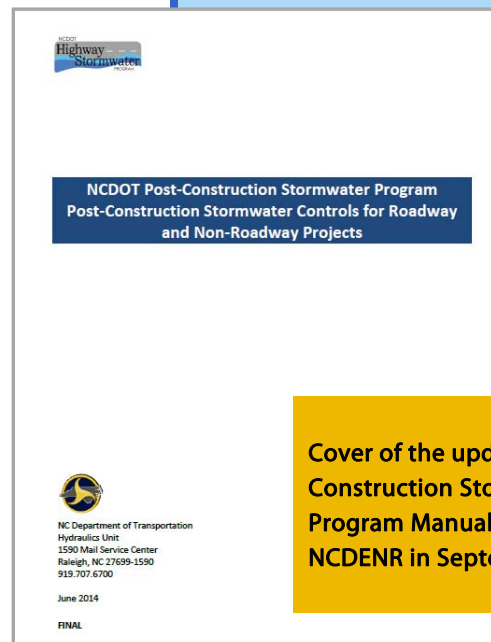
- a. Implement post-construction stormwater control measures for discharges in accordance with the PCSP.
- b. Implement a PCSP.
- c. Submit revisions to the PCSP to DWQ for approval.

NCDOT Submits Updated Post-Construction Stormwater Program to NCDENR

NCDOT created a working group in 2012 to develop an update to the Department's Post-Construction Stormwater Program (PCSP). Workflows for both roadway and non-roadway projects were updated to include significant new compliance requirements and state permitting requirements. The Environmental Management Commission (EMC) recently approved implementation of NPDES programs for compliance of state nutrient management strategy rules in the Falls and Jordan Lake watersheds. The rules require nutrient load reductions for applicable projects within those watersheds. Another significant change related to the NCDENR's initiative to streamline stormwater permitting requirements. As of August 1, 2013, the NCDOT is no longer required to submit state stormwater permit applications for projects discharging stormwater runoff in High Quality Waters (HQW) and Outstanding Resource Waters (ORW) watersheds.

The updated PCSP guidance document *Post-Construction Stormwater Controls for Roadway and Non-Roadway Projects* was submitted to NCDENR on April 2, 2014 for compliance with the provisions of Permit No. NCS000250, Part II, Section B.5b(c). NCDENR officially approved the PCSP on September 29, 2014.

In addition to updating workflows to include compliance and permitting requirements, the minimum measures, the planning and design measures considered for every project, were also incorporated.



Cover of the updated Post-Construction Stormwater Program Manual approved by NCDENR in September, 2014



Minimum measures implemented during the drainage design phase include:



Stabilizing embankments and drainage ditches



Maximizing vegetative cover



**PCSP
Program Contact**

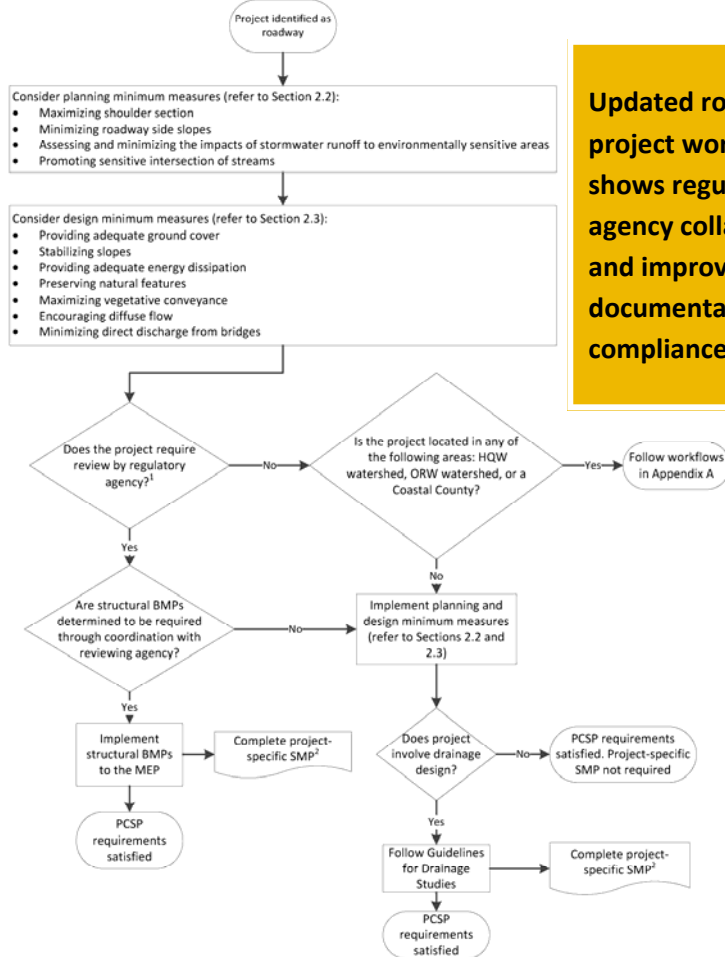
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Minimum measures describe decisions that are made by participating groups throughout the planning and design process that can impact stormwater. Planning minimum measures are considered for roadway projects through activities such as the Merger Process. These measures can minimize impervious surfaces, promote sensitive intersection of streams and minimize impacts of runoff to environmentally sensitive areas. Drainage designers evaluate design minimum measures, which are design approaches rooted in green infrastructure (GI) concepts of conservation and use of on-site natural features to retain or treat runoff close to the source, for all projects with new built upon area (BUA). Design minimum measures include maximizing vegetative cover and conveyances, encouraging diffuse flow, and minimizing direct discharge from bridges.

Documentation is an important component of the PCSP. The updated PCSP provides guidance for improved documentation of workflows and agencies participating in the PCSP decision making process. The revised workflows direct the user to the appropriate types of documentation that are acceptable for compliance for the PCSP. Some projects will require the use of a project-specific stormwater management plan (SMP). The HSP recently updated the standardized SMP tool to include non-roadway project data as well as roadway data.

Figure 2.1. Overall PCSP Process for Roadway Development



Updated roadway project workflow shows regulatory agency collaboration and improved documentation for compliance

¹Includes the following programs: 404/401 Water Quality Certification, Isolated Wetlands/Waters, Merger Process, Riparian Buffer Authorizations, CAMA Permits, Endangered Species Act/Section 7 Consultation.
²A copy of the project-specific SMP shall be sent to the Hydraulics Unit.





Training Conducted by Vegetation Management Section

The Vegetation Management Section of the Roadside Environmental Unit (REU) organized and conducted two regional training sessions in April 2014. Herbicide recertification credits were provided. The focus of the training centered on selecting and applying fertilizers and pesticides in a manner that would minimize impacts to potential stormwater runoff. The training agenda included:



- Invasive plants control
- Pesticide labeling
- Turfgrass management according to regional turf species
- GPS and mapping for roadside herbicide use
- Landscape plant bed weed control update
- NPDES Pesticide regulatory update and aquatic weed control options
- Updates on new application trucks
- Wildflower herbicide program update
- 2013 vaseygrass control report and plans for 2014 control efforts

At the eastern NC session, 94 employees were trained and 111 employees were trained at the western NC session. In addition, approximately 40 employees attended training at the North Carolina Vegetation Management Association Annual Symposium held in December 2013, for industry updates in vegetation management.

