

# JOINT TRANSPORTATION RESEARCH PROGRAM

**Principal Investigator:** Darcy M. Bullock, Purdue University, darcy@purdue.edu, 765.494.2226

**Program Office:** jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

**Sponsor:** Indiana Department of Transportation, 765.463.1521

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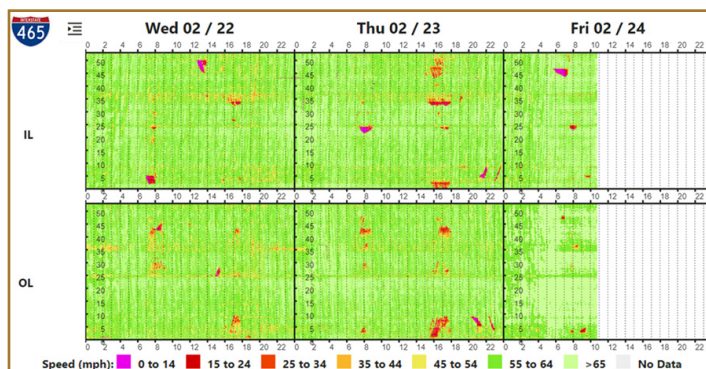
## Implementation of Enhanced Probe Data (CANBUS) for Tactical Workzone and Winter Operations Management

### Introduction

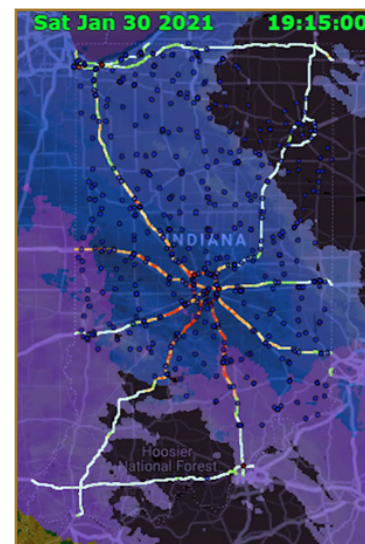
For over a decade, segment-based probe data has been extensively used by transportation stakeholders for monitoring mobility on Indiana roadways. However, enhanced probe data from connected vehicles includes a richer dataset that can provide more detailed real-time and after-action reviews. This enhanced data includes detailed vehicle trajectories, at 3s resolution, and “event data.” This event data is near real-time and includes hard-braking events, hard-acceleration events, and weather-related data, including wiper activations and some seat belt usage data. This project developed a set of methodologies

and resulting visualizations that enables the use of emerging connected vehicle data in operational decision-making on work zone management and winter operation activities.

Each month approximately 13 billion connected vehicle records are ingested in Indiana. During peak periods, approximately 625,000 records per minute are ingested. Without substantial processing, this large data set is “data-rich, information-poor.” This study developed techniques to rapidly assign relevant data to interstate segments so that visual graphics could be efficiently generated. This provided the ability for both real-time monitoring as well as after-action assessment to identify opportunities to improve work zone operations and winter operation activities.



Aggregated heatmap view of I-465 around Indianapolis (February 22–24, 2023).



Winter operations dashboard view (January 30, 2021).

## Findings

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- The findings from this project were used to guide both the Indiana Task Force on Work Zone Safety, which was established in August 2019, and the INDOT winter operations staff.
- The use of hard-braking events as a surrogate safety measure has been widely accepted. Using near real-time hard-braking event data allows stakeholders to identify emerging safety issues in a few days or weeks instead of waiting months or even years for a statistically significant crash history to develop.
- The heatmap dashboard generated in part by this project is now widely used for monitoring construction zones, significant crashes, and winter weather events.

## Implementation

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A series of dashboards developed over the course of this project are now in operation and being widely used by public and private stakeholders across the state as well as at the federal level—aided in part by the demonstrated scalability of these techniques.

- Aggregated heatmap (with aggregated truck trajectories, aggregated passenger vehicle trajectories and segment-based data).
- Trajectory heatmap.
- Winter operations dashboard.

Easily digestible visualizations such as heatmaps and speed profiles have helped INDOT proactively monitor work zone congestion and identify areas of concern during construction, as well as the impacts of their winter maintenance operations. In multiple instances, these

agile reviews have influenced MOT changes in construction zones and winter maintenance practices around the state, which lead to a marked improvement in observed mobility and safety. With input from a wide range of stakeholders, the weekly work zone safety and mobility reports have now been institutionalized over the course of the past three construction seasons and provided invaluable operations monitoring and feedback to designers for similar future construction projects.

The summaries derived from these dashboards and datasets have helped promote effective actionable dialog among agencies, contractors, and public safety colleagues towards the overarching goal of improving interstate safety and mobility. The inherent scalability of these summaries has encouraged interest from peer states and may lead to potential collaborations among state departments of transportation towards managing cross-border construction and winter weather maintenance operations.

## Recommended Citation for Report

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