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PRICED MANAGED LANE GUIDE

2012

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16. Abstract

This *Guide* is intended to be a comprehensive source of collective experience gained from priced managed lanes implemented in the United States through 2012. The *Guide* presents a wide range of information on priced managed lanes. The purpose of this *Guide* is to assist transportation professionals as they consider, plan, and implement priced managed lanes projects.

The *Priced Managed Lane Guide* also updates the Federal Highway Administration's (FHWA) 2003 *Guide for HOT Lane Development*. At the time the earlier *Guide* was written, there were only four priced managed lane facilities operating in the United States and few transportation professionals had firsthand experience with implementing or operating these facilities. As of May 2012, there are 14 operating managed lane facilities nationwide, an additional 14 in construction, and approximately 25 others in planning.

The *Guide* addresses a wide range of policy, outreach, and technical issues associated with the implementation of priced managed lanes, focusing on the knowledge and experience gained from the new projects that have advanced in the past decade. The *Guide* also provides detailed profiles of 21 priced managed lane projects that are either operational or nearing completion. These resources represent the most comprehensive compilation of data and information prepared by FHWA on priced managed lanes to date.

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ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ALPR	Automatic License Plate Recognition
ATM	Active Traffic Management
BRT	Bus Rapid Transit
BTL	Bus Toll Lane
Caltrans	California Department of Transportation
CCTV	Closed-Circuit Television
CDA	Comprehensive Development Agreement
CHP	California Highway Patrol
CMAQ	Congestion Mitigation and Air Quality
CNG	Compressed Natural Gas
CRD	Congestion Reduction Demonstration
DAR	Direct-Access Ramp
DB	Design-Build
DBB	Design-Bid-Build
DBFOM	Design-Build-Finance-Operate-Maintain
DBOM	Design-Build-Operate-Maintain
DSRC	Dedicated Short Range Communications
EA	Environmental Assessment
EIS	Environmental Impact Statement
ETC	Electronic Toll Collection
ETL	Express Toll Lane
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FTA	Federal Transit Administration
FY	Fiscal Year
GARVEE	Grant Anticipation Revenue Vehicle
GDOT	Georgia Department of Transportation
HCTRA	Harris County Toll Road Authority
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
HOV2	Two-Person High-Occupancy Vehicle
HOV2+	Greater than Two-Person High-Occupancy Vehicle
HOV3	Three-Person High-Occupancy Vehicle
HOV3+	Greater than Three-Person High-Occupancy Vehicle
ICM	Integrated Corridor Management
ID	Identification
ILEV	Inherently Low-Emission Vehicle
ISTEA	Intermodal Surface Transportation Efficiency Act (1991)
ITS	Intelligent Transportation System
MAP-21	Moving Ahead for Progress in the 21st Century

MARTA	Metropolitan Atlanta Regional Transit Authority
MDTA	Maryland Transportation Authority
MnDOT	Minnesota Department of Transportation
MPH	Miles Per Hour
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NCHRP	National Cooperative Highway Research Program
NCTA	North Carolina Turnpike Authority
NEPA	National Environmental Protection Act
NTTA	North Texas Tollway Authority
P3	Public-Private Partnership
RFID	Radio Frequency Identification
RITA	Research and Innovation Technology Administration
ROD	Record of Decision
RSTP	Regional Surface Transportation Program
RTR	Real-Time Ridematching
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SANDAG	San Diego Association of Governments
SHRP 2	Second Strategic Highway Research Program
SOV	Single-Occupant Vehicle
SR	State Route
SRTA	State Road and Toll Authority (of Georgia)
TCRP	Traffic Congestion Relief Program
TDM	Transportation Demand Management
TIFIA	Transportation Finance and Innovation Act
TIP	Transportation Improvement Program
TMC	Traffic Management Center
TOT	Truck-Only Toll Lanes
TxDOT	Texas Department of Transportation
UPA	Urban Partnership Agreement
USDOT	United States Department of Transportation
VDOT	Virginia Department of Transportation
VMS	Variable Message Sign
VOR	Value of Reliability
VOT	Value of Time
VPPP	Value Pricing Pilot Program
WAN	Wide-Area Network
WSDOT	Washington State Department of Transportation

Preface

The Purpose of this Guidebook

This *Guide* is intended to be a comprehensive source of collective experience gained from priced managed lanes implemented in the United States through 2012. The *Guide* presents a wide range of information on priced managed lanes. The purpose of this guide is to assist transportation professionals as they consider, plan, and implement priced managed lanes projects.

The *Priced Managed Lane Guide* also updates the Federal Highway Administration's (FHWA) 2003 *Guide for HOT Lane Development*. At the time the earlier *Guide* was written, there were only four priced managed lane facilities operating in the United States and few transportation professionals had firsthand experience with implementing or operating these facilities. As of May 2012, there are 14 operating managed lane facilities nationwide, an additional 14 in construction, and approximately 25 others in planning.

In the nine years since the publication of the earlier *Guide*, priced managed lanes have become an integral part of the nation's transportation infrastructure and its response to urban mobility challenges. There is also greater diversity in the design, operation, and procurement of these facilities. Yet, a number of basic commonalities prevail: priced managed lanes provide an opportunity to manage congestion, generate revenue to support a variety of transportation needs, and facilitate the provision of new travel options.

The *Guide* addresses a wide range of policy, outreach, and technical issues associated with the implementation of priced managed lanes, focusing on the knowledge and experience gained from the new projects that have advanced in the past decade. The *Guide* also provides detailed profiles of 21 priced managed lane projects that are either operational or nearing completion. These resources represent the most comprehensive compilation of data and information prepared by FHWA on priced managed lanes to date.

Conducted as a partnership between FHWA and a consultant team led by Parsons Brinckerhoff, together with Kimley-Horn and Associates, Inc., and PRR, Inc., the *Guide* has benefited from the ongoing input of a Peer Development Group comprised of over 30 transportation professionals around the country who are involved in implementing or operating priced managed lane projects. The experience of the Peer Development Group is reflected in the *Guide* and the project profiles. The *Guide* has also benefited from their technical review.

Organization of this Document

The *Priced Managed Lane Guide* has been prepared to educate and foster informed decision making and is organized into the following chapters:

1. Managed Lanes: Congestion and Travel Demand Management
2. Planning and Implementation of Priced Managed Lanes
3. Organizational / Institutional Frameworks for Priced Managed Lanes

4. Public Outreach
5. Finance and Procurement
6. Design
7. Operations and Maintenance

Appendix 1: Priced Managed Lane Project Profiles

If readers need information on a specific topic or project, they may refer to individual chapters, sub-sections, or profiles. Useful information can be obtained without reading the document from cover to cover.

