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An Analysis of Express Lanes in Utah

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Abstract

This paper reports on an analysis conducted to identify ways to improve average speeds in the Express Lanes (ELs) in Utah. The research began with an investigation of the current usage of both the ELs and the General Purpose (GP) lanes by user type (e.g., single-occupant vehicle, high-occupancy vehicle (HOV) 2, HOV 3+, "C" decal, Express Pass user, motorcycle, bus, freight vehicle, and emergency vehicle) to better understand the breakdown of vehicles in the lanes and to calculate average vehicle occupancy. Violation data were examined to determine ways to reduce violator rates, while ways to control Express Pass traffic and to evaluate changes to toll rates and to estimate the impacts on speed of specific toll increases along the corridor were explored.

The data collected were examined to better understand the speed-flow relationship on the ELs and to estimate the impact of volume changes on speeds in the lanes. This allowed the research team to estimate the impact on EL and GP lane volumes and speeds under a combination of EL education campaigns, increased EL enforcement, and increased EL peak period toll rates.

Depending on the scenario analyzed, it was determined that the speeds in the ELs could be expected to increase as a result of the recommendations. The increase was found to be dependent upon the scenario chosen and the response of the traffic to the increases with an average maximum change in EL speed of 7.8 mph for a combination of education, enforcement, and increased tolls.

Keywords: Managed lanes, Express lanes, High-Occupancy Toll (HOT), High-Occupancy Vehicle (HOV), Transportation, Violation rates, Enforcement, Average Vehicle Occupancy (AVO), Carousel method

1 Introduction

The Utah Department of Transportation (UDOT) and Brigham Young University (BYU) recently completed two research reports on the utilization of the High Occupancy Toll (HOT) lanes (i.e., Express Lanes or ELs) along the Wasatch Front (Schultz et al. 2014; Schultz et al. 2015b). The 2014 report provided preliminary guidance on the impacts of current traffic levels on the ability of the ELs to meet their performance objectives. The primary objectives of that project were to examine the utilization of the ELs under a limited number of congestion and pricing scenarios and to provide

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preliminary recommendations on EL use. The researchers analyzed the data for the ELs in Utah, including an analysis of speed, volume, and toll rates within the lanes, as well as a detailed analysis of Express Pass transponder and "C" decal (i.e., clean fuel vehicle) use within the state. The results of the study indicated that the majority of the EL corridor within the state of Utah is operating within the 10th percentile speed goal of 55 mph set by UDOT and the requirement of 45 mph set by the Federal Highway Administration (FHWA). There are, however, some zones where 10th percentile speeds have dropped below 55 mph and some that have also dropped below 45 mph.

Several methods were identified as part of the research to reduce the volume in the ELs and subsequently increase the speeds within the lanes. The primary methods identified in the research included (Schultz et al. 2014):

1. Increase EL tolls during peak periods, including an increase in the maximum allowable toll.
2. Increase the High Occupancy Vehicle (HOV) limits in the ELs from 2+ to 3+ persons per vehicle during peak periods.
3. Reduce violation rate along the corridor through methods such as increased enforcement, education campaigns regarding policies related to the proper use of the ELs, and the consideration of a "HERO" program for public enforcement.

In addition to these methods, several other alternatives to reduce the volume in the ELs were brainstormed by the Technical Advisory Committee (TAC) to consider at a future date.

The 2015 report was conducted to evaluate the alternatives in more detail by completing a detailed analysis of average vehicle occupancy (AVO) both in the ELs and the GP lanes, a more detailed analysis of methods available to reduce violation rates, and a more in depth analysis of the impacts on volume and speed of increasing EL tolls (Schultz et al. 2015b). This paper provides a summary of these results including a discussion on data collection, data analysis, proposed recommendations, and conclusions.

2 Data Collection

The method for collecting data is a key component of this analysis and was conducted in an effort to quantify the current vehicle occupancy and vehicle types in the Express and GP lanes. The vehicle occupancy and vehicle type data were collected using the carousel method. The carousel method involves one or more observation vehicles driving concurrent with the flow of traffic to collect data in the adjacent lanes. In each observation vehicle, there is a driver and multiple observers; the driver focuses on maintaining ideal speed; the observers focus on their assigned lane(s). The carousel method was compared to several additional data collection methods including the roadside method (D'Ambrosio 2011, Heidtman et al. 1997), the video recording method (Heidtman et al. 1997), the survey/database method (Heidtman et al. 1997, Gan et al. 2005), and the automated (infrared camera and in-vehicle sensor) methods (Hao et al. 2011). Comparisons were made in terms of safety, cost, and perceived accuracy of the methods (Schultz et al. 2015a, Schultz et al. 2015b). A summary of the process of collecting data through the carousel method for this study are included in the following subsections: routes, collection periods, and classification of observation data.

2.1 Routes

The segments of I-15 being observed are outlined by zone in Table 1 and illustrated in Figure 1.