NCDOT's Vegetative Management for Coastal Sands and Dredge Spoils featured in *Road & Bridges* magazine

The October 2013 *Roads & Bridges* publication featured NCDOT's Vegetation Management efforts in minimizing impacts to water quality along a sensitive coastal corridor. Located south of Wilmington, the second bridge connecting Oak Island to the mainland was recently completed. Over two miles of roadway skirting coastal marshes and wetlands was constructed to span the new structure over the Intracoastal Waterway. The majority of the roadway was built out of sandy, granular spoil material dredged from the waterway. REU engineers anticipated challenges in establishing vegetation along the of the project. When conventional seeding and mulching methods failed to establish vegetation and stabilize the slopes of the dredged spoil piles from which borrow material was obtained, compost seeding was implemented. This vegetative establishment technique utilizes a mixture of seed, fertilizer, and compost applied pneumatically to roadway slopes. Various application rates of compost were used on 2:1 (H:V) cut slopes to evaluate erosion protection and vegetative establishment. Results from this evaluation were used when applying compost seeding to stabilize the completed roadway. Although logistics for hauling the compost product to a remote coastal location and the specialty application equipment appeared to be challenging and costly, the erosion protection and vegetation stabilization provided by the compost seeding system proved to be beneficial for preserving water quality along this environmentally sensitive location.

Program Objectives and Management Measures

NPDES Permit Part II.B.6

Objectives

- i. Manage application of pesticides, fertilizers, and other vegetation management materials to minimize pollutant potential of stormwater runoff.
- ii. Use only approved vegetation management materials.

Management Measures

- a. Implement appropriate pest control practices.
- b. Use appropriate vegetation management materials.
- c. Provide training on vegetation management.



Stabilizing spoil material using compost seeding



Research Conducted for Vegetation Management

Two research projects are underway to investigate current or potential future NCDOT vegetation management practices:

1. Brush Control and Woody Vegetative Management Guidelines – Economic Analysis Grant (Dr. Rob Richardson, NCSU).
2. Vaseygrass Management and Installation of Dormant Zoysia Sod for Low Maintenance Corridor Turfgrass Management (Dr. Travis Gannon, NCSU).

The Department plans to develop guidelines for species-specific brush control techniques. Current brush control techniques include herbicidal control, mowing, and mechanical control. Dr. Richardson's study will evaluate the effectiveness of different herbicides and the timing of applications in combination with and without mechanical cutting.

A cost/benefit analysis will be performed in order to determine the most effective approach and provide guidelines for each species. This study will also benefit water quality in that it may help limit disturbance and optimize vegetative cover and soil stability.



NCDOT seeks to improve methods to control brush and woody vegetation through researching new herbicide and mechanical control techniques

In its regular practices, the Department continually strives to control the invasive vaseygrass species in roadside turfgrass. This species is a significant problem mostly in eastern and central North Carolina and it is believed that dormant Zoysia sod may be a viable solution for low maintenance corridors. Dr. Gannon's study looked at three variables:

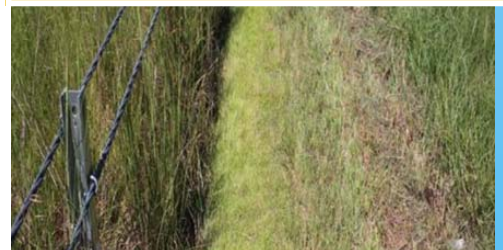
1. Multiple cultivars of Zoysia
2. Various preparation techniques
3. Different seasonal installation times

The cultivars studied were Meyer, El Toro, and Zeon. Preparation techniques included using a sod cutter, tilling alone, and tilling and raking. Installation timeframes ranged from mid-December to mid-May.

Performance was graded according to the amount of cover provided by the sod at the end of the study period. The study found that March and January were the best installation timeframes followed by April and then May. Meyer was found to be the best performing cultivar followed by El Toro and then Zeon. The results of the study appear to indicate that installation date may have an effect on which installation technique performs best. For April and May installations, till+rake outperformed just tilling and the sod cutter method. However, for the January and March periods, the installation technique did not have a significant effect on the performance of the sod.



Zoysia sod studies in the NCDOT ROW
Photo credit: NCSU



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Utility installation on NCDOT's right-of-way on Green Level Church Road, Cary (SR 1625)

Program Objectives and Management Measures

NPDES Permit Part II.C

Objectives

- i. Assist NCDENR to ensure all discharges to NCDOT's roadway drainage are properly permitted under applicable laws and rules.

Management Measures

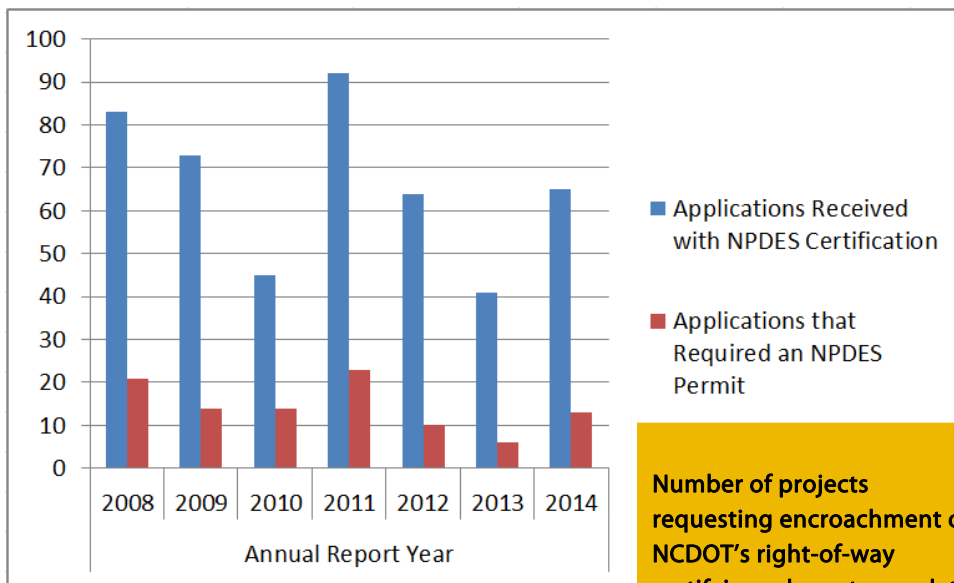
- a. Require certification of stormwater program coverage and compliance.

NCDOT Continues to Implement the Encroachment Program

In compliance with the NPDES permit, NCDOT requires that all facilities requesting to connect to NCDOT roadway drainage submit a certification of appropriate NPDES and State Stormwater Program coverage and compliance. Potential encroaching activities include installation of utilities (power, water, and sewer lines) and other infrastructure improvements (driveways, turn lanes, roadway widening, grading, and storm drainage). NCDOT currently uses two forms to document stormwater program coverage and compliance: NPDES-1 and Verification of Compliance with Environmental Regulations Checklist Form (VCER-1). The NPDES-1 form is used for encroachments that connect to or modify NCDOT drainage. The form identifies if the project requires an NPDES permit, and if so, if a SWPPP and required BMPs are in place. The VCER-1 is used by encroachers to certify the facility is in compliance with NCDENR and US Army COE permitting. Currently, the NPDES-1 and VCER-1 forms are available on NCDOT's website at the following link: <https://apps.dot.state.nc.us/quickfind/forms/>.

The NCDOT State Encroachment Coordinator reviews encroachment applications and keeps track of the submitted NPDES certification forms. During review of applications, the Coordinator also identifies projects where an NPDES certification form should have been provided, but was not. For these instances, the Coordinator will notify the encroaching party or District Engineer that review cannot proceed until the completed certification form has been received. While the Coordinator reviews applications and checks that the certification forms are complete, he/she is not required to confirm that the information provided on the forms is correct (i.e., whether the facility requires an NPDES permit or not), which is the purpose of requiring certification by a duly authorized representative of the facility.