1 Purpose and Need for Managed Lanes

1.1 Managed Lanes in the Context of Congestion and Travel Demand Management

Managed lanes are designated lanes or roadways within highway rights-of-way where the flow of traffic is managed by restricting vehicle eligibility, limiting facility access, or and in some cases collecting variably priced tolls. The term "managed lanes" was introduced in the late 1990s over a decade ago to refer to a variety of special-use highway lanes including and referred to high-occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, express toll lanes (ETL), and truck-only toll (TOT) lanes.[1] At its broadest, managed lanes could refer to any dedicated and restricted lane that is not a general-purpose lane. However, the term "managed lanes" has come to mean the subcategory of highway lanes that are more actively managed through the use of pricing. This *Guide* addresses only managed lanes on controlled-access highways. A wide variety of managed lanes also operate in arterial settings, but at the time of publication, none of these facilities involved tolling a subset of lanes.

The earliest managed lanes in the United States were exclusive busways built in the late 1960s. In response to the oil shocks of the early 1970, carpools were permitted to use the Shirley Highway (I-395) busway in Virginia. After a 1976 bus strike, carpools of three or more persons to were allowed to use the El Monte Busway in California. The concept of HOV lanes soon followed, providing an incentive to promote ride sharing by allowing vehicles with a designated number of occupants—usually two—to use the managed lane. The ability to provide travel benefits to carpoolers while promoting greater operational efficiencies and environmental benefits made HOV lanes a common approach for expanding capacity in many states. Federal funding policies favoring transportation improvements that addressed air quality concerns reinforced this trend during the 1980s and '90s. Today, HOV lanes remain the most prevalent form of managed lane in the United States, with lane-miles in service doubling from 1,500 in 1995 to over 3,000 in 2005.

The first priced managed lanes were introduced in the mid to late 1990s. This was due largely to the flexibility afforded by electronic toll collection (ETC) and a developing realization that pricing could be an effective congestion-management tool. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) also encouraged the spread of priced manage lanes by providing the opportunity to introduce variably priced tolls on Interstate highway lanes on a demonstration basis and established the Congestion Pricing Pilot Program to promote and study pricing applications. The earliest priced managed lane facilities included:

- **State Route 91 (SR 91) Express Lanes – Orange County, California:** An ETL facility in the median of an existing highway, with toll rates that vary by hour of the day, direction of travel, and day of the week. The SR 91 Express Lanes opened to service in 1995 as the first priced managed lane facility in the United States.

[1] Tina Collier and Ginger Daniels Goodin, "Developing a Managed Lanes Position Paper for a Policy-Maker Audience," Project Bulletin 4160-5B, College Station, TX: Texas Transportation Institute, September 2002.

- **I-15 Express Lanes – San Diego, California:** Conversion of an underutilized reversible-flow HOV facility to HOT operation. The I-15 Express Lanes opened in late 1996 and was the first managed lane facility in the U.S. to use toll rates that vary in real time, known as dynamic pricing.
- **Katy Freeway QuickRide – Harris County, Texas:** Conversion of a reversible-flow HOV lane to HOT lane facility that allowed HOV 2 vehicles to pay to use the facility during peak periods and HOV 3+ vehicles to use the facility at no cost. The Katy Freeway QuickRide was introduced in 1998. In 2009, an expanded HOT lane facility replaced the Katy Freeway QuickRide.
- **Northwest Freeway (U.S. 290) QuickRide – Harris County, Texas:** Conversion of a reversible HOV lane to HOT lane facility. The Northwest Freeway QuickRide conversion occurred in 2000 and was replaced in 2012 with a more advanced, dynamically priced ETC operation that allowed single-occupant vehicles (SOV) to pay to use the facility.

As of May 2012, an additional 10 priced managed lane facilities have opened to service and another 40 are in construction or advanced planning. These new projects offer great diversity in their design and involve the conversion or extension of existing HOV facilities to priced operation, as well as investments in mega-projects with multiple lanes and points of access and egress. In addition, a number of metropolitan regions are moving forward with plans to develop networks of managed lanes that provide improved access and new travel options. The varied experience emanating from this new generation of priced managed lane projects is captured in this *Guide*.

1.2 Priced Managed Lanes Defined

Priced managed lanes combine two of the most effective highway management tools:

- **Congestion Pricing:** The use of pricing to moderate demand during peak periods is common in sectors such as power and air travel. Similarly, the concept of value pricing within the highway sector involves the introduction of road user charges that vary with the level of congestion and/or time of day, providing incentives for motorists to shift some trips to off-peak times, less-congested routes, or alternative modes. Higher prices may also encourage motorists to combine lower-valued trips with other journeys or eliminate them entirely. When peak-period volumes are high, a shift in a relatively small proportion of trips can lead to substantial reductions in overall congestion levels and more reliable travel times.
- **Lane Management:** The rationale for lane management is to maintain a superior level of service and provide an alternative to general-purpose lanes during peak travel periods. Lane management involves restricting access to designated highway lanes based on occupancy or vehicle type. By limiting the number of vehicles in designated lanes, it is possible to maintain a desirable level of traffic service. Managed lanes are separated from general-purpose lanes by differentiating pavement striping or physical barriers, with entry often but not always limited to designated locations.

Priced managed lanes may include HOT lanes, ETLs, TOT lanes, and Bus Toll Lanes (BTL). The following subsection describes the different forms of priced managed lanes.

What's in a Name?

This *Guide* defines four types of priced managed lanes:

1. High Occupancy Toll (HOT) Lanes
2. Express Toll Lanes (ETLs)
3. Truck-Only Toll (TOT) Lanes
4. Bus Toll Lanes (BTL)

However, the proper names by which priced managed lane projects are known often do not use these same terms. Some sponsors have developed stand-alone proper names for priced managed lanes. Many others have incorporated the terms "Express" or "Express Lanes" into the names of HOT lane projects. This may confuse the distinction between HOT lanes, where qualified vehicles travel at no cost, and ETLs where all vehicles pay a variably priced toll to use the lanes.

The following table provides the proper names of several priced managed lanes that are operating or nearing completion around the country, together with information on the type of pricing they use.

Name	Location	Form of Priced Managed Lane
I-15 FasTrak	San Diego, CA	HOT Lane
I-680 Express Lane	Alameda County, CA	HOT Lane
Metro Express Lanes*	Los Angeles, CA	HOT Lanes
SR 91 Express Lanes	Orange County, CA	HOT/ETL Hybrid
SR 237 Express Lanes	San Jose, CA	HOT Lanes
I-25 HOV Express Lanes	Denver, CO	HOT Lanes
95 Express	Miami, FL	HOT Lanes
I-595 Express	Fort Lauderdale, FL	HOT Lanes
Express 85	Atlanta, GA	HOT Lanes
I-95 Express Toll Lanes	Baltimore, MD	ETL
MnPass Express Lanes*	Minneapolis, MN	HOT Lanes
LBJ Express	Dallas, TX	HOT Lanes
North Tarrant Express	Fort Worth, TX	HOT Lanes
Katy Managed Lanes	Houston, TX	HOT Lanes
Metro HOT Lanes*	Houston, TX	HOT Lanes
I-15 Express Lanes	Salt Lake City, UT	HOT Lanes
495 Express Lanes	Northern Virginia	HOT Lanes
SR 167 HOT Lanes	Auburn, WA	HOT Lanes

* Term used to refer to multiple HOT lane facilities

1.2.1 High-Occupancy Toll Lanes

High-occupancy toll (HOT) lanes use price, occupancy and access restrictions to manage the number of vehicles traveling on them, thereby maintaining free-flow traffic conditions, even during peak travel periods. Typically, qualifying HOVs may use these limited-access highway lanes for free or at a reduced cost. Motorists in vehicles that do not meet passenger occupancy requirements may choose between the general-purpose lanes or paying for premium conditions in the HOT lanes.

