



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Transportation
Safety and
Mobility

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Project Title:
Methods for Identifying High
Collision Concentration Locations
for Potential Safety Improvements

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Wet and Nighttime SPFs Development

Support California Department of Transportation (Caltrans) in implementing an Safety Performance Functions (SPF)-based network screen methodology with the goal of substantially

WHAT IS THE NEED?

Identifying high collision concentration locations is a major objective of many state and local transportation agencies. In parallel to efforts that are establishing the necessary, methodological and functional capability to conduct network screening at high levels of efficiency, it is also necessary to consider a subset of unique circumstances that may be sensitive to a different set of safety concerns. These circumstances can include wet conditions, nighttime, and congestions.

In light of this, to better account for safety during these situations, it is necessary to develop Safety Performance Functions for such conditions, and to develop considerations for congestion related crashes. Moreover, to provide comprehensive operational support, there is also a need to modify and update existing traffic safety tools so that they are aligned with these newly developed tools.

WHAT ARE WE DOING?

The techniques and SPFs developed in this study will help Caltrans to more efficiently target locations under specific circumstances, that will likely benefit from safety improvements and would result in the greatest reduction in fatal and injury collisions.



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WHAT IS OUR GOAL?

The proposed project has several goals:

- i. Supporting economic evaluation (Safety Index) for safety performance
- ii. Developing an inventory of all data elements for wet, nighttime, congestion, and run-off-road based safety evaluation
- iii. Updating existing rate group estimates in Traffic Accident Surveillance and Analysis System
- iv. Analyzing crashes under congested traffic conditions.

WHAT IS THE BENEFIT?

This project represents an effort to enhance the network screening capability under certain circumstances. These refinements can provide a more concerted effort to identify high collision concentration locations across the state highway system. For example, identifying locations that demonstrate a higher than expected wet crashes will help identify locations requiring a traffic safety investigation and might benefit from implementing countermeasures to reduce wet crashes.

Similarly, evaluating the effect of congestion-related collisions on network screening will provide an opportunity to flag congestion-related property damaged only collisions which are less likely to result in a safety recommendation, and are commonly labeled as false-positives. Developing a package of capabilities and tools to account for such circumstances and provides a better overall networks screening program.

WHAT IS THE PROGRESS TO DATE?

The following tasks have been accomplished within this period:

Task 2:

- Research team conducted interviews with the Caltrans' experts to understand the existing Safety Index (SI) and Intersection Control Evaluation (ICE) tools. Based on the insights from the interviews, research team will develop a mock-up of MS Excel Macro enabled economic evaluation tool/s aligned with the HSM and CA-specific SPFs.

Task 3:

- As part of developing data dictionary, research team proposed a new wet crash definition based on the research findings using five years (2013-2017) TASAS crash data. This proposed definition includes road surface condition—ROAD_SURF_COND_DESC: WET, SLIPPERY, SNOW/ICY and weather condition – WEATHER_COND_DESC: ALL (Raining; Snowing; Fog; Cloudy; Clear; Other; Not stated). This definition is based on the percentage of FSV crashes (Fatal+Severe+Visible Injury severity) compared to the existing approach.
- New nighttime crash definition was suggested among the four alternatives based on five years (2013-2017) TASAS crash data. Research findings indicates Alternative 3; LIGHTING_COND_DESC: (i)Dusk / Dawn; (ii) Dark – No Street Light; (iii) Dark - Street Light, defines nighttime crash well based on the percentage FSV crashes compared to other alternatives.
- Data dictionary for congestion related crash analysis was also proposed, which includes the crash data dictionary recommended in the earlier SPF phase project, and an additional data set from the PeMS (Caltrans Performance Measurement System) data base – Vehicle Miles Traveled; Vehicle Hours Traveled; Occupancy and Speed.

Task 4:

- Advancing research effort to develop Wet SPFs based on the proposed wet crash definition – to identify wet crash and data structure.

Task 6:

- Developed methodology to understand spatial distribution of crashes by two segment crash groups based on speed – free flow speed crashes and low speed crashes, which in turn will help to identify congestion related crashes during network screening and to reduce the likelihood of flagging false positive High Collision Concentration Locations (HCCLs).
- Advancing research efforts on automation process to evaluate congestion related freeway crashes using kinematic waves - cumulative occupancy curves and spatiotemporal proximities methodologies.