DRISI
CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION
TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Accuracies and Standards for the Caltrans' Spatial Reference Network (CTSRN) Project

Researching the California Department of Transportation (Caltrans) GNSS specifications and providing recommendations to update current standards and practices for maintaining the CTSRN.

Right of Way and Land Surveys

April 2026

Project Title: Accuracies and Standards for the Caltrans' Spatial Reference Network (CTSRN) Project

Task Number: 4120

Start Date: June 30, 2023

Completion Date: June 29, 2025

Task Manager:
Arvern Lofton
Transportation Engineer (Electrical)
arvern.lofton@dot.ca.gov

DRISI Division Chief:
Prakash Sah, PE
Prakash.Sah@dot.ca.gov

WHAT IS THE NEED?

Caltrans has a Real Time Network (RTN) that provides precise Global Navigation Satellite System (GNSS) positioning to the Division of Right of Way and Land Surveys and others. With advancements in satellite positioning systems, the amount of Network Real-Time Kinematic (NRTK) surveys tied to the CTSRN have increased.

Caltrans needs to update its GNSS specifications and accuracy standards to address NRTK survey methods and advancements in GNSS technology.

WHAT ARE WE DOING?

This research will examine the use of NRTK surveys connected to a continuous Global Navigation Satellite System within the CTSRN.

Survey stations will be set up at test sites and Caltrans setup procedures will be followed to establish horizontal and vertical control. The NRTK data will be collected at the test sites then processed using Trimble Business Center, then the following key points will be assessed:

- Repeatability of NRTK within the CTSRN
- Frequency of human error and repeatability of measurements when utilizing CTSRN
- Accuracy of NRTK measurements within CTSRN
- Effects of varied constellation configurations on accuracy
- Accuracy related to time-based measurements and precision achieved through redundancy

Caltrans

DRISI provides solutions and knowledge that improves California's transportation system.

- Seasonal effects of measurements when using CTSRN

WHAT IS OUR GOAL?

The goal of this project is to provide Caltrans better accuracies and recommendations for best practices and procedures in using the CTSRN.

WHAT IS THE BENEFIT?

The project plans to provide Caltrans with innovations in current CTSRN practices. These NTRK surveys are expected to provide greater accuracy in spatial data collection for use in land surveys and construction, thus enabling higher quality and timely completion of construction projects.

WHAT IS THE PROGRESS TO DATE?

Unable to complete the research due to the June 29, 2025, contract end date and time lost from an unanticipated, lengthy contract execution process that caused the research to begin after the scheduled start date, the university researchers collaborated with Caltrans and requested a No-Cost Extension (NCE) Amendment to complete the unfinished research. Caltrans Division of Procurement and Contracts (DPAC) informed the Caltrans task manager (TM) that DPAC will not process an NCE Amendment after the contract end date.

The next immediate steps include disencumbering the remaining, unexpended funds within the research project, officially closing out the project, and investigating options and actions for a new research contract.

For more information, please contact the TM.