HOT lanes use electronic toll collection and traffic information systems that make it possible to provide variable, real-time toll pricing for non-HOV vehicles. Motorists receive information on price levels and travel conditions via variable message signs, providing potential users with information they need to decide whether or not to use the HOT lanes or the general-purpose lanes.

1.2.2 Express Toll Lanes

ETLs are dedicated managed lanes within highway rights-of-way that motorists may use by paying a variably priced toll. They are also typically located next to the median to encourage travel for longer distance trips. Unlike HOT lanes, ETLs charge all vehicles—including HOVs—for passage. In some cases they may also offer discounted passage for HOVs, but ETLs do not incentivize ride sharing to the extent that HOT lanes do. Enforcement is much simpler and less costly than HOT lanes because there is no need to enforce vehicle occupancy. ETL concepts are also attractive to transportation agencies that want to use toll revenues to cover the cost of new construction and operation.

1.2.3 Truck-only Toll Lanes

TOT lanes are tolled highway lanes available only to trucks. Currently, there are no TOT lanes in the U.S., although there have been a few studies and proposals to implement TOTs. Truck lanes are best suited to locations where merge/diverge maneuvers can be improved with a dedicated lane or roadway for a short distance.

1.2.4 Bus Toll Lanes

BTLs represent the pricing of a managed lane or lanes with up to 10 percent of the capacity dedicated to bus transit. BTL is not a HOT lane. Only transit buses would be allowed to use the lane(s) without paying a toll.

1.3 Goals for Priced Managed Lanes

Priced managed lanes can achieve a number of complementary regional transportation goals:

- **Traffic Management:** Priced managed lanes are an effective tool to optimize the use of highway capacity, manage traffic volumes and conditions, and reduce congestion.
- **Revenue Generation:** By charging tolls, priced managed lanes provide regions with the opportunity to generate new revenues to pay for the cost of implementing and operating the lanes themselves or support other transportation needs.
- **New Travel Choices:** Priced managed lanes provide new options to travelers in congested highway corridors, such as the opportunity to pay for a faster and more reliable trip.
- **Enhanced Transit Service:** Priced managed lane projects provide regions with the opportunity to improve transit services by providing congestion-free highway lanes on which new transit service run. In some cases, excess revenues from the priced managed lanes can support these transit services.

For priced managed lanes to meet these goals, however, regions and individual corridors must first exhibit a number of underlying conditions. The most fundamental is recurring traffic congestion during peak

periods and other times of the day. Priced managed lanes are particularly appropriate when regions have limited options for highway expansion or wish to minimize the need for expanding highways.

1.4 Lane Management Strategies

Priced managed lanes combine powerful tools to manage traffic flows and maintain desired traffic service levels.

1.4.1 Vehicle Eligibility

Restricting the use of lanes to specific users is one of the primary tools for limiting demand and managing traffic service. The most common eligibility requirement on managed lanes is vehicle occupancy. HOV lanes have required minimum occupancy rates of two or three persons per vehicle, with those vehicles meeting the occupancy requirement allowed to use the lanes at no or a discounted toll. Restrictions can be in effect 24 hours or vary by time of day or day of the week. A managed lane using a variable eligibility strategy may restrict use to HOVs with a minimum of three or more occupants during the peak commute hours, and then relax restrictions to include lower-occupancy vehicles and occupancy-exempt vehicles or other users during off-periods. With some projects, tolling is not employed during periods of maximum demand, and only vehicles meeting requisite occupancy requirements are allowed. Other types of vehicles that may also be allowed to use priced managed lanes without paying the toll include emergency response vehicles, transit vehicles, motorcycles, and in some cases, inherently low-emission vehicles (ILEV).

1.4.2 Pricing

A growing number of managed lane facilities use demand-based tolls as a means to make access to managed lanes available to vehicles not meeting eligibility requirements. Also known as "congestion pricing" and "value pricing," this pricing involves charging a fee or toll to travel on a lane or roadway. The fee or toll varies according to time of day (peak/off peak) and day of week or by the level of congestion on the adjacent lanes. Pricing is used to meter the number of non-qualifying vehicles on the managed lane so it does not become congested. Tolls may vary according to a fixed schedule (fixed variable pricing) or in real time (dynamic pricing) based on actual traffic conditions in the corridor. Higher tolls are charged when congestion is heaviest and delay is at its worst, while lower tolls or free access may be provided to some or all users during periods of lowest demand. Pricing is used to balance demand and lane capacity, and may encourage some peak-period users to shift their trips to periods of lower demand.

1.4.3 Access

Controlled access using lane separation and designated access points is another important mechanism to control the use of managed lanes. While unlimited concurrent access from parallel general-purpose lanes is common with many HOV facilities, access to priced managed lanes is sometimes limited to designated areas with defined toll zones. Initially, this was accomplished using fixed physical barriers, but more recently a growing number of priced managed lane facilities use lane markings to identify access points. In a similar evolution, while the majority of the nation's early HOT lane facilities had single points of access and egress, a number of recent priced managed lane facilities provide intermediate and multiple access points—and in some cases direct grade-separated ramp connections—to managed lanes on other highways.

1.4.4 Emerging Standards of Practice – Carpool Registration

An additional management approach gaining acceptance is to limit free access for HOV vehicles on managed lanes to carpools that have registered with a local ridesharing agency. Registered carpool vehicles may be identified by a sticker posted on the vehicle, by license plate, or by a transponder that identifies the vehicle as a qualified carpool for purposes of toll collection and enforcement. Versions of this approach are in operation on the I-95 Express Lanes in Miami and the I-85 HOT lanes in Atlanta.

1.5 The Benefits of Priced Managed Lanes

Priced managed lanes offer a variety of benefits to motorists and transit users. While no single strategy can eliminate congestion, priced managed lanes have the potential to improve travel conditions for a meaningful segment of the driving public:

