

Rural

MAY 2025

Project Title:

Winter Chain-On Travel Time Delay

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TPF-5(494) Winter Chain-On Delay Travel Times

Determining Chain-On Travel Delays for I-5 Travelers

WHAT IS THE NEED?

Increases in severe winter conditions along the I-5 corridor have resulted in more aggressive chain control restrictions and in some cases closure of the interstate corridor-wide. Districts utilize a series of strategic chain control checkpoints to determine a vehicle's ability to drive through an impacted area. These chain control checkpoints often create a large amount of non-recurring congestion and enormous vehicle queues. During winter operations, D2's Fawndale chain control checkpoint generates queues of up to 20 miles, creating hours of delay for commercial vehicles and motorists. This reduced efficiency has a significant safety, economic, and operational impact on the State of California. Many Caltrans districts have implemented travel time messages to improve efficiency in urban areas experiencing re-occurring congestion. With increases in commercial vehicles supporting an ever-growing supply chain, we need to better understand queue delay times and be able to inform the public of delay times at chain control checkpoints during inclement weather.

WHAT ARE WE DOING?

We are procuring, installing, and operating Bluetooth detection devices near District 2's Fawndale chain control point. Using the collected Bluetooth detection data, D2 RWIS data, and National Weather Service data, we will utilize data fusion techniques to develop a winter travel delay algorithm for this chain control point. Once developed, we will ground truth and make fine-tuned adjustments to the algorithm and system during the project. We intend to develop this algorithm/system so it will be usable at other chain control checkpoints statewide. We will also document this system's design, installation, integration, operation, and maintenance processes.



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WHAT IS OUR GOAL?

To provide accurate, timely, and reliable chain control checkpoint delay times to motorists during weather events. Providing this information to the traveling public is crucial for the Department to improve winter travel efficiency as supply chain issues increase and climate change-induced events continue. A key goal is to develop a working algorithm and system to deploy at multiple chain control points. Another key goal is to inform commercial vehicle operators and motorists that significant delays are ahead, allowing for travel changes before arriving at the chain control point. Finally, Caltrans will better understand current and impending congestion problems, which will provide data for future planning activities.

WHAT IS THE BENEFIT?

Climate change is not going away, and supply chain issues will continue to impact our roadways. As severe winter storms continue to cripple the state highway system, having the ability to communicate accurate winter travel delay times will be crucial to maintain the safety, operational efficiency, and goods movement of our roads. Accurate winter travel delay times communicated to motorists at strategic decision points allow motorists the ability to take an alternate route, re-adjust travel plans, or avoid traveling, resulting in fewer vehicles on the road and fewer greenhouse gases emitted into the atmosphere during the queuing process. Finally, reducing the economic impact on the commercial vehicle industry due to chain-up delays would benefit one of the largest users of our system.

WHAT IS THE PROGRESS TO DATE?

Montana Technological University has been selected by the technical advisory panel and the research team.

- Access to Caltrans Bluetooth Sensor data was tested and downloaded for preliminary analysis. Initial data retrieval scripts were developed to access Caltrans Chain Requirements, CMS Messages, CCTV, and RWIS.
- NWS NDFD Weather Forecast and Here.com speed data retrieval scripts were previously written and continued to operate.

- Montana Tech senior project students gathered data from Bluetooth sensors deployed along the highway under study.
- Software was written to collect Bluetooth mac addresses and calculate travel times based on distance and time traveled.
- Data collection continued with some bad weather and several chain-up events at Fawndale.
- Additional sites were brought online by Caltrans. Access was tested and data was downloaded for subsequent analysis. Travel time estimation was tested and associated delay was observed in conjunction with known chain-up events.
- During the non-winter operations months, work and analysis was minimal as preparations are being put together to further collect data this upcoming winter season (2024/2025) in anticipation of a wet winter.
- With the additional Bluetooth readings from the winter of 2024/2025, data collection has concluded. Analysis and comparison across different travel time sources including HERE Inc. and local weather sensors is being prepared for final report.
- An outreach presentation will be presented at the 2025 ITE / NRITS Conference in Orlando in August 2025 by Douglas Galarus (Montana Technological Institute) and Jeremiah Pearce (Caltrans).

IMAGES



Image 1: Truck chain-on queues at Fawndale and Pine Grove on I-5.