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New Jersey Department of Transportation
Bureau of Research

Technical Brief

Stormwater System Monitoring and Evaluation - Implementation

The New Jersey Department of Transportation (NJDOT) has installed numerous prefabricated stormwater treatment systems throughout the State. The use of such systems, known as Manufactured Treatment Devices (MTDs), is expected to continue in the foreseeable future. As the responsible party for the maintenance of these MTDs, NJDOT initiated this project with the goal of determining optimum maintenance intervals and expected maintenance costs for these MTDs. This project has resulted in a model for predicting the maintenance intervals with the number of vehicles on the road(s) and the impervious drainage area as inputs.

Background

The previously completed one-year field monitoring indicates that up to half a foot depth of sediment was trapped by the stormwater manufactured treatment devices. A linear extrapolation of the one-year depth leads to an estimate of maintenance interval of four years. The extrapolated/estimated maintenance interval of four years is far less than one year generally suggested by the device manufacturers. This would lead to a significant savings in maintenance costs for NJDOT. Due to the potential for significant savings and the possible non-linear sediment accumulation, the extrapolated/estimated maintenance interval should be confirmed by the actual measured maintenance interval.

Research Objectives and Approach

- To inspect and monitor the previously chosen twelve devices every three months
- To affirm the maintenance interval extrapolated from the previous project and the maintenance cost reduction derived from the previous project

The sediment accumulation depth over the observation period was used as the lead indicator for the time interval between MTD cleanouts. The sediment depths were measured subsequently from the clean state. The depths were measured at a pre-determined time interval, every two months from December 2007 to July 2009 and every three months thereafter till November 2012.

The sediment accumulation depth was measured using a stadia rod. Personnel trained in safety procedures, including confined space entry, manually opened the manhole cover atop the swirl chamber of each MTD. Pictures of oil and floatables were taken and the proportion of covered area was calculated.

Additional research was deemed necessary on combined variables related to the increase in the amount of trapped materials on the device bottom. This research presents development and integration of information such as rainfall intensity and duration, highway drainage area characteristics, and traffic volume. Regression analysis has been performed to obtain a relationship between the cleanout interval and the variables.

Data on the drainage areas were obtained from the corresponding design companies and/or estimated from the NJDOT drainage plans. Information on devices was from the manufacturers' websites and/or brochures. The traffic count was conducted on sites through this project.

Findings

The sites for the twelve devices were divided into three different categories: (1) sites with inadequate inflow to the device, (2) sites with the poor source control, and (3) sites under general conditions. For the sites with inadequate inflow, the installation problems should be corrected and/or the inlet pipes should be cleared. For the sites with poor source control, a maintenance interval of one and one half years is recommended, but, it is preferably recommended that they are made stable, to reduce the degree of erosion, and then put on a maintenance interval for the general sites.

For the general sites, the maintenance intervals were measured to be from three to four and one half years. For planning future maintenance/cleanout activities, it is recommended that the predictive model be used with the number of vehicles on the road(s) and the impervious drainage area as inputs.

For the same type of devices or other types of devices, the maintenance interval can be predicted first using the same relationship obtained from this study and then adjusted proportionally based on the ratio of the maximum allowable bottom sediment storage volumes.

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A final report is available online at: http://www.state.nj.us/transportation/refdata/research/. If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

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