- **Trip Time Reliability:** Traffic volumes on priced managed lanes are metered to ensure superior, consistent, and reliable travel times, particularly during peak travel periods.
- **Travel-Time Savings:** Priced managed lanes afford higher speeds than congested general-purpose lanes.
- **Reduced Vehicle Hours Traveled:** The addition of management strategies and pricing to highway corridors may improve traffic service and reduce congestion facility wide, including general-purpose highway lanes. These improvements also have the potential to draw vehicles off of other parallel routes and improve overall flows, speed levels, and trip reliability in the corridor.
- **Revenue Generation:** Priced managed lanes can provide an additional source of revenue to support transportation improvements such as the construction and operation of the lanes themselves, or to address corridor transit needs or other local demand management strategies. In areas with funding constraints, certain improvements might not be possible without the additional revenue provided by managed lanes.
- **Transit Improvements:** Priced managed lane revenues may be used to support transit improvements, and new managed lane facilities provide faster highway trips for transit vehicles.
- **Enhanced Corridor Mobility:** Improved trip-time reliability, higher speeds, travel-time savings, and possible transit improvements all lead to greater mobility at the corridor level.
- **Environmental Advantages:** Compared to general-purpose lanes, priced managed lanes may provide environmental advantages by limiting greenhouse gas emissions caused by stop-and-go traffic and by encouraging people to use carpools and mass transit. At the same time, concerns regarding tolling equity need to be considered with any pricing strategy as part of the environmental review process.
- **Travel Options:** Priced managed lanes provide SOV motorists with the option of paying for a congestion-free, dependable, and faster trip. They also provide the same travel advantages to travelers opting to take transit or ridesharing rather than driving alone.
- **Efficient Use of Capacity:** Priced managed lanes may provide an opportunity to improve the efficiency of existing or newly built HOV lanes by filling "excess capacity" that would not otherwise be used. With overused HOV lanes that warrant an increase in occupancy rates, the introduction of pricing also facilitates the maximum use of lane capacity.

1.6 Priced Managed Lane Requisites

The most common requisite for priced managed lane projects is recurring congestion. Highway congestion occurs when average speeds operate below 35 miles per hour (mph) for prolonged periods of 2 to 3 hours or more during each peak commute period. Priced managed lanes can be part of a broader strategy to manage congestion. Today's priced managed lane projects benefit from a variety of complementary strategies that improve their performance, including the following:

- **Active Traffic Management (ATM):** Techniques that use intelligent transportation system (ITS) strategies together with innovative operational approaches to manage traffic congestion and increase traffic flows, improve travel-time reliability, and optimize the use of roadway capacity.
- **Transportation Demand Management (TDM):** Strategies to manage and provide new choices on the location of the workplaces, the timing of the work day, shared and alternate travel modes, and routes used for work trips.
- **Integrated Corridor Management (ICM):** Multimodal strategies developed in a coordinated manner by partnering agencies to manage highways, arterial streets, and rail and bus transit in heavily traveled corridors as a system-rather than individual assets.

There are a number of conditions that may indicate that priced managed lanes could be effective:

- **Lack of Free-Flowing Parallel Routes:** Priced managed lanes work best in metropolitan areas with high-density corridors where there are limited travel options. When there are limited travel options other than the highway corridor itself, priced managed lanes offer motorists and transit riders a new choice.
- **Lack of Planned Future Improvements:** The corridor or region does not have enough future capacity planned to meet demand looking forward, given consideration for all modes and likely travel patterns affected.
- **Congested HOV Facilities:** Priced managed lanes can also be effective when the demand for an HOV lane demand exceeds the capacity of a single lane, but cannot justify the addition of a second HOV lane. The introduction of pricing coupled with raising occupancy requirements on carpools may make optimal use of congested HOV lanes.
- **Underutilized HOV Facilities:** Priced managed lanes are effective in locations where demand for an existing HOV lane is below its operational capacity and there is congestion on the parallel general-purpose lanes.

These precursor conditions lead to two distinctly different types of priced managed lane projects: those that convert existing HOV lanes to priced operation, and those that add new priced capacity to existing highways.

1.6.1 HOV-to-HOT Conversions and Extensions of Existing Facilities

One common motivation behind the conversion of an HOV lane to HOT operation is the desire to manage demand on the corridor more effectively, thereby improving the overall efficiency of the HOV lane and the general-purpose lanes. While the conversion of existing HOV lanes to tolled operation is relatively simple

and inexpensive compared to projects adding new highway capacity, there are a number of challenges. These often involve the location and installation of electronic toll collection equipment and signage. In some cases, local traffic mitigation is needed at exit points due to increased traffic volumes as a result of the conversion.

HOV-to-HOT conversions should also be considered when HOV lanes are congested and operating at or in excess of their capacity. When this is the case, project sponsors often consider increasing occupancy requirements, normally from HOV-2 to HOV-3. The sponsors may also consider revoking occupancy requirement exemptions for ILEVs. These changes can markedly reduce the number of vehicles in the HOV lane. However, a simultaneous HOT conversion provides the opportunity to use the newly opened capacity with variably priced tolls used as a tool to meter the flow of paying vehicles so that acceptable traffic services levels are maintained.

HOT conversions can also work well in situations where existing HOV facilities operate at capacity during peak travel periods, but have excess capacity to accommodate additional traffic during fringes of the peak or off-peak periods and in the nonpeak direction. In this case, the feasibility of a HOT conversion is enhanced if the parallel general-purpose lanes experience congestion at those times. This is the case with the I-10 HOV lanes in Los Angeles, where the facility has an HOV-3+ occupancy requirement from 6:00 to 9:00 a.m. and 3:00 to 7:00 p.m. on weekdays, and an HOV-2+ requirement at all other times. A similar approach is being taken in Houston on I-45 South. Requiring carpools to register may have the same potential benefit of metering flow, particularly if the registration process is coupled with transponder requirements for toll-paying customers.

In some situations an HOV-to-HOT conversion may also involve new construction to extend the existing HOV lane or fill in missing sections so that the converted facility has greater coverage and improved connectivity. Conversions may also involve reconfiguring the existing roadway. Several HOV-to-HOT conversion projects, notably I-95 in Miami and I-10 in Los Angeles, added a design change that accommodated a second managed lane without roadway widening next to the original HOV lane, thus adding capacity and better management to both directional lanes at the same time.

1.6.2 New Capacity Managed Lane Opportunities

A growing number of regions—including Seattle, Austin, Salt Lake City, San Diego, Houston, Dallas-Fort Worth, Miami, and Northern Virginia—are incorporating priced managed lanes as major highway expansion projects. This is an appropriate strategy in congested highway corridors where there is a lack of parallel routes that can offset demand. Invariably these types of projects are expensive, but under the right conditions can generate revenues to fund a modest to significant portion of the project cost. This approach is particularly viable in regions with funding gaps and an extensive backlog of unbuilt projects.

The possibility of operating new highway capacity on a priced managed lane basis should be considered during the environmental approval process. Environmental impact statements (EIS) and environmental assessments (EA) that contain priced alternatives provide an excellent opportunity to assess the mobility benefits enabled by pricing and regional public opinion on the use of tolling. The extensive public outreach efforts associated with environmental approval documents also provide project sponsors with the opportunity to engage stakeholders in a dialog about pricing and the ability of tolls to make projects affordable in regions that might not be able to undertake them on an un-tolled basis. Public consensus is essential to move large highway projects forward and is even more important on projects involving pricing.

