White Paper #7

Truck-Only Toll (TOT) Lanes

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White Paper #7
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Executive Summary

The purpose of this white paper is to explore the potential application of truck-only toll (TOT) lanes in Oregon. Currently, a handful of truck-only facilities exist in the United States, among them the I-5 climbing lane in Oregon, but there are no TOT lanes.

The TOT lanes proposed in the last few years are of two main types: long-haul and urban. Examples of proposed long-haul TOT applications include the I-70 corridor spanning Missouri, Illinois, Indiana, and Ohio (which may or may not involve tolls); the Trans-Texas Corridor; the I-15 corridor in California; and a truck tollway network proposed by the Reason Foundation. Urban TOT lanes have been proposed in California on SR 60 and I-710, and Miami, where lanes are intended to aid traffic getting into and out of busy ports. Another type of urban TOT lane system was proposed in Atlanta to reduce urban traffic congestion and improve the mobility of freight to and through the region.

This paper provides a scan of recent TOT lane proposals in the United States and addresses issues related to design and configuration of TOT lanes, estimating travel demand, financial feasibility, and evaluation considerations. Finally, it offers some perspectives on the potential applicability of TOT lanes in Oregon.

Design and Configuration

TOT lanes have special design and configuration requirements. For example, pavement must be designed to accommodate the heavier loads due to exclusive truck use or overweight limit allowances, staging areas must be provided for assembling and disassembling long combination vehicles (LCV) if these are allowed to operate, and on/off ramps must be designed to allow heavy vehicle safe access to and from adjacent highway facilities. Design and configuration issues are similar for long-haul and urban TOT facilities, with the exception of issues related to cross-sectional configuration, access/egress ramps, and staging facilities.

In rural corridors, the minimum cross-section for TOT lanes is one lane in each direction, with outer breakdown shoulders and passing lanes every few miles and on hills for truck passing maneuvers. This type of design requires a minimum right of way (ROW) of 54 feet (excluding passing lanes). Adding another lane in each direction would increase ROW requirements to at least 78 feet.

Most studies on TOT lanes in urban corridors suggest providing two lanes in each direction. ROW requirements for a four-lane at-grade TOT lane facility ranges from 88 to 98 feet, depending on the width of inner and outer shoulders. In urban areas with ROW constraints, it has been proposed to build TOT lanes on elevated structures or underground. Constructing new lanes in urban environments is likely to be very expensive regardless of configuration, but elevated or underground concepts add significant construction costs.

The need for access/egress ramps in TOT lane corridors depends on the nature of the corridor. For corridors serving long-haul/through trips, access points can be limited to key interchanges and staging areas (if LCVs are permitted to operate). In urban corridors where most trips are relatively short distances, more access points are required. The cost and financial analyses of TOT lane options should consider the tradeoffs between capital costs, usage/toll revenues, and safety.

Studies from the Texas Transportation Institute, the U.S. Department of Transportation (DOT), and the Georgia Department of Transportation (GDOT) offer guidance when considering these issues. Cambridge Systematics, Inc., (CS) currently is conducting a National Cooperative Highway Research Program (NCHRP) study on various topics concerning truck-only lanes, including design and configuration issues.

Demand for TOT Lanes

The extent to which trucks will be attracted to TOT lanes depends on the relationship between the value that truckers get from the facility and the price being charged. Estimating the value of time for trucks is challenging because of the diversity in the trucking industry and the competitive nature of operating cost information. In long-distance TOT configurations, the main value to truckers comes from allowing LCV on to the toll lanes, thereby providing productivity benefits for the special lanes. If the toll rate is set so that the increased productivity exceeds the value of the toll, some truckers may be attracted to the new lanes. For urban TOT lanes, the value of the lane derives from the opportunity for a truck to avoid congestion. Because trucks tend to operate all day, but auto use tends to peak during morning and evening commute periods, urban TOT lanes are likely to struggle to attract demand during nonpeak periods.

Travel time reliability is another potential benefit of TOT lanes, especially in urban environments; but reliability benefits also are likely to be limited to peak commute periods in most locations. Also, not all truckers may value travel time reliability sufficiently to warrant the toll.

How frequently trucks can access the special lanes is another issue related to demand for TOT lanes. More frequent access points help demand, but can hurt traffic operations and increase costs. Making the use of TOT lanes mandatory has been proposed; this would significantly affect the demand profile for a TOT lane.

Financial

As with any toll facility, a TOT lane might be expected to have some or all of its operations, maintenance, and capital costs covered by toll revenues, either through government-initiated financing or through public private partnerships (PPP). With a publicly financed facility there are numerous ways to structure financing that are well beyond the scope of this paper. Most structures are likely to include some form of revenue or general obligation bonds, with the toll proceeds pledged to pay off the debt after satisfying operating and maintenance requirements.

The literature shows mixed results related to the stand-alone financial feasibility of TOT lanes and such analyses must be done on a case-by-case basis. Arguably, the most financially viable business models are those that allow LCV to use special lanes for a fee in intercity line-haul conditions, thus providing productivity benefits regardless of travel time savings. Construction costs for highway lanes in intercity environments are typically lower than in urban environments, further enhancing the financial picture for such applications.

Urban TOT lanes are squeezed from two sides in that the costs of construction are likely to be high, and the revenue potential limited to a few hours of the day.

Evaluation Considerations of TOT Lane Proposals

The applicability of TOT lanes in Oregon will depend on whether there are corridors, both urban and rural, that may warrant providing a separate truck facility. This decision is based on truck volumes, congestion levels, existing truck activity centers, and the willingness of truckers to pay for using TOT lanes. Beyond the benefit to truckers, other goals for a successful TOT lane might include:

- Enhancing safety for all transportation systems;
- Reducing congestion, improving level of service, and improving access and mobility for all citizens;
- Providing a plan for truck lanes that is fiscally responsible, economically feasible, and equitable for all parts of the state;
- Supporting local, regional, state, and national economic development initiatives; and
- Avoiding, minimizing, and mitigating adverse impacts on the built, natural, social, and cultural environments.

Conclusions

When considering TOT lanes in the context of Oregon's transportation needs, it is instructive to do so from the perspective of the different types of TOT concepts: long-haul truckways, urban access to ports, and urban congestion relief/travel time reliability.

The main selling point of dedicated long-haul truckways is that they would be built to standards that would allow LCV to operate safely, and truckers would be willing to pay to use these facilities to reap greater productivity from the line-haul portion of their trip. Oregon, however, already allows LCV on major highways, so there is little additional value to be derived from this variety of TOT lane in Oregon.

Truck access to ports is not a significant concern in Oregon, so creating new highway capacity to service this market through TOT facilities is not likely.

Congestion exists in parts of the Portland metropolitan area and is expected to increase over time. Right of way is limited, and there is little appetite for freeway expansion. Urban corridor TOT lanes may be a potential solution to providing trucks with a reduced-congestion alternative to moving around the metropolitan area.

As with any infrastructure project, consideration of urban corridor TOT lanes requires careful examination of the capital and operating costs, environmental impacts, user benefits and costs, economic benefits and costs, and financial feasibility. The outcome of such analysis will vary widely depending on the specifics of any proposal, but the following general comments apply:

- The cost of new lanes in urban areas is high. Because of special design standards, the cost of new lanes that cater to trucks are higher. In Atlanta, the cost per lane-mile of implementing new truck-only lanes was estimated to be approximately $21 million. Other TOT studies show lane-mile costs in urban areas ranging between $10 million and $30 million, depending upon the inclusion of mixed at-grade and elevated structures, ROW costs, and other construction elements (e.g., interchanges, mobilization).

- Truck travel demand is fairly level over the course of the day, whereas auto traffic tends to peak in the morning and evening commute periods. Truckers will pay only for time or reliability savings, and those savings are significant only during commute peak-periods. This likely means little demand for special TOT lanes because potential time savings would be limited.

- Long-distance trucks passing through the Portland metro area may see little value in time savings that are a small percentage of the total travel time of a trip. Other types of truckers--in particular delivery services needing to visit multiple customers per day--may be more sensitive to travel time delay and reliability and more willing to pay a toll. The question is: what fraction of the truck demand in the region is made up of this type of truck, and to what extent are they traveling in congested time periods when paying a toll would be worthwhile?

- It is difficult to raise enough money through tolls for a standard road that generates revenue all day. A road (or lane) that is expensive due to location and design standards but only has value to the customer for a few hours per day is not likely to succeed.

- Currently, many toll roads are built with a combination of toll-leveraged funds and government funds. In this case, government should calculate whether expenditure for this subsidy is the best use of public funds, or whether there are other, more cost-effective means of achieving the same objective. This calculation would be entirely subject to the specifics of the proposal.

Truck-only toll facilities can provide value in Oregon, but the opportunities are limited and should be compared carefully to other ways to accomplish similar objectives.

1.0 Introduction

Truck-only lanes have been proposed as an option to increase productivity in the trucking industry and provide safer travel by allowing larger and heavier vehicles travel within designated truckways. Truck-only toll (TOT) lanes involve charging a toll to use these special lanes. Though there is also the idea of special lanes dedicated to trucks that do not involve tolling, these toll-free facilities are not discussed in this white paper. The motivation for considering TOT lanes is to guarantee the efficient movement of goods and truck flows when general purpose lanes are congested. The purpose of this paper is to explore the potential application of TOT lanes, how the potential applications might achieve their objectives, and what methodological issues there may be in evaluating this concept in Oregon.

There are two main categories of TOT lanes: long-haul and urban, described below.

Dedicated Long-Haul Toll Truckways

Dedicated long-haul toll truckways[1] are built next to existing roadways, but are barrier-separated from general traffic to improve safety. Toll truckways can be built to withstand greater vehicle weights, thus enabling a single truck driver to carry several times the payload currently permitted in most states. They also can have longer trailer configurations (called longer combination vehicles, or LCV) than allowed in some states. Oregon is one of 21 states where LCVs already are allowed to operate on designated routes. The intent of TOT lanes is to attract truckers to use them because the toll cost would be more than offset by the additional safety and productivity of using the special

[1] Reason Foundation, *Toll Truckways: A New Path Towards Safer and More Efficient Freight Transportation*, June 2002.

lanes. Use of the lanes would be optional for truckers, but they only could take advantage of the more lenient weight and length restrictions if they used the toll lanes.

Urban TOT Lanes

Urban TOT lanes come in two varieties:

1. **Access Routes to Ports.** The last mile from the national highway system to a port is sometimes the most congested. Some regions proposed dedicated truck facilities to move truck traffic from the highway system to ports more quickly and with less impact on the community, and others proposed tolls to help pay for these facilities.

2. **Urban Corridor Truck Lanes.** Another TOT lane concept involves urban corridors, which do not necessarily allow longer or heavier vehicles or access routes to ports. These corridors tend to be shorter in length, and must provide enough time or cost savings to the truckers to justify paying a toll. More access points may be provided along the corridor (compared to long-haul routes) to attract higher demand. Use of these special lanes in urban areas may be optional or mandatory. Urban corridor TOT lanes may serve as an alternative for long-haul truck traffic traveling through heavily congested urban areas.

