Announcing the Final Examination of Alicia McDougal for the degree of Master of Science

Time & Location: March 21, 2014 at 10:45 AM in Eng II 442K
Title: Optimization of Block Layout and Evaluation of Collection MAT Materials for Polyacrylamide Treatment Channels

Construction sites are frequently cited as major sources of pollution that degrade the quality of surface water. The highly erodible topsoil is transported off site by stormwater runoff causing negative effects downstream. Research has shown that the small particles, which are the most susceptible to erosive forces, have more pollutants associated with them than larger soil particles. Currently, in the state of Florida, it is not permissible to discharge water to a receiving water body if the turbidity is more than 29 Nephelometric Turbidity Units (NTUs) above background or higher than background for an outstanding Florida waterbody. The removal of fine suspended sediment from water can be achieved by filtration, settling, and the use of chemical coagulants.

Polyacrylamide (PAM), a coagulant, has been shown to be effective in removing fine suspended particles from water via coagulation and flocculation. The Stormwater Management Academy at the University of Central Florida has researched the use of PAM and collection mats in a treatment channel to meet state discharge requirements.

In this study, turbid water using sediment from typical Florida soils was simulated and passed through a channel. The channel contained polymer blocks in a configuration previously determined to be the most effective. An important component of the treatment system is the floc collection. This research examined three types of collection mats, namely jute, coconut fiber and polypropylene mix to collect the flocs. This thesis presents the results of this investigation.

The results for the sandy soil tests showed an average removal efficiency prior to the collection mat starting at 71% and decreasing to 44% at the end of the tests. The 20-foot coconut mat maintained an average removal efficiency of 90%. The turbidity due to silty-sandy soil was decreased with an average removal efficiency prior to the collection mat ranging from 50% to 65%. The average removal efficiency for the 20-foot coconut mat started at 85% and decreased to 60% during the tests. The turbidity due to crushed limestone showed an average removal efficiency prior to the collection mat ranging from 81% down to 69% over time. The average results from the 20-foot coconut mat ranged from 65% to 80%. Turbidity was tested on the samples under two conditions, a 30 second settling time and completely mixed. Statistical results show a significant decrease ($\alpha=0.05$) in turbidity between the mixed and settled samples.

Statistical analyses were performed on the collected data, which concluded that the capability of the mat to reduce turbidity can be repeated with a 95% confidence interval. The 20-foot length coconut mat had the highest turbidity removal efficiency for every soil type examined. Further statistical analysis showed that the achieved turbidity reduction was significantly different ($\alpha=0.05$) for the various materials. It was observed that generally, each type of mat clogged during testing indicating that longer collection mats be used, possibly lining the entire channel. Recommendations from this study are to provide a settling area after the collection mats and line the entire length of the channel with the collection mat selected.

Major: Environmental Engineering

Educational Career:
Bachelor’s of Environmental Engineering, BS, 2012, University of Central Florida

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Approved for distribution by Manoj Chopra, Committee Chair, on March 6, 2014.

The public is welcome to attend.