Right of Way and
Land Surveys

# Expanding Mobile Terrestrial Laser Scanning (MTLS) Capability and Capacity throughout Caltrans
Fully integrating rapidly evolving MTLS technology into Caltrans workflow for the benefit of Caltrans projects statewide.

**MAY 2019**

**Project Title:**
Expanding Mobile Terrestrial Laser Scanning (MTLS) Capability and Capacity throughout Caltrans

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## WHAT IS THE NEED?

Pilot project results from prior research show use of mobile terrestrial laser scanning (MTLS) results in increased employee safety, reduced costs, and expedited delivery of State transportation improvement projects. Caltrans had realized and experienced these benefits in its northern districts. Caltrans Headquarters, Office of Land Surveys, recognized the need to expand MTLS capability and capacity into its central and southern districts in order to experience the full potential of MTLS throughout California.

## WHAT WAS OUR GOAL?

The research goal was to maintain Caltrans MTLS capabilities in northern California and expand the capability and capacity for MTLS into central and southern California. In addition, the research intended to deliver Caltrans MTLS standards and specifications, best practices, and workflow documentation including recommendations on data storage, data network infrastructure, and data management.

## WHAT DID WE DO?

The researchers continued deployment support of the Trimble MX8, Caltrans' first owned and operated MTLS system, on projects throughout Districts 1, 2, 3, and 4. Deployment support included, but not limited to, assisting Caltrans district and headquarters personnel in resolving any technical issues encountered during deployment. The research team summarized and documented the deployment results from the northern California districts. The summarized deployment results provided insightful information for deploying the MX8 system throughout

the central and southern districts in California. The researchers identified the Information Technology (IT) resource needs for Caltrans' central and southern regions with respect to post-processing and feature extraction. Prior to deployment in the central and southern regions, the researchers developed, presented, and delivered training materials to the MTLS end users. In addition to training materials, the research provided live training sessions regarding on-site data collection and in-office data post-processing. After the completion of the training, the researchers conducted pilot projects with the central and southern district surveyors.

The research included MTLS case studies for special projects, including District 4's overhead sign mapping project, use of MTLS for the Multidisciplinary Accident Investigation Team, and use of MTLS for collecting data for Connected Vehicle Smart Intersections: a.k.a. Multi-Modal Intelligent Traffic Signal Systems. The researchers also assisted Caltrans in selecting, procuring, and deploying a second and next generation Caltrans MTLS system, the Riegl VMX-1HA. Finally, the researchers assessed Caltrans-wide MTLS-related high-level IT infrastructure requirements and provided recommendations.

## WHAT WAS THE OUTCOME?

The outcome of the research was successful deployment support for the Trimble MX8 and the Riegl VMX-1HA MTLS systems, including support for MTLS data management and distribution, data backup policy, retention policy for raw and post-processed MTLS data, data sharing policy, and visualization for MTLS data availability. In addition, the research outcome encouraged customer interest in adding a new 360-degree camera and integrating 3D ground penetrating radar technology to the MX8 MTLS system, and provided support for updating Chapter 15 of the Caltrans Surveys

Manual. Also, Caltrans will incorporate the IT infrastructure requirements and recommendations into the Caltrans MTLS documentation.

## WHAT IS THE BENEFIT?

MTLS provides high-resolution 3D data that improves visualization, enhances project design, and facilitates decision-making. Collecting and processing data safely, efficiently, and accurately saves money while significantly reducing work crews' exposure to direct traffic, minimizing injuries, injury-related costs, and roadway congestion for traveling motorists by reducing lane closures required for survey work.

## LEARN MORE

Review the complete report.

http://ahmct.ucdavis.edu/pdf/UCD-ARR-18-02-14-01.pdf

## IMAGES



Image 1: Caltrans vehicle

DRISI
Caltrans Division of Research,
Innovation and System Information

Technology Transfer Intelligent Compaction
Consortium (TTICC) for Intelligent Compaction (IC)

Research Results

\Image 2: Riegl VMX-1HA sensor pod mounted on a Caltrans vehicle



Image 3: An MX8 MTLS system camera image of a vehicle accident site: embankment on SR-74 in District 12
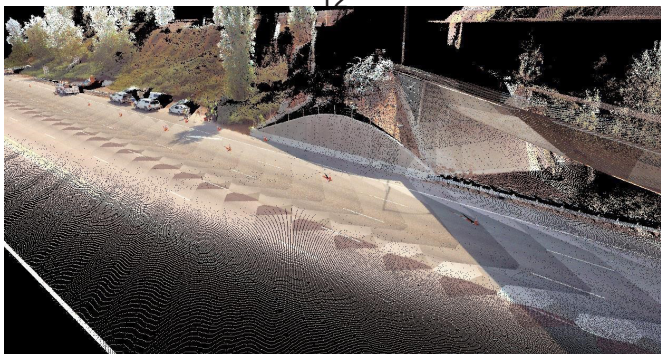


Image 4: Colorized point cloud of the accident site on SR-74 and the surrounding area in District 12



Image 5: Point cloud rendering of the El Camino Real Blvd & Page Mill Rd Connected Vehicle Smart Intersection



Image 6: Point cloud rendering of the El Camino Real Blvd & West Charleston Rd Smart Intersection