This paper first describes national experience with TOT lanes (Section 2.0), outlines the design and configuration requirements of TOT lanes (Section 3.0), addresses issues related to attracting truck traffic to TOT lanes and estimating demand (Section 4.0), and finally considers financial feasibility (Section 5.0). The conclusion (Section 6.0) reflects on potential opportunities for TOT lanes in Oregon, and poses questions that should be considered if available opportunities are pursued.

Appendices provide supplemental material. Appendix A is a glossary of terms and a list of acronyms, Appendix B has bibliography and references, and Appendix C has the evaluation criteria for TOT lanes, based on Oregon Department of Transportation (ODOT) tolling policy objectives. Case studies of national experience with TOT lanes are in Appendix D, and evaluation criteria used in a study of TOT lanes in Georgia is in Appendix E.

■ 2.0 National Experience with TOT Lanes

Currently, no TOT lanes exist in the United States, but some states and institutions have analyzed the feasibility of implementing TOT lanes. This section summarizes the TOT lane proposals that evaluated over the last decade. Case studies of TOT lane studies are provided in Appendix D.

Long-Haul TOT Lane Proposals

Several long-haul TOT lanes were proposed over the last decade. A study of the 45 miles of I-15 in California from SR 60 to Victorville found that TOT lanes were the least cost-effective and most expensive of all alternatives evaluated, and that revenues from tolling would not be adequate to fund construction, operations, and maintenance of the project.

The Reason Foundation[2] proposed a national network of intercity toll truckways to accommodate LCVs and other heavy trucks in places where there are gaps in the LCV network. The study concluded with the following recommendations for policy changes to implement TOT lanes: 1) provide right of way (ROW) along existing highway corridors on the federal-aid highway system; 2) relax current federal truck size and weight restrictions for vehicles using the TOT lanes; and 3) reimburse/rebate state and federal fuel taxes of TOT lanes users for the miles driven on the facility. The 2002 study concluded that TOT lanes could be self-supporting and could even attract private investment under the study assumptions (e.g., construction within existing unused ROW).

Other proposals have not yet been evaluated. These include truck-only lanes along 800 miles of I-70 spanning four states --Missouri, Illinois, Indiana, and Ohio --where a feasibility study currently is underway. The study will consider tolls as an alternative for financing the project. The Trans-Texas Corridor (TTC) is a 4,000-mile network that includes toll roads for passenger vehicles and trucks along with other multimodal facilities. Two main segments currently are being considered for initial implementation, although it is unlikely that any TOT lanes will be included in the initial phases of implementation.

Urban TOT Lanes

Urban TOT lane corridors have been evaluated in Los Angeles, California (SR 60 and I-710); Atlanta, Georgia; Chicago, Illinois; and Miami, Florida. The TOT lane facilities proposed in Los Angeles and Miami would serve primarily short-haul trips, improving access between ports and rail yards, warehousing, and distribution facilities. The TOT lanes in Atlanta would serve primarily through-truck traffic, bypassing congestion in the region. The Chicago Mid-City Freightway would serve both through- and short-haul truck traffic.

The I-710 and SR 60 corridors in California serve major truck trip generators in the Los Angeles area. I-710 is a major access route between east Los Angeles and the ports of Long Beach and Los Angeles, serving trucks traveling between the ports and rail yards, warehouses, and distributions points throughout the area. SR 60 is a major east-west corridor from downtown Los Angeles that runs through industrial sections of the San Gabriel Valley and through the warehouse districts south of the Ontario International

[2] The Reason Foundation is a nonprofit organization "promoting libertarian principles."

Airport. Both corridors have truck traffic representing 15 to 20 percent of the total, with significant volume increases projected over the next 15 to 20 years. Dedicated truck lanes were among several alternatives evaluated in separate feasibility studies for each corridor. The financial analysis for SR 60 determined that only 30 percent of the TOT facility costs could be recouped through tolls. First, truck volumes were the highest during the midday period, after the morning peak and before the afternoon peak, when congestion is hardly an issue. Consequently, travel time savings in the special lanes during the highest truck volume periods are minimal, reducing demand for TOT lanes. In addition, travel distances for most trips were short, and limited access points affected demand for the proposed TOT facility. The preliminary toll analysis on I-710 provided results similar to the SR 60 financial analysis.

The Reason Foundation conducted a preliminary feasibility study of TOT lanes connecting the Port of Miami and the Miami International Airport with points west of the airport. The toll revenue analysis concluded that tolls could cover over 50 percent of the project costs. However, other revenues would be needed to fully support the project, assuming between 30 to 40 percent diversion of existing truck traffic.

The Georgia State Road and Tollway Authority (SRTA) conducted a feasibility study for high-occupancy toll (HOT) and TOT lanes in the Atlanta region. The use of TOT lanes was assumed as voluntary based on recommendations from the trucking industry, and projected truck demand levels that would exceed TOT lane capacity. Overall, the study found that TOT lane users could realize travel time savings and congestion in the general purpose lanes would be reduced, although additional analysis of the concept was recommended. More recently, the Georgia DOT conducted a study on dedicated truck lanes, but did not consider TOT lanes.

The "Mid-City Freightway" is one of five alternatives being studied for the Mid-City Transitway Corridor in Chicago. A study of the 22-mile corridor[3] found that the freightway would likely attract 6,100 to 12,400 trucks per day at a toll rate double that of the Illinois Tollway. This is a 10- to 30-percent reduction in truck traffic compared to the full build scenario without tolls (8,400 and 13,700 trucks per day). In general, the freightway would lead to increases in truck traffic on feeder routes to the freightway and decreases in parallel routes. The study also included an assessment of the revenue potential under different toll rates (i.e., current and double I-Pass rate) for a 20- to 99-year operating period. Assuming the current I-Pass rate, the present value of toll revenues was estimated at $408.7 million over 20 years, and $761.5 million over 99 years (assuming a 5.2 percent discount rate, based on Federal Office of Budget and Management guidance). For the double I-Pass rate scenario, the present value of toll revenues was estimated at $676.2 million over 20 years, and $1.26 billion over 99 years. Project cost estimates were not available to compare whether tolls were sufficient to support TOT lane implementation in this corridor.

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[3] Cambridge Systematics, Inc., *Mid-City Freightway: Evaluation of Alternative Alignments and Tolls*, prepared for the Chicago Department of Transportation, November 2006.

3.0 Design and Configuration Issues Related to TOT Lanes

TOT lanes have special design and operational requirements. For example, pavement must be designed to accommodate the heavier loads due to exclusive truck use or overweight limit allowances, staging areas must be provided for assembling and disassembling LCV (if these are allowed to operate), and on/exit ramps must be designed to allow heavy vehicle safe access to and from adjacent highway facilities. This section discusses the following design and operations issues:

- Pavement design;
- Geometric design and cross-sectional configuration;
- Methods of separation;
- Access/egress ramps; and
- Staging facilities.

Design and configuration issues are similar for both long-haul and urban TOT facilities, with the exception of issues related to cross-sectional configuration, access/egress ramps, and staging facilities.

Pavement Design

Compared to general-purpose lanes, TOT lanes will consistently carry heavier loads at higher speeds; therefore, the pavement deteriorates at a faster pace unless the higher frequency of heavier loads is factored into the pavement design. Pavement design issues are similar for either long-haul or urban TOT lanes. On facilities where LCV and/or overweight vehicles are permitted, this issue becomes even more significant. The primary factors affecting pavement design of truck facilities include traffic loads, speeds, and the type of soil; these factors lead to different choices in pavement design, including pavement thickness and the type of material.

The City College of New York developed a basic pavement design for TOT lanes and general purpose lanes for four scenarios of truck traffic as part of a study on truck tollways by the Reason Foundation (2002). Overall, the main difference compared to general purpose lanes was in the thickness of the various pavement layers (e.g., subbase, base, and asphalt concrete layer).

Geometric Design and Cross-Sectional Configuration

Geometric design (horizontal and vertical alignments) and cross-sectional features (e.g., lane widths, shoulder widths) for general purpose lanes take into consideration the physical and operational characteristics of trucks. However, TOT lanes, especially those that allow LCV and higher speeds, require independent design standards. A study by the

Texas Transportation Institute (TTI)[4] identified key design factors (Table 3.1) and highlighted those that need to be modified or require additional research for truck facility design.

Table 3.1 Design Factors Potentially Affected by Truck Characteristics

Design Category	Specific Focus Area
Sight Distance	• Stopping sight distance; • Decision sight distance; • Passing sight distance; • RR-highway grade crossing sight distance; and • Intersection sight distance.
Horizontal Alignment	• Curve radius; • Superelevation; • Intersection and channelization; and • Pavement widening.
Vertical Alignment	• Critical length of grade; and • Downgrades.
Cross-Section Elements	• Lane width; • Shoulder width and composition; • Side slopes and drainage features; • Pavement cross-slope breaks; • Vertical clearance; • Traffic barrier; • Passive signs; • Curbs; and • Acceleration lanes.

Source: Texas Transportation Institute (TTI), Truck Accommodation Design Guidance: Policy-Maker Workshop, TTI Research Report 4364-3, October 2003.

The cross-sectional design for TOT lanes is an important consideration that may determine whether TOT lanes are feasible in a corridor. Forecast of truck traffic demand on the TOT facility determines how many lanes in each direction are required, also ensuring that TOT lanes are congestion-free, such that trucks are attracted to potential benefits from improved reliability and travel time savings. The cross-sectional design also determines ROW requirements.

[4] Texas Transportation Institute (TTI), Truck Accommodation Design Guidance: Policy-Maker Workshop, TTI Research Report 4364-3, October 2003.

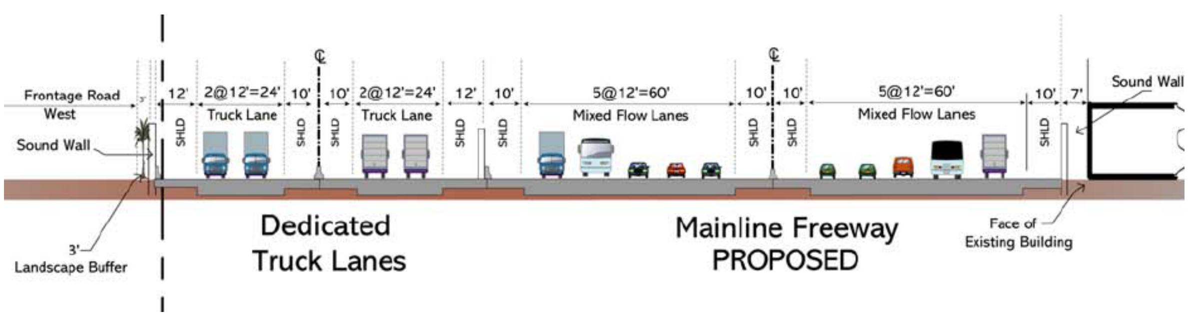
For long-haul TOT lanes in rural areas, the Reason Foundation suggested toll truckways within the median ROW of existing Interstate highways, with the following cross-sectional characteristics:

- One 12-foot lane in each direction, with truck passing lanes provided at intervals of every few miles and on hills to allow for truck passing maneuvers;
- Four-foot Jersey barrier in the center;
- Ten-foot outer breakdown shoulders in each direction; and
- Jersey barriers on each side separating TOT lanes from general purpose lanes.

