# KANSAS DOT RESEARCH PROJECTS
# QUARTERLY PROGRESS REPORT

Lead Agency (University or Contractor):_____Kansas DOT_____

**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.*

| | |
|---|---|
| **KDOT Project Number**<br>RE-0617-01 | **Transportation Pooled Fund Program - Report Period:**<br>☐Quarter 9 (January 1 – March 31, 2015)<br>☐Quarter 10 (April 1 – June 30, 2015)<br>XQuarter 11 (July 1 – September 30, 2015)<br>☐Quarter 12 (October 4 – December 31,2015) |

**Project Title:**
Real-Time Quality Control Monitoring and Characterization of Aggregate Materials in Highway Construction using Laser Induced Breakdown Spectroscopy

**Project Manager:** Randy Billinger, P.G., KS DOT, TAC Member **Phone:** 785-291-3037 **E-mail:** Randyb@ksdot.org
Rodney Montney, P.E., Admin, Contact

**Project Investigator:** **Phone:** 516-431-4031 **E-mail:** wchesner@chesnerengineering.com
Warren Chesner

| **Lead Agency Project ID:** | **Other Project ID (i.e., contract** | **Project Start Date:** |
|---|---|---|
| RE-0617-01 | | June 1, 2013 |
| **Original Project End Date:**<br>**May 31, 2016** | **Current Project End Date:**<br>**December 31, 2016** | **Number of Extensions:**<br>0 |

Project schedule status:

☐ On schedule ☐ On revised schedule ☐ Ahead of schedule X Behind schedule

Overall Project Statistics:

| Total Project Budget | Total Cost to Date for Project | Total Percentage of Work Completed |
|---|---|---|
| $975,000 | $641,217.59 | 65.8% |

***Quarterly*** Project Statistics:

| Total Project Expenses This Quarter | Total Amount of Funds Expended This Quarter | Percentage of Work Complete This Quarter |
|---|---|---|
| $975,000 | **$65,470.79** | 6.7% |

**Project Description**:

The primary objectives of this research effort is to calibrate laser-spectral models to develop the means to monitor aggregate materials from participating State agencies, and to demonstrate the use of the technology in actual field applications. The overall objective is to transition the technology from a lab-based application to a field based system. Testing of aggregates and the calibration models developed in the NCHRP 150 research effort were accomplished using a laboratory-based laser-optical system. The proposed pooled fund work plan is designed to transition the technology from the laboratory to the field through the calibration, deployment and demonstration of the technology at selected field demonstration site(s). As part of the NCHRP 168 project, a field prototype sampling and laser targeting system field prototype, referred to as the SLT system (Sampling and Laser Targeting System), is under development for use in the pooled funding effort. The SLT system is a bulk sampling and laser-targeting system that is designed to analyze a diverted portion of the bulk material by passing target aggregate material passed a laser that is strategically located to provide for continuous or semi-continuous monitoring of the bulk aggregate stream. Diversion of samples of the bulk material into the SLT system is designed to remove the aggregate from the bulk stream during material transport, such as conveying. This material diversion provides the means to minimize interferences that would be encountered in an in-line monitoring system, without diminishing the effectiveness of the laser monitoring system to obtain large quantities of data necessary to properly characterize the targeted material. It also provides the means to ensure safe operation of the laser by enclosing the entire system in a separate sealed housing disconnected from the main bulk material conveying system, thereby ensuring a contained and safe operation. The SLT can be deployed in a laboratory environment as well where buckets of samples are periodically introduced for analysis or in a continuous or semi-continuous field operation where materials are diverted from a conveying operation to the SLT for analysis.

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

During this period, the research effort focused on an investigation of the overall effectiveness of the data modeled to date. In general the modeled data were encouraging because they defined the correct general trends, but were not as accurate and precise as desired. New laser firing procedures were initiated and data analysis procedures employed to study the statistical distribution of laser intensities generated by individual (as opposed to average) laser shots. The objective was to assess whether improved laser firing and data analysis procedures could be employed using single laser shots. Initial results suggest that these new data analytical procedures have the potential to improve modeling results

**Anticipated work next quarter**:

SLT software and hardware modifications are planned to enable further assessment of single laser shot analyses.

**Significant Results:**

Data models are providing predictive results that follow anticipated trends. These findings were based on averaging the results of at least 1500 laser shots per sample. Preliminary assessments undertaken during this quarter suggest that single shot analyses may provide more accurate modeled outputs.

**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, with recommended solutions to those problems).**

At the present time the project is approximately 6 to 9 months behind schedule due to equipment down time and delays in receiving samples; and additional work to resolve erratic spectral issues. In addition, single shot analyses could result in a change in laser operations and data analytical procedures. During the next quarter, this will be considered in greater detail.