

UTC Project Information	
Project Title	MPC-436 – Using Flocculation to Reduce Turbidity of Construction Site Runoff
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Agency ID or Contract Number	DTRT12-G-UTC08, Modification No. 1
Project Cost	\$53,154
Start and End Dates	January 1, 2013- December 31, 2013
Project Duration	1 Year
Brief Description of Research Project	<p>The United States Environmental Protection Agency (USEPA) is in the process of developing a new regulation on turbidity for the stormwater runoff from construction sites. Construction of highways usually requires large areas of land disturbance which may result in accelerated soil erosion. The stormwater runoff from highway construction sites typically contains a large amount of fine silt and clay particles that are difficult to remove using conventional best management practices (BMPs) such as silt fences, mulching, and sedimentation basins. It is crucial to develop technologies that can effectively reduce the turbidity of runoff from highway construction sites in order to meet future regulations and protect natural water resources. Polyacrylamide (PAM) flocculation has been demonstrated to be a cost-effective and practical BMP for erosion and sediment control. The application of PAM in construction sites requires an evaluation of specific soil types and climate conditions. The goal of this research is to determine the effectiveness of PAM flocculation to reduce the runoff turbidity level for highway construction sites in South Dakota.</p> <p>The turbidity of stormwater runoff from highway construction sites can be affected by many factors including soil type, site slope, precipitation patterns, and the implemented BMPs. The runoff from construction site can have turbidity up to several thousand nephelometric turbidity units, even with the use of conventional BMPs (Minton, 1999). PAM is a class of long-chain polymers that vary in net charge, molecular weight, and charge density. PAM can react with fine particles to form larger particles, thereby improving particle removal through sedimentation or filtration. The results of laboratory experiments and field trials suggest that PAM flocculation is effective in reducing turbidity levels of</p>

	<p>construction runoff (Hayes et al., 2005; McLaughlin and Bartholomew, 2007; Rounce, 2012). The effectiveness of PAM is affected by many parameters including soil type, pH, temperature, organic matter, and the type and dose of PAM. The optimum PAM flocculation conditions are site-specific. Therefore, it is critical to investigate the flocculation for specific soil types and environmental conditions in order to determine the optimum PAM treatment conditions to achieve low effluent turbidity.</p> <p>This study will determine the effectiveness of different PAMs in reducing turbidity of construction site runoff in South Dakota. Runoff and soil samples from construction sites across South Dakota will be collected and tested to develop an understanding of the PAM's ability to promote flocculation of South Dakota soils. The results of this study can lead to an effective BMP for construction site runoff turbidity control in South Dakota.</p> <p>Research Objectives:</p> <p>Erosion and sediment control has become an increasingly important component of highway construction projects. Developing effective PAM BMPs for construction site runoff turbidity control has significant environmental and economic benefits. The objectives of this study are to:</p> <ol style="list-style-type: none"> 1. Determine the effects of PAM types and flocculation conditions on the turbidity reduction of runoff from highway construction sites 2. Determine the impact of low temperatures on the effectiveness of PAM flocculation 3. Provide recommendations on the application of PAM flocculation to reduce runoff turbidity levels for highway construction sites
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>This study evaluated the impacts of different PAM types, treatment conditions, and environmental factors on the PAM flocculation of synthetic construction site runoff. Different PAMs behaved differently when treating soil samples collected from four construction sites. Lab testing of specific soil samples is recommended to determine the optimum PAM type and dosage for construction site runoff treatment. Although there is an optimal polymer dose to achieve the minimum turbidity of the treated water, this study shows that only a fraction of this dose may be needed to lower the turbidity to the target value. Mixing intensity and time, settling time and flocculation temperatures are critical factors that can affect final turbidity levels. These results provide better understanding of the PAM flocculation processes. The results of this study can also improve the design and operation of stormwater treatment systems using PAMs.</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>This study focuses on developing PAM flocculation technology to reduce the turbidity in the runoff from the highway construction sites. The results showed that PAM flocculation is an effective treatment technology to reduce turbidity in the runoff. The improved water quality of the runoff will help maintain the natural habitats of surface</p>

	waters, promote the environmental sustainability, and reduce the need for costly dredging of the water systems. The use of PAM flocculation will also improve the erosion and sediment control of the construction sites and reduce the sediment loss.
Web Links <ul style="list-style-type: none">• Reports• Project Website	https://www.ugpti.org/resources/reports/details.php?id=991