According to the Reason Foundation report, the minimum ROW required for this type of design is 48 feet, excluding outside Jersey barriers that separate the TOT lanes from general purpose lanes and the ROW required for passing lanes. The Reason Foundation study recognized the benefits of four-lane truck tollways compared to two-lane facilities, particularly associated with increased capacity and truck passing capabilities. However, the proposal for two-lane facilities was driven by the lower ROW requirements. Adding one lane in each direction would increase ROW requirements to at least 72 feet.

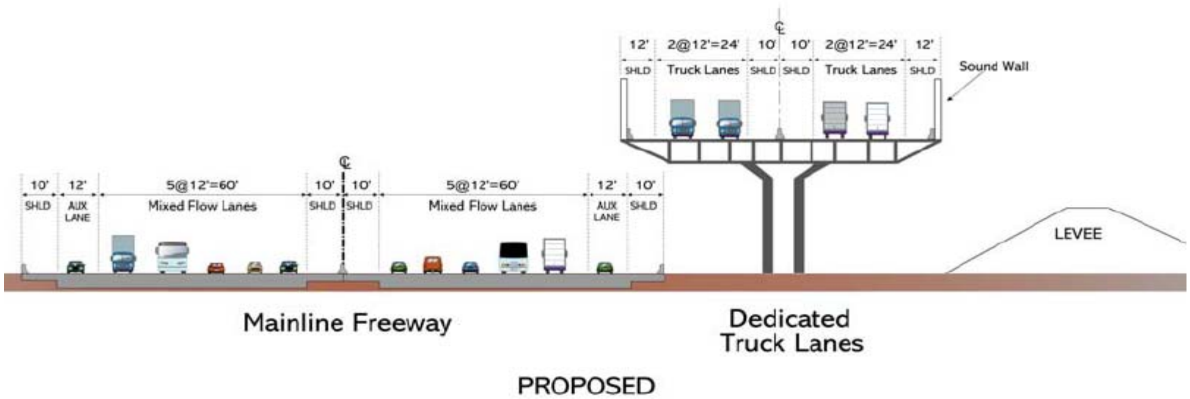
For TOT lanes in urban corridors, most studies suggested providing two lanes in each direction. The SR 60 study determined that two lanes per direction are required to allow greater flexibility during incidents. From both the California Department of Transportation (Caltrans) and the user perspective, providing two lanes per direction is critical. For Caltrans, it was important to allow for continued operation in the TOT lanes during an incident, as well as providing greater access to emergency vehicles. From the user perspective, a four-lane facility mitigates the impact of incidents or slow moving vehicles on reliability. On the I-710 corridor, projected truck traffic demand warranted the provision of a four-lane facility (92 feet of ROW) to ensure congestion-free operation. Most of the length of the proposed I-710 truck lanes would be at-grade, while some sections would be elevated due to ROW restrictions. Figures 3.1 and 3.2 present the proposed cross-sectional configurations of the at-grade and elevated section, respectively.

Figure 3.1 I-710 Corridor Cross-Sectional Configurations
At-Grade Truck Lanes



Source: *I-710 Major Corridor Study, Final Report*, March 2005.

Figure 3.2 I-710 Corridor Cross-Sectional Configurations
Elevated Truck Lanes



Source: *I-710 Major Corridor Study, Final Report*, March 2005.

As demonstrated in the I-710 study, there may not always be adequate ROW to add TOT lanes. Elevated structures are one option if the congestion relief and safety benefits are sufficient enough to warrant the added cost (which can be substantial). However, in the case of the I-710 corridor, the elevated structure was a controversial feature, with the study's Oversight Policy Committee expressing concerns about the emissions and safety implications of this type of design.

ROW requirements for TOT facilities are based on factors that include:

- Type of facility: at-grade, elevated, or underground TOT lanes;
- Location of TOT lanes relative to general purpose lanes: whether the TOT lanes are located in the median ROW of existing highways, or adjacent to the general purpose lanes of existing highways;
- Number of TOT lanes;
- Width of TOT lanes;
- Width of inner and outer shoulders; and
- Width of Jersey barriers (and side barriers/guard rails if any).

At-grade TOT lane facilities have the maximum ROW requirement and are typically proposed where there is ample ROW availability, either along the median of or adjacent to existing highways. In cases with ROW constraints, either elevated or underground TOT lane configurations are proposed. Proposals for elevated TOT lane facilities are increasingly considering innovative elevated structural design concepts such as box girders with slender columns to minimize their ROW requirements. Underground TOT lanes are not subject to ROW issues, but their implementation would significantly impact construction costs because per lane-mile construction costs of underground facilities are the highest when compared with elevated and at-grade facilities. Elevated and underground TOT lanes are typically considered in metropolitan areas subject to significant land-use constraints. Table 3.2 presents a summary of the ROW requirements for various TOT lane configurations. Based on cost data analysis from the various TOT lanes studies conducted to date, the lane-mile cost of TOT lanes in urban areas is estimated to be between $10 and $30 million (2007 dollars), which assumes mixed at-grade and elevated structures, ROW costs, and other construction elements (e.g., interchanges, mobilization). The lane-mile cost of rural at-grade TOT lanes was estimated at $1.4 million (2007 dollars) by the Reason Foundation based upon assumptions of modest use of bridges and climbing lanes and excluding ROW costs.

Methods of Separation

An important consideration in the design of TOT lanes (and applicable to other types of truck-only facilities) is how to separate these facilities from general purpose lanes. Separation methods for at-grade truck-only lanes include using Jersey barriers or other methods, like pylons or rumble strips, which prevent auto access and yet allow flexibility for trucks to enter/exit the toll facility at specified points, or building the TOT lanes on an elevated facility. Full separation from general purpose lanes is expensive, but provides additional safety benefits (from truck diversion and lower auto-truck conflicts) and the ability to address operational problems experienced in high-truck traffic volume facilities.

Access/Egress Ramps

Ramps dedicated to trucks entering or exiting TOT lanes allow efficient and safe access and egress of trucks between TOT lanes and general purpose lanes. Ramps also can be designed to provide a connection between TOT lanes and staging areas where LCV can be assembled before entering the TOT lanes or disassembled before entering roadways where LCVs are prohibited.

The provision of access points to/from the TOT lanes depends on the nature of the corridor. For corridors serving long-haul/through trips, access points can be limited to key interchanges and staging areas (if LCVs are permitted to operate). On the other hand, in urban corridors where most trips are a relatively short distance, more access points would be required. In this case, the cost and financial analyses should consider the tradeoffs among capital costs, usage/toll revenues, and safety.

The California SR 60 and the I-710 corridor studies demonstrated the importance of providing frequent access points to increase truck traffic demand in urban TOT corridors that serve primarily short-haul trips. In the SR 60 study, the tradeoff between limiting access points and generating high demand was a major issue, especially because high demand is desired to maximize toll revenues. Yet, adding access points increases the capital costs for the corridor.

Table 3.2 Right-of-Way (ROW) Requirements for Various Dedicated Truck Lane Configurations

Type of Facility	Location of Facility	Number of Lanes (Total, Both Directions)	Shoulder Configuration	ROW Requirement	Comments
At-Grade Dedicated Truck Lanes	Median of existing highway mainlines	2	No inner shoulders; 12-foot outer shoulders	54 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (total of three barriers for truck-truck and truck-auto separation)
At-Grade Dedicated Truck Lanes	Median of existing highway mainlines	2	Five-foot inner shoulders; 12-foot outer shoulders	64 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (total of three barriers for truck-truck and truck-auto separation)
At-Grade Dedicated Truck Lanes	Outside existing highway mainlines	2	No inner shoulders; 12-foot outer shoulders	52 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (one barrier for truck-truck separation, and 1-foot side barriers on either side of the facility)
At-Grade Dedicated Truck Lanes	Outside existing highway mainlines	2	Five-foot inner shoulders; 12-foot outer shoulders	62 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (one barrier for truck-truck separation, and 1-foot side barriers on either side of the facility)
At-Grade Dedicated Truck Lanes	Median of existing highway mainlines	4	Five-foot inner shoulders; 12-foot outer shoulders	88 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (total of three barriers for truck-truck and truck-auto separation)
At-Grade Dedicated Truck Lanes	Median of existing highway mainlines	4	Ten-foot inner shoulders; 12-foot outer shoulders	98 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (total of three barriers for truck-truck and truck-auto separation)
At-Grade Dedicated Truck Lanes	Outside existing highway mainlines	4	Five-foot inner shoulders; 12-foot outer shoulders	88 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (one barrier for truck-truck separation, and 1-foot side barriers on either side of the facility)

Table 3.2 Right-of-Way (ROW) Requirements for Various Dedicated Truck Lane Configurations (continued)

Type of Facility	Location of Facility	Number of Lanes (Total, Both Directions)	Shoulder Configuration	ROW Requirement	Comments
At-Grade Dedicated Truck Lanes	Outside existing highway mainlines	4	Ten-foot inner shoulders; 12-foot outer shoulders	98 feet	Other assumptions: 12-foot lane widths; 2-foot Jersey barrier width (one barrier for truck-truck separation, and 1-foot side barriers on either side of the facility)
Elevated Dedicated Truck Lanes	Median of existing highway mainlines			Width of pier + (2 * inner shoulder width)	ROW does not typically depend on number of lanes (other than cases where number of lanes are too high to warrant more than one supporting pier for the elevated structure)
Elevated Dedicated Truck Lanes	Outside existing highway mainlines			Width of pier	ROW does not typically depend on number of lanes (other than cases where number of lanes are too high to warrant more than one supporting pier for the elevated structure)
Underground Dedicated Truck Lanes				None	No ROW requirement since facility is constructed underground

Source: Cambridge Systematics, Inc. for National Cooperative Highway Research Program (NCHRP) 03-73, *Separation of Vehicles – CMV Only Lanes* (ongoing).

Staging Facilities

For LCV to be effective, staging areas are needed to make up and break up the trailer combinations. The cost of these staging areas might be borne by the owner/operator of the toll facility or by the private sector. In Oregon, staging facilities are privately owned.

4.0 Issues Related to Demand for TOT Lanes

This section focuses on factors that influence whether trucks will choose to use TOT lanes, how those choices might affect traffic on other facilities, and how these considerations influence demand estimation in studies. Of particular consideration are issues related to how truckers value their time, access to and egress from the special lanes, how truck traffic is different from auto traffic in terms of demand over the course of a day, and issues related to travel time savings and reliability.

