# Project Summary

Texas Department of Transportation

# 0-4663: Strategies for Separating Trucks from Passenger Vehicle Traffic

## Background

Truck travel in the United States has more than doubled since 1970 as measured in vehicle-miles traveled (VMT), whereas the population has increased by only 33 percent. Forecasts of future freight flows indicate that this growth trend will continue. It is anticipated that the growth in the numbers of trucks will bring a commensurate increase in the number and severity of vehicle crashes, all other factors equal. Nationwide statistics indicate that fatal crash rates are higher when trucks are involved. To meet this growing need, the Texas Department of Transportation (TxDOT) commissioned this project to investigate the following truck treatments: truck lane restrictions, dedicated truck lanes, and exclusive truck roadways. The emphasis was on the last option, given the fast pace of the Trans-Texas Corridor (TTC).

Consideration of exclusive truck facilities is not new to Texas, but the magnitude of the current Trans-Texas Corridor initiative is unprecedented. The TTC is a proposed multi-use, statewide network of transportation routes in Texas that will incorporate existing and new highways, freight and passenger railways, and utility rights-of-way. This very ambitious project is one of the most revolutionary ideas for transportation in Texas and one of the largest engineering projects ever proposed.

## What the Researchers Did

The major activities involved in this two-year research project were to: 1) identify the key criteria to determine the need for truck roadways, 2) use the criteria to develop a plan for classifying truck corridors, and 3) develop truck facility analysis tools for use on this system of roadways. The final analysis used a benefit/cost (B/C) approach to determine truck roadway needs.

Researchers developed VISSIM simulation models of generic rural freeway sections as a starting point for determining the capacity of an exclusive truck facility. Analysts then developed variations on this basic model to explore the capacity impacts of terrain and entrance and exit ramps. The development of level of service (LOS) tables for truck-only facilities was a straightforward process once the basic lane capacity value was known. Utilizing the same ratios provided for mixed-flow traffic in LOS tables contained in the *Highway Capacity Manual*, the authors established LOS ranges for trucks for the maximum density, minimum speed, maximum volume/capacity ratio, and maximum service flow. Besides mainline truck and non-truck volume, the following variables were part of this simulation:

- ramp volumes of 10, 20, and 30 percent of through-vehicle flow,
- grades of 0, 2, and 4 percent, and
- terrain that was flat, gently rolling, or rolling.


## Research Performed by:

Texas Transportation Institute (TTI),
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To facilitate the analysis, the research team followed a geographic information system (GIS)-based approach to select the truck traffic roadway network, overlay TxDOT count stations to the highway network, estimate the spatial distribution of truck traffic growth rates, and map those growth rates to all segments within the selected roadway network. Using a GIS approach facilitated the analysis given the large number of count stations and the extent of the roadway network. One primary result of the VISSIM and GIS efforts was a series of maps showing projected average annual daily truck traffic and LOS. The plotted LOS values on these maps represented operating conditions for exclusive truck roadways with a minimum of four lanes.

The primary outcome of this effort was both tabular and graphic, providing the number of lanes for any combination of the above modeled aspects. This format provided performance data to compare truck-only/auto-only roadway design scenarios with mixed-flow designs.

Other VISSIM outputs from this analysis were delay, fuel consumption, and emissions for mixed-flow versus separated facilities for computing the operational costs (delay time value and cost of fuel consumption) of each design under the broad range of operating conditions examined in this research. These results facilitated comparisons of the operational performance of truck-only roadway and conventional designs and allowed assessment of the cost of operations for these different situations.

## What They Found

A cursory examination of the research data indicates that separating trucks from cars never results in fewer lanes: it always requires an equal or greater number of lanes. Even where the number of lanes is the same, there would be greater initial cost with separation due to the additional right-of-way requirement.

Applying the procedures developed in this research to the Texas highway network indicates that in 20 years I-35 will be the most congested roadway and the most likely to need exclusive truck facilities. This finding supports ongoing activities related to the TTC-35, the highest priority corridor of the TTC concept.

Final comparisons of benefits and costs used a minimum B/C value of 2.0 to indicate success. The results do not consider the impacts of tolls, although some of the TTC facilities will undoubtedly require tolls. Based on simulation results, savings due to reductions in fuel consumption and delay, plus the savings due to expected crash reductions with truck roadways will, in many cases, exceed the estimated initial construction costs of $11 million per mile for four-lane truck roadways. Almost all of the B/C values exceed the selected threshold of 2.0.

## What This Means

Based on the calculated benefit/cost values, the idea of exclusive truck roadways warrants further consideration. One of the remaining unknowns is the change (if any) in crash rates when trucks operate on an exclusive truck facility. Results of another research activity paralleling this one might offer some assistance in the near future. Project 0-4663 produced the *Truck Facility Guidebook*, which will guide users through the process of applying the truck facility analysis tools developed in this research.

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