Grant Deliverables and Reporting Requirements for UTC Grants

UTC Project Information	
Project Title	Pavement Rehabilitation Policy for Reduced Life-Cycle Cost and Environmental Impact Based on Multiple Pavement Performance Measures
University	University of South Florida
Principal Investigator	Qing Lu
PI Contact Information	qlu@usf.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT: $59,392 USF: $41,073
Total Project Cost	$100,465
Agency ID or Contract Number	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
Start and End Dates	▪ Start date: 12/1/2017 ▪ End date: 9/30/2018
Brief Description of Research Project	Pavement structures are fundamental elements of the automobile transportation system. Deterioration of pavement condition will increase both vehicle operating costs and greenhouse gas (GHG) emissions. Pavement condition may be maintained at an acceptable level through rehabilitation activities over the life span of a pavement. Traditional pavement rehabilitation policy is primarily based on minimization of the life-cycle cost incurred by both agencies and users. The environmental impacts associated with the cost-effective rehabilitation policy are typically ignored. This project develops a methodology for selecting pavement rehabilitation policy by considering both cost factor and environmental impact (energy consumption and pollutant emission). The project is completed in two phases. Phase I develops a life-cycle assessment (LCA) framework for pavement maintenance and rehabilitation. Phase II focuses on developing pavement performance models with consideration of both environmental factors and rehabilitation activities. Specifically, a post-overlay pavement roughness progression model in terms of international roughness index (IRI) is

	developed using long-term pavement performance (LTPP) data. Based on the post-overlay IRI model, the life cycle environmental and economic impacts of various overlay strategies are evaluated by the combined LCA and life cycle cost analysis (LCCA) approach. Finally, a multi-objective optimization framework is proposed for identifying the eco-friendly and cost-effective asphalt overlay strategy. Based on comparative analysis results, the inclusion of 30% reclaimed asphalt pavement in asphalt overlay is found to reduce life cycle energy consumption, GHG emissions, criteria air pollutants, and life cycle costs. For asphalt overlay projects, pavement surface roughness effects, construction activity, and material production are three major contributors to life cycle energy consumption and GHG emissions.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The research outcomes, in terms of the post-overlay pavement roughness progression model and the multi-objective optimization framework for sustainable overlay strategy selection based on an integrated LCA-LCCA model, may be readily implemented by transportation agencies to predict future pavement condition and schedule pavement rehabilitation activities. The research outcomes were introduced to graduate students in the PI's class "Infrastructure Systems Management" in Fall 2018, and will be disseminated through paper publication in journals and presentation at professional conferences such as the Transportation Research Board (TRB) annual meetings.
Impacts/Benefits of Implementation (actual, not anticipated)	Students in the PI's class are able to develop pavement rehabilitation policies with cost and environmental impact considerations. Impacts of future dissemination of research outcomes are yet to be determined.
Web Links • Reports • Project website	http://ctech.cee.cornell.edu/final-project-reports/