Quarterly Progress Report:
Project Number and Title: 3.6 Optimal Design of Asphalt Mixture with RAP Based on Sustainability Trade-Off
Research Area: Thrust 3 New Systems for Longevity and Constructability
PI: *Natacha Thomas, University of Rhode Island*
Co-PI(s): *K. Wayne Lee, University of Rhode Island*
Reporting Period: *1/1 to 3/31/20*
Submission Date: *3/31/20*

Overview:

The below list describes the activities undertaken in the current quarter by the study team:

- Completed the pavement LCCA data collection survey instrument using Pavement LCA data input screens.
- Filled in survey data using survey instrument for 5 different pavement test sections of Rhode Island Route 165.
- Gearing up to conduct LCCA analyses, assessing boundaries, Pavement LCA software additions and potential software swap.

Provide context as to how these activities are helping achieve the overarching goal(s) of the project…

The overarching project goal is the design of better performing asphalt pavements that take into account not only their structural but also their environmental impacts. To this end, the environmental impacts must be assessed. Data collection is an integral part of environmental impact assessment. This quarter, the data collection effort was launched with the completion of the survey instrument, the identification of the pavement sections of interest and the determination of the survey data entries for study sections. Test sections of the full-depth reclaimed (FDR) Route 165, as rehabilitated in 2013, were selected for LCCA comparisons including:

- a control section,
- a section with calcium chloride additive,
- a section with asphalt emulsion additive,
- a section with Portland cement additive and
- a geo-grid embedded section.

These sections are of the utmost importance to the RIDOT and were established as test sections in order to obtain performance feedback on their respective designs. This study will expand this performance to now include environmental impacts as well. The sections differ slightly per the additives utilized. Yet prior study has pointed to widely differing performance expectations. Additional feedback on the relative environmental impacts of the varied design can only enhance decision making by RIDOT personnel toward an optimal selection.

Describe any accomplishments achieved under the project goals…

The data collection effort was launched and completed with 5 test roadway sections of RI Route 165 inventoried.

Complete the following tables to document the work toward each task and budget (add rows/remove rows as needed, make sure you complete the Overall Project progress row and include all tasks even if they have ended or have not been started)…

Table 1: Task Progress

Task Number	Start Date	End Date	% Complete
Task 1:	7/1/18	12/31/18	100%
Task 2:	1/1/19	6/30/19	75%
Task 3:	7/1/19	10/31/19	50%
Task 4:	11/1/19	2/29/20	25%
Task 5:	3/1/19	6/30/20	5%
Task 6:	7/1/20	9/30/20	0%
Overall Project:	2/1/19	9/30/20	35%

Table 2: Budget Progress		
Project Budget	**Spend – Project to Date**	**% Project to Date***
$250,169	$147,610	59%

Include the date the budget is current to.

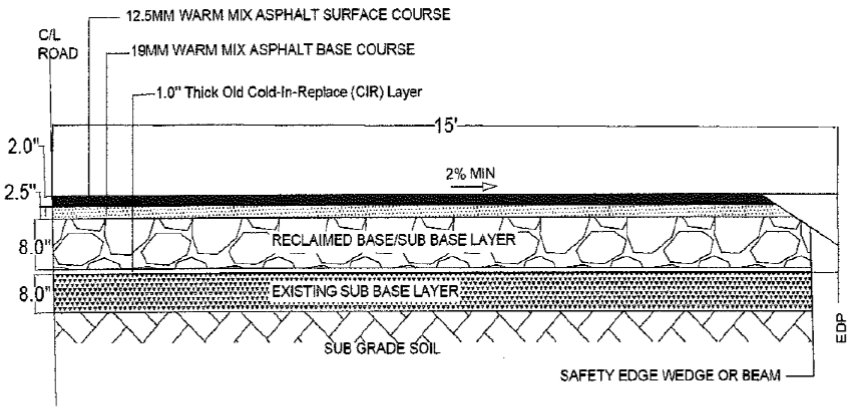
Describe any opportunities for training/professional development that have been provided…

An undergraduate researcher, Appy Appolonia, led the design of the survey instrument. He learned the fundamentals of survey instrument design and helped sketched the instruments. The same student and the graduate student researcher, Ali Joubani, were in direct communication with RIDOT personnel to gather information critical to filling the survey instruments.

Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period. Please use the tables below for any Publications and Presentations in addition to the description of any other technology transfer efforts that took place during the reporting period.)… Use the tables below to complete information about conferences, workshops, publications, etc. ***List all other outputs, outcomes, and impacts after the tables*** *(i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings).*

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	**Event**	**Type**	**Location**	**Date(s)**
Presentation title	Name of event (i.e. TIDC 1st Annual Conference)	i.e. Conference, Symposium, Seminar,		
Resilient Cold In-Place Recycling Asphalt Mixtures and Pavements	ASCE Construction Institute (CI) Summit	Conference	Los Angeles, CA	2/20 – 2/22/20

Table 4: Publications and Submitted Papers and Reports				
Type	**Title**	**Citation**	**Date**	**Status**
None				



CROSS SECTION OF ROUTE 165 FOR CONTROL TEST SECTION

Participants and Collaborators:

Use the table below to list all individuals who have worked on the project.

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	**Email Address**	**Department**	**Role in Research**
Natacha Thomas	Thomas@uri.edu	Civil Engineering	Principal Investigator
K. Wayne Lee	leekw@uri.edu	Civil Engineering	Co-Principal Investigator

Use the table below to list all students who have participated in the project during the reporting. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.)

Table 6: Student Participants during the reporting period				
Student Name	**Email Address**	**Class**	**Major**	**Role in research**
Appy Appolonia	_____	Senior	Civil Engineering	Survey Designer
Ali Joubani	_____	Graduate	Civil Engineering	Survey Data Collection

Use the table below to list any students who worked on this project and graduated during this reporting period.

Table 7: Student Graduates			
Student Name	**Role in Research**	**Degree**	**Graduation Date**
N/A			

Use the table below to list organizations have been involved as partners on this project and their contribution to the project.

Table 8: Research Project Collaborators during the reporting period						
Organization	**Location**	**Contribution to the Project**				
		Financial Support	**In-Kind Support**	**Facilities**	**Collaborative Research**	**Personnel Exchanges**
N/A						

List all other outputs, outcomes, and impacts here (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings). Please be sure to provide detailed information about each item as with the tables above.

Have other collaborators or contacts been involved? If so, who and how? (This would include collaborations with others within the lead or partner universities; especially interdepartmental or interdisciplinary collaborations.)

Table 9: Other Collaborators			
Collaborator Name and Title	**Contact Information**	**Organization and Department**	**Contribution to Research**
Kate Wilson	Kate.wilson@dot.ri.gov	RIDOT	Technical Champion

Who is the Technical Champion for this project?
Name: Wilfred Hernadez, Ph.D.
Title: Safety Specialist/EDC Coordinator

Organization: FHWA
Location (City & State): Providence, RI
Email Address: wilfred.hernandez@dot.gov

Changes:

Discuss any actual or anticipated problems or delays and actions or plans to resolve them…
Through communications with Athena, the graduate researcher has determined that the sub-base/base layer additives and geo-grid separation with the base cannot be simulated taking supply chains into account. One additive in particular is not included in the software materials, chloride calcium and the dataset is locked to users. The software was useful to help derive the survey instrument. However, based on the data collected using the survey, the software is inadequate for further use. Now there is a need to deploy other LCCA software for the remaining of the study.

Discuss any changes in approach and the reasons for the change…
The graduate student is actively seeking free software to utilize for the study now that materials and equipment of interest have been identified through the survey instrument. It is our belief that necessary software can be identified quickly and deployed.

Planned Activities:

Software selection followed by the conduct of the life cycle cost analysis for all 5 control test sections of RI Route165 using selected software.