Number of projects requesting encroachment on NCDOT's right-of-way certifying adequate regulatory coverage

From July 1, 2013 through June 30, 2014, the NPDES Stormwater Permit Compliance Certification was included in 65 encroachment agreement applications; 13 of these applications did require an NPDES permit, and the remaining 52 applications certified that the permit was not required. The chart above summarizes the number of NPDES certifications received with encroachment applications and number of those certifications that required an NPDES permit over the last seven years.



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Sidewalk construction in NCDOT's right-of-way Green Level Church Road, Cary (SR 1625)



NCDOT Creates Erosion & Sediment Control Manual

NCDOT has developed a new erosion and sediment control manual titled, “*NCDOT Erosion and Sediment Control (E&SC) Design and Construction Manual.*” The manual focuses on providing guidelines for designing E&SC plans and constructing E&SC practices for linear transportation projects. The intended audience includes designers, inspectors, and contractors. The new manual merges three existing guidance documents for NCDOT’s three primary functional areas: Construction, Maintenance, and Bridge Management and provides updated guidance based on the NCG01 Construction General Permit released in 2011. The content covers regulations, planning, design, construction, inspection, and maintenance associated with E&SC portions of a project and provides a one-stop shop for all audiences and projects.

In addition to compiling updated information in one source, the new manual has a modernized format and appealing graphics. It includes enhanced components from NCDOT’s standard drawings and specifications. New content includes:

- Policy and procedures associated with contracted bid-build projects, contracted design-build projects, and projects utilizing state forces
- Cover stabilization requirements
- Additional E&SC BMPs and new technologies:
 - Gravel construction entrance
 - Safety fence and jurisdictional flagging
 - Wattle
 - Polyacrylamide (PAM)
 - Inlet protection
 - Silt and sediment basin variations

The stabilization guidance is based on the new requirements contained in the 2011 NCG01 Construction General Permit as summarized in Table 1.

Table 1. Stabilization Timeframes

Site Area Description	Stabilization	Timeframe Exceptions
Perimeter dikes, swales, ditches, and slopes	7 days	None
HQW Zones	7 days	None
Slopes steeper than 3:1	7 days	If slopes are 10’ or less in length and are not steeper than 2:1, 14 days are allowed.
Slopes 3:1 or flatter	14 days	7 days for slopes greater than 50’ in length.
All other areas with slopes flatter than 4:1	14 days	None except for perimeter and HQW Zones

Program Objectives and Management Measures

NPDES Permit Part II.D.1

Sediment and Erosion Control Program

Objectives

- i. Continue to control development activities disturbing one or more acres of land surface.
- ii. Require construction site operators to implement appropriate erosion and sediment control practices.
- iii. Require site inspection and enforcement of control measures.
- iv. Establish requirements for construction site operators to control waste that may cause adverse impacts to water quality.

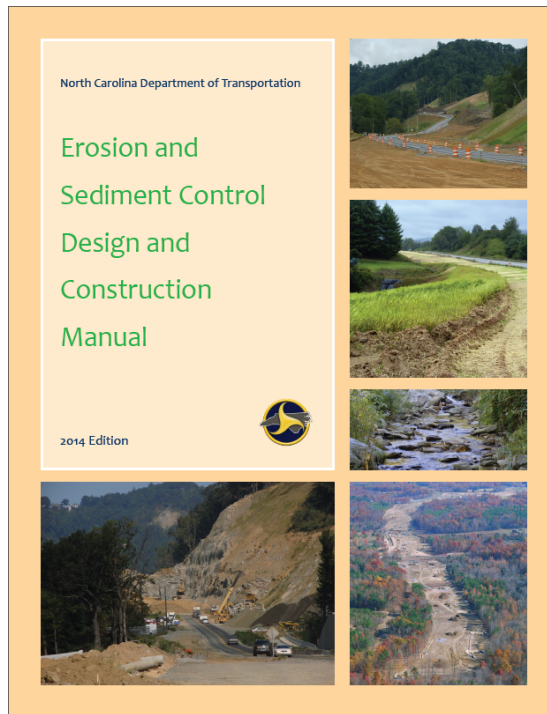
Management Measures

- a. Implementation of the NCDENR DLR Erosion and Sediment Control Program delegated to NCDOT.
- b. Incorporation of requirements of NCG010000 associated with construction activities into the Erosion and Sediment Control Program.

A large focus of the new E&SC Manual was to provide guidance for newer BMPs and technologies. E&SC products utilizing excelsior and coir fibers (such as matting and wattles) are being adopted by many agencies. The use of wattles is also increasing as an alternative for silt fence and check dams. PAM has been widely used by the department to enhance settling. PAM is applied to fibrous BMPs such as wattles to provide an exchange site. The PAM encourages silt particles to coagulate resulting in increased settling. Settling occurs downgradient of the application site in sediment basins and similar BMPs.

Several design variations for sediment basins have been developed in recent years. Coir fiber baffles and skimmers are often added to enhance settling. Challenges associated with linear projects and limited right-of-way have resulted in developing various basin shape and configuration alternatives. For example, tiered skimmer basins are ideal for elongated footprints located on steeper grades.

The new E&SC manual is sure to provide designers, inspectors, and contractors a valuable resource in the office and on the construction site.



Program Objectives & Management Measures

NPDES Permit Part II.D.2

Borrow Pit/Waste Pile Activities Objectives

- i. Continue to implement sediment and erosion control measures and reclamation plans on all borrow pit and waste pile projects.

Management Measures

- a. Implement erosion and sediment control measures on all noncommercial borrow pits/waste piles.
- b. Implement approved reclamation plans on all borrow pits/waste piles.
- c. Implement Borrow Pit Discharge Management Program.

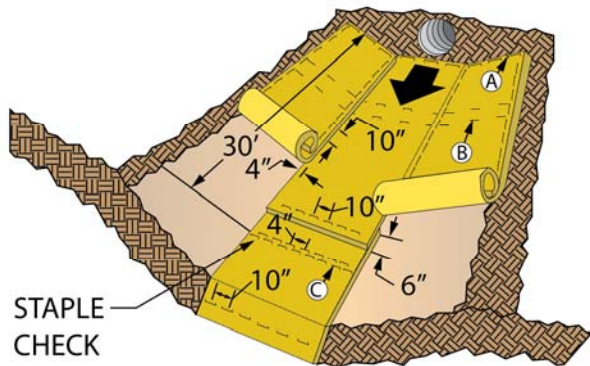


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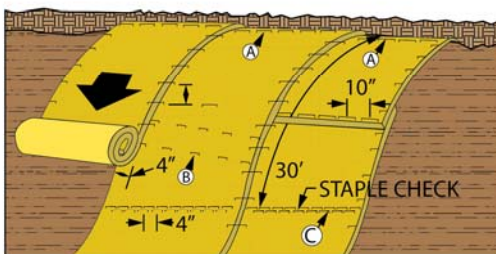
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ISOMETRIC VIEW - MATTING IN DITCHES (NOT TO SCALE)

The new E&SC manual includes easy to read, detailed graphics to convey design and installation requirements of construction BMPs, such as matting installation (shown on the left)



