

Infiltration Rates:

The BMPTRAINS software does not allow for site specific infiltration rates to be utilized to benefit from more efficient retention in dryer sandy soils. Undeveloped land use on upland sandy soils have bare minimum pre-development nutrient loadings, without any way to account for the benefit of increased percolation from those soils.

BMPTRAINS allows for several BMP's to be analyzed related to the equivalent inches of dry retention provided. The efficiencies of these systems are based upon tables generated in the 2007 report by Harper and Baker. The tables were generated by applying actual runoff data to a continuous model and determining what percentage of the incoming runoff exited the pond. The simplifying assumption to calculate this was the rate of stormwater infiltration in the pond. As infiltration rates vary across the State, the rate of removal was simplified to match the bare minimum meeting the State standard, or recovery of the full retention volume in 72 hours.

To address infiltration rates, an input for the infiltration rate is required. Processing of that infiltration could either be approximated, or a continuous model of the actual proposed pond would be necessary with the infiltration rates specified. Recovery of unsaturated vertical infiltration would need to be estimated. This is a much more detailed analysis than is currently used in common practice.

First Flush/Concentrations:

The existing BMPTRAINS software does not vary pollutant concentrations dependent upon rainfall amounts.

"However, in many watersheds, significant first-flush effects do not occur, and therefore, removal efficiencies will not be as high as reported in the Wanielista study. Subsequent research has suggested that first-flush effects occur primarily on relatively small watersheds (<10 acres) with a high percentage of DCIA. In large watersheds with a low or moderate DCIA percentage, significant first-flush effects may not occur."(p. 5-5, Harper & Baker, 2007)

A substantial portion of projects within the State are within the size and site characteristics that would indicate a first-flush effect. This would be expected to be even more relevant at higher treatment volumes, where 3 to 4 inches of retention is required.

The existing BMPTRAINS software multiplies the incoming runoff by the Event Mean Concentration (EMC) to determine incoming pollutant load. The EMCs are based upon a literature review performed in the 2007 report by Harper and Baker.

In effect, the BMPTRAINS model does not account for any first-flush effect. The model is not detailed enough to differentiate between pollutant concentrations that may vary by rainfall amount. This results in a conservative simplification that the pollutant loading of the last inch of runoff during a hurricane is just as concentrated as a routine afternoon 1/4" shower.

To address these points, an updated review of the underlying research literature would be required to determine average concentrations for a range of rainfall amounts. These concentrations would then need to be assigned to the rainfall amounts in this historical record and applied to the continuous model. Practicing professionals do not do this today, and the existing software in use is not tailored to this sort of analysis. The underlying data may be insufficient to determine average concentrations for various rainfall amounts. If this is the case, additional research would be necessary to provide a reasonable average for use in project analysis.

Source:

Evaluation of Current Stormwater Design Criteria within the State of Florida. Final Report. June 2007, Harvey H. Harper, Ph.D., P.E. and David M. Baker, P.E.