North Carolina Department of Environment and Natural Resources

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Governor

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MEMORANDUM

To: ENVIRONMENTAL REVIEW COMMISSION
The Honorable David Rouzer, Chair
The Honorable Mitch Gillespie, Co-Chair
The Honorable Ruth Samuelson, Co-Chair

FROM: Kari Barsness KKB
Director of Legislative and Intergovernmental Affairs

SUBJECT: Stormwater Requirements for Airports Report

DATE: February 1, 2012

Pursuant to Section 20 of Session Law 2011-394, the department shall study stormwater requirements for airports in the state and report to the Environmental Review Commission by February 1, 2012. Please see the attached report to satisfy this reporting requirement.

If you have any questions or need additional information, please contact me by phone at (919) 707-8618 or via e-mail at Kari.Barsness@ncdenr.gov.

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Review of Stormwater Management Requirements for Airports

Prepared for the Environmental Review Commission by the Department of Environment and Natural Resources, Division of Water Quality

Feb. 1, 2012

Report Requirement

Under Session Law 2011-394, Section 20, the Department of Environment and Natural Resources (DENR or department) "shall study the stormwater management requirements for airports in the state. The department shall specifically consider whether the requirements might be amended or implemented in a different way to achieve the same level of water quality protection while reducing the cost and other regulatory burdens associated with compliance with the requirements. In conducting this study, the department shall consult with representatives of the airports in the state. The department shall report its findings and recommendations to the Environmental Review Commission no later than February 1, 2012."

Findings & Recommendations

Even prior to Session Law 2011-394, the Division of Water Quality (DWQ) had been working with the North Carolina Airports Association (NCAA) and others to develop a menu of stormwater best management practices (BMPs) for airports. In addition to developing the menu, input from the group was used to identify the unique issues related to management of stormwater at airports: safety, expansion needs and diverse land uses.

Based on recommendations from the group, DWQ is amending the DWQ Stormwater BMP Manual to provide a separate chapter for airport stormwater management (Stormwater BMP Tool Box for Airports). The amended DWQ Stormwater BMP Manual will include modified BMPs that can be used for linear road projects as well as commercial and/or residential developments, and will identify practical uses of those BMPs to assist in addressing some of the unique situations that exist at airports. These nontraditional BMPs will assist in: addressing the safety issues, providing more cost effective stormwater treatment and providing more flexibility to the regulated community in evolution of their individual development plans.

In addition, DWQ will share design tools (including specialized spreadsheets and supplemental forms) and conduct educational outreach to the regulated community to share information about the use of nontraditional stormwater BMPs. DWQ will kick off outreach efforts at the annual NCAA conference in New Bern on April 25-27, 2012. The flexibility and improved cost effectiveness provided by the updated stormwater BMPs, coupled with better training and design tools, should in turn reduce the regulatory burden associated with the stormwater rules. All of these activities can be completed under existing regulations; therefore no modifications to the rules are recommended at this time.

Background

In March/April 2010, prior to Session Law 2011-394, a joint team represented by WK Dickson, NCAA, the North Carolina Department of Transportation Division of Aviation (NCDOA), North Carolina State University (NCSU), and DWQ met with airport staff at 10 airports to assist with

development of the Stormwater Best Management Tool Box for Airports in North Carolina. To further understand current practices used to drain and treat runoff at airports, the team made site visits to the following North Carolina airports:

- Avery County
- Asheville Regional
- Dare County
- Columbus County Municipal
- Concord Regional
- Fayetteville Regional
- Harnett County
- Northeastern Regional
- Piedmont Triad
- Wilmington International

After these initial site visits, DWQ continued to meet with the NCAA, WK Dickson and NCDOA. The division also consulted with Mike Reesman at the Asheville Airport, Bradley Whited at the Fayetteville Airport, Richard Walls and Jennifer Fuller with NCDOA, Scott Hinton at the Elizabeth City Airport, Julie Wilsey at the Wilmington Airport, and consultants working on the expansions at Albert J. Ellis Airport in Onslow County.

Considerations

The main considerations in development of stormwater management plans for airports were identified as maximizing safety, allowing for expansions and managing multiple sources of stormwater due to diverse site uses.

