QUARTERLY PROGRESS REPORT

December 1, 2017 - February 28, 2018

PROJECT TITLE: Research Advances on the Use of Solid Wastes in Concrete and Asphalt

PRINCIPAL INVESTIGATOR(S): Timothy G. Townsend

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COMPLETION DATE: February 28, 2018 **PHONE NUMBER: 352-392-0846**

PROJECT WEBSITE: https://www.essie.ufl.edu/home/townsend/research/bu/research-advances-on-waste-in-concrete--asphalt/

Work accomplished during this reporting period:

During this time period, the portland cement concrete (PCC) mixes that incorporate recycled glass powder and waste-to-energy (WTE) bottom ash have continued to be examined periodically. These specimens were created in accordance with the standard laboratory procedure ASTM C192 for the determination of alkali-silica reactivity (ASR) as per test method ASTM C1293. A total of 16 concrete mixes were cast (in triplicate) comparing a control group to three experimental groups containing a 30% replacement of coarse aggregate with WTE bottom ash from three different Florida WTE facilities. Other experimental groups prepared include cementitious materials replacements of 20% with ground glass and fly ash. Throughout this reporting period, there still has been no sign of ASR.

An extensive literature review of waste-to-energy (WTE) bottom ash washing treatment as well as the utilization of washed and unwashed bottom ash in asphalt concrete continues. This review investigates the benefits and potential concerns related to the ash washing process for using WTE ash as a construction aggregate. It revealed that the washing process can be an effective pre-treatment step for removing heavy metals, reducing chloride content, and undesirable finer particles that surround the surface of coarser WTE ash particles. These particulates are believed to contribute to difficulties in achieving suitable volumetrics necessary for a Superpave asphalt concrete mix design (e.g., meeting the parameter of minimum voids in mineral aggregate - VMA).

Based on the literature review, the UF research team is currently developing a research plan including the characterization of WTE bottom ash properties (e.g., gradation, specific gravity, absorption), application of ash washing process (i.e., finding an optimum liquid-to-solid ratio and

contact time for washing), and methods of analysis for assessing the impacts of ash washing on economic and environmental scales.

UF researchers are currently working on acquiring bottom ash from various Florida WTE facilities and aggregates that meet the Florida Department of Transportation (FDOT) Road and Bridge Specifications for use in asphalt concrete.

Work planned for the next reporting period:

UF researchers will continue acquiring WTE bottom ash from several Florida WTE facilities and traditionally used aggregates that fulfill the FDOT specifications. This ash will undergo the washing process under different liquid to solid ratios and contact times to identify the optimum washing parameters. Unwashed WTE bottom ash aggregate properties (e.g., specific gravity, absorption, gradation) will be compared to that achieved using washed WTE bottom ash aggregate to examine how washing changes these properties. Data derived from these experiments will be utilized when considering the effects of ash washing on the physical and environmental performance of ash-amended asphalt and portland cement concretes and factored into the economic analysis associated with this project.

TAG Meetings:

No Technical Awareness Group (TAG) meetings were planned for this period.

Metrics:

- *Graduate Students:*

Name	Rank	Department	Professor	Institution
Kyle Clavier	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida
Yalan Liu	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida
Chad Spreadbury	PhD Student	Environmental Engineering	Timothy Townsend	University of Florida

- *Undergraduate Students:*

Name	Rank	Department	Professor	Institution
Ian Vicnansky	Undergraduate Research Assistant	Civil Engineering	Timothy Townsend	University of Florida
Mohamad Shawar	Undergraduate Research Assistant	Civil Engineering	Timothy Townsend	University of Florida

- *Research publications resulting from THIS Hinkley Center project:* **None.**

- *Research presentations resulting from (or about) THIS Hinkley Center project:* **None.**

- *Who has referenced or cited your publications from this project:* **None.**

- *How have the research results from THIS Hinkley Center project been leveraged to secure additional research funding? What additional sources of funding are you seeking or have you sought?* **None.**

- *What new collaborations were initiated based on THIS Hinkley Center project?* **None.**

- *How have the results from THIS Hinkley Center funded project been used (not will be used) by the FDEP or other stakeholders?* **None.**