Selected new capacity managed lane projects under construction or recently opened include the following:

- **I-15 FasTrak®, San Diego, CA:** This 20-mile, $1.2 billion project sponsored by the San Diego Association of Governments (SANDAG) and the California Department of Transportation (Caltrans) added 4 express lanes and was constructed in three phases over 7 years. The project was completed in January 2012, and also involves the provision of four park-and-ride lots and associated transit centers. The four priced managed lanes are equipped with a moveable center barrier, allowing the flexibility to provide three priced lanes in the peak travel direction. The project was cleared with a Finding of No Significance (FONSI) in 2004 and construction began in 2006. The project has been funded by the TransNet (half-cent sales tax) program, as well as other state and federal funds. It replaced the initial 8-mile, two-lane, reversible-flow HOV lane facility that was the first HOV-to-HOT conversion project in the United States in 1996.
- **495 Express, Northern Virginia:** This $2.1 billion public-private partnership (P3) is adding two new priced managed lanes in each direction on an 11-mile segment of the Capital Beltway between I-95 and Tysons Corner in Northern Virginia. The project also involves the reconstruction of the eight general-purpose lanes, 11 interchanges, and the replacement of more than $260 million of aging infrastructure, including 53 bridges. The project will also provide dedicated HOV ramps connecting the managed lanes on the Capital Beltway and I-95. This project was environmentally cleared in 2006; construction began in 2008 and will be completed in 2013. The project is being delivered as a 75-year design-build-finance-operate-maintain (DBFOM) concession, with toll proceeds covering approximately 74 percent of the cost of constructing the project. The Virginia Department of Transportation (VDOT) has provided a public subsidy of $500 million to make the P3 approach financially feasible.
- **North Tarrant Express, Fort Worth, Texas:** This $2.1 billion P3 project involves the reconstruction, widening, and addition of priced managed lanes along 13.3 miles of existing highway. Initially, two priced managed lanes will be added in each direction together with new frontage roads on I-820 and SH 121/SH183 extending east from Fort Worth toward Dallas-Fort Worth International Airport. By 2030, a third priced managed lane along SH121/SH183 and a third general-purpose lane along I-820 will also be constructed. The project is being delivered as a 52-year DBFOM agreement. The project was environmentally cleared in 2008 and 2009. Construction began in 2010 and will be complete in 2015. Toll proceeds are being used to finance 72 percent of the implementation costs. The Texas Department of Transportation (TxDOT) is providing a $575 million public subsidy to support the remaining 28 percent of the capital cost.

1.7 Priced Managed Lane Experience to Date

Table 1-1 provides a listing of the priced managed lane projects in operation, construction or planning as of May 2012. As of this writing, there are 14 operating priced managed lane facilities in eight states nationwide. The most recent to be completed are the 15.5 mile IH-45S in Houston, which has been operating since February 2012, and the four-mile SR-237/I-880 Express Lanes project, which opened to service in March 2012. An additional 14 priced managed lane projects are currently in construction in eight states and approximately 25 others are in planning in seven state states. Together the 53 priced managed lane projects captured in Table 1-1 extend across 10 states.

TABLE 1-1: PLANNED PRICED MANAGED LANE FACILITIES IN OPERATION, CONSTRUCTION AND PLANNING: SPRING 2012

Operating Priced Managed Lane Facilities			Planned HOT / Express Toll Lanes		
State	**Region**	**Facility**	**State**	**Region**	**Facility**
CA	Orange County	SR-91	CA	Alameda County	I-580
CA	San Diego	I-15	CA	Alameda County	I-680 NB
CA	San Francisco	I-680	CA	Inland Empire	I-10
CA	San Jose	SR-237/I-880	CA	Inland Empire	I-15
CO	Denver	I-25	CA	Inland Empire	SR-91
FL	Miami	I-95	CA	Orange County	I-405
GA	Atlanta	I-85	CA	San Diego	I-5
MN	Minneapolis	I-35W	CA	San Diego	I-805
MN	Minneapolis	I-394	CA	San Diego	SR-52
TX	Houston	I-10	CA	San Francisco	I-80
TX	Houston	I-45S	CA	San Francisco	U.S. 101
TX	Houston	US 290	CA	San Jose	SR-85
UT	Salt Lake City	I-15	CA	San Jose	U.S. 101
WA	Seattle	SR-167	GA	Atlanta	I-75 / I-575
			GA	Atlanta	GA-400
			MN	Saint Paul	I-35E
Priced Managed Lane Facilities Under Construction			NC	Charlotte	I-77
State	**Region**	**Facility**	NV	Las Vegas	I-15
CA	Los Angeles	I-10	TX	Austin	Loop 1
CA	Los Angeles	I-110	TX	Dallas	I-30
CO	Denver	U.S. 36	TX	Dallas	I-35 Thornton
FL	Fort Lauderdale	I-595	TX	Dallas	I-35E Stemmons
MD	Baltimore	I-95	TX	Dallas	I-635
TX	Dallas	DFW Connector	TX	San Antonio	Loop 1604
TX	Fort Worth	I-820 / SH-121	VA	Northern Virginia	I-95
TX	Houston	IH 45 North	WA	Seattle	I-405
TX	Houston	US 59 North			
TX	Houston	US 59 South			
TX	Houston	US 290			
UT	Provo	I-15			
VA	Northern Virginia	I-495			
WA	Seattle	SR-520			

Source: Parsons Brinckerhoff

1.7.1 Evolution of Priced Managed Lanes Facilities

Today's widespread development of priced managed lanes demonstrates that they have become an integral part of the nation's transportation infrastructure since the publication of FHWA's 2003 *Guide for HOT Lane Development*. Appendix 1 of the *Priced Managed Lane Guide* provides detailed profiles of 21 of the projects included in Table 1. Presented in a standard template to facilitate benchmarking comparisons, the profiles provide comprehensive information on the following areas:

- Description
- Stakeholders
- Implementation costs
- Utilization

- Financing
- Operational policies
- Technology and enforcement
- Transit services
- Contact information

The information provided in the Appendix 1 profiles demonstrates that there is also greater diversity in the design, operation, and procurement of priced managed lane facilities around the country. While the initial cohort of projects included in the 2003 Guide were simple facilities with single points of access and egress, many newer priced managed lane projects include multiple access points that integrate them with multiple activity centers. Projects like the I-15 Express in San Diego also include transit centers and park-and-ride lots serving new bus rapid transit (BRT) service operating on the managed lanes.

Several regions with existing priced managed lanes and others with keen interest in developing new priced managed lane capacity have begun to incorporate significant focus on this model into long-range Regional Transportation Plans and separate Managed Lane Network Plans. The movement toward coordinating the implementation of priced managed lanes at a regional scale rather than one corridor at a time stems from a desire to improve regional connectivity and improve travel options. It also fosters broader regional goals of improved transit connectivity and rideshare program participation levels. Cities that have adopted regional Managed Lane plans include Atlanta, Charlotte, Houston, Miami, Northern Virginia, Minneapolis, Phoenix, San Diego, San Francisco, and Seattle.

The remaining chapters of the *Priced Managed Lane Guide*s provide guidance on wide range of issues germane to priced managed lanes. The information in this Guide is also supplemented by many other technical publications on the topic of managed lanes that have been prepared by FHWA and are available on the Office of Operations website http://ops.fhwa.dot.gov/.

