

Jonathan Dowds and James Sullivan

University of Vermont Transportation Research Center

Introduction

Planning for snow and ice control (SIC) activities is a persistent challenge for VTrans due to variability in winter severity and limited understanding of the relationship between severity and SIC costs. The purpose of this project is to develop an implementation-ready tool for estimating the cost of achieving the Agency's SIC performance targets across a range of weather conditions.

To create this tool, the research team utilized a decade of SIC cost data from VTrans' Maintenance Activity Tracking System (MATS) database and weather data from the National Oceanic and Atmospheric Administration (NOAA), the investigators explored the relationship between SIC costs and winter severity. The locations of VTrans garages in the MATS database and NOAA stations used for the project are shown in Figure 1.

Winter Severity Metrics

The research team explored a variety of winter severity measures and determined that the Accumulated Winter Season Severity Index (AWSSI) was best suited for analyzing the relationship between severity and SIC cost. The AWSSI is calculated from daily snowfall, snow depth, and minimum/maximum temperature at NOAA stations and has several desirable features:

- Good coverage across the state
- Long accurate historical data record
- Daily, storm-level (multi-day) and season-level scoring are all feasible
- Independent of SIC activities because NOAA stations are not on the road network

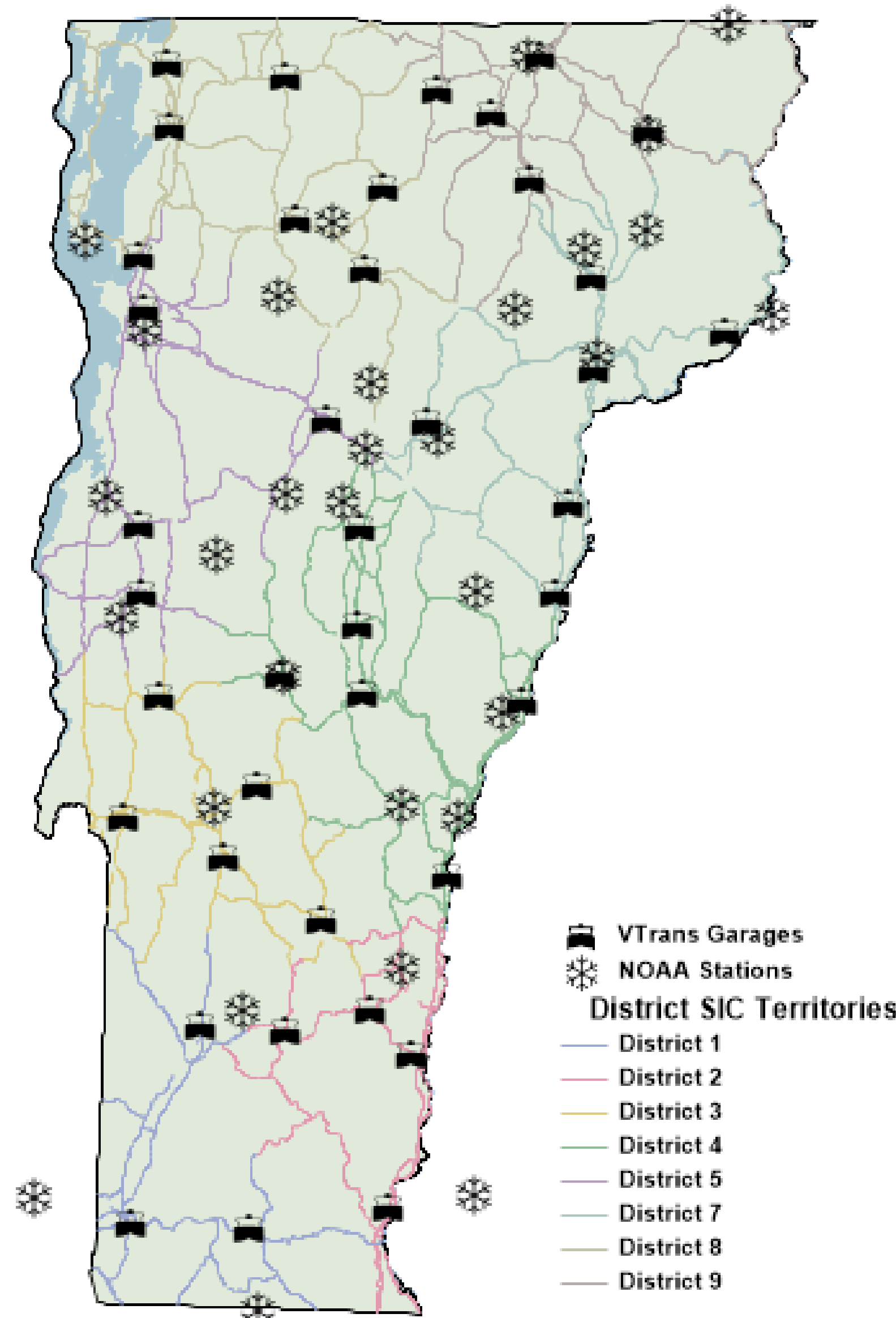


Figure 1. VTrans garages and NOAA weather stations

Correlation Between SIC Costs and Winter Severity

After aggregating SIC costs and daily AWSSI scores into multi-day storm events, cost and severity were highly correlated with an R^2 of 0.74 across ten years of data (see Figure 2). This relationship was also robust at the individual garage level for all garages in the state.