ISOMETRIC VIEW - MATTING ON SLOPES

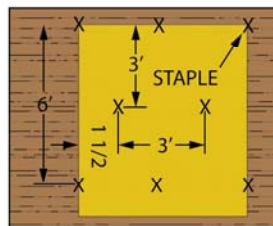


DIAGRAM REFERENCE B





NCDOT Maintains SPPP Implementation

NCDOT continues to maintain and implement site-specific Stormwater Pollution Prevention Plans (SPPPs) at its industrial facilities, which includes county maintenance yards, equipment shops, ferry terminals and a ferry maintenance facility, roadside environmental shops, traffic services shops, bridge maintenance yards, a rail maintenance facility, and remote salt and material storage locations. NCDOT SPPPs describe potential pollution sources at each facility and provide best management practices (BMPs) to minimize potential impacts on stormwater from on-site industrial activities. NCDOT continues to incorporate the Spill Prevention Control and Countermeasure (SPCC) Plans requirements from 40 CFR 112 into the appropriate facility SPPPs as part of NCDOT's Industrial Activities program. NCDOT SPCC Plans describe spill prevention measures, inspections of SPCC-regulated oil containers, and spill response and notification procedures. Additionally, NCDOT includes quantitative monitoring requirements and documentation of the resulting observations in the SPPPs.

During the permit year, SPPP updates were performed for various NCDOT industrial facilities because of changes to the facilities. NCDOT began construction of a new Graham County Maintenance Yard (CMY) in the city of Tuluja and is gradually transferring operations from the existing county facility over to the new yard. NCDOT HSP prepared a new SPPP for the new CMY and will continue to update these plans as the transition continues. Additionally, NCDOT is also in the process of constructing a new remote salt storage yard in Division 5.

NCDOT HSP emphasizes employee training as part of its Industrial Activities Program. NCDOT HSP also utilizes many unique approaches to train Division personnel on stormwater pollution prevention, good housekeeping, and spill prevention. NCDOT uses videos for initial or annual refresher training, individual or group training sessions, posters and handouts for program reminders, and NCDOT's Industrial & Roadway Maintenance Activities (IRMA) BMP Guidance Manual for training briefings at the Division level. NCDOT conducted 19 SPPP/SPCC Implementation Training Workshops with both Level I morning and Level II afternoon sessions in the spring of 2014 that provided new training for Division Equipment Shop staff and advanced level training to NCDOT SPPP Team Leaders and team members. For more information on this training, please see the Internal Education section.

Program Objectives and Management Measures

NPDES Permit Part II.E.1 and 2

Stormwater Pollution Prevention Plans

Objectives

- i. Maintain and implement an SPPP for each facility with an industrial activity that is covered by the permit.
- ii. Develop and implement an SPPP prior to operation of any new industrial facilities.

Management Measures

- a. Maintain and implement an SPPP for each covered industrial activity and related facility.

NPDES Permit Part II.E.3 Qualitative Monitoring

Objectives

- i. Evaluate the effectiveness of the industrial Stormwater Pollution Prevention Plans (SPPP) for each industrial facility.
- ii. Perform required qualitative monitoring at stormwater outfalls identified in the SPPPs and during supplemental inspections for new sources and discharges.



Before and after views of the new Fuel Station constructed at the new Graham (Tuluja) CMY



NCDOT HSP developed the "IRMA BMP Guidance Manual Abridged for Equipment Shop Staff" (see the Internal Education section) during this permit year and plans to update IRMA with Roadside Environmental Chapters in the next permit year.

NCDOT continues to utilize its SPPP website to help manage and track SPPP/SPCC implementation at each industrial facility. The SPPP website allows Industrial Activities program managers and Division-level engineers to track the overall program implementation and also allows personnel at each facility to document SPPP/ SPCC task completion, including qualitative monitoring of stormwater discharges, facility inspections, employee training, and BMP implementation. During this permit term NCDOT upgraded the SPPP website platform.



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Ongoing Internal Maintenance Yard Reviews

NCDOT HSP staff members continue to conduct internal reviews of NCDOT maintenance yards throughout the state, including over nine internal reviews performed during this permit year. Each internal review performed includes an evaluation of the facility's SPPP/SPCC Plan, including documentation of completed tasks, an interview with the SPPP Team Leader and discussion of site-specific changes or needs for the facility, and an in-depth site inspection of the maintenance yard. Verbal BMP recommendations are provided during the internal review and written BMP recommendations are provided later. The internal reviews also serve as an opportunity to gather appropriate site data to fully update the SPPP/SPCC Plans.



NCDOT HSP staff review a NCDOT industrial facility

The primary goals of the internal maintenance yard reviews are to help the Divisions identify potential stormwater pollution concerns, evaluate their SPPP/SPCC Plan implementation, and provide additional BMP recommendations if needed. The internal reviews also aid Division management in prioritizing any major stormwater related expenditures.

The internal reviews also serve as additional one-on-one stormwater pollution prevention training for facility staff which supplements other annual training they perform. NCDOT anticipates continuing these internal reviews in the future.

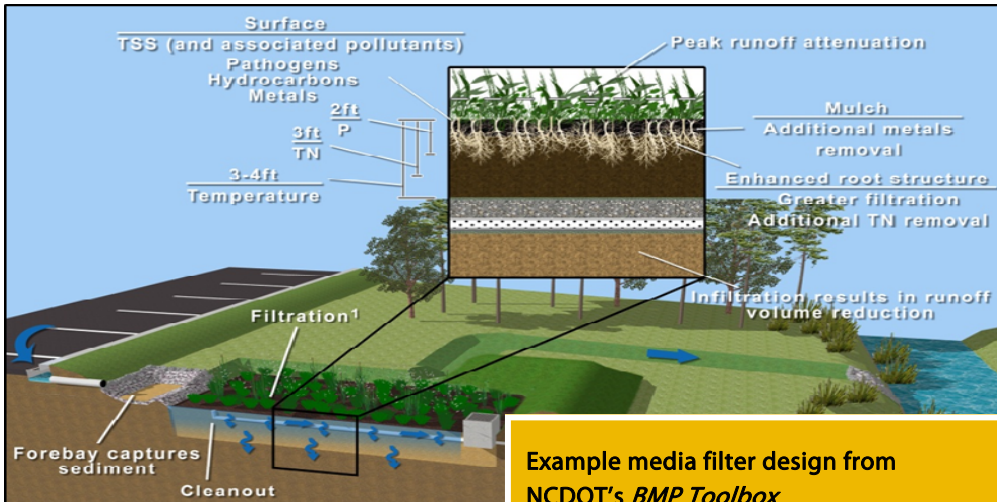
NCDOT HSP Structural BMPs for NCDOT Industrial Facilities

NCDOT continues to implement SPPP BMPs at industrial facilities. Example BMPs include: covered secondary containment for salt brine operations, fuel truck storage buildings, covers for material storage areas and scrap metal bins, wash pads for vehicle and equipment wash operations, paved salt loading areas, spill containment pallets to store hazardous substance drums; storm drain blocker mats, and spill response kits.