Truck Value of Time

Usage of TOT lanes will be heavily influenced by the value truckers place on their time. This is not simple to determine. The trucking industry is not homogeneous. There are long- and short-haul trucks operated by fleets, in-house operations, and owner operators. It is not always clear who gets to make routing decisions and how different elements of those decisions are considered. For example, some truckers are paid by the mile, regardless of travel time. Others have a high value on reliability or speed, especially in short-haul dray operations or when a truck driver approaches his legal daily driving limit. Trucking firms are usually not willing to share their operating cost data.

Several studies provide some insights into truck value of time, but any proposals in Oregon should consider the specifics of the market in the corridors being considered.

The analysis of the I-15 corridor in California included a survey of corridor travelers. Truck drivers were asked whether they were willing to pay a toll, and if so, how much for saving 15 minutes of travel time. Almost one-half (46 percent) of the truck drivers were willing to pay an average toll of $8.15 (2007 dollars) for 15 minutes of travel time savings.

The American Transportation Research Institute (ATRI) conducted a survey following the Georgia TOT lanes study to estimate truckers' willingness to pay for using optional TOT lanes. Respondents were asked to indicate under what circumstances they would decide to use TOT lanes; options and response rates are summarized in Table 4.1. Most respondents indicated they would use TOT lanes if there was an accident on the general purpose lanes causing significant delays. The second highest response was use during peak congested periods.

Table 4.1 Georgia Truck Survey: Reasons to Pay for TOT Lane Use

Reason to Use TOT Lanes	Percent Response
Due to importance of current delivery time	52%
For hours-of-service compliance	41%
To improve overall operations	51%
When highways are congested (i.e., during rush hour)	55%
When a traffic accident has stopped or slowed traffic on nontoll lanes	62%

Source: Jeffrey Short, ATRI, *Survey of Motor Carrier Opinions on Potential Optional Truck Only Toll (TOT) Lanes on Atlanta Interstate Highways*. Presented at the Transportation Research Board (TRB) Annual Meeting, January 2007, Washington, D.C.

A second question asked respondents to indicate how much they would be willing to pay to use the TOT lanes under a congestion pricing scheme where the TOT lanes would be guaranteed to operate at the speed limit. Sixty percent of respondents indicated they were not willing to pay, with 40 percent willing to pay 5 cents per mile. At 30 cents per mile, only 7 percent of respondents would be willing to use the TOT lanes. The survey focused on Georgia-based motor carriers, and did not include out-of-state carriers who travel through the Atlanta region on a daily basis and who might be potential users of TOT lanes.

In a study by the Georgia Institute of Technology (Georgia Tech), truckers' willingness to pay was included as part of a framework to identify potential TOT corridors. This information was gathered through trucker stated-preference surveys on I-75 in Atlanta. The survey asked for the minimum value of cost savings necessary for the user to consider paying a toll. A truckers' cost saving distribution was developed with the average value of time at $31 per hour. The resulting distribution shows 90 percent of the trucks willing to pay $3 per hour of saving, with 50 percent of truckers willing to pay $15.40 per hour of saving.

In the Miami TOT lanes study (2007), the Reason Foundation developed toll rates for two types of users: drayage operations and nondrayage trucking. The study assumed that drayage operators would benefit from TOT lanes based on the additional trips that they could make in 1 day compared to using the existing roadways. Based on current conditions, the study estimated a single truck could make 3.1 trips per day. Travel time saving from using TOT lanes would allow drayage operators to add one trip per day, at a value of $147 (2007 dollars). Under the premise that truckers would be willing to pay up to one-half of the gains realized by the additional trip, the study concluded that a reasonable toll rate for drayage operations is $9 one-way. In the case of nondrayage operators, the study assumed a one-way toll of $6 based on the value of time for truck drivers.

The I-710 study in Los Angeles relied on estimating travel time savings from the travel demand forecasting model and truck value of time data obtained from a stated-preference survey by researchers at the University of California at Berkeley. The mean value of time was $31.85 per hour and the median value of time was $19.11 per hour[5] (in 2007 dollars); this distribution is skewed to the left, with most vehicles having low values of time. The study illustrated the impacts of truck value of time assumptions on toll values for a desired utilization of the dedicated truck lanes. At a 7 cents per mile toll rate, the TOT lanes attracted 60 percent of the trucks using I-710, whereas at 16 cents per mile, the attraction rate of the TOT lanes dropped to 35 percent.

Hsing-Chung Chu[6] conducted sensitivity analysis of various trucker's value of time to understand the relationships between toll rates and key performance measures for truck-only toll lanes, such as revenue generation potential, congestion (travel time savings), and TOT lane utilization rates. As expected, toll rates higher than the optimal values would result in a decrease in total revenues due to a reduction in utilization of the toll truckway.

Travel Time Reliability

A variant on the concept of travel time savings is travel time reliability. Some truckers may be willing to pay a toll to ensure their ability to deliver their load on time, removing some of the uncertainty that can arise in traffic flows. TOT lanes may be able to contribute to improved reliability. A study by the Federal Highway Administration (FHWA) and tATRI[7] determined both travel time and buffer time indexes for freight significant corridors. The buffer time is the additional time added to ensure on-time arrival of goods. This buffer time would include the effects of both recurrent (e.g., peak-period travel-related) and nonrecurring (e.g., accident-related) congestion. When the buffer index was applied to a trip on the I-5 corridor (between San Diego, California, and Blaine, Washington), the buffer time added was estimated at 6 hours to ensure that the goods would arrive on time, with 95 percent confidence.

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[5] For the original study (2005), the mean value of time was $30 per hour and the median value of time was $18 per hour. Values have been adjusted to 2007 dollars using CPI.

[6] Hsing-Chung Chu, *Implementing Truck-Only Toll Lanes at the State, Regional, and Corridor Levels: Development of a Planning Methodology*, Ph.D. Dissertation, Georgia Institute of Technology, December 2007.

[7] American Transportation Research Institute and Federal Highway Administration, *Measuring Travel Time in Freight-Significant Corridors*, April 2005. Available on-line at: http://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas.htm (last accessed on October 10, 2008). ATRI is part of the American Trucking Associations Federation, and describes its primary mission to "conduct research in the field of transportation, with an emphasis on the trucking industry's essential role in a safe, efficient, and viable transportation system." http://www.atri-online.org/.

The Southern California Association of Governments (SCAG) applied this concept of travel time reliability to assess the travel time and buffer time savings from TOT lanes in I-710, SR 60, and I-15, assuming a toll rate of 86 cents per mile. The study estimated travel time savings for trips between the San Pedro Bay Port Complex and three major warehouse districts in downtown Los Angeles (18 miles), the Ontario International Airport (about 56 miles), and the City of Victorville (about 142 miles). Total time savings per trip were estimated from almost 1.5 hours up to 6.75 hours, which includes buffer time savings. Buffer time savings account for about 70 percent of the total time savings.

When looking at TOT proposals in Oregon, it is important to consider the mix of truck trip types and the commodities being shipped to evaluate whether straight travel time savings or reliability savings might be something worth paying for on a TOT facility. For some trips, truckers are paid by the mile, so the shipper is insensitive to the cost of travel time delays. Some types of truck operators may be more or less sensitive to travel time disruptions, depending on whether they are owned by the shipping companies, for-hire fleets, or independent owner-operators. If time or reliability savings enable an owner-operator to make one additional short trip, or make one more delivery in congested conditions, they may be willing to pay a toll. However, if the value of the savings is one-half hour on a multiday trip down the coast or across the country, the value of those savings might be minimal.

Voluntary Versus Mandatory Use of TOT Lanes

Part of the attraction of TOT lanes is the separation of truck from auto traffic, yielding a safer, more comfortable ride for both trucks and automobiles. Complete separation of the two traffic streams can only be achieved if the TOT lanes are mandatory for trucks (or certain classes of trucks). Making TOT lanes mandatory has a significant influence on financial feasibility – if trucks are forced to use the toll facility, prices can be set higher without fear of diversion. With a voluntary system, the toll operator would need to be much more cognizant of providing value for the toll charge in order to attract the trucks on the toll lane. This value can be boosted by allowing LCVs, providing make-up/ break-up areas, and allowing for higher axle weights in the special lanes.

A hybrid TOT lane option may include TOT facilities that allow voluntary use for existing truck configurations, but use is mandatory for LCVs. In the case of Oregon, LCVs currently operate on designated routes; therefore, mandatory use of TOT lanes may be more difficult to justify (unless larger truck configurations are permitted). In Oregon, travel time saving and reliability are the main factors to encourage TOT lanes.

The financial evaluation for I-15 corridor included two operating scenarios for the TOT lane alternative: 1) voluntary use of TOT lanes for all truck traffic; and 2) mandatory use of TOT lanes for LCVs. The first scenario assumes no LCV operation (currently prohibited in California). The second scenario assumes that LCVs are allowed, but only on the TOT lanes; other heavy vehicles (i.e., non-LCV) will continue to travel on the general purpose lanes. Neither option was financially feasible.

Access/Egress Points in Urban Corridors

Providing frequent access/egress points in urban TOT corridors is an important feature impacting travel demand on TOT lanes that serve short-haul trips. The SR 60 study in California found less than 50 percent of the truck traffic was attracted to dedicated TOT lanes if access was restricted to freeway-to-freeway interchanges or interchanges with the highest truck usage. This finding highlights the importance of weighing travel demand and revenue generation potential versus the increased cost of construction from providing frequent access/egress points for urban TOT lanes.

Demand Variations by Time of Day

Another critical issue related to travel demand is the time period when most truck travel occurs and its impact on travel time savings. Truck drivers typically avoid traveling during peak-periods in urban areas because of the congestion; therefore, truck volumes are the highest during midday.

The SR 60 study estimated that 69 percent of the truck traffic from the heaviest vehicles would occur outside the peak-period. However, travel time savings from using the TOT lanes during off-peak hours was minimal, thus reducing demand for the lanes and reducing their benefits for traffic relief. When analyzing the number of trucks that would use TOT lanes, and the impact of change in travel behavior on congestion levels, it is important to consider the effects at different times of day.

■ 5.0 Financial Feasibility Issues Related to TOT Lanes

As with any toll facility, a TOT lane might be expected to have some or all of its operations, maintenance, and capital costs covered by toll revenues, either through government-initiated financing or through public private partnerships (PPP). Financing for a publicly financed facility can be structured in numerous ways; many are beyond the scope of this paper. Most financial structures are likely to include some form of revenue or general obligation bonds, with the toll proceeds pledged to pay off the debt after satisfying operating and maintenance requirements.

With PPP, a public entity could enter into a long-term franchise agreement with the private sector to finance, build, and operate the facility for a specific timeframe specified under the franchise agreement, at the end of which the ownership of the facility would revert to the public entity. The private consortium would use toll revenues from the facility to repay its debt, as well as derive profit. A positive return on investment (ROI) would imply that toll revenues are sufficient to cover the capital and operating costs of the truckways, and also provide a return on the funds invested. Private investors would generally consider a ROI in double digits to be attractive.