2 Planning and Implementation

2.1 Development and Implementation of Priced Managed Lanes

The planning and implementation process for priced managed lanes should be familiar to most transportation professionals. As shown in Figure 2-1, the steps involved are similar to those associated with any highway improvement and also align with the metropolitan planning organization (MPO) and National Environmental Protection Act (NEPA) processes.

2.1.1 Pre-Planning

Once the need for an improvement is identified, the responsible transportation agency—often in coordination with the local MPO—identifies and reviews conceptual, operational and physical solutions for their effectiveness, anticipated cost, ease of implementation, and acceptability to the public. The improvement is then weighed against the other needs facing the state and local region, and then a decision is made whether or not to proceed with the project.

2.1.2 Planning

If the project sponsor makes a decision to proceed with the project, the project must be incorporated into the MPO's long-range Metropolitan Transportation Plan (MTP) that identifies transportation needs and policy over a 20-year horizon. Once in the MTP, federal funding may be used to support planning work and the completion of NEPA environmental clearance documents. During this process, the project sponsor narrows and refines conceptual improvements and assesses the ability of a shortlist of more promising alternatives to meet a variety of desired goals.

The process culminates with the identification of a preferred alternative, which is approved through a Categorical Exclusion, a FONSI upon the completion of an Environmental Assessment, or a Record of Decision (ROD) upon completion of an EIS. In order to be cleared with a FONSI or ROD, projects must also be incorporated into the MPO's Transportation Improvement Program (TIP), which is a near-term, fiscally constrained plan identifying which projects in the MTP will be completed in the coming four-year cycle.

2.1.3 Design and Procurement

Once the MPO and NEPA requirements have been completed and funding commitments have been secured, the project sponsor completes design work for the preferred alternative and then puts the project out to bid. If the project is being procured using the traditional design-bid-build (DBB) model, the project sponsor would retain a design consultant to complete 100-percent final design drawings and hold a second procurement for project construction, with the award made to the qualified contractor submitting the lowest bid.

Alternatively, if the project sponsor opts to procure the project on a design-build (DB) or DBFOM concession basis, a design-builder or private concessionaire would complete the final design work. The sponsor would also need to undertake additional analyses in order to determine if DBFOM procurement would be feasible. These would include conducting a financial feasibility analysis to see if the project

could be funded from forecasted toll proceeds and preparing a "base financial case" to determine what project sponsor's cost would be if it built, operated, and maintained the project. The project sponsor would compare the "base financial case" with offers submitted by private developers to determine whether private development would deliver a better value than a traditional public procurement.

2.1.4 Construction

During the construction phase a private contractor, design-builder, or private development partner builds the project according to the design or design specifications and implementation schedule established in the construction contract. The project sponsor supervises the construction to ensure that it will be consistent with the design and meets the necessary quality standards.

2.1.5 Operation and Maintenance

Once the construction has been completed to the satisfaction of the project sponsor, the new facility is put into operation. With traditional DBB or DB procurements, the project sponsor assumes responsibility for maintaining and operating the managed lane. With DBFOM concessions, the private developer operates and maintains the facility for a designated concession period, during which it has the right to collect toll revenues or receive availability payments from the project sponsor. In some cases, the project sponsor or other public toll agency might be responsible for toll collection. Responsibility for enforcement and incident management also remains with the appropriate public agencies.

2.2 Common Challenges with Priced Managed Lanes

While the steps involved in the implementation process may be familiar, priced managed lane projects can be expected to introduce new technical, institutional, and outreach challenges. Because of these challenges, agencies implementing priced managed lane projects must develop expertise that is not needed to implement more traditional highway improvements. The following section and subsequent chapters of the *Priced Managed Lane Guide* discuss these issues.

2.2.1 Technical Challenges

The following are technical challenges associated with implementing priced managed lanes:

- Priced managed lanes often require complex design solutions and the need to consider exceptions to design standards, because they are built in constrained highway corridors with right-of-way constraints and require the installation of electronic toll collection equipment and enforcement locations.
- Access to priced managed lanes introduces new operational challenges in corridors where they are implemented that may be compounded when there are additional connections to other highway facilities or congested urban street grids.
- Priced managed lanes also require a variety of ITSs to detect traffic conditions, set variable toll rates in real time, convey information to motorists, enforce against toll evasion, and manage incidents as they arise.

- Planning efforts for priced projects also require project sponsors or in some cases the local MPO to enhance travel demand models to assess the effects of variably priced tolls on travel behavior, including the effects of tolls that vary in real time or by hour of the day, direction of travel, and day of the week.
- If toll proceeds are going to be leveraged to pay for the cost of implementing the project, project sponsors must develop expertise in project finance. This expertise is standard for toll authorities, but is generally lacking in transportation agencies that do not have experience with tolls.
- If priced managed lane projects are implemented through P3 procurements project sponsors will need additional expertise in legal and procurement issues, as well as financial feasibility analyses.

2.2.2 Institutional Challenges

The following are potential institutional challenges associated with implementing priced managed lanes:

- Priced managed lane projects require coordination with multiple transportation stakeholders. For example, the goals that underpin priced managed lane projects should be consistent with those articulated by the local MPO in its MTP and project sponsors should encourage input from the MPO throughout the planning process.
- In some locations, pricing projects may be the first application of tolls in a state or region; a fact that may require project sponsors to establish new legal authorities, including the ability to levy tolls, use variably priced tolls, use video enforcement equipment, or enter into a P3 arrangement with private partners.
- ETC systems on new priced managed lane facilities need to be compatible with systems used by other toll agencies in neighboring regions and states.
- Most priced managed lane projects also involve improvements to transit service. This requires close coordination with transit operators in order to maximize potential synergies.
- Priced managed lane projects inevitably involve coordination with other public agencies including state and local police and emergency response agencies.

2.2.3 Public Acceptance Challenges

Public outreach and consensus building activities are critical components throughout the process of implementing priced managed lane projects, due to numerous challenges:

- While the benefits of combining occupancy requirements, access, and price to manage demand bring clear transportation benefits, the concept is often difficult for political decision makers and the public to embrace.
- Tolling may be perceived as double taxation because other transportation needs are funded with motor fuel taxes, vehicle registration fees, and other tax revenue.
- Equity is a key concern with priced managed lane projects, as some stakeholders may believe that it is inequitable to provide premium service to those who appear more likely to afford it.

As described further in Chapter 4, Outreach efforts are essential to the successful outcome of priced managed lane projects. This *Guide* recommends the following approach:

- Begin with market research to understand how the public would react to pricing and identify specific concerns and strategies to alleviate them.
- Once the project sponsor begins studying pricing alternatives, outreach should focus on public education and constituency building.
- Once pricing projects are operational, outreach should focus on marketing the managed lanes and disseminating data documenting their performance and benefits they provide to the traveling public.

How are priced managed lanes different from traditional highway and HOV projects?

- Priced managed lanes use market price and other management tools to provide dependable and superior travel conditions, particularly during highly congested peak travel periods.
- Priced managed lanes provide a new and desirable transportation option for motorists and transit users in congested travel corridors.
- Priced managed lanes generate revenues that can be used to pay for their implementation and/or operation and to help underwrite other transportation improvements.
- Priced managed lanes require considerable attention to roadway management, including monitoring traffic operation and responding to incidents.
- Priced managed lanes benefit from innovative ways to apply traffic management and toll collection technologies.
- Priced managed lanes require ongoing marketing and public awareness outreach efforts.
- Priced managed lanes are likely to require interagency cooperation.