New covered containment constructed for salt brine bulk storage tanks at a NCDOT industrial facility





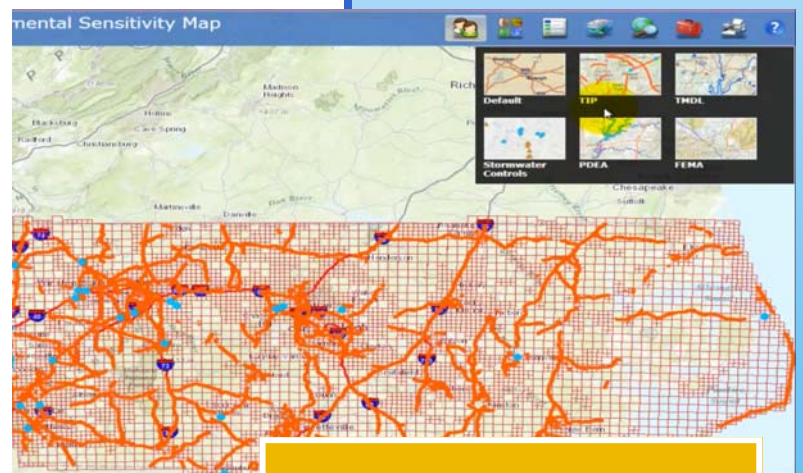
Example media filter design from NCDOT's BMP Toolbox

Media Filter Basin Construction Training

In anticipation of constructing a media filter basin at the rest area on the transportation improvement project (TIP) number K-3800 to relocate US 17 in Beaufort County, HSP staff provided training to construction and maintenance staff in April 2014. The training discussed the importance of adhering to the design plan so that the media filter, which consists of sod, filter fabric, clean sand, and washed #57 stone design, is constructed in the correct sequence to allow infiltration. Additionally, staff were reminded to avoid compaction of the media or allowing run-on of untreated stormwater during construction as these events have the potential to prevent infiltration. Other aspects of the planned BMP, including the cleanout system and underdrain, were also discussed.

ESM Training Videos

Online or on-demand training allows users to participate at their convenience; additionally, screencast tutorials allow users to review the content multiple times for point-of-use training, if necessary. NCDOT staff frequently employ the GIS data gathered from the Environmental Sensitivity Map (ESM) when designing SCMs. To provide training for ESM users who are unfamiliar with GIS data, the HSP developed a series of video tutorials. The series includes 10 videos that demonstrate tasks such as using the buffer tool, switching basemap views and adding layers; the series also includes an example scenario that demonstrates how to use multiple tools to accomplish a GIS task. The full video series was uploaded to NCDOT's Stormwater Program's YouTube channel, and links to them are posted on the HSP Connect NCDOT website.



A snapshot of the ESM Video showing how to switch the view tool

Program Objectives and Management Measures

NPDES Permit Part II.F.1

Objectives

- i. Implement a program to train NCDOT staff and contractors about the importance of stormwater quality.
- ii. The training should include topics such as spill control, chemical application, illicit discharges, and illegal dumping, etc.

Management Measures

- a. Provide pollution prevention awareness training for construction workers.
- b. Provide pollution prevention awareness training for maintenance workers.
- c. Provide pollution prevention awareness training for NCDOT staff.
- d. Develop and submit an Internal Education and Involvement Plan.

Level I-ES Training for Equipment Shop Staff Developed

NCDOT HSP staff continues to provide annual SPPP/SPCC Training for NCDOT's Division personnel. In addition to training Highway, Rail, and Ferry Division personnel during this permit term, a special workshop was provided to NCDOT Division of Aviation staff working at Raleigh-Durham International Airport. Additionally, NCDOT HSP held 19 training workshops across the state from March 3 to May 29, 2014. Baseline BMPs such as good housekeeping, preventative maintenance, and spill prevention practices were reviewed with all attendees. For the third straight year, separate workshops were provided for entry level staff (Level I) and more experienced staff (Level II).

During the last permit term, the NCDOT HSP internal maintenance yard reviews uncovered a need for additional training. In response, NCDOT HSP developed a new Training for Equipment Shop Staff (Level I-ES). This course is specific to Division Equipment Units. The new Level I-ES training focused on shop-specific pollution sources found at NCDOT maintenance shops and covered such topics as: used oil management, vehicle/ equipment repair, cleaning, and refueling; oil/water separator inspection and maintenance; and shop waste handling and disposal. New training materials were developed specifically for the Level I-ES training and were provided to all Division Equipment Shops.

The provided materials included:

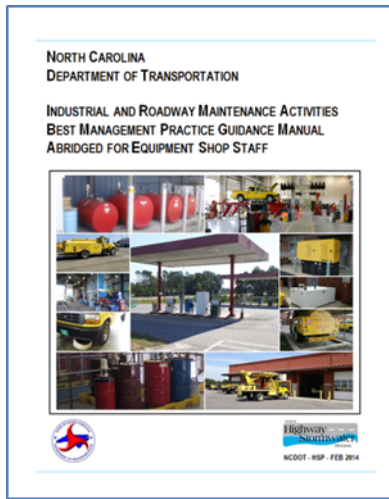
- New Stormwater Pollution Prevention Posters
- New "IRMA BMP Guidance Manual Abridged for Equipment Shop Staff"
- New Oil/Water Separator Inspection and Maintenance Guidance
- Interactive Equipment Shop exercise to assess how well information has been retained at the end of the training

Level II Advanced SPPP/SPCC Training was provided to SPPP Team Leaders for each NCDOT industrial facility (typically County Maintenance Engineers) and other key team members. The advanced topics vary each year; this year NCDOT HSP instructors provided summary updates on the SPPP/SPCC program, SPPP website, and other SPPP/SPCC implementation issues relevant to Team Leaders. NCDOT HSP instructors also reviewed IRMA BMP Guidance Manual topics, spill prevention and cleanup updates, IDDEP procedures, and nutrient management



NCDOT Equipment Shop BMP Review

Example of interactive Equipment Shop BMP Review Training



New IRMA BMP Guidance Manual Abridged for Equipment Shop Staff



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DO YOUR PART to help prevent Stormwater Pollution. An observant Equipment Shop employee is the key to a successful Stormwater Management Program.

New poster provided to display in NCDOT Equipment Shops

guidance for Division staff located in Jordan Lake and Falls Lake watersheds. An interactive BMP exercise was also used during each workshop. Training was provided for a total of 508 individuals, including 58 staff in Divisions 5, 7, and 8 who received nutrient management training.





On the Road with HSP

This year several HSP staff members took their expertise on the road (and the internet) to share their knowledge with other stormwater practitioners, college and high school students and other state DOTs at home and throughout the country.

Andy McDaniel and Ryan Mullins enlightened a diverse audience at the December 2013 NC Water Resources forum about retrofit and research components of the new Guided Reduction of Excess Environmental Nutrients program (GREEN). Andy repeated this presentation in June to an audience of interagency leadership team members in Raleigh.

Jordan Woodard spent time in the classrooms at Pamlico High School in March 2014. Jordan engaged varied audiences of carpentry, calculus, and drafting students about the activities of the NCDOT Hydraulics Unit and the HSP.

At the September 2013 American Public Works Association (APWA) conference held in Wilmington, NC, Andy McDaniel paired with the cities of Burlington and Graham to give a presentation entitled "Little Alamance Creek Category 4b Plan." The audience included both college students and seasoned stormwater professionals.

HSP expertise was also shared with audiences outside of the state boundaries. In June 2014, Chris Niver discussed roadway design and maintenance of post-construction stormwater controls in an EPA webinar of the same title. His presentation of NCDOT's level of service ranking of stormwater control measures generated a lot of interest. Chris's presentation was posted to EPA's website (http://water.epa.gov/polwaste/npdes/roadwaydesign_webcast.cfm).