Other variations of PPP involve the private sector designing, building, operating, and maintaining a project without taking revenue risk. Such projects might reimburse the private partner through mechanisms such as availability payments or shadow tolls, but the revenue risk would remain with the government project sponsor.

If toll revenues prove insufficient to finance TOT lanes, there is the option of blending toll-based funding with other public funds. A decision to mingle the two sources of funds should consider whether there may be more uses of required public funds.

The Reason Foundation study (2004) on TOT lanes contained a sketch-level analysis that showed for a rural, two-lane toll truckway with a capital cost of approximately $2.74 million per route-mile (or $1.4 million per lane-mile), tolls must generate revenues of around $400,600 per mile per year to cover $274,400 in annual debt service and $126,200 in annual Operations and Maintenance (O&M) costs.[8] The Reason Foundation's 2002 study provided estimates for the private ROI for various toll rates, truck traffic diversion, and capital cost scenarios to assess the feasibility of private sector investment in long-haul TOT lanes, and found that under certain circumstances (e.g., high truck diversion rates and low capital costs) TOT lanes could be an attractive investment for the private sector.

Other studies, however, have concluded that toll revenues may not be sufficient to fully cover cost of TOT lanes. Initial financial analyses on the proposed California TOT lanes showed that tolls would be unlikely to cover the full cost of implementation. The analysis on the SR 60 determined tolls would cover less than 30 percent of the project costs. In a recent evaluation of the California TOT lane system, SCAG estimated the ROI for trucks using TOT lanes in the morning peak-period at between $5 and $11 in travel time savings for each $1 of toll paid, based on a toll of 86 cents per mile. However, the study concluded that, even though the analysis suggested tolls could be set at a much higher rate than initially assumed, it would be unlikely the tolls could be set at a rate sufficient to cover the full TOT lane system costs. The Reason Foundation study on the Miami toll truckway estimated that tolls could cover over 50 percent of the project cost, yet other revenues would be needed to fully support the project.

Double-Taxation Issues

Consideration of current federal and state/local taxes paid by trucks in the feasibility analysis of TOT lanes is particularly important in the case of mandatory enforcement of truck operations on these facilities. The Reason Foundation study (2002) makes a case for not charging fuel and other trucks excise taxes to vehicles using mandatory TOT lanes. The study argues that applying tolls for trucks on TOT lanes in addition to levying federal and state/local user taxes would be equivalent to "double taxation," and could potentially encounter strong trucking industry opposition. The study suggests providing rebates based on vehicle miles traveled (VMT) traveled on TOT facilities to either trucking companies or TOT lane operators.

[8] Costs were adjusted from 2004 dollars to 2007 dollars using CPI. In 2004 dollars, cost per route-mile of TOT lanes was $2.5 million; toll revenues = $365,000 per mile; debt service = $250,000; and O&M costs = $115,000.

Such tax rebates could potentially harm State Highway Trust Funds (HTFs) by decreasing their ability to meet state highway investment needs. The Reason Foundation provided the following examples on how the TOT lanes would benefit states – benefits which, in their opinion, outweigh the potential impact to state transportation revenues

- The addition of TOT lanes to an existing highway corridor would provide new lane capacity at a location where it was needed, and where the state DOT would otherwise, presumably, have to spend its own funds to realize that capacity. Thus, through the implementation of a TOT lanes (assuming that they are self-financed), the DOT would avoid the cost of adding that lane capacity.
- TOT lanes could lead to significant reductions in wear and tear on general purpose (GP) lanes by attracting between 25 and 100 percent of existing heavy-duty truck traffic off these lanes. This would, in turn, result in significant reduction in the DOT's maintenance and rehabilitation expenditures on the GP lanes.

In the case of Oregon, trucks weighing more than 26,000 are charged a weight-distance tax and are exempted from paying the state diesel tax (24 cents per gallon). Weight-distance tax rates are reviewed periodically through highway cost allocation studies. Final weight-distance tax rates are established through legislative action. The Constitution of Oregon requires that "the share of revenues paid for the use of light vehicles, including cars, and the share of revenues paid for the use of heavy vehicles, including trucks, is fair and proportionate to the costs incurred for the highway system because of each class of vehicle." Any tolling scheme for TOT lanes would have to be consistent with this provision. This would seemingly require the total expense of TOT lanes, including maintenance, to be toll financed.

Risk Factors

As with any toll facility, numerous risk factors must be taken into account and addressed in the financial structure. Revenue risk is one – whether enough drivers will choose to pay the tolls sufficiently to repay the investors (whether they are private equity investors or bondholders). Revenue risk is likely to be significant for a new type of toll product such as a TOT lane, and will result in higher concession bids from the private sector, higher interest rates on bonds, or insurance premiums on bond insurance. Other risk factors include construction risk (the ability of the government or the contractor to deliver the project on time) and political risk (the decisions of individual government entities that could delay the project).

■ 6.0 Evaluation Considerations for TOT Lane Proposals

Chu and Meyer (Georgia Tech) proposed a five-criteria framework for TOT lanes in urban corridors based on a review of similar work around the country. Criteria used in this and other TOT lane studies include:

- Truck volumes (as a percentage of total volumes or average daily truck volumes);

- Number of through truck trips (particularly in urban areas);
- General traffic volumes (peak, off-peak, or daily);
- Level of service (congested conditions in general purpose lanes, V/C ratio);
- Proximity to truck activity centers (e.g., airports, seaports, truck terminals, railroads);
- High rates of truck-related crashes;
- Existence of freight bottlenecks; and
- Truckers' willingness to pay.

Table 6.1 summarizes the criteria developed by Chung and Meyer for urban TOT lanes serving primarily through truck traffic. The various measures for each criterion were developed using Atlanta-specific data. For example, the daily truck volumes and truck percentage thresholds were based on the 50th percentile for both measures. The threshold for the rate of truck-related accidents was based on the average value on the freeway network from 2000 to 2005. Chung also developed criteria to determine engineering feasibility based on a percentage of through truck trips and ROW availability. These criteria would be used to determine the location of TOT lanes (e.g., at-grade inside or outside the general purpose lanes, or in an elevated structure). For instance, of 20 interstate segments examined in Atlanta, the percentage of through truck traffic in one-half of these segments exceeded 50 percent. When the percentage of through truck traffic exceeds 50 percent, Chung suggested that truck lanes be constructed inside the corridor, with few access points. Developing a similar methodology for Oregon would require an evaluation of these criteria against Oregon's traffic data on facilities where TOT lanes would be attractive, such as heavily congested urban highways, highway access to truck traffic generators, and long-haul truck corridors through rural areas.

Table 6.1 Screening Criteria Used to Identify Potential TOT Lanes in Metropolitan Atlanta

Screening Criterion	Measure
Level of service (LOS), p.m. peak	2030 LOS ≥ E
Truck volumes (daily)	2030 Truck Volumes ≥ 9,000
Percentage of trucks (daily)	2030 Truck Percentage ≥ 14%
Rate of truck-related crashes (based on average regional crash rate)	Truck-Related Crashes ≥ 63 per 100 million VMT
Cost saving threshold (CST), p.m. peak (based on 90th percentile truckers' cost threshold)	CST > $3.00 per hour

Source: Hsing-Chung Chu and Michael D. Meyer, Ph.D., P.E., *A Screening Process for Identifying Potential Truck-Only Toll Lanes in Metropolitan Atlanta: The Atlanta Case*, presented at the TRB 2008 Annual Meeting.

GDOT recently completed a truck-only lanes study[9] (not truck-only *toll* lanes) in which the selection and evaluation process consisted of three phases: exploratory, segment, and system. The exploratory phase looked at: truck volumes (i.e., greater than 30,000 trucks per day in 2035), traffic congestion (i.e., LOS E or F in 2035), major truck activity centers/routes, freight bottlenecks, and planned/programmed improvements to identify potential TOT corridors. Once potential TOT corridors were identified, candidate segments were subject to a more extensive analysis based on the goals defined by GDOT for the study. The higher performing segments then were grouped into a system. A table summarizing the evaluation criteria for the GDOT truck-only lanes study is in Appendix E. The detailed evaluation criteria focused on the following six goals:

1. Enhance safety for all transportation systems;

2. Reduce congestion, improve level of service, and improve access and mobility for all citizens;

3. Provide a plan for truck lanes that are fiscally responsible, economically feasible, and equitable for all parts of the state;

4. Support local, regional, state, and national economic development initiatives; and

5. Avoid, minimize, and mitigate adverse impacts to the built, natural, social, and cultural environments.

The GDOT study looked at the benefit/cost ratio of truck-only lanes, but it did not include financial feasibility and/or tolling as part of the analysis. The economic benefits of truck-only lanes were estimated using the Highway Economic Analysis Tool (HEAT).

In separate work in California, Caltrans developed criteria to select potential TOT lane corridors based on the literature review for the SR 60 study, including: 1) percent of truck volumes > 30 percent; 2) peak hour volumes > 1,800 vehicles per lane per hour; and 3) off-peak volumes > 1,200 per lane per hour.

The criteria for selecting rural truck tollway corridors used by the Reason Foundation included: 1) truck volumes (greater than 10,000 per day in 2020); 2) volume to capacity ration (V/C) greater than one by 2020; 3) connectivity to existing LCV routes; 4) number of LCV-oriented companies interested in using TOT lanes if offered on specified rural corridors; 5) ROW availability; and 6) type of terrain (flat, rolling, and mountainous).

[9] HNTB, *Georgia Statewide Truck Lanes Need Identification Study*, prepared for the Georgia Department of Transportation, April 2008. Available on-line at http://www.gatrucklanestudy.com (last accessed on October 14, 2008).

Oregon DOT identified four potential policy objectives that might be achieved by toll applications, including TOT lanes.[10] The methodology for evaluating potential TOT corridors and/or proposals should include criteria that address each of these policy objectives: funding, congestion relief, economic growth, and environment. Based on the literature review, and drawing mainly from the GDOT study, Table 6.2 summarizes some of the measures that might be considered by Oregon DOT to evaluate TOT lane proposals so that they can be compared to other alternatives.

Table 6.2 Proposed Criteria to Evaluate TOT Lane Proposals

Funding/Financial	Congestion Relief	Economic Growth	Environment
• Capital Costs; • O&M Costs; • Toll Revenues; and • Return on Investment.	For both GP and TOT lanes, and for the transportation system as a whole, peak and daily average: • Speed; • Vehicle miles traveled; • Vehicle hours traveled; • Delay; • Travel time; and • Reliability improvements.	• Productivity improvements; • TOT lane impacts on employment, income, gross state product compared to the no-build alternative; • User benefits from business trip; • Accessibility; and • Benefits/costs.	• Air quality; • Noise; • Effects on land use; and • Energy consumption.

7.0 Conclusions

A few truck-only highway facilities exist in the United States, but no truck-only toll lanes. The purpose of truck-only facilities is to promote safer traffic flow by separating trucks from cars, or to reduce traffic congestion (for cars, trucks, or both). Current truck-only facilities are in use on steep highway grades (on I-5 in Oregon and California), and for special access routes to ports (Louisiana).