Threat to Human Safety

Wildlife, including birds and mammals, can be a threat to human safety during aircraft takeoff and landing, and stormwater BMPs must not increase that threat. There is concern that some traditional stormwater BMPs promote standing water and may attract wildlife that could be hazardous to aircraft. A number of alternative stormwater BMPs are available that should be selected and designed to minimize creation of habitat that attracts wildlife and their associated risks.

Public Airport Expansions

Public airport expansions include the addition of newly constructed hangars, terminal building expansions, runway extensions and construction of new taxiways, aprons or ramp areas. The nature of airport operations forces development (and the areas of higher construction density) to the fringes of the airport property, leaving large open areas in the center of the site adjacent to the runways.

Each airport has a long-term master plan, known as an airport layout plan (ALP). The ALP includes future expansion plans and shows the impervious surfaces that will be constructed. The ALPs typically do not address stormwater management for existing or future expansion.

Site Use

There are three general areas on public airports:

1. Runway, taxiway and infield (airside);
2. Hangars and associated aprons or ramps (airside); and
3. Parking lots, terminal buildings and other non-flight commercial developments (landside).

Runways, taxiways and much of the infield areas have water quality impacts and site constraints similar to a road or highway. In addition, pollutants from runways and taxiways are similar in character to those from roads or highways. However, stormwater samples collected at the Wilmington Airport show that runoff from its runways and taxiways may be significantly cleaner than runoff from typical urban areas or roads and highways. This might be attributed to regular cleaning operations to avoid debris on runway areas. Also, much like roads and highways, runways and taxiways are typically not directly connected to piped or vegetative stormwater conveyance systems. Runoff typically enters a grassed buffer, shoulder and/or a grass swale, providing infiltration and treatment.

Other locations on airport grounds, such as the hangar area, terminals and parking lots, often have direct stormwater discharge to piped or vegetative stormwater conveyance systems. It is in these areas of more dense impervious surfaces that modified BMPs or BMPs implemented in nontraditional ways can be both cost effective and achieve the same level of water quality protection as traditional approaches.

Stormwater BMP Tool Box for Airports

Some practices commonly used elsewhere in North Carolina may not be appropriate at airports due to safety concerns; for example, wet detention ponds and constructed wetlands can attract wildlife that present a hazard to aviation. Other existing stormwater practices can be both cost effective and achieve the same level of water quality protection: open spaces that promote infiltration, infiltration trenches, filter strips, bioretention areas and swales.

Airports' diverse site uses require unique approaches to stormwater management that include practices described in the Stormwater BMP Tool Box for Airports (Tool Box) such as: non-structural stormwater control measures, compensatory treatment, low impact development (LID), practices that promote infiltration, modified BMPs or BMPs implemented in a different way, and alternative designs.

The proposed BMP guidelines described in the Tool Box provide acceptable alternatives for use at airport facilities in North Carolina. The Tool Box provides guidance for modifying BMPs or BMP implementation in a manner that is cost effective and achieves the same level of water quality protection on or near airports and within the airport influence areas.

Where practical and cost effective, DWQ encourages airports to adopt and implement BMPs described in the Tool Box as the airport develops and expands operations. The following paragraphs provide more information on some of the options provided in the Tool Box:

Non-structural Stormwater Control Measures: Unlike non-linear residential and commercial development, airports often have the resources to implement and sustain non-structural stormwater controls measures, such as frequent power vacuum sweeping. Frequent power vacuum sweeping of taxiways has been shown to reduce total suspended solids and associated pollutant loads.

Compensatory Treatment: To be most effective, BMPs should treat locations with the greatest pollutant loads. For instance, if runway extension and/or taxiways do not generate the greatest pollutant loads, then more water quality benefits will result from treating stormwater from a more polluted, but similarly-sized, impervious area elsewhere on the airport property.

Low-Impact Development (LID): Low-impact development maintains a site's natural hydrology to the maximum extent practicable by creating a landscape that mimics natural infiltration to both shallow and deep aquifers, runoff to surface waters and evaporation from soil and plant uptake. For airports LID practices include:

- Small-scale practices and controls distributed throughout the site that allow for infiltration, retention, storage and filtering of stormwater. These designs eliminate standing water and the need for a centralized structural stormwater runoff control device. Design techniques may include: rain gardens and bioretention cells, rooftop retention, bioretention swales, bioslopes, high flow rate modular bioretention systems and directing rooftop runoff to an appropriately sized and designed rain garden, rain barrel or cistern.
- Infiltration and more contact time with the landscape by preserving natural drainage patterns, use of pervious pavement, sheet flow and vegetative swales, and lengthening flow paths.
- Disconnected impervious surfaces that reduce or eliminate piped and/or vegetative conveyances.