In July 2014, Craig Deal traveled to Washington, DC, to present to an audience of 36 State DOTs at the National Stormwater Practitioners meeting; his presentation was titled "Level of Service Ratings for Assets Management of BMPs." Finally, Andy represented NCDOT as 1 of 9 state DOTs invited to present at the April 2014 Federal Highway Association (FHWA) Water Quality Peer Exchange in Olympia, Washington and Portland, Oregon. In addition to general group meetings, he also gave a presentation on using the Integrated Report Category 4b option as an alternative to a TMDLs, and a second presentation on the NCDOT BMP asset management program.

Program Objectives and Management Measures

NPDES Permit Part II.F.2

Objectives

- i. Implement a program to educate the public about the importance of stormwater quality, including chemical application, illicit discharges and illegal dumping, etc.
- ii. Maintain diverse educational materials to engage and educate the public from different social, economic and age groups.
- iii. Involve the public in NCDOT water quality programs.

Management Measures

- a. External Education and Involvement Plan.
- b. Provide pollution prevention awareness educational materials to general public.
- c. Maintain a public education website.
- d. Develop educational partnerships.
- e. Continue public involvement programs.



Assessing the Needs of the HSP Program

Over the three permit terms that HSP has been in existence, the audiences that need to be reached have grown and the tools and methods for communication have evolved rapidly. In late 2013, the HSP Education and Outreach team conducted an education needs assessment that covered both external and internal education. This project was undertaken to review the current program and to evaluate opportunities for the development of new approaches to promote stormwater education and training. Additionally, the Education Needs Assessment was used to collect the information necessary to develop an Education and Training Guidance document that will help staff select appropriate options for training and outreach.

The study revealed that individual HSP programs were developing useful products, had a good understanding of their audiences and were doing a good job of communicating internally. Nonetheless, the Education team determined that the HSP could do a better job of promoting HSP awareness and program discovery both within NCDOT and with external audiences. There was also concern that the process for centrally managing, distributing and storing HSP products needed improvement. Program leaders also expressed a need for on demand training or training of remote staff. Moreover, many communication channels offered by NCDOT's Communication Office, such as social media, were underutilized.

As a result of the needs assessment, the use of social media for external outreach is being explored (see below). Additionally, the Education team developed standardized templates and procedures for creating videos that can be easily accessed by remote users. These templates have been used for internal training regarding the use of the Stormwater Control Management System (SCMS) for the Inspection and Maintenance Program (2013), and the Environmental Sensitivity Map (see other sections of the annual report). The templates can also be used for external education.

HSP is on Facebook!

The HSP has recently experimented with social media, a proven method for engaging the public and driving action, and looks forward to promoting stormwater awareness in online spaces. HSP team members evaluated a variety of communications strategies to connect with the public and reach out to new audiences. It was determined that regular Facebook posts are an effective and cost-efficient engagement strategy at this time. NCDOT will utilize Facebook to engage the public and drive traffic to the Connect NCDOT website, where users can learn more about NCDOT and what they do. The HSP kicked off its social media engagement with a Facebook post about the stormwater control at the North Carolina Zoo.



NCDOT Facebook page snapshot

Water Pollution Handouts

NCDOT also developed a mailer that was sent to approximately one million North Carolina residents urging their support by reporting incidents of illegal disposal of oil, paint, tires, trash, construction debris and other wastes along the roadside. A copy of the flyer and more information can be found on Page 2 of the annual report.



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Tillage and Soil Amendments to Increase Infiltration in Vegetated SCMs

Vegetated stormwater control measures (SCMs) are an integral part of NCDOT's practices to reduce the impacts of stormwater on receiving streams and comply with the Department's NPDES permit. Infiltration is an important pollutant reduction mechanism in these SCMs, especially for nutrients which have inconsistent concentration reductions from vegetated treatment. Recent research by North Carolina State University (NCSU) indicates that tillage can increase infiltration rates by an order of magnitude but historical studies have only evaluated tillage over relatively short study periods (4 - 5 months). NCDOT is currently conducting research on the longevity of infiltration enhancements, and the ability of soil amendments to extend this time period.



(Left) Installation of test plots at NCSU; (Right) Plots after grass establishment

Three soil amendments are being evaluated – compost, gypsum and cross-linked polyacrylamide (x-PAM). x-PAM is a water-absorbing polymer that is used in landscaping.

The first phase of this project is currently being conducted in controlled test plots at NCSU, and features four replicates of four tests and a control plot (total of 20) – the test plots were deep tilled with no amendments, and deep tilled respectively with compost, gypsum and x-PAM. After establishment of solid grass stand, researchers at NCSU will subdivide the subplots to mow some with heavy mowing equipment typical of the highway environment and others where string trimmers are used from the perimeter of the plot to determine the effects of heavy loads on infiltration rates and grass growth. NCDOT will be continuing to monitor the test plots, as well as implementing the second phase of the project, which involves monitoring at actual highway sites.

Program Objectives and Management Measures

NPDES Permit Part II.G

Objectives

- i. Conduct research with faculty and staff at state universities or other designated institutions that results in independent quantitative assessment of stormwater from NCDOT permitted activities and/or measures structural BMP effectiveness.
- ii. Conduct research to enhance or improve existing practices or develop new methods or processes to meet future permit requirements.

Management Measures

- a. Maintain a Research Plan in keeping with guidelines established by the Federal Highway Administration (FHWA).
- b. Submit the Research Plan to DWQ for approval.
- c. Implement the Research Plan.

Biofiltration Conveyance Research in the Piedmont

NCDOT had reported last year about research on biofiltration conveyance (BFC) in Brunswick County. BFC is an emerging SCM inspired by riverine systems, and features a series of step pools for detention and infiltration, separated by riffle weirs for energy dissipation of higher-intensity storms. Research at Brunswick County was focused on hydrological monitoring and had provided evidence of peak flow mitigation and stormwater runoff volume reduction.

In the last year, NCDOT has been conducting hydrological and water quality monitoring at an exit ramp leaving the Alamance County I-85 Southbound rest area near Burlington. The 4-acre watershed is highly impervious, consisting primarily of parking areas and building rooftop. In contrast with the Brunswick site, the underlying soil at the Alamance site is composed of 6 inches of sandy loam covering 6-8 inches of tight clay, which is classified as hydrologic soil group D. The BFC at this site consisted of three pools with an average slope of 2.5%, followed by a 9.5-ft drop into a series of three wetland pools for increased nutrient removal. The wetland pools included an exfiltration trench.

Initial results support the potential for substantial runoff volume and peak flow reductions, despite the presence of clayey soils. These early results seem to indicate that the majority of the surface runoff was converted to shallow interflow, which is similar to the hydrology of undeveloped watersheds.



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Check Dams to Enhance Swale Performance

Swales are an integral part of the stormwater system in the roadway environment. Research in Minnesota, Virginia and Taiwan showed improvements in infiltration as well as nutrient removal when swales were retrofitted with check dams. However, the datasets are relatively small and do not include soils native to North Carolina. NCDOT is currently partnering with NCSU to study the effectiveness of check dam retrofits to existing swales in improving the water quality of swale effluent.

