Rhode Island Storm Water Demonstration Facility

THE UNIVERSITY OF RHODE ISLAND

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Introduction

- Urban roadways contribute large amounts of suspended solids/sediments, heavy metals, petroleum hydrocarbons, deicing chemicals, bacteria and other constituents to receiving waterways (Goebel et al., 2007).
- To lessen the pollutant loads to receiving waterways the Rhode Island Department of Transportation (RIDOT) introduced using structural Best Management Practices (BMP's).
- Science-based data is required for selection the most appropriate BMP's for addressing specific problems in Rhode Island.
- For the purpose of evaluating performance of the BMP structures against the manufacturer's claims and under environmental conditions prevailing in Rhode Island, the RI DOT and the URI Transportation Center have provided funding for a new facility known as the ***"Rhode Island Stormwater Management and Treatment Demonstration Facility" (RI SDF).***

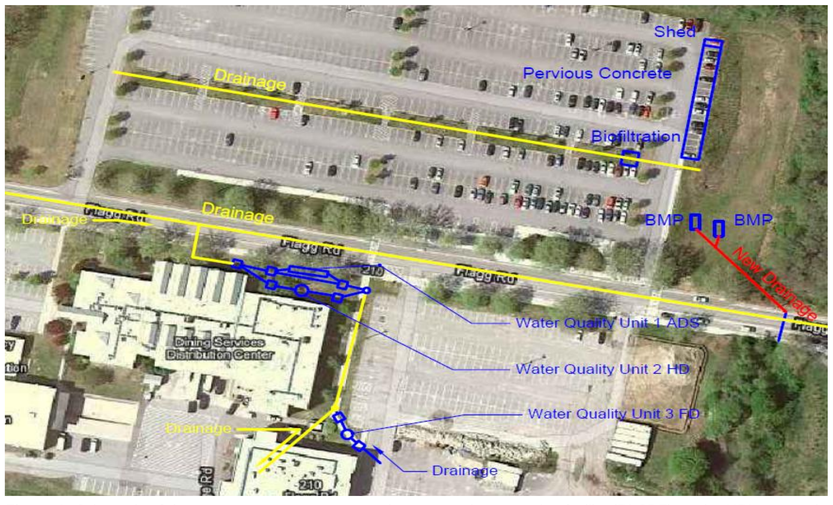

Figure 1: Schematic of the stormwater management and treatment demonstration facility (RI SDF) on the URI campus in Kingston, RI. There are two drainage systems to which BMPs can be connected to either the runoff generated on the surface of the parking lot (yellow) or from Flagg Road (red). Shown are the tentative locations for the hydraulic separator and the pervious pavement. Also shown are the tentative locations of other treatment structures, such as a biofiltration unit and another BMP.

Rhode Island Stormwater Management and Treatment Demonstration Facility (RI SDF)

- The demonstration facility for testing innovative stormwater treatment systems and best management practices is being set up on the URI Kingston Campus– adjacent to a parking lot on Flag Road.
- The RI SDF will provide the test grounds for evaluating commercial or innovative best management practices (BMP). The focus on the treatment of suspended solids, toxic metals and petroleum hydrocarbons, nutrients, pathogens, and other relevant water quality parameters.
- The RI SDF ties into an existing catch basin structure (Figure 1), which permits direct comparison of this conventional treatment approach to other more innovative ones to be tested at the facility.
- Monitoring construction and operating cost together with maintenance requirements will provide BMP specific cost data. The closeness to our URI laboratories ensures quick analysis turnaround times and provides our students with important field experience.
- The facility will eventually promote research focused on exploring the potential reuse of treated stormwater for domestic, agricultural and commercial uses, and generic water resources protection. URI researchers will independently evaluate BMP systems based on parameters such as: Implementation, operation, and maintenance: simple, sustainable solutions requiring minimal maintenance.

Field Performance Testing of Hydrodynamic Separator Units

- A hydrodynamic separator is a structural BMP method designed to minimize the potential adverse impacts of runoff. The objective of the project is to investigate the overall performance of three different commercial hydrodynamic separators.

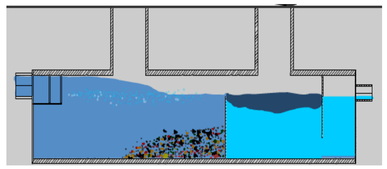

Figure 2: ADS Stormwater Quality Unit. The storm water will enter the Sediment Chamber, which consists of an upright weir for trapping sediment. A second chamber uses an inverted weir to trap oils, grease, and debris.