2.3 Operational and Policy Decisions for Priced Managed Lanes

As agencies begin the planning process for new priced managed lane projects, they need to make important decisions on a wide range of operational and policy decisions. This is often accomplished with the preparation of a Concept of Operations document. While the preparation of a Concept of Operations is not required, FHWA strongly recommends preparing a Concept of Operations document for priced managed lane improvements, especially for larger more complex projects. Section 2.3.1 describes the Concept of Operations process.

2.3.1 Concept of Operations

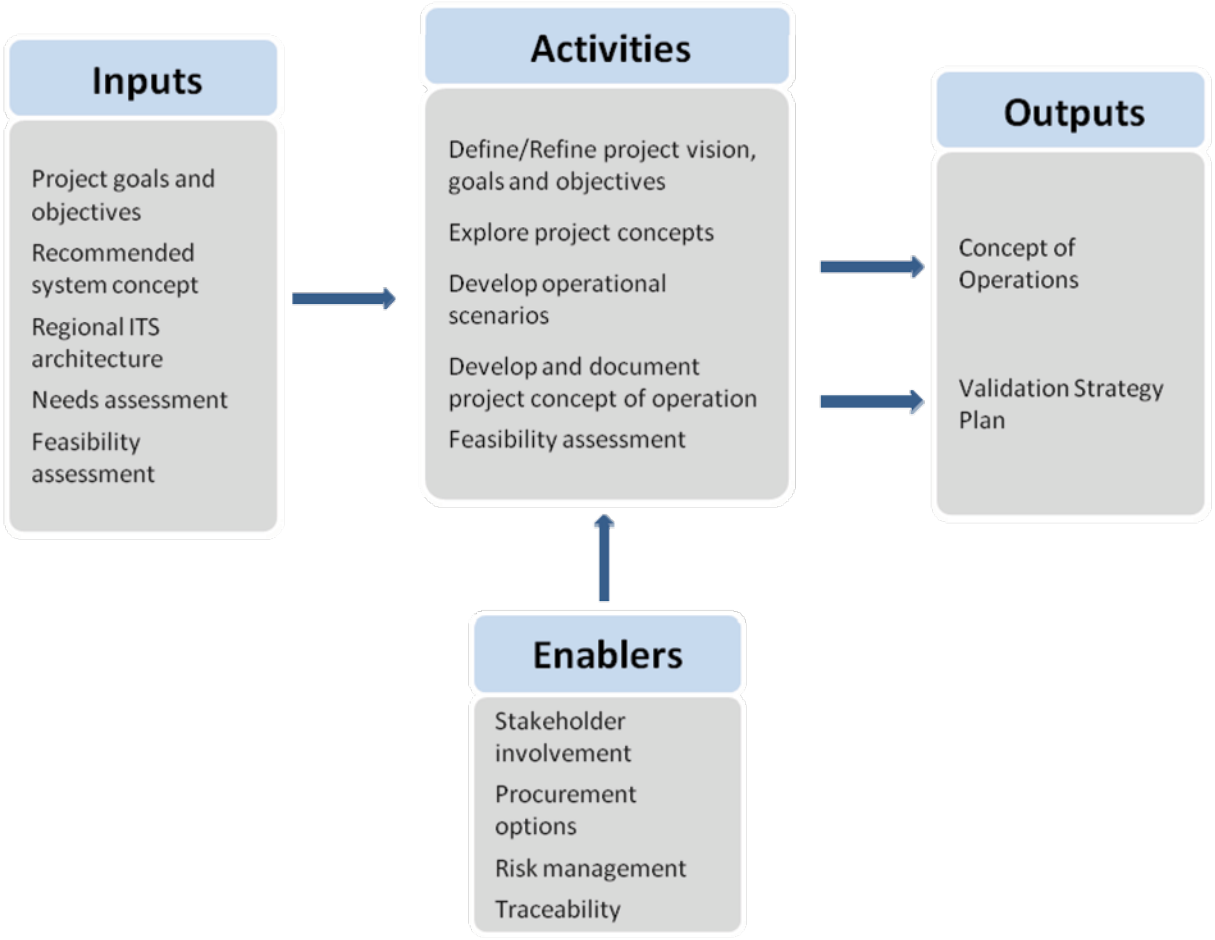
The Concept of Operations is a formal document that describes the use and operation of priced managed lanes projects. It is used to present the proposed project to decision makers and other stakeholders and to solicit their feedback on how to improve it. The Concept of Operations is often a living document that evolves as decisions are made as planning and design work progresses. The Concept of Operations provides information on the following issues:

- Purpose of and need for the project
- Current conditions and characteristics of the proposed corridor

- Design and system standards to which the project will be developed
- The different priced managed lane alternatives that will be assessed
- Operational policies including occupancy rates, hours of operation and toll-setting procedures
- Transit improvements to be implemented as part of the project, such as new park-and-ride facilities and new bus services
- Legislative approvals and other agreements needed to implement the project

As part of a larger Systems Engineering Guidebook, FHWA's California Division Office has developed guidance on the Concept of Operations process (Figure 2-1). In addition to descriptive information, this guidance also provides examples of Concept of Operations documents as well as other useful templates and checklists.

Figure 2-1: Concept of Operations Process



Source: FHWA California Division. http://www.fhwa.dot.gov/cadiv/segb/views/document/sections/section3/3_4_3.htm. Accessed October 1, 2012

The Concept of Operations should inventory all known institutional requirements that will be needed to implement the priced managed lane project, as well as any outstanding institutional or technical needs. These could range from issues such as the need to pass toll authorization legislation or enhance travel demand models. The document should also describe the public information program that will be implemented to gain feedback and support for the priced managed lane. Lastly, the Concept of Operations should also identify the different stakeholders that would be involved in implementing and operating the managed lanes, together with their respective roles. The development of the Concept of Operations should also involve all stakeholders and serve to build consensus in defining the mission and goals behind the project and agreement on the roles each of the stakeholders will play.

The Concept of Operations process should be flexible and can be used to guide improvements in a single corridor or the development of a regional network of priced managed lanes.

Regional Concept of Operations do not address the specifics of individual corridors, but rather address policy, operations, and technology issues. They may also be used to determine the extent of the network of lanes on which pricing will be implemented, as well as the phasing of those improvements. Regional Concepts of Operations tend to be top-down efforts that establish policies that will be applied at a broad level. As such, they support the development of individual projects that will ultimately become part of the network. For example, the Metropolitan Transportation Commission (MTC – the MPO for the San Francisco Bay Area) prepared a regional Concept of Operations for the region in 2010-2011. That same document also supported the opening of the I-680 Express Lane in Alameda County in 2010 and the SR 237 Lanes in Santa Clara County in 2012.

