Measuring and Modeling the Impact of construction on stormwater

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Urbanization and growth in population have led to an increase in impervious surfaces, which results in an upsurge of stormwater runoff volume and amount of pollutants flowing downstream to the receiving waters. Areas used for construction have been found to contribute the highest sediment loading to urban runoff when compared to loadings from other urban land use types. Urban construction includes activities like excavation and grading which have significant potential to increase the sediment loading that flows downstream. Pollutants such as total suspended solids, silt, clay, heavy metals, nitrogen, phosphorous and come from construction, industrial, and municipal wastes. To mitigate the negative environmental and ecological impacts in terms of stormwater runoff quantity and quality, various storm water best management practices are implemented in urban areas. Examples of these include wet ponds, bio-retention basins, ecology ditches, and green roofs.

The purpose of this study is to measure the impacts of construction on stormwater runoff using best management practices. Particularly, Wet ponds, and modeling the data using stormwater modeling to forecast the results for the future possible development areas within Charlotte, North Carolina. The first objective is to measure the quantity of total suspended solids (TSS) that enters the wet pond during storm events for treatment after filtration and compare the results and compare the results with the past available data in the university prior to the rapid construction in the last 5years. The second objective is to forecast risk levels for future probable development areas within North Carolina by using stormwater modeling.

Data is collected from the wet ponds in the University of North Carolina at Charlotte which were retrofitted recently. For this work, peak inflow and discharge values are measured and recorded. In addition, the removal efficiency of the total suspended solids, nitrogen, phosphorous and other heavy metals from runoff entering the wet pond, are being monitored and evaluated. The samples are taken using the Isco 6712 Full-size Portable Sampler. It is placed inside a Tracom Model 200-071 instrument enclosure. A V-notch weir is set up at the inlet near the fore bay area. Isco 674 Rain Gauge which uses a tipping bucket design for rainfall measurement is connected directly to the Isco 6712 Sampler. The Isco 730 Bubbler Module which prevents clogging and resists damage by lightning and debris is also attached to the inlets and outlet which helps in determining the flow rate. Manual samples are also taken for laboratory analysis.

The performance of the wet pond will be checked by measuring the quantities of TSS treated. The filter medium will be checked for clogging and pollution level. Using model simulation, the results will be forecasted to provide guidance for the engineers and contractors to plan for mitigating the effects of sedimentation that affect the performance of BMP's due to swift development in construction. Using the University of North Carolina at Charlotte as a case study, scope of the study is to identify current and past trends of volumes of Total Suspended Solids from construction stormwater runoff to be treated by the wet ponds. The risk level for future development areas within the state of North Carolina can be assessed which aids in determining future suitable methods and guidelines for stormwater control.

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