Table 1 shows the range of storm severity scores for the central garage in each maintenance district.

Table 1. Historical storm severity

Garage	Storms Per Season		Storm AWSSI	
	Mean	Max	Mean	Max
Bennington	25	30	20	502
Dummerston	19	23	24	324
Mendon	25	29	26	330
White River	20	24	22	136
Colchester	22	25	27	322
St Johnsbury	24	29	34	421
St Albans	20	25	32	367
Derby	20	26	46	575

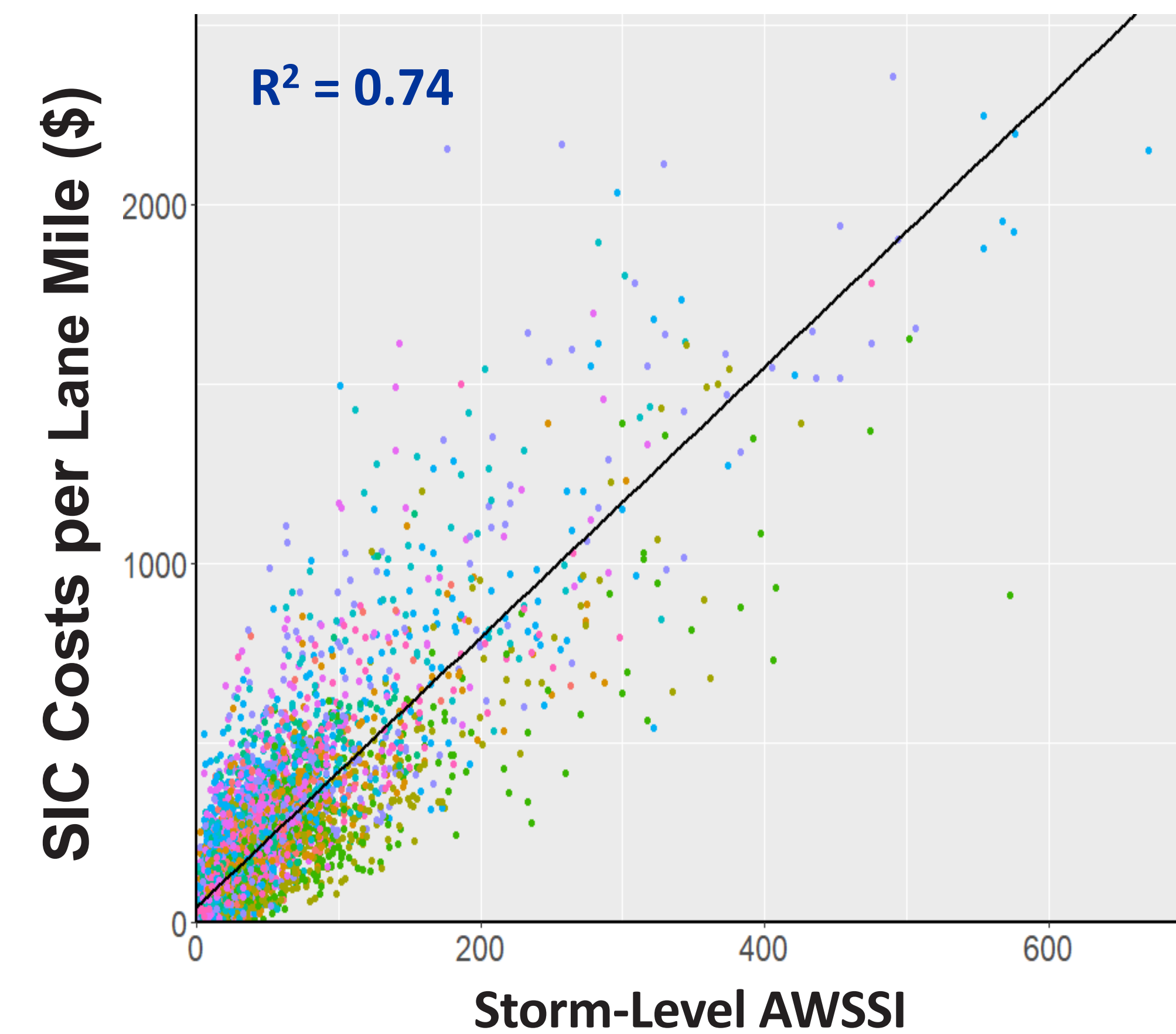


Figure 2. SIC cost versus storm severity

Next Steps

Friction data collected at Road Weather Information System (RWIS) stations are being used in conjunction with the NOAA data to create a new SIC performance measure that captures the Grip loss on the roadway relative to the storm severity. This performance measure will be used to stratify historical SIC performance. The final tool will use performance levels to provide a range of cost estimates for seasonal SIC activities when presented with a winter forecast. This tool will enable VTrans to make data-driven decisions about appropriate levels of investment in SIC for a given winter.

Acknowledgments

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