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MEMORANDUM

Date: April 28, 2004
To: Bradley Bennett, DWQ
From: Kimberly Brewer, Tetra Tech, Inc.
Subject: Upper Neuse SET Assumptions for Dry Detention and Permeable Pavement
Cc John Cox, Mark Senior, Rich Gannon, Steve Zoufaly, Chris Dreps, Scott Job

During the recent Upper Neuse SET Task Group Meeting, the group acknowledged that we had made significant progress in agreeing on the types of BMPs that should be included in the Upper Neuse SET, and appropriate assumptions about the BMPs' pollutant removal efficiencies and volume capture potential. Also, we all agreed that the SET is a tool that should be updated regularly based on new technologies and research.

The Task Force, however, continued to struggle with the appropriate assumptions for 2 of the 15 proposed BMPs in the SET menu: dry detention and permeable pavement. By this memo and the meeting with you next week, I hope to convey the concerns I have heard expressed about how these BMPs are handled in the SET (concerns both by DWQ staff and local government staff), and to propose new assumptions for you to consider based on recommendations by Bill Hunt during a related conference call April 22.

Dry Detention

DWQ's Concerns

- Dry detention does not receive nitrogen removal credit in the state's Neuse and Tar-Pamlico local stormwater programs. The SET needs to be consistent with the State's programs/rules.
- Dry detention has been shown to export nitrogen in some cases. There is a wide range of values in the literature.
- DWQ would like more specific data on dry detention, based on monitoring in the field of these devices. Staff would be willing to consider revising the assumptions in the future based on monitoring data.

Local Governments' Concerns

- Because it is relatively affordable, the dry detention BMP is being used and will continue to be used by developers in a BMP series, to help meet peak flow control requirements. Durham is requiring dry detention on every stormwater outlet to manage flow (“peak matching”). If the BMP can provide pollutant removal and well as volume control, it should be given credit for both.
- Research has shown extended dry detention removal efficiencies is dependent on the amount of volume entering the basin. Low volume = low efficiencies. High volume, dirty water = higher removal efficiencies.
- There is a wide range of removal efficiencies reported in the literature, giving the BMP a credit of “0” penalizes a popular and widely used BMP. Similarly, there is a range of types of dry detention. According to comments from local government stormwater staff, there should be credit for some types. Mike Coughlin of Wake County states, "There’s no question dry detention removes some TSS." He thinks there should be nutrient credit, even if the # is low end. John Cox of Durham Stormwater Services believes that it is better to give credit based on low end of data than to give no credit.
- We should differentiate between extended dry detention & peak flow dry detention, and give removal credit to extended dry detention.
- The menu of options and assumptions that we make are the incentives we’ll be providing to developers to select certain BMPs over others.
- We need a trial period to test options. If we don’t provide credit, however small, developers will not choose to use BMPs that we would like more information about.

Discussion, Recommended Revised Assumptions, and Guidance (Per Bill Hunt 4/22/04)

- Available information suggests that very well maintained dry detention (i.e., mowed regularly, not allowed to develop a soggy bottom) tends to have little to no annual pollutant removal, while poorly maintained dry detention (i.e., soggy bottom with some wetland characteristics) has better pollutant removal.
- Bill discussed Dan Line’s recent study, a well maintained extended dry detention basin with no significant overall pollutant removal. Tetra Tech discussed another study in Greenville, NC from 1992, which showed 71% removal of TSS, 14% of TP, and 26% of TN. Bill was familiar with the site and commented that it exhibited definite wetland characteristics; the study itself confirmed that within a year of construction, the bottom of the basin had become soggy and portions of it near the outlet were reverting to shallow wetland.
- Bill believes that in all likelihood, most dry detention constructed in the region will not be well maintained and will develop wetland characteristics to some extent.
- Bill recommends the following reduced removal rates for extended dry detention: 25% for TSS, 10% for TN, and 10% for TP.
- Bill recommends zero removal for standard (not extended) dry detention

Permeable Pavement

DWQ Concerns

- Permeable pavement does not perform like undeveloped land, therefore is considered as “built upon area” in the water supply protection regulations.