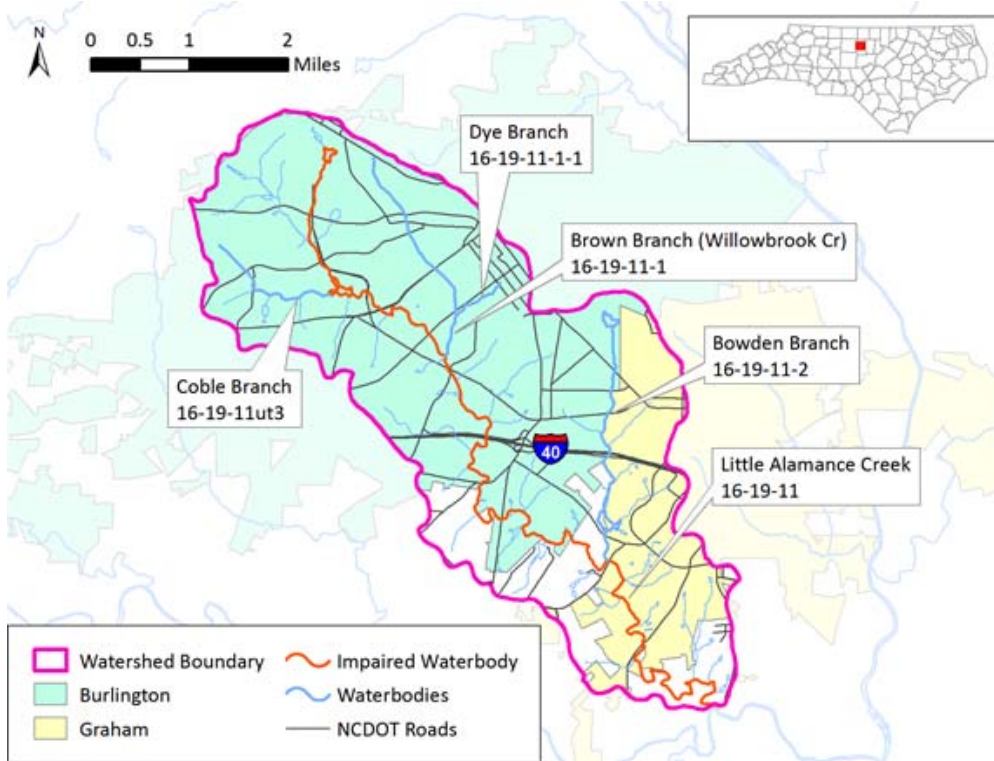


Two different types of check dams were implemented at existing research study sites. At the Mango Creek Research Facility, the existing swale was retrofitted with a system of standard rock check dams, an existing site on I-40 was retrofitted with a system of standard excelsior wattles. Filter socks filled with proprietary phosphorus-adsorptive media were placed directly upstream of the second and third wattle. At both sites, swale performance in terms of removal of solids and nutrients, as well as hydrology was monitored for several events before the retrofit. The swales will continue to be monitored for one year following the retrofit, to evaluate the impact of the check dam retrofits will be analyzed.



(Top) Rock check dams at Mango Creek site;
(Bottom) Wattle check dams at I-40 site





Program Objectives and Management Measures

NPDES Permit Part III.C

Objectives

NCDOT will develop and implement a program to address impaired waters identified in Total Maximum Daily Loads (TMDLs) in which NCDOT is named as a significant contributor of the pollutant and an assigned Waste Load Allocation.

Management Measures

Management measures include: assessment & monitoring plans for each TMDL location, schedules for plan execution, and findings reports submitted to DWQ.

Little Alamance Creek, Category 4b Demonstration Plan Completed

NCDOT, together with the Cities of Burlington and Graham as local municipal partners, submitted the Little Alamance Creek Category 4b Demonstration Plan to the Division of Water Resources (DWR) in July 2014 for approval. NCDOT, Burlington, and Graham are working with DWR to develop alternative watershed management approaches to restore water quality in lieu of a TMDL limiting impervious cover within the watershed which could hinder transportation improvement projects. Category 4b of DWR's biennial State Water Quality Assessment provides for an accounting of impaired waters with a restoration/demonstration plan in place as an alternative to an EPA approved TMDL. The Category 4b plan includes: a detailed review of available water quantity and quality data for the entire watershed; an overview of potential stressors, including potential legacy stressors such as textile mills where dyeing operations took place along the riverbanks; an implementation plan including structural and non-structural pollution controls to be implemented across the watershed; and a monitoring plan that uses a proposed website to provide updates on the status of ongoing BMP implementation efforts. The use of a public website will allow for more timely and frequent updates on progress, and can provide a more graphical and interactive user experience. Upon formal approval, NCDOT will begin implementing the Category 4b plan and engaging with local stakeholders in efforts that will help restore the biological health of Little Alamance Creek.



Little Alamance Creek

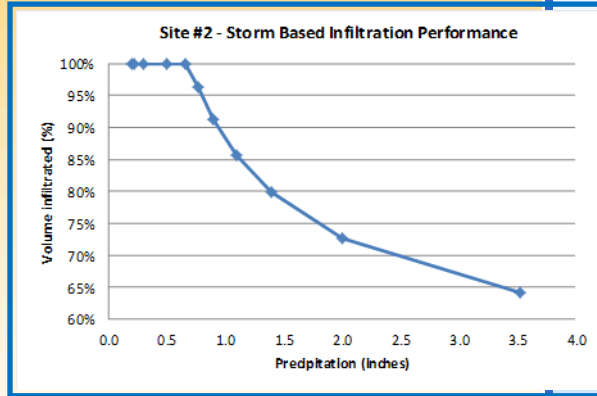


Southeast White Oak River Watershed linear infiltration basin retrofit

Southeast White Oak River Watershed linear infiltration basin retrofit



NCDOT's Report of Findings (RoF) in the Southeast White Oak River Watershed describes the results of the Department's Assessment and Monitoring Plan implementation activities; including field evaluations and stormwater control measure retrofit feasibility studies. The feasibility study resulted in a determination that one of the four study sites was viable as a retrofit location. This site ("Site #2"), located in Boathouse Creek watershed, includes a permanent drainage easement that receives drainage from portions of the NC-24 corridor within the Town of Cedar Point. The proposed infiltration basin BMP at Site #2 includes a weir within an existing open-channel conveyance that impounds an estimated runoff volume of 3,725 cubic feet. Construction of the infiltration basin retrofit (pictured) began in early 2014 and was completed in the summer of 2014. Since completion, NCDOT has routinely inspected and maintained the BMP so that it continues to function as designed. As described in the RoF, NCDOT's assigned wasteload allocation in Boathouse Creek is expected to be achieved through implementation and proper maintenance of the infiltration basin. At this time, no viable BMP options have been identified for reducing bacteria loads from NCDOT ROW in the Hills Bay watershed; however, NCDOT will continue to investigate opportunities for future projects in this watershed.



Single event storm infiltration performance of the infiltration basin BMP



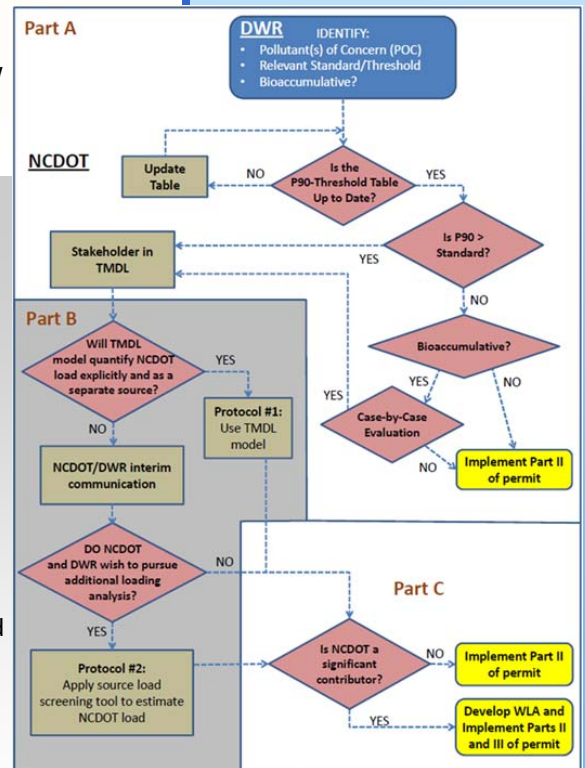
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NCDOT and DWR Collaborate on Significant Contributor Protocol

