

Stormwater National Pollution Discharge Elimination System (NPDES)

What does this mean?

National Discharge Elimination System (NPDES) is a provision of the [Clean Water Act \(CWA\)](#) of 1977 that regulates “point source” (discrete conveyances such as pipes or man-made ditches) pollution ([40CFR122.26 122.26](#)). When referring to stormwater pollution, the regulation applies to water pollution that degrades surface waters making them unsafe for drinking, fishing, swimming, and other activities. The NPDES program controls stormwater pollution by regulating point sources that discharge pollutants into waters of the United States. In most cases, the NPDES permit program is administered by authorized states. In the State of Florida, the Florida Department of Environmental Protection (FDEP) is authorized to regulate stormwater pollution under the [United States Environmental Protection Administration \(USEPA\) authorization](#). Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our nation's water quality. The [USEPA website](#) has additional information and tools to help you better understand the NPDES system. The FDEP also has a wealth of information on their [Stormwater website](#).

How are the data collected? (Methods)

Stormwater data are collected by various means in order to meet the specific requirements of the NPDES permit. There are two primary types of data used for this purpose. The first is ambient water quality data which is used to determine the general health and water quality trends of a waterbody. These data are collected with a grab sample (a sample which is taken from a water source without consideration of existing or previous conditions). The ambient samples may be taken at pre-established times and locations (sites) within the waterbody or they may be taken at times and places randomly selected for each sample event. This second approach to sample site management is called randomized stratified sampling.

Storm event sampling is the second type of water quality sampling used in an NPDES stormwater sampling program. The goal of storm event sampling is to capture water quality data in such a manner that it is representative of the whole storm event. This is accomplished by first establishing sites at the outfall of a stormwater conveyance and then sampling these sites at specific times over a storm event. Detailed approaches to this type of data collection can be found on the [FDEP NPDES Stormwater Program](#) page. Related publications may be found in the *Additional Information* section below.

The result of storm event sampling is an estimate of the pollution load leaving an area of land. The sample plan normally selects sample sites that are representative of a specific land use so that these land use types may be quantified relative to their pollution potential. For example, it may be desired to determine the pollution potential of areas of the urban environment that have a high density residential housing land use. The sampling plan would include one or more sites

where water collects from the land parcels that are used for high density residential housing. These sites, and the resulting sample data, would be used to characterize this land use type relative to its stormwater pollution potential.

Samples are taken using either timed grab samples (grab samples timed to best estimate the storm event) or a stormwater sampler (an instrument that takes samples at specific times and of specific volumes based on a storm event or other criteria). In either case, it is important to time the samples so that the storm event is adequately represented. The resulting data may then be used to estimate the pollution load that would be expected for specific pollutants from a certain storm event (usually classified by rainfall volume over the period of event) and from a specific type of land use. For the earlier example, it may be found that high density residential land use has a greater than normal total phosphorus pollution load for large storm events. These data may be used to evaluate future plans for this type of land use, especially if the land parcels drain to a natural waterbody.

Calculations

Storm event sampling is expensive in terms of equipment costs and/or labor. It is therefore important to preserve the data that results from storm event sampling in a manner that allows its use have for many different applications. This may be accomplished by calculating a parameter that estimates the pollution load leaving a specific land use type. This parameter is call the event mean concentration or EMC. [Harper, 2003](#) and [Chow and Yusop, 2008](#) are two good sources for general and specific information on EMCs and their application.

Chow and Yusop (2008) provide the following equation used to determine an EMC for a flow weighted composite sample take during a storm.

$$EMC = \bar{C} = M/V = \int C(t)Q(t) dt / \int Q(t) dt \quad (\text{normal units of mg/l})$$

Where \bar{C} is the mean concentration over the event, $C(t)$ is the concentration of a constituent at time t and $Q(t)$ is stormwater discharge at time t and M and V are pollutant mass and runoff volume during the storm event. In general terms this equation determines the sum of the incremental change of constituent mass divided by the incremental change in flow volume and provides the result as a concentration (mg/l) of constituent for the period of the storm.

The EMC is then used to characterize the stormwater pollution or stormwater pollution potential for a specific type of land use and a specific chemical constituent (phosphorus, nitrogen or cadmium, for example). EMC values are commonly used in pollution potential models and to determine the effectiveness of a pollution control best management practices.

Additional Information

- [Harvey H. Harper](#), 2003, Evaluation of Alternative Stormwater Regulations for Southwest Florida, Final Report (Revised Sept. 8, 2003) for Water Enhancement and Restoration Coalition, Inc.

- [M.F. Chow and Z. Yusop](#), 2008, A Review of Event Mean Concentration for Urban Stormwater Runoff, International Conference of Environmental Research Technology (ICERT 2008).
- [Durham Geo Slope Indicator](#), Flier, Sampling Storm Water Runoff, Manual VS Automatic Methods.
- [USEPA](#), 1992, NPDES Storm Water Sampling Guidance Document, EPA 833-8-92-01, July 1992.