TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): RMRC on behalf of WisDOT (Lead Agency)

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* TPF - 5(270) WisDOT Project ID: 0092-14-23	**Transportation Pooled Fund Program - Report Period:** ☐ Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☐ Quarter 3 (July 1 – September 30) ☑ Quarter 4 (October 1 – December 31)	
Project Title: Work Order 4.0:2014 RMRC 3G - Use of Recycled Materials as Mechanically Stabilized Earth (MSE) Retaining Wall Reinfo		
Name of Project Manager(s): Bill LIkos	**Phone Number:** 608-890-2662	**E-Mail** likos@wisc.edu
Lead Agency Project ID: 0092-14-23	**Other Project ID (i.e., contract #):** PRJ88VD	**Project Start Date:** 08/27/2014
Original Project End Date: 09/30/2015	**Current Project End Date:** 3/01/2016	**Number of Extensions:** 2

Project schedule status:

☐ On schedule ☑ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
$115,000.00	$108,607.92	80 %

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$6,197.10 and 5%	$6,197.10	88 %

Project Description:

The overall goal of this project is to facilitate use of recycled materials in reinforced backfills for MSE retaining walls. The project is envisioned to contain two phases. Phase I (this project) includes tasks (i) to assess the suitability of a wide range of recycled materials for specific use in MSE walls, (ii) to clarify any unresolved or potential “bottle-neck” issues that could limit their use (e.g., permeability issues for RCA, creep issues for RAP, compatibility with reinforcement), and (iii) to develop a preliminary plan for a Phase II field testing program that will involve long-term performance monitoring of full-scale MSE wall(s) constructed using recycled materials.

There are four primary tasks:

1) Conduct a thorough literature survey to critically summarize relevant properties related to the suitability of recycled materials for use in MSE wall applications.

2) Develop an inventory of reinforced backfill applications of recycled materials and their field behavior. Results will be analyzed to produce a “beneficial use” matrix that provides guidelines regarding where these materials can be used based on the limitations identified.

3) Conduct experimental research and analyses necessary to address the lesser-known aspects or potential “bottle-neck” issues, such as compatibility with reinforcement, creep potential, drainage, and environmental durability.

4) Conduct the legwork to identify and initiate project wall(s) that will use one or more recycled granular materials for long term field monitoring (Phase II).

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

In this quarter we continued progressing on Tasks 3 and 4 which includes laboratory testings. Interface tests and triaxial compression tests were completed. We were analyzing the test results and completing the draft report Thermal preloading tests on Geotextile-RAP and Geogrid-RAP interface shear strength were conducted to evaluate the effect of thermal preloading on interface shear strength. From the results of the tests, two papers were submitted to Geo-congress 2016 and one paper was submitted to the Journal of Geotechnical and Geoenvironmental Engineering.

All of the RCA tests with nonwoven geotextile are completed and the electrochemical properties of the RCA is assessedbased on the leachate collected from the GRT tests with RCA samples. We also evaluated two image analyses from non-woven and woven geotextiles to evaluate clogging. We also performed two GRT Tests using non-aged RCA and woven geotextile (HP570). The results indicated that for lower hydraulic gradients, both tests did not exhibit any clogging behavior. However, the permeability ratio of one of the duplicate tests (RCA-01) showed a significant increase in permeability ratio when the hydraulic gradient was increased to i=2.5. Since these materials were tested as received, the fine content within the whole sample as well as within each layer was not controlled. It is speculatedthat this may be the a reason for the observed behavior.

Anticipated work next quarter:

We anticipate to finish Tasks 3 and 4 and submit the draft report to RMRC.

Significant Results:

The results of triaxial compression tests on compacted specimens of RAP and RCA showed that RAP and RCA have comparable strengths to natural aggregates. The results of the triaxial compression tests were also used to calculate the interaction coefficients for predicting embedment length of geosynthetics in the RAP and RCA backfill.

The nonwoven geotextile does not appear to hinder the flow when used with RCA within hydraulic gradient 1. Higher gradient conditions show clogging based on permeability ratio developed by Aydilek and Edil, however, even clogged samples show apparentflow but the actual measured values are in line with typical sandy soils.

Woven geotextile samples showed different hydraulic behavior compare to non-woven geotextile samples but part of which are attributed to the issues observed during the tests. The post GRT sieve analysis on different layers of the soil sample RCA-01 indicated that a huge portion of the fines in the lower 6 mm of the sample were washed out due to large and relatively uniform opening size of the woven geotextile

In test GT2, 33 gr of soil and in GT3 11 gr of soil (all <#200 sieve) piped through the woven geotextile. These correspond to piping rates of 4,070 g/m2 and 1,356 g/m2 piping rates, respectively. A piping rate limit of 2,500 g/m2 has been suggested by Lafleur et al. (1989) for internal stability of soils and has been adopted by others in future studies. It is apparent from the GSD curves that piping was mostly from the 6 mm part of the lower chamber. Piping rate was negligible (~0 g/m2) for the nonwoven geotextile. In summary, a uniform and open pore structure of the woven geotextile is likely to promote piping of RCA fines, which may ultimately affect the internal stability of soils and influence clogging conditions in the soil medium.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

None to date.

Potential Implementation:

This project is highly implementable. The implementation recommendations are expected to be made soon after completion of the project. The project team met to discuss potential implementation venues and will follow-up with these options in this quarter.