

# Risk-Based Roadway Departure Crash Assessment

## STUDY TIMELINE

October 2021 –  
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## INVESTIGATORS

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## KEYWORDS

Lane Departure,  
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Focus Crash Types, Risk Factors

## FUNDING

405C Traffic Records  
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Projects

More information about the Agency of Transportation Research Program, including additional Fact Sheets, can be found at:  
<http://vtrans.vermont.gov/planning/research>

## Introduction (or Problem Statement)

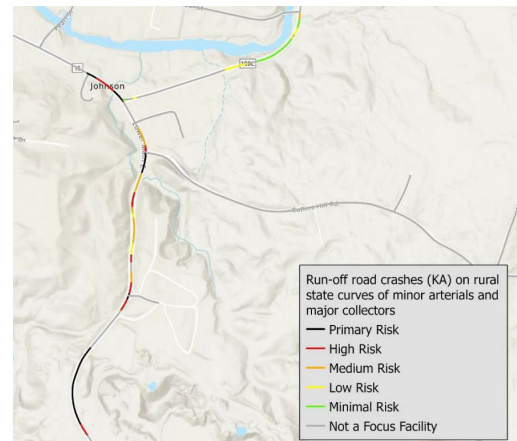
In Vermont, roadway departure crashes represent over 70% of all fatal and serious injury crashes and are therefore a primary crash type year after year. However, the nature of fatal and serious injury crashes is random and the locations where roadway departure crashes occur change. Because the locations are dispersed, they are not detected by traditional high crash location network screening methods. A challenge is to identify where roadway departure crashes are likely to take place in order to construct appropriate treatments to eliminate roadway departure crashes statewide.

This project applied the systemic safety approach and integrated crash data with roadway data to identify the roadway features that are correlated with roadway departure crashes in order to classify the locations most likely to produce roadway departure crashes.

## Project Methodology

Crash, roadway characteristics, traffic volume, and asset data from VTrans were integrated into a single segment database. Based on the need to identify focus crash types specific

to target lane departure safety strategies, the following focus crash types were selected: Head-on crashes, Fixed object crashes, Overturn crashes, Run-off-road crashes and Nighttime run-off-road crashes. A crash tree was created for each of these crash types to discern where on the roadway network (referred to as focus facility types) fatal and suspected serious injury crashes are occurring. Fourteen crash type/facility type combinations were identified (five on local curves, five on state curves, three on state tangents, and one on the interstates). For each of these combinations, a binary logit regression model was generated to identify their risk factors and a weight was assigned to each factor. Segment risk scores for each of the



focus crash type/facility type groups were calculated by summing the weights of each factor present on each segment. Based on their scores, segments were put into percentile bins. Each of these percentile bins corresponds to a risk category as shown below.

## Conclusions/Next Steps

Risk factors for fourteen focus crash type/facility type combinations, representing the combinations on which severe roadway departure crashes occurred most frequently, were

**Table 1 Risk Categories Based on Percentile Score Range**

Risk Category	Percentile Score Range	Color
Primary Risk	95-100	Black
High Risk	85-94	Red
Medium Risk	60-84	Orange
Low Risk	30-60	Yellow
Minimal Risk	0-30	Green
Not a Focus Facility	N/A	Gray

identified to screen the Vermont roadway network and determine those network locations (curves and tangents) at highest risk of severe roadway departure crashes. The primary output of this project is a set of GIS risk-based maps of the

locations most likely to produce roadway departure crashes in Vermont. Special [roadway departure route logs](#), that were generated by the VTrans Mapping Section, are available as an alternative way of viewing the data for state roads. A [data viewer application](#) was developed by the VTrans Operations and Safety Bureau to facilitate access and use of the roadway departure data and screening results as well as to facilitate the identification of possible mitigation strategies for any given site.

## Impacts and Benefits

All roads in Vermont have now been assigned risk levels for the likelihood of lane departure crash events. This is an important step forward in combating lane departure crashes in Vermont and in implementing the systemic safety approach as roadway departure risks that are distributed throughout the road system can now be targeted. At VTrans, one way of achieving this is by integrating safety treatments into non-safety projects, such as paving projects, through the formulation of New Project Summaries, where engineers can identify opportunities to include low-cost, targeted countermeasures based on the risk-based screening.