Truck size and weight restrictions on most U.S. highways limit the productivity of trucks. In some states and on some roads LCV are allowed, thus enabling more freight to be hauled by a single truck and increasing productivity on certain routes. A third motivation

[10] Cambridge Systematics, Inc., *The Future of Tolling in Oregon: Understanding How Varied Objectives Relate to Potential Applications*, prepared for the Oregon Department of Transportation, August 2007.

for truck-only facilities, then, is to increase freight-hauling productivity of trucks while mitigating any safety concerns.

The motivation to add tolls to truck-only facilities is to provide a revenue source to pay for the improvements. For TOT facilities to work, they must provide value to the trucker; otherwise, they will not pay the toll. Although building new truck toll lanes (or converting existing HOV lanes to truck toll lanes) and requiring trucks to use them has been considered, such a policy is unlikely to ever be enacted. The only potential for mandatory use of a toll lane for trucks is in the case of LCV, where LCV are permitted in the toll lane, but not in the adjacent nontoll lane.

TOT lanes can come in three varieties:

1. Dedicated long-haul truckways;

2. Access routes to ports; and

3. Urban corridor truck lanes.

The main selling point of dedicated long-haul truckways is that they would be built to standards that allow LCV to operate safely. Truckers would be willing to pay to use these facilities to allow them to reap greater productivity from the line-haul portion of their trip. Oregon, however, already allows LCV on major highways so there is little additional value to be derived from this variety of TOT lane in Oregon.

Truck access to ports is not a significant concern in Oregon, so creating new highway capacity to service this market through TOT facilities is not likely.

Congestion exists in parts of the Portland metropolitan area, and is expected to increase over time. Right-of-way is limited, and there is little appetite for freeway expansion. Urban corridor TOT lanes are a potential solution to providing trucks with a reduced-congestion alternative to moving around the metropolitan area.

As with any infrastructure project, consideration of urban corridor TOT lanes requires careful examination of the capital and operating costs, environmental impacts, user benefits and costs, economic benefits and costs, and financial feasibility. The outcome of such analysis will vary widely depending on the specifics of any proposal, but the following general comments apply:

- The cost of new lanes in urban areas is high. Because of special design standards, the cost of new lanes that cater to trucks are higher. In Atlanta, the cost per lane-mile of implementing new truck-only lanes was estimated at approximately $21 million. Other TOT studies show lane-mile costs in urban areas ranging between $10 million and $30 million.

- Truck travel demand is fairly level over the course of the day, whereas auto traffic tends to peak in the morning and evening commute periods. Truckers will pay only for time or reliability savings, and those savings are significant only during commute peak-periods. This likely means little demand for special TOT lanes for much of the day, because of inadequate time savings.

- Long-distance trucks passing through the Portland metro area may see little value in time savings that are a small percentage of the total travel time of a trip. Other types of truckers, in particular delivery services that need to visit multiple customers per day, may be more sensitive to travel time delay and reliability and more willing to pay a toll. The question is: what fraction of the truck demand in the region is made up of this type of truck, and to what extent are they traveling in congested time periods when paying a toll would be worthwhile.

- It is difficult to raise enough money through tolls for a standard road that generates revenue all day. A road (or lane) that is expensive due to location and design standards, but only has value to the customer for a few hours per day, is not likely to succeed.

- Currently, many toll roads are built with a combination of toll-leveraged funds and government funds. In this case, government should calculate whether expenditure for this subsidy is the best use of public funds, or if there are other, more cost-effective means of achieving the same objective. This calculation would be entirely subject to the specifics of the proposal.

Truck-only toll facilities can never provide value in Oregon, but the opportunities are limited, and should be compared carefully to other ways to accomplish similar objectives.

Appendix A

Glossary of Terms and List of Acronyms

Glossary of Terms

Buffer Time – The additional time added to the estimated travel time to account for recurrent and nonrecurrent congestion to ensure on-time arrival of goods.

Distance-Based Tolls – Fixed toll rates based on distance traveled and vehicle type.

Diversion – The result of people making different travel choices, in this case as a result of a toll. Diversion can refer to taking different routes, or changing modes, travel time or destination.

Exclusive Truck Lanes (ETL) – A road facility that is open exclusively for trucks.

High-Occupancy Toll (HOT) Lane – Travel lanes restricted to either qualifying HOVs or solo drivers willing to pay a toll. The toll typically varies by time of day or traffic levels and are collected electronically.

High-Occupancy Vehicle (HOV) – A vehicle containing more than one person.

High-Occupancy Vehicle (HOV) Lane – A travel lane restricted to transit and carpool vehicles meeting occupancy requirements of two or three people per car. HOV lanes are meant to carry more people in less space than general purpose lanes.

Longer Combination Vehicles (LCV) – Tractor/trailer combinations of two or more cargo trailers or semitrailers operating on the Interstate System at a gross vehicle weight greater than 80,000 pounds.

Managed Lanes – Any toll lane that uses variably priced tolls to maintain superior, less congested travel conditions.

Nonrecurrent Delay – A type of highway delay that occurs because of incidents and is, therefore, not as predictable as recurrent delay caused by traffic exceeding capacity, bottlenecks, or other infrastructure problems.

Recurrent Delay – A type of highway delay that occurs regularly, due to too much traffic and/or geometric constraints.

Tolling – Charging a price to use a road, bridge, or tunnel.

Travel Time Reliability – A measure of variation in travel time from day to day.

Truck-Only Toll (TOT) Lane – Limited access, normally barrier-separated toll lanes available only to trucks for a variably priced toll. All tolls are collected electronically.

Value of Time – One of the most important benefits of road pricing, as well as other transportation projects, is travel time savings. What these savings are worth to motorists can vary by income, gender, age, trip purpose, mode used, length of trip, uncertainty of travel time, and other factors. This in turn implies analytical difficulties in applying values to given situations.

List of Acronyms

ATRI	American Transportation Research Institute
EIS	Environmental Impact Statement
ETL	Exclusive Toll Lanes
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
HEAT	Highway Economic Analysis Tool
GDOT	Georgia Department of Transportation
GP Lanes	General Purpose Lanes
HOT Lanes	High-Occupancy Toll Lanes
HOV Lanes	High-Occupancy Vehicle Lanes
HTF	Highway Trust Fund
LCV	Long Combination Vehicles
O&M Costs	Operations and Maintenance Costs
Oregon DOT	Oregon Department of Transportation
PPP	Public-Private Partnerships
ROI	Return on Investment
ROW	Right-of-Way
SANBAG	San Bernardino Associated Governments
SCAG	Southern California Association of Governments
SRTA	Georgia State Road and Tollway Authority
TOT Lanes	Truck-Only Toll Lanes
TTI	Texas Transportation Institute
TTC	Trans-Texas Corridor
U.S. DOT	United States Department of Transportation
V/C	Volume to Capacity Ratio
VMT	Vehicle Miles Traveled

Appendix B

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Appendix C

Evaluation of TOT Lanes Ability to Achieve Policy Objectives

Evaluation of TOT Lanes Ability to Achieve Policy Objectives

Policy Objective		Convert GP to TOT	Convert HOV to TOT	New TOT Lane
I.	**Funding**			
a.	Fund Project Costs	Yes, cost likely low	Possible	Possible, new TOT lanes likely to be very expensive
b.	Maximize Revenue Generation	Possible, because conversion would be a "take-away," revenue maximizing policy might be a difficult policy choice	Likely public policy would be to maximize flow rather than revenue	Possible
c.	Subsidize Other Transportation Improvements	Possible	Possible	Possible
d.	Attract Private Investment	Does not address – converting a GP to TOT lane would not require new private investment; converting and then leasing would be possible, but policy rationale would be tenuous	Does not address – converting a HOV to TOT lane would not require new private investment; converting and then leasing would be possible, but policy rationale would be tenuous	Possible
e.	Accelerate Project Delivery	Does not address	Does not address	Possible
II.	**Congestion Relief**			
a.	Demand Management	Does not address	Does not address	Does not address
b.	Reduce Recurrent Delay	Potentially for trucks; could worsen for other vehicles	Potentially for trucks; could worsen for other vehicles	Yes
c.	Improve Reliability	Potentially for trucks; could worsen for other vehicles	Potentially for trucks; could worsen for other vehicles	Yes
III.	**Economic Growth**			
a.	Competitiveness of Specific Industries	Unlikely benefits; higher value commodities would benefit, but would increase wages and decrease access to labor	Uncertain benefits; higher value commodities would benefit, but could increase wages and decrease access to labor	Uncertain benefits; higher value commodities would benefit, but alternative capacity (HOT or GP) may have larger benefit

Policy Objective		Convert GP to TOT	Convert HOV to TOT	New TOT Lane
III.	**Economic Growth (continued)**			
b.	Business Attraction	Unlikely benefit; TOT would have to trigger significant industrial development for benefits to exceed disbenefits to mixed flow traffic	Unlikely benefit unless TOT makes underdeveloped areas very attractive for truck-related industries	Possible benefit if under or undeveloped land needs new roadway access
c.	Trade and Good Movement	Unlikely benefit; TOT would have to generate significant trucking benefits to exceed disbenefits to mixed-flow traffic	Possible benefit if trucking benefits exceed disbenefits from potential increase congestion in mixed traffic	Possible benefit if GP lanes congestion imposes severe delay and uncertain reliability on goods movement
IV.	**Improve the Environment**			
a.	Air Quality	Countervailing effects needing specific study	Countervailing effects needing specific study	Countervailing effects needing specific study
b.	Growth Management	Countervailing effects needing specific study	Countervailing effects needing specific study	Countervailing effects needing specific study
c.	Increase Ridership	Countervailing effects needing specific study	Countervailing effects needing specific study	Countervailing effects needing specific study
d.	Reduce energy Consumption	Countervailing effects needing specific study	Countervailing effects needing specific study	Countervailing effects needing specific study

Appendix D

National Experience on TOT Lanes

National Experience with TOT Lanes

In the United States, several states have evaluated the feasibility of dedicated truck lanes, and some states have either dedicated truck lanes in operation (e.g., Oregon's I-5 truck bypass lanes) or impose lane restrictions that prohibit heavy vehicles from traveling on certain lanes. However, there are no TOT lanes in operation in the United States, although some states and institutions have analyzed the feasibility of implementing them. This section presents some of the TOT lane proposals that have been evaluated over the last decade.

California

In Southern California, TOT lanes have been proposed and evaluated in three corridors (SR 60, I-710, and I-15). These corridors carry significant freight traffic, have significant truck mobility issues, and have issues involving truck contribution to congestion.

SR 60 Truck Lane Feasibility Study (February 2001)[11]

The Southern California Association of Governments (SCAG) conducted a feasibility study of dedicated truck lanes on about 38 miles of SR 60. SR 60 is a major east-west corridor from downtown Los Angeles, running through industrial sections of the San Gabriel Valley and through the warehouse districts south of the Ontario International Airport. Heavy truck traffic accounts for about 15 percent of the total traffic volumes. The study determined feasibility in three areas: technical, community, and financial.