NCDOT is required to develop and implement a program to address impaired waters identified in TMDLs in which NCDOT is named as a significant contributor of the pollutant addressed by the TMDL and that assigns NCDOT a wasteload allocation separate from other point sources. Over the past several years, NCDOT and DWR have worked closely to support the development of TMDLs and the evaluation of NCDOT as part of those TMDLs; however, a procedure for determining when NCDOT is considered a significant contributor in a TMDL has not been formally documented. Under this project, NCDOT and DWR developed a method for evaluating NCDOT's relative contribution in a TMDL watershed and defined how the determination of significant contributor status will be made. To date, a draft protocol has been prepared and coordination meetings held among the project team members. The draft protocol includes an evaluation of the TMDL parameter in the context of pollutants associated with transportation runoff and procedures for evaluating NCDOT's contribution, depending on the methods and models used to prepare the TMDL. The final product is a relatively simple, scientifically-based, and transparent protocol for DWR and NCDOT to follow in preparing TMDLs.



TMDL Contribution Evaluation Flowchart





Falls Lake Watershed

Program Objectives and Management Measures

Jordan Lake Rules:

15A North Carolina Administration Code (NCAC) 02B .0262-.0273, .0311, and NC Session Laws 2009-216, 2009-484

Falls Lake Rules:

15A NCAC 02B .0275—.0282

The Jordan Lake Rules allow the use of existing management programs and annual reporting mechanisms to implement the rule. NCDOT intends to use the HSP annual reporting process as well as the following HSP programs:

- Illicit Discharge Detection
- BMP Toolbox
- Post-Construction Stormwater Program
- Research Program
- Industrial Activities
- Retrofits
- Internal Education
- External Education

Falls Lake GREEN Program Receives EMC Approval

NCDOT's program to address Nutrient Load Reduction Rule requirements in the Falls Lake watershed, referred to as the Guided Reduction of Excess Environmental Nutrients (GREEN), was approved by the North Carolina Environmental Management Commission (EMC) on January 9, 2014. This program describes the Department's plan for addressing nutrient load reduction requirements associated with new and widening roads, new non-road development, and existing road and non-road development.

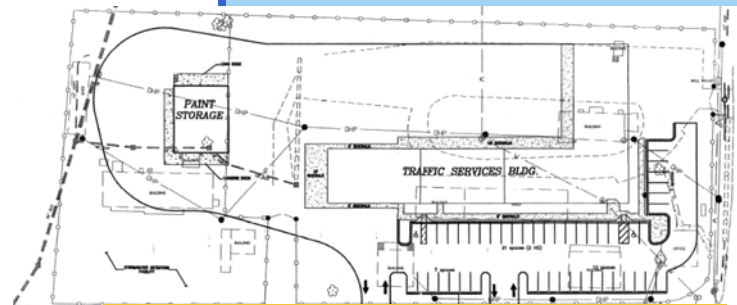
The Rules establish a nutrient management strategy to reduce algal growth in Falls Lake. As part of the Rules, contributors of nutrients, including the NCDOT, are required to reduce their loading of total nitrogen and total phosphorus in order to meet the nutrient load objectives of the Rule and restore water quality standards in the lake.

Nutrient Load Accounting from Interim Period NCDOT

As part of the GREEN Program in Falls Lake, NCDOT is accounting for nutrient load changes on lands developed subsequent to the baseline period but prior to implementation of its new development program. This period, referred to as the "interim development" period, began on January 1, 2007 and extended through January 15, 2014. NCDOT's interim development area was defined using best available road and non-road datasets, project site plans and aerial imagery. Nutrient loads associated with the interim development were calculated using uniform pre-development loading rates and the nutrient accounting tool, NCDOT-JLSLAT (Jordan/Falls Lake Stormwater Nutrient Load Accounting Tool).

New Non-Road Development Projects in 2014

No new non-road project development projects were initiated over the past year in the Jordan Lake or Falls Lake watersheds. Future annual reports will include a list of certified projects, descriptions of the projects and stormwater control measures (SCMs), project-specific copies of the NCDOT-JLSLAT and other supporting calculations, and a summary of changes in nutrient loads associated with these activities.



Interim development included the construction of a new traffic services building on the Durham County Maintenance Yard



Retrofit Projects to meet Existing Development Requirements

In the Falls Lake watershed, NCDOT's GREEN Program includes load reducing activities that contribute to the achievement of the Stage I objective. These activities include implementation of six stormwater retrofits per year or a combination of structural and nonstructural nutrient load reducing measures equivalent to six retrofits per year as described in 15A NCAC 02B .0281 (9)(d)(iv).



Proposed stormwater retrofit locations in the Falls Lake Watershed at the NC 50 and NC 98 interchange

In 2014, NCDOT performed a retrofit feasibility assessment of 5 interchanges in the Lower Falls Lake watershed and 20 interchanges in the Upper Falls Lake watershed. Based on this assessment, NCDOT selected a location in Lower Falls Lake watershed, at the intersection of N.C. Highway 50 and NC Highway 98, to construct up to 10 stormwater retrofits. The intersection consists of approximately 13 acres of NCDOT property, including roadways, open space, and forested areas. At this time, NCDOT anticipates retrofits to convert concrete-lined ditches to swales and vegetated areas with enhanced bio-filtration, and construction of dry detention basins. Final BMP selection will be dependent on design and site limitations. Project-specific copies of NCDOT-JLSLAT, along with final load reduction estimates, will be provided upon project completion. NCDOT is not required to implement stormwater retrofits under the Jordan Lake GREEN program at this time.

Rehabilitation of Existing Stormwater Controls

NCDOT's Stormwater Control Management System (SCMS) is used to track inspection and maintenance (I&M) of SCMs located within the Jordan Lake and Falls Lake watersheds. NCDOT Division Roadside Environmental Unit Engineers actively maintain SCMs in the Jordan and Falls Lake watersheds. In 2014, no significant rehabilitation projects were identified or reported. As such, nutrient load reduction/performance changes, associated with significant BMP maintenance or rehabilitation, is not provided in this annual report.

Summary of Outfalls from Primary Roads

NCDOT has completed a field inventory of NCDOT's road drainage system near the Cities of Burlington and Graham within the Little Alamance Creek Watershed. This portion of the Jordan Lake watershed was selected to identify retrofit opportunities that support nutrient management concerns under the GREEN program as well as benthic macroinvertebrate impairment in the Little Alamance Creek watershed. This inventory included detailed attribution (e.g. pipe size, pipe material, depth, lining, and widths) of the system, mapping grade GPS, and photographs as appropriate to define the connectivity of the drainage system within the study area.

Nutrient Scientific Advisory Board Support

NCDOT's continued membership on the Nutrient Scientific Advisory Board (NSAB) over the past year included active participation in monthly Board meetings as well as subcommittees tasked with providing recommendations on modeling, nutrient reducing measures, and nutrient accounting tools. Since late 2013, NCDOT has worked closely with NCDENR and other stakeholders to address model concerns and implement post-processing analyses that address concerns in a transparent and cooperative fashion.



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