While the development of Concepts of Operations tends to begin as a top-down process led by a state department of transportation (DOT) or regional planning authority, this may change as individual projects near implementation when a subsequent project-specific Concept of Operations document would be prepared by the project sponsor. In this case, as lessons are learned from an individual project, they may also be to Concepts of Operations for other priced managed lanes in the region.

2.3.2 Establishing Operational Objectives

Establishing goals and objectives is an essential early step in the planning process for priced managed lanes. The establishment of operational objectives should also be a collaborative process between the project sponsor, the local MPO, transit partners and local communities. Planning for operations is different than planning for capital improvement projects. FHWA promotes the use of an objectives-driven, performance-based approach to planning for operations as an effective way to integrate operations in local transportation plans and provides comprehensive guidance on the process in its 2007 guide, *Advance Metropolitan Planning for Operations: The Building Blocks of a Model Transportation Plan Incorporating Operations.*

Operating agencies are typically involved in the regional transportation planning process and interact with MPOs. However, it is important to engage day-to-day operating agency managers from a systems operations perspective and not simply as advocates for capital projects. Developing an interagency committee that focuses on improving regional management and operations has been an effective technique used by several MPOs to engage operators in addressing regional operations. This forum can be uses this forum to determine system performance priorities, operations objectives, data availability, and funding opportunities.

Once the goals for road pricing projects have been established, project sponsors and planning organizations develop a set of objectives to assess and compare the extent to which different pricing alternatives are able to achieve the desired goals. Possible objectives include one or more of the following:

- Improving travel-time reliability for managed lane users
- Maximum overall travel-time savings (may include effects on both the managed lanes and the general-purpose lanes)
- Maintaining minimum speed levels on the managed lanes
- Maximum vehicle throughput subject to traffic level of service or minimum speed constraints
- Maximum person throughput subject to traffic level of service or minimum speed constraints
- Maximize revenue

In cases where the private sector is responsible for developing and financing priced managed lanes, their main objective may be to maximize revenue levels. Public agencies implementing priced managed lane facilities may also be more focused on maximizing operational efficiencies such as throughput and travel-time savings. These metrics are not necessarily exclusive as revenue maximization should generally coincide with the optimization of operational efficiencies, such as throughput and travel-time savings.

2.3.3 Occupancy Requirements

Occupancy requirements are another essential issue underpinning priced managed lane projects. Most HOV and HOT lane facilities have a two-person occupancy requirement for free trips, but a number of highly utilized facilities have an HOV-3 occupancy requirement. The project sponsor will need to make decisions about which vehicles will be allowed to use the priced managed lane for free or at a reduced priced and which vehicles will pay the full variably priced toll. Decisions on occupancy rate should be driven by HOV utilization, revenue generation aspirations, and occupancy requirements on other HOV or priced managed lanes in the region. They may also reflect other regional goals such as encouraging ride sharing and greater use of transit.

In some instances, increasing HOV occupancy requirements poses public acceptance challenges. However, these may be easier to overcome if increases in occupancy rates are made along with other improvements, such as the implementation of priced managed lanes. With projects that involve the conversion of an existing HOV facility to priced operation, the pre-existing occupancy rate on the HOV lanes is a fundamental metric. As discussed in Section 1.8, if the HOV lanes are under-utilized during peak periods, occupancy rates are usually left unchanged. However, if the lanes are at or near capacity during the peak period then there may be a need to increase them. Increases may apply to all hours of operation or they may be limited to peak travel periods.

Similar issues arise with priced managed lane projects involving the provision of new capacity. However, in this case occupancy rates may be driven to a greater degree by policy goals and revenue generation needs and less by expected utilization rates. For example, the I-95 Express in Miami involved the conversion of an existing HOV lane to HOT operation and the provision of an additional managed lane. The existing HOV-2 lane was heavily utilized and the project sponsor was concerned that the new lane would fill quickly with additional HOV motorists if the occupancy rate remained unchanged. So, the decision was made to increase the occupancy requirement for free trips to HOV-3 when the HOV-to-HOT

conversion was made. This ensured that the new lanes would not become congested with non-paying HOV vehicles and enable the lanes to generated additional toll revenue. It also avoided the challenges of increasing the occupancy rate at a later date. Interestingly, the change from HOV-2 to HOV-3 did not generate much controversy because conditions improved in both the managed and general-purpose lanes after new lanes entered service. This was particularly true on the managed lanes with the provision of a second travel lane each direction, allowing motorists to pass slower vehicles.

In some cases it may be helpful not to make decisions on occupancy early on in the assessment of priced managed lane projects, to provide the flexibility to respond to future developments, such as increases in the cost of fuel or the decision to implement the project on a P3 basis. Planning and environmental studies provide an excellent process by which to assess the performance of the priced managed lanes assuming different occupancy rates, as well as the opportunity to assess public opinion.

2.3.4 Vehicle Requirements

There are other vehicle requirements that need to be established for priced managed lane projects. The most fundamental is whether vehicles need to be equipped with ETC transponders in order to use the facility. Currently, all priced managed lane facilities in the U.S. require paying non-HOV vehicles to have transponders. Access to transponders is another mechanism to manage the number of vehicles using the managed lane. However, this may change in the future with the greater deployment of tolling systems with license plate readers using character recognition technology and greater use of transponders among motorists.

Today, qualified HOVs are not required to be equipped with transponders on most priced managed lane facilities. However, in some cases project sponsors may also require HOV motorists to have transponders that identify them as qualified non-paying HOV vehicles. This approach is being used on the HOT conversion of the existing HOV lanes on I-10 and I-110 in Los Angeles. These Metro Express Lanes will be the first in the U.S. requiring HOV motorists to use transponders with a toggle switch to identify their vehicle as a qualified HOV vehicle or declare themselves as a paying SOV if they are driving alone and wish to use the lanes. Any HOV vehicles using the Metro Express Lanes with standard transponders will be charged the same toll as SOVs.

In addition to qualified HOV vehicles, certain other vehicles may be allowed to use priced managed lanes at no cost. These normally include transit vehicles (buses and vanpools), police, emergency response vehicles, and in some cases motorcycles.

Certain SOVs may also be allowed to use priced managed lanes at no cost. The most common exemption of this type is made for low-emission ILEVs.[2] Some states provided unlimited free access to ILEVs on priced managed lanes. Others have limited the number of qualified ILEVs allowed on managed lanes by issuing a fixed number of ILEV permits. In some cases the more prevalent use of low-emission vehicles, has lead to significant numbers of ILEVs on HOV facilities to the point where they may degrade traffic services. Many policymakers now believe that the reduced fuel costs are incentive enough for

[2] The 1990 Clean Air Act Amendments established the clean-fuel vehicle program and the specific attributes of qualifying ILEV vehicles. It also authorized publicly owned ILEVs to use HOV facilities without meeting vehicle-occupancy requirements means to encourage the purchase of low emission vehicle fleets. The Transportation Equity Act for the 21st Century (TEA-21) allowed states to expand this authorization to include individually owned ILEVs. This provision was scheduled to expire, but has been extended in subsequent authorization legislation.

the purchase of ILEVs and that the ILEV exemption is no