Technical feasibility was evaluated by first assessing the facilities needed to meet future truck demand. Based on 2020 projections of truck traffic, it was determined that a four-lane truck facility would be needed to accommodate future demand. An at-grade facility would require significant right-of-way acquisition, whereas an elevated structure would have less right-of-way impact, requiring only new right-of-way on two percent of the alignment. A "hybrid" alternative was considered that combined at-grade for most of the corridor and elevated truck lanes in two segments, minimizing both the right-of-way acquisition needs and the higher costs of constructing elevated structures. The project was determined "technically feasible" under the hybrid alternative.

The travel demand analysis of the study dealt with issues related to truck traffic in this corridor. First, truck volumes were the highest during midday period, after the morning peak and before the afternoon peak when congestion is hardly an issue. Consequently,

[11] Kaku Associates, *SR 60 Truck Lane Feasibility Study*, prepared for the Southern California Association of Governments, February 2001.

travel time savings in the special lanes during the highest truck volume periods are minimal, reducing demand for TOT lanes. In addition, travel distances for most trips were short, and limited access points affected demand for the proposed TOT facility.

The cost of constructing a dedicated truck facility on SR 60 was estimated at $4.3 billion (about $28.2 million per lane-mile,[12] in 2007 dollars), of which $1.2 billion could be covered by charging tolls to trucks, covering less than 30 percent of the project costs. Additional resources from local, state, and federal agencies would be required to fully fund the TOT lanes.

I-710 Major Corridor Study (March 2005)[13]

The 18-mile I-710 corridor is a major access route between East Los Angeles and the ports of Long Beach and Los Angeles. Congestion, air quality, and safety are major issues in the corridor, with truck traffic accounting for about 20 percent of the vehicles, a figure that has been projected to increase significantly by 2025, with truck traffic accounting for over 50 percent of the freeway capacity in some segments. This corridor is a main route for trucks traveling between the ports to rail yards, warehousing, and distribution points throughout the area. Similar to the SR 60 study, travel demand analysis showed that most truck trips are short-haul trips, making access to/from the TOT lanes an important consideration. Yet, limiting access points in the TOT corridor still generated sufficient truck demand.

The study initially evaluated five alternatives, one of which included the construction of a four to six-lane truck-only facility. Based on public input and concerns brought by citizens through the public process, a hybrid alternative was developed for further study, which combines improvements on the general purpose lanes and various interchanges, the construction of a four-lane truck-only facility (mostly at-grade), dedicated truck ramps, and access ramps to rail yards. The cost of the hybrid alternative was estimated at around $4.9 billion (about $68 million per lane-mile,[14] in 2007 dollars). Project funding analysis is ongoing, and includes potential application of tolls in the truck-only lanes.

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[12] Cost per lane-mile calculated assuming a four-lane, 38-mile facility. Cost includes right-of-way and all construction elements.

[13] Parsons Brinckerhoff Quade & Douglas, Inc., *I-710 Major Corridor Study*, prepared for the Los Angeles County Metropolitan Transportation Authority, March 2005.

[14] Cost per lane-mile calculated assuming a four-lane, 18-mile facility. Cost includes right-of-way and all construction elements, such as elevated structures and interchanges.

I-15 Comprehensive Corridor Study (December 2005)[15]

SCAG identified I-15 in its Regional Transportation Plan as a truck-lane corridor. This, combined with Caltrans' need to identify future right-of-way needs for preservation and the San Bernardino Associated Governments' (SANBAG) need to develop a long-range improvement plan and implementation strategy for the corridor, led to this study. Some of the issues in the corridor include high truck traffic volumes (10 to 15 percent of total traffic), steep grades, heavy traffic, and lack of alternative travel options. One of the alternatives chosen for detailed evaluation consisted in providing truck-only lanes along the 45-mile corridor between SR 60 and the City of Victorville. The analysis showed that truck-only lanes were the least cost-effective and most expensive of all alternatives evaluated. The cost was estimated between $2.1 and $3.7 billion ($12 to $21 million per lane-mile),[16] which is at least two to four times more expensive than the other build alternatives.

The financial analysis of alternatives considered two toll options: with or without provision for LCVs. The financial analysis indicates that revenues from truck tolls are not sufficient to fully fund the construction of dedicated truck lanes in this corridor.

Georgia

The Georgia State Road and Tollway Authority (SRTA) conducted a feasibility study for High-Occupancy Toll (HOT) and TOT lanes[17] in the Atlanta region. The TOT lanes study considered a network of voluntary TOT lanes and three scenarios:

1. New four-lane TOT facilities on I-75, I-85 N, and I-285;

2. Option 1, plus High-Occupancy Vehicle (HOV) lanes inside I-285 operating as TOT lanes during midday hours (10:00 a.m. through 3:00 p.m.); and

3. TOT lanes to operate in place of HOV outside and on I-285.

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[15] Parson Brinckerhoff Quade & Douglas, Inc., *I-15 Comprehensive Corridor Study*, prepared for the Southern California Association of Governments, the San Bernardino Associated Governments, and Caltrans (District 8), December 2005.

[16] Cost per lane-mile calculated assuming a four-lane, 45-mile facility. Cost includes right-of-way and all construction elements, such as elevated structures and interchanges.

[17] Parson Brinckerhoff Quade & Douglas, Inc., *Truck Only Toll Facilities: Potential for Implementation in the Atlanta Region*, prepared for the State Road & Tollway Authority, July 2005.

The analysis considered five performance measures:

1. Trip-time saving to TOT lane users;

2. Vehicle hours traveled in the region;

3. Vehicle miles traveled in the region;

4. Impact on conditions in the general purpose lanes of freeways; and

5. Impact on the region's local road network.

Overall, the study found that TOT lane users could realize travel time savings, and congestion in the general purpose lanes will be reduced.

A more recent study by GDOT [18] analyzed the feasibility of truck-only lanes assuming that no tolls would be collected and use would be voluntary. The analysis found that the additional capacity realized from trucks shifting to the truck-only lanes was consumed immediately by new travelers from parallel arterials, thus resulting in minimal impact to congestion on the general purpose lanes. The lane-mile cost of truck-only lanes was estimated between $20 to 22 million (2007 dollars). GDOT did not study TOT lanes.

I-70 (Missouri-Illinois-Indiana-Ohio), Corridors of the Future[19]

The states of Missouri, Illinois, Indiana, and Ohio are proposing the implementation of truck-only lanes along the 800-mile segment of I-70 that spans these four states. Truck volumes exceed 20 percent of the overall traffic using this route, and the project also might attract trucks from parallel routes. In addition, traffic congestion in the urban segments of the corridor is expected to increase dramatically by 2035, with heavy congestion forecasted in 97 percent of the urban segments.

The feasibility study (currently underway) will test the truck-only lanes concept on the I-70 corridor. The study will consider tolls as an alternative to finance the project. The project also proposes that the facility may be used to pilot LCVs and overweight increases on dedicated truck lanes.

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[18] Presentation by Mathew Fowler, Georgia Department of Transportation, *Georgia Truck Lane Needs Identification Study*, at the FHWA Talking Freight Seminar, March 19, 2008.

[19] Missouri Department of Transportation, Illinois Department of Transportation, Indiana Department of Transportation, and Ohio Department of Transportation, *Corridors of the Future Phase II Application: Interstate 70 Dedicated Truck Lanes*, submitted to Federal Highway Administration, May 2007.

Reason Foundation TOT Lanes Studies

Over the last several years, the Reason Foundation has published various studies, proposing TOT lanes, with emphasis on facilities that would allow LCVs to operate primarily through rural areas, and a recent study proposing TOT lanes in Miami that would support short-haul movements in an urban area.

Toll Truckways: A New Path Towards Safer and More Efficient Freight Transportation (June 2002)[20]

In this study, the Reason Foundation proposes the construction of TOT lanes to accommodate LCVs and other heavy trucks. The study assumed that truckers would be willing to pay a toll that is equivalent to up to one-half of the cost savings realized from using the truck lanes compared to the general purpose lanes.

The analyses in the study included:

- **Basic pavement design parameters for TOT lanes and general purpose lanes.** The analysis assumes that because of trucks transferring over the TOT lanes, design characteristics for the general purpose lanes change compared to the base case.

- **Productivity analysis, with two different levels of axle load limits and two different types of vehicles.** This analysis concluded that productivity gains through the implementation of TOT lanes carrying heavier and larger trucks were significant for trips over 25 miles.

- **Analysis of toll potential**.[21] TOT lanes in states with the most restrictive axle load limits could charge tolls between $0.50/mile to $2.14/mile, depending on the truck type, with a breakeven average distance of 14 miles. In states with more relaxed axle load limits, tolls range between $0.55/mile and $1.75/mile, depending on truck type. For this scenario, the breakeven average distance is 14 miles for a standard tractor/trailer and 49 miles for a long double truck.

- **Return on Investment (ROI) estimates**.[22] The study also evaluated the financial feasibility of TOT lanes, under various capital cost scenarios (from $1.2 million per lane-mile to $3.5 million per lane-mile), and tolls between $0.46/mile and $0.92/mile. The analysis yielded positive ROIs for all scenarios tested under different traffic conditions. The authors concluded that TOT lanes would be self-supporting and could even attract private investment under the study assumptions (e.g., construction within existing unused right-of-way).

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[20] Reason Foundation, *Toll Truckways: A New Path Towards Safer and More Efficient Freight Transportation*, Policy Study 294, June 2002.

[21] All data presented here have been adjusted from 2002 to 2007 dollars using CPI.

[22] Ibid.

The study concluded with recommendation on policy changes required for the implementation of TOT lanes, as proposed in the study: 1) provide right-of-way along existing highway corridors on the federal-aid highway system; 2) relax current federal truck size and weight restrictions for vehicles using the TOT lanes; and 3) reimburse/rebate state and federal fuel taxes of TOT lanes users for the miles driven on the facility.

Corridors for Toll Truckways: Suggested Locations for Pilot Projects (February 2004)[23]

Building upon the 2002 study, the Reason Foundation conducted a study that evaluated and recommended potential corridors for TOT lanes, with emphasis of providing facilities that both accommodate LCV trucks and connect with existing corridors where LCVs currently are allowed to operate. In Oregon, I-5 and I-84 currently allow LCVs.

As part of the study, the authors asked trucking companies (that currently operate LCVs) about corridors important for the operations. These corridors, coupled to others identified by Reason, were evaluated based on financial feasibility, in terms of both revenue generation and relatively low cost.

The revenue criteria for TOT corridor evaluation were:

- **Truck Volumes –** Gross volume over 10,000 trucks per day (by year 2020) and the percentage of all miles in the corridor with volumes exceeding 10,000 trucks per day.
- **Congestion –** Volume to capacity (V/C) ratio by 2020; the higher the V/C ratio, the more attractive the corridor is to add TOT lanes.
- **Connectivity –** Whether the proposed corridor connects to an existing LCV route.
- **Industry Suggestion –** Whether the proposed corridor was identified by trucking industries to be important for their operations.