Many of these practices can be established during the design phase of the airport. For example, apron or rooftop area could be reduced, or downspouts from buildings could be routed through vegetated areas.

Conventional stormwater management systems typically involve hard infrastructure, such as curbs, gutters and piping. LID-based designs, in contrast, use natural drainage features or engineered swales and vegetated contours for runoff conveyance and treatment. In terms of costs, LID techniques can reduce the materials needed for paving roads and for installing curbs and gutters. By infiltrating or evaporating runoff, LID techniques can reduce the size and cost of stormwater control structures. LID techniques can also reduce the amount of land required to implement a stormwater management practice and lower maintenance costs.

Based on EPA studies at 10 locations employing LID, cost savings ranged from 15 percent to 80 percent as compared to a conventional stormwater system. Only one of the sites had costs slightly higher than more than conventional methods using ponds and wetlands. While airports may be different than the sites that EPA studied, clearly, alternative designs can cost significantly less than conventional methods. For more detailed information comparing the cost of conventional BMPs and the cost of LID for 10 developments visit: http://www.epa.gov/owow/NPS/lid/costs07/factsheet.html

Infiltration: Practices that promote infiltration provide an opportunity to reduce runoff volumes so that costly larger-scale practices that mitigate peak flow may be avoided. Infiltration BMPs, such as bioretention, infiltration trenches, permeable pavement and filter strips function best for water quality and hydrologic improvements in a sandy-type soil where the seasonal high water table is not so high that it prevents infiltration. To improve surface drainage, infiltration rates in certain soil types may be further enhanced with soil amendments (material added to a soil to change its properties, in this case to make it more permeable). The division continues to gather information in order to assess the long term benefits of infiltration BMPs.

Modified BMPs: In 2011, the N.C. Clean Water Management Trust Fund, NCDOT, N.C. Coastal Federation (NCCF), and Brunswick County sponsored research and a workshop to consider LID for linear transportation systems such as roads. The study examined whether BMPs might be modified or implemented in a different way to achieve the same level of water quality protection while reducing the cost and other regulatory burdens associated with stormwater requirements. Leading stormwater experts from North Carolina, Florida, Maryland, Texas and Washington contributed to the research and workshop. Specific BMPs that were evaluated for linear development included:

1. Bioretention Swales
2. Bioslopes
3. High Flow Rate Bioretention Systems
4. Level Spreaders, and
5. Infiltration Basins

These types of modifications can be considered in the development of stormwater management plans.

Alternative Designs: Alternative designs not included in DWQ guidance (including the Tool Box) may be used in an airport's stormwater management plan. To demonstrate equal or better stormwater control for the design storm using alternative designs, the stormwater management plan must demonstrate that:

1. The stormwater for the design storm for both existing and future development would infiltrate on site (i.e., no discharge), or
2. The pre-construction hydrograph for the site prior to any permits issued by the state met the post-construction hydrograph for both existing development and future development, or
3. The hydrograph for the alternative design provided equal or better stormwater control than the hydrograph based on the conventional approach to permitting (i.e., relying on wetlands and wet ponds).

Conclusions

In addition to development of the Stormwater BMP Tool Box for Airports and its inclusion in the current BMP manual, DWQ and the work group identified other activities that would further support cost effective stormwater control at airports including development and sharing of design tools and increased outreach.

In the permitting process DWQ utilizes various spreadsheets and supplemental forms to review and approve traditional BMPs. The airports and DWQ will benefit from developing and sharing tools that assist in the design and review process to effectively implement alternative designs.

To ensure that DWQ staff, consultants and airport managers are all fully aware of DWQ's ongoing efforts to allow and encourage alternative practices at airports, DWQ plans to kick off outreach efforts at the annual NCAA conference in New Bern on April 25-27, 2012. Additional DWQ outreach efforts will be coordinated with NCDOT Division of Aviation and the North Carolina Airports Association.