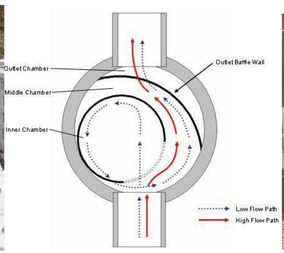

Figure 3: Hydroguard Separator
The Hydroworks HG separator treats both high and low flows in one device, but maintains separate flow paths for low and high flows.

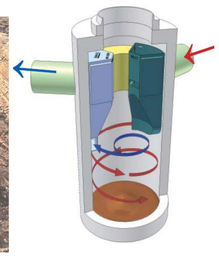

Figure 4: First Defense *Enhanced Vortex Separator.* The First Defense uses vortex technology to separate sediment, oils and other debris from stormwater runoff and capture the pollutants in a storage sump.

Pervious Concrete for Enhanced Pollutant Removal

- Pervious pavements are a storm water management technique which can be used on parking lots and low volume roadways to reduce both storm water runoff volume and pollution.
- The goal of the project is the development and study of enhanced pervious concrete system at different scales (laboratory and pilot scale). Organically modified clay ammendments promise to further enhance the pollutant removal efficiency of these pervious materials.

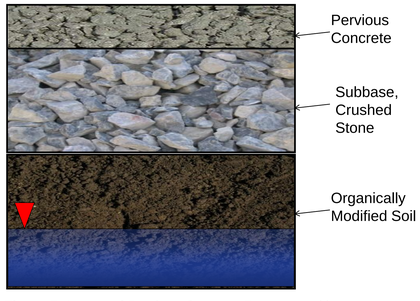

Figure 5: Layers of Pervious Concrete Pavement with organically modified soil.

Figure 6 : Pervious Concrete. Showing the infiltration capacity of the Pervious Concrete

- Because of its benefits in controlling stormwater runoff and pollution prevention, pervious concrete systems amended with organo-soils can potentially earn credit points in the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED).

Stormwater Management with Enhanced Tree Filter Systems

- Tree filter systems are a relatively recent innovation that are growing in usage because they replicate unpaved, predevelopment conditions by encouraging direct infiltration and treatment of stormwater runoff close to its source (UNHSC, 2007).
- On the grounds of the RI SDF, a conventional tree tilter system will be tested for its pollutant removal performance. It will be compared to an innovative tree filter designed specifically for the enhanced treatment of pathogens and PAH. Possible enhancements include bioactive amendments and geotechnical sorbents the will be tested under field conditions.

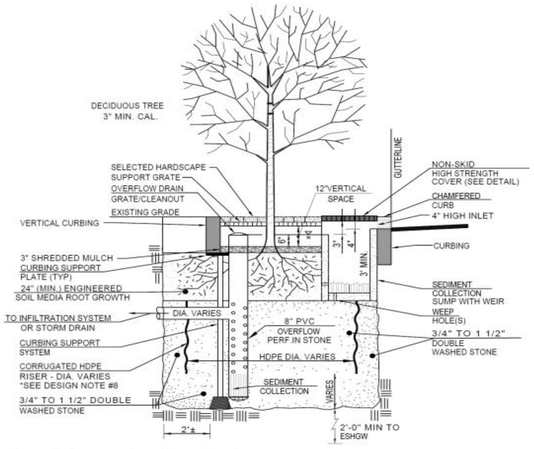

Figure 7: Cross section of Tree Filter System

Figure 8 : Interior of tree filter system ready for tree planting. In foreground, "pre-treatment" sump with weep holes; bypass/overflow pipe also shown.

SUMMARY

- Based on the assessment of the Hydrodynamic Separator performance and effectiveness on the treatment of stormwater recommendations will be made to RIDOT whether hydrodynamic separators may be better be suited as part of a treatment-train system, i.e. in combination with other (innovative) BMP rather than as individual treatment systems.
- Pervious Concrete testing facility will be developing and testing enhanced pervious concrete pavements structures with organically modified soils for efficiently removing pollutants in storm water.
- Investigating the pathogen and PAH removal efficiency of a tree filter and implementing the optimized bioactive amendments sorbents into the tree filter system will evaluate the effectiveness this BMP.
- The *Rhode Island Stormwater Management and Treatment Demonstration Facility* (RI SDF) will provide precise information on performance of the BMP's under weather and environmental conditions prevailing in state of Rhode Island.

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ACKNOWLEDGEMENTS

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