- If permeable pavement is not maintained it can clog and become impermeable. These BMPs have performed poorly in the past due to poor construction and/or lack of maintenance. How can you ensure proper construction and maintenance?
- If permeable pavement is installed in areas that are still developing, sediment will likely wash onto the site from upland construction activities/land disturbance. The sediment will clog the pavement, making it impermeable.

Local Concerns

- Given the Phase II post construction stormwater requirements for volume control, local governments and developers in urban areas will need many BMP options, including permeable pavement, to meet the regulations.
- Local governments also have concerns about proper use, installation, and maintenance of permeable pavement. However, they believe this is an issue for many of the conventional and innovative BMPs.
- Local government representatives had requested that permeable pavement be added to the SET menu, with caveats/specifications regarding where the BMP can be used, maintenance requirements, etc.
- If we do not give credit to permeable pavement, developers will not use it and we will not be able to do monitoring and research needed to test its potential effectiveness in the Piedmont.
- Mike Coughlin of Wake County has seen a permeable pavement BMP in Wake County, which is still performing well after 10 years.
- John Cox said Durham would like to include/require permeable pavement for overflow parking in the draft Unified Development Ordinance.
- Suggestions from the Task Group included
 - o Include permeable pavement in menu; update the assumptions when we have additional data. Bill Hunt has a few sites being monitored in the Triangle (Birklands subdivision).
 - o Use the SET model assumptions to simulate a surface runoff between built upon and non-built upon area by giving it a higher curve number than undeveloped but lower than built upon.
 - o Calculate the storage volume potential. With several inches of underlying gravel, it provides at least some detention storage.
 - o Do not allow it in developing areas, only in stable areas.

Discussion, Recommended Revised Assumptions, and Guidance (Per Bill Hunt 4/22/04)

- Bill stated up front that he has a different set of recommendations for permeable pavement in the coastal plain, where he says it performs very well. The following items pertain only to permeable pavement in the Upper Neuse.
- Bill recommends no pollutant removal credit for TSS, TP, or TN for permeable pavement.
- The problem with permeable pavement is clogging and maintenance. The presence of unstable clay soils in the area greatly increases the risk of clogging. Any permeable pavement area should be scoured thoroughly by a street sweeper on an annual basis, and this should be stipulated in the design approval process.
- In the Upper Neuse, permeable pavement performance is site and situation specific:
 - o No credit should be given for new residential development. The primary application here is for house driveways. The problem is that even if a permeable pavement driveway is the last thing installed at a site, the driveway will probably be exposed to clay, tracked in from the occupants' car tires. Construction is likely to continue in a housing development, and heavy equipment regularly tracks large amounts of clay into the surrounding streets. The represents a continuous load of clay soil that ends up clogging

the permeable pavement driveway early in its life. Annual maintenance is not likely to occur as well at a residential site.

- Credit should be given for large parking lot installations of permeable pavement. This is provided that the permeable pavement is designed properly and maintained on an annual basis. Big installations are much harder to clog; some clogging may happen on the fringes but the balance of the area should remain intact. In the SET, credit would be given by using reduced Rational Coefficients, Curve Numbers, and input/calculation of runoff storage. Bill suggests a Rational Coefficient of 0.45 – 0.50 (with certain design and maintenance stipulations).
- One question is at what point does a parking area become too small and run the risk of substantial clogging? Bill does not have much concern about a 100 stall parking area, but definitely has concerns about a 20 stall parking area.
- Urban redevelopment is a special case. Bill recommends allowing credit for redevelopment in downtown urban areas (Durham, Raleigh) even for small sites. Small redevelopment sites for permeable pavement do not have a high risk of clay soil clogging since the site is probably miles away from active construction site and there is not a heavy clay load to be tracked in.

Recommended Next Steps

In the short term, we recommend that DWQ provide conservative and qualified credit, as noted above, for dry detention and permeable pavement. During an established trial period, the BMPs can be installed and monitored. The interim assumptions and design specifications can be revised or the BMPs removed from the BMP menu based on monitoring data. The Upper Neuse Task Group recommends regular updates of SET assumptions for these as well as all other BMPs based on new technology and research.

We appreciate your consideration of these recommendations.