

POOLED FUND PROJECT REPORT
Quarterly Report—10/1/2009

Project Title: <i>Application of Three-Dimensional Laser Scanning for the Identification, Evaluation, and Management of Unstable Highway Slopes</i>	
Project Number: TPF-5(166)	Budget: \$240,000
Lead Agency: Arizona Department of Transportation	
Reporting Period: July 1, 2009–September 30, 2009	
Project Administrator: Frank Darmiento fdarmiento@azdot.gov	Principal Investigator: Dr. John Kemeny University of Arizona
Participating States: AZ, CA, CO, NH, NY, PA, TN, TX	
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Project Description:

Despite the advantages of rockfall management systems, the identification, evaluation, and categorization of comparatively high-risk slopes remains a labor intensive task that is further complicated by the broad range of geologic conditions that influence rockfall hazards. In the past several years LIDAR (Light Detecting And Ranging) has gained acceptance as a potentially valuable new technology for rock mass characterization. In that period of time the LIDAR hardware has improved, automated point cloud processing software has been developed specifically for rock mass characterization, and best practices are starting to be developed for field scanning and 3D data processing. However, there are several issues that still need to be addressed. These include:

- Lack of documented, and fully qualified, procedures for data acquisition to ensure accuracy and fitness for purpose of the terrestrial LIDAR data.
- Terrestrial LIDAR produces very large 3D clouds of points that are visually interesting but not immediately analyzable by traditional software products.

Objectives:

This study will focus on the development and application of three-dimensional terrestrial LIDAR technology for geotechnical applications affecting the construction and maintenance of highways. The objectives include:

- a. Using three-dimensional information from a LIDAR survey to estimate dimensions and volumes at a site.
- b. Using LIDAR surveys for rock mass site characterization.
- c. Using successive LIDAR scans along with "change detection" algorithms to determine the location and rates of rockfall events at a site.

Scope of Work:

1. Evaluate and assess the recommended field procedure for the scanning and rescanning of highway rock cuts developed by the currently funded FHWA study.

2. Field-test procedures and algorithms for the processing of laser scan data (point clouds) developed by the current Federal Highway Administration and National Cooperative Highway Research Program (NCHRP) IDEA projects.
3. Evaluate the Integration of laser-scanned data into Rockfall Hazard Rating Systems.
4. Facilitate widespread systematic use of laser-scanned data by state transportation agencies.
5. Produce a draft Recommended Practice document for submission to and review by the American Association of State Highway and Transportation officials (AASHTO).

Comments:

Minimum state commitment is \$30,000 over two years (\$15,000 per year). Additional states can still join the study.

Activities During Quarter:

The technical advisory committee (TAC) held conference telephone calls on July 14, 2009, August 4, 2009 and September 8, 2009. The Pennsylvania Department of Transportation (PennDOT) provided Dr. Kemeny with scan data and photographs collected by PennDOT from two site locations.

Dr. Kemeny visited Texas Department of Transportation (TxDOT) and PennDOT during August 2009. At TxDOT, scanning was performed over a day and a half. Scans were shot from a wide median in the roadway at 10 scan positions. Data from these scans are currently being compiled. The scans were shot from the road shoulder at approximately 30 scan positions. At PennDOT, Dr. Kemeny discussed the data previously collected by PennDOT. The meeting included PennDOT staff and representatives from the Pennsylvania Geological Survey. The data are now being processed. PennDOT may acquire a new scanner. If so, a second scan is being considered for late spring 2010. The data from the new scanner would be compared with the data currently on file.

Schedules for field visits to the remaining participating states were discussed. A field visit to New York and New Hampshire is targeted for November 2009. A visit to the California Department of Transportation (Caltrans) is targeted for March-April 2010.

Future Activities:

Field visits to all participating states will be conducted over the next 24 months. Data collected from the field visits will be compiled and reported back to the participating states.