Transportation Research Procedia

Volume 15, 2016, Pages 676–693

ISEHP 2016. International Symposium on Enhancing Highway Performance

Evaluation of Variable Speed Limit Pilot Projects for Texas Department of Transportation

Beverly T. Kuhn, Ph.D., P.E.
Texas A&M Transportation Institute, College Station, TX
b-kuhn@tamu.edu

With
Kevin Balke, Ph.D., P.E.
Robert Brydia
LuAnn Theiss, P.E.
Ioannis Tsapakis, Ph.D.,
Leonard Ruback
Minh Le, P.E.

Abstract

In May 2013, the regular session of the 83rd Texas State Legislature passed House Bill (HB) 2204 related to the establishment of a variable speed limits (VSL) pilot program by the Texas Transportation Commission. The bill was signed into law by the governor in June 2013. In December 2013, the Texas Transportation Commission established Rule §25.27 of the Texas Administrative Code authorizing and requiring the Texas Department of Transportation (TxDOT) to implement a variable speed limit pilot program to "study the effectiveness of temporarily lowering prima facie speed limits to address inclement weather, congestion, road construction, or any other condition that affects the safe and orderly movement of traffic on a roadway." The goal of the pilot program was to deploy VSL in up to three locations to test the concept under three operational conditions and to determine the impacts of VSL on facility operations and safety. The specific objectives of the pilot project evaluation were to determine how much congestion was reduced in the area impacted by the implementation of VSL, to understand the users' perceptions of the VSL systems, to assess the safety impacts of VSL, and to determine the overall costs and benefits of VSLs. TxDOT worked with the Texas A&M Transportation Institute (TTI) in selecting pilot project sites for the development, implementation, and evaluation of VSL. The VSL systems were used for the purpose of controlling speeds at sites that have (a) construction work zones, (b) weather-related events, and (c) urban congestion. This paper presents the overall approach to the development, implementation, and operation of the VSL pilot projects along with the analysis of the installations with respect to their

 Selection and peer-review under responsibility of the Scientific Programme Committee of ISEHP 2016

doi:10.1016/j.trpro.2016.06.057

impact on congestion, safety, users' perception, violations, and benefit-cost of the projects. It also presents a number of lessons learned throughout the course of the pilot tests that provide beneficial insight into how to improve similar projects for permanent installations. Based upon the limited data available for the VSL pilot project, it was determined that VSLs would be beneficial if implemented to address inclement weather, congestion or road construction. VSLs had a safety benefit at each location and motorists had a clear understanding of the purpose of the VSLs.

Keywords: active traffic management, variable speed limits, weather, congestion, construction, evaluation

1 Introduction

Active traffic management (ATM) is the ability to dynamically and proactively manage recurrent and non-recurrent congestion on an entire facility based on real-time or pre-planned traffic conditions (*1*). Focusing on trip reliability, ATM strategies maximize the effectiveness and efficiency of a facility while increasing throughput and enhancing safety. ATM strategies rely on the use of integrated systems with new technology, including comprehensive sensor systems, real-time data collection and analysis, and automated dynamic deployment to optimize system performance quickly, and in some cases, without the delay that occurs when operators must deploy operational strategies manually. A common ATM strategy that has been long-used in Europe and is gaining popularity in the United States is variable speed limits (VSL). VSL involve the adjustment of speed limits based on real-time traffic, roadway, and/or weather conditions (*2*). They can either be enforceable (regulatory) speed limits or recommended speed advisories, and they can be applied to an entire roadway segment or individual lanes. These are also known as dynamic speed limits, variable advisory speeds, and speed harmonization.

Overview of VSL

A recent review of domestic VSL deployments indicated that the strategy has been deployed at a minimum in Alabama, Arizona, Colorado, Delaware, Florida, Maine, Michigan, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, Oregon, Pennsylvania, Tennessee, Texas, Utah, Virginia, Washington, and Wyoming (*3*). Overall, VSL is one of the more predominant ATM strategies deployed to date in the U.S. Experience has been positive overall, and these strategies demonstrate that reduction in congestion and improvement in travel time reliability can be achieved. Additionally, some of these strategies are deployed in a work zone application to improve operations impacted by construction. The potential benefits for VSL include a reduced difference between posted speed versus actual speed; reduced speed variability; reduced spatial extent of congestion; reduced temporal extent of congestion; reduced crash rates; and reduced crash severity. Challenges with past domestic applications have been limited before-after studies and the tendency to deploy VSL along with other strategies, which can confound the impacts of the strategy.

VSL came to light as an agency practice in a 2006 International Scan Report which first highlighted the potential for ATM to work to address congestion challenges in the U.S. (*4*). This review of European best practices identified commonalities between Europe and the U.S. in terms of challenges and issues facing the countries. These challenges included an increase in travel demand, a growth in congestion, a commitment to safety, and a shift in agency culture toward active management and system operation that focus on the customer, the willingness to use innovative strategies to address congestion, and the reality of limited resources to address all of these challenges (*4*).

Among other places, VSL has been used at the entrances to tunnels along a tollway in Greece with success. In Denmark, VSL was used to manage congestion during a major construction project, which helped contribute to maintaining safety during the project (*4*). In the Netherlands, travelers are alerted