Abstract

Determining Site-Specific Mean Annual Mass Removal Efficiencies for Dry Retention Systems Using ICPR - An Alternative to the Harper Methodology –

Presented at the

ASCE Florida West Coast Branch
Water and Environment Committee
One-Day Seminar

"WE ARE CHANGING THE RULES …"

September 25, 2008
(10:55 to 11:25)

by

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The proposed Statewide Stormwater Treatment Rule relies heavily on the methodologies developed in the report entitled "Evaluation of Current Stormwater Design Criteria within the State of Florida" (June 2007) prepared by Harvey Harper and David Baker of Environmental Research & Design, Inc. The "Harper Methodology", as it is called, focuses on two primary treatment mechanisms – wet detention and dry retention. The report states that wet detention by itself cannot achieve 80% removal of nitrogen. Consequently, dry retention and percolation of stormwater runoff will become critical components for most land development projects once the new rule is implemented.

The Technical Advisory Committee (TAC) has raised several issues with respect to the Harper Methodology. Specifically, items 6 and 7 in their "Methodology List of Issues" (revised July 2008) state:

6. The methodology assumes fixed recovery criteria (50% of the volume is recovered in 24 hours, 100% recovered in 72 hours). Those numbers are not practical and no credit is given for ponds that recover more quickly.

7. The continuous simulation for developing the curves does not take into account the faster infiltration rate outside the 3 to 4 week wet season, which represents less than 10% of the year. It is not fair to assume that the 72 hour dry retention recovery rate applies year-round. It is not a true continuous simulation as it doesn't account for fluctuation of the water table and variable recovery times.

These concerns are well founded considering that the Harper Methodology is used to determine "mean annual mass removal efficiencies". The traditional concept of fixed recovery criteria (e.g., 100% removal in 72 hours) has little meaning for annual assessments because percolation is a complex process that depends as much on cumulative impacts as it does on soil properties. In other words, percolation rates in August are likely to be much different than those in February.

The Harper Methodology also makes no distinction between dry retention methods. For example, percolation from swales is generally more efficient than retention ponds and consequently should receive more credit in terms of pollutant removal efficiency.

The issues are further complicated when treatment trains consisting of various BMPs are used for a single project such as multiple dry retention ponds in series or in combination with swales, underground stormwater chambers, exfiltration trenches, porous pavement, etc. The hydraulic interactions and interdependencies on the surface have a direct impact on percolation rates and groundwater movement below the surface.

The purpose of this presentation is not to critique the Harper Methodology, but instead, to explore some of the issues cited by the TAC and offer an alternate methodology to determine mean annual pollutant removal efficiencies. Specifically, the PercPack™ module of ICPR is used to analyze percolation capacities for various dry retention configurations. Water table fluctuations and groundwater mounding impacts below and adjacent to the dry retention facilities are tracked for a six-year period including two dry years, two average years and two wet years. Annual mass pollutant removal efficiencies are determined for each of the six years as well as for the entire simulation period. Comparisons are made with the Harper Methodology.

Note: The full presentation can be downloaded after September 25, 2008 at:

www.streamnologies.com/pdfs/singhofen_ascewcb_080925.pdf