Each of the revenue criteria was given a weight factor, and 10 corridors with the highest scoring were selected for additional analysis on cost. Most of these corridors are in the eastern portion of the United States, where LCVs operate in only a few corridors, compared to the West Coast where LCV use already is more prevalent. The proposed corridors are in rural areas, and a cross-section design of two lanes (one in each direction), plus shoulder/breakdown lane, and separated in the median and from general purpose lanes by Jersey barriers was assumed. For this type of design, the minimum right-of-way width required is 48 feet. Adding one lane in each direction would increase width requirement to at least 72 feet. For the cost analysis, Reason evaluated the 10 potential TOT corridors by weighing right-of-way availability and a terrain factor (flat, rolling, or mountainous). Finally, a revenue/cost ratio was determined to rank the 10 corridors.

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[23] Reason Foundation, *Corridors for Toll Truckways: Suggested Locations for Pilot Projects*, Policy Study 316, February 2004.

In addition to restating the policy recommendation from the 2002 study, the authors suggested legislation that facilitates multistate collaboration in planning and developing these TOT corridors, since most of them pass through two or more states.

Miami Toll Truckway: Preliminary Feasibility Study (November 2007)[24]

This study evaluated the feasibility of TOT lanes connecting from the Port of Miami and the Miami International Airport with points west of the airport. The TOT lanes would connect with the Port Tunnel that will be constructed over the next few years. Four alternative alignments were analyzed, assuming a combination of elevated structure and tunnel in the airport area.

The study assumed a TOT facility with two lanes and a total width of 50 feet. The cost per mile for elevated sections was assumed at $45 million (or $22.5 million per lane-mile), and $200 million per mile (or $100 million per lane-mile) for the tunnel sections. Right-of-way costs were developed using local data and estimated at $23 million/mile. The total cost for the TOT lanes was estimated at $1.1 to $1.3 billion (about $30 to 34 million[25] per lane-mile, in 2007 dollars).

The second part of the feasibility study included traffic and revenue forecast. Traffic was estimated from 2005 truck traffic data, assuming that truck diversion will be higher from routes that are closer to the proposed TOT lanes location, and a growth rate between three and five percent for all traffic through 2016 (opening year) and for Port traffic after 2016, respectively. The toll rate for drayage operations was estimated assuming that truck drivers are willing to pay up to 50 percent of the additional revenue that drayage operators[26] could realize by using the TOT lanes by being able to make more trips within a day by avoiding road congestion. That translated into a $9 toll (one-way, in 2007 dollars). The nondrayage toll was assumed at $6 one-way. An inflation factor of 3.5 percent was applied to adjust toll rates in the future. TOT revenues could cover over 50 percent of the project costs, and other revenues would be needed to fully support the project.

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[24] Reason Foundation, *Miami Toll Truckway: Preliminary Feasibility Study*, Policy Study 365, November 2007.

[25] Total cost includes ROW costs, and combines elevated (34 percent), tunnel (16 percent), and surface (50 percent) segments on a two-lane facility (one-lane per direction).

[26] Drayage operation consists of short-haul movements of containers from one point to the other over a short distance. In the case of Miami, these trips occur between the Port and both a rail yard west of the airport and several distribution centers in the Doral/Medley area.

Trans-Texas Corridor (TTC) Truck-Only Lanes

The Trans Texas Corridor (TTC) is a proposed 4,000-mile network of super corridors up to one-quarter mile in width consisting of toll roads for passenger vehicles and trucks, among other facilities such as intercity passenger and commuter rail, freight rail, and pipelines. Each segment of the TTC would consist of four 13-foot truck-only lanes, with a total width of 84 feet, including inner and outer shoulders.

Two main segments of the TTC currently are being considered for initial implementation include: 1) TTC-35, between Oklahoma to Mexico, running generally parallel the existing I-35 corridor between Laredo and Gainesville, passing through the Dallas-Fort Worth, Austin, and San Antonio metropolitan areas; and 2) I-69/TTC, between northeast Texas and Mexico, following U.S. 59 from Texarkana through Houston to either Laredo or the Rio Grande Valley. Other high-priority corridors in the TTC system include corridors that would parallel I-45 from Dallas to Houston, and I-10 from El Paso to Orange.

The entire 4,000-mile network of corridors in the TTC system is expected to cost between $167.4 billion and $211.5 billion ($10.5 to $13.2 million per lane-mile, 2007 dollars),[27] based on the assumption that right-of-way (ROW) costs range between $13.5 billion and $43.8 billion, construction costs amount to around $144.6 billion at the rate of $36.2 million per centerline-mile, and miscellaneous costs range between $9.2 billion and $23 billion.

Given the significant costs of implementing the TTC, the Texas Department of Transportation (TxDOT) has focused in pursuing public-private partnerships (PPP or P3) for the delivery of the TTC. In March 2005, TxDOT signed a comprehensive development agreement with a private consortium authorizing $3.5 million for planning of the TTC-35 segment. This agreement, however, does not designate the alignment, authorize construction, or set toll rates for the TTC-35 corridor. It is unlikely that the initial phases of TTC 35 will involve TOT lanes.

Chicago Mid-City Freightway

The "Mid-City Freightway" is a proposed grade-separated roadway with one lane in each direction for the exclusive use of commercial vehicles, including both trucks and scheduled buses, and it is one of five alternatives being studies for the Mid-City Transitway Corridor. The 22-mile corridor runs parallel and one-fourth mile west of Cicero Avenue, starting at the I-90 and I-94 junction, running south up to I-94 (Dan Ryan Expressway) in the vicinity of 87th Street. A study[28] was completed in November 2006 that

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[27] Converted from $145.2 billion and $183.5 billion in 2002 dollars to 2007 dollars using CPI.

[28] Cambridge Systematics, Inc., *Mid-City Freightway: Evaluation of Alternative Alignments and Tolls*, prepared for the Chicago Department of Transportation, November 2006.

evaluated demand for proposed alignments and tolls. The study evaluated four tolling scenarios: 1) no tolls; 2) current I-PASS per mile rate for trucks; 3) double the I-PASS per mile rate; and 4) four times the I-PASS per mile rate.

The full build scenario without tolls was expected to attract between 8,400 and 13,700 trucks per day. By adding a toll equivalent to double the current I-PASS rate, the freightway would be expected to attract 6,100 to 12,400 trucks per day. In general, it was observed that the implementation of the freightway would lead to increases in truck traffic on feeder routes to the freightway and decreases in parallel routes.

Appendix E

Criteria for Detailed Evaluation of Truck-Only Lanes

Criteria for Detailed Evaluation of Truck-Only Lanes

A. Enhance Safety for All Transportation Systems

1. Improve Safety for Cars and Trucks on Georgia's Highway Network:
   - Total crashes;
   - Injury crashes;
   - Fatality crashes;
   - Effects on fatality crashes per year; and
   - Effects on fatality crashes over a 30-year lifecycle.
2. Promote Security of Highway Network for All Motorists:
   - Access to truck stops;
   - Access to rest areas; and
   - Access to weigh stations/inspection stations.

B. Reduce Congestion, Improve Levels of Service, and Improve Access and Mobility for All Citizens

1. General Travel Conditions:
   - Corridor length;
   - Average truck lane usage; and
   - Average General Purpose lanes usage:
     - Cars;
     - Trucks;
     - Total: General Purpose lanes;
     - Total: General Purpose lanes plus Truck-Only lanes; and
     - Percent of trucks utilizing Truck-Only lanes.
2. Reduce Congestion
   - Average peak-period speed (p.m. peak-period):
     - General Purpose lanes; and
     - Truck-Only lanes.
   - Average daily speed:
     - General Purpose lanes;
     - Truck-Only lanes;
     - Peak-period level of service (LOS);
     - General Purpose lanes; and
     - Truck-Only lanes.
   - Daily LOS:
     - General Purpose lanes; and
     - Truck-Only lanes.

B. Reduce Congestion, Improve Levels of Service, and Improve Access and Mobility for All Citizens (continued)

2. Reduce Congestion (continued)
   - Vehicle miles traveled per day:
     - Facility;
     - Corridor (Buffer = four miles);
     - Corridor (Buffer = 12 miles); and
     - Region.
   - Vehicle hours traveled:
     - Facility;
     - Corridor (Buffer = 4 miles);
     - Corridor (Buffer = 12 miles); and
     - Region.
   - Daily congestion delay (free flow minus congested):
     - Autos;
     - Trucks in General Purpose lanes;
     - Trucks in Truck-Only lanes; and
     - Total.

3. Improve Access, Connectivity, and Reliability:
   - Provide access to major truck generators;
   - Provide an alternative to major freight bottlenecks;
   - Connect major freight origins and destinations;
   - Average travel time – General Purpose lanes;
   - Average travel time – Truck-Only lanes;
   - Improve system reliability; and
   - Total number of interchanges and intersections improved.

C. Provide a Plan for Truck Lanes that are Fiscally Responsible, Economically Feasible, and Equitable to All Parts of the State

1. Capital Costs:
   - Preliminary engineering;
   - Cost of construction;
   - Cost of right-of-way requirements;
   - Cost of utilities; and
   - Total capital cost.

2. Annual Costs:
   - Annual operations and maintenance costs.

C.	**Provide a Plan for Truck Lanes that are Fiscally Responsible, Economically Feasible, and Equitable to All Parts of the State (continued)**
3.	Transportation Benefits: • Annual user delay savings; • Travel time and cost effects (annual based on 250 weekdays per year); • Safety; • VMT change; • Reliability; • Market accessibility; • Economic impacts (regional and state economy); and • Transportation expenditures.
4.	Cost-Effectiveness: • Benefit/cost ratio.
D.	**Support Local, Regional, State, and National Economic Development Initiatives**
1.	Consistent with Plans: • Consistent with regional and local transportation plans; • Consistent with regional and local land use plans; and • Consistent with regional and local economic development plans.
E.	**Avoid, Minimize, and Mitigate Adverse Impacts to the Built, Natural, Social, and Cultural Environments**
1.	Social and Economic Effects: • Effects on known historic, archeological, and cultural resources; • Total number of residential and commercial displacements; • Effects on major utilities; • Effects on aesthetics and visual quality; and • Effects on neighborhood and business access, circulation, and emergency services.
2.	Effects on Natural Environment: • Effects on air quality; • Effects on noise; • Energy consumption; • Disturbance to floodplains, hydrology, water quality, and water resources; • Disturbances to wetlands/jurisdictional waters; and • Effects on/from potential hazardous materials sites.
3.	Effects on Parklands.
4.	Effects on Land Use: • Effects on land use patterns/compatibility; and • Effects on potential land development.
F.	**Miscellaneous**
1.	Construction: • Temporary construction effects; and • Constructability.

Source: GDOT, Georgia Statewide Truck Lanes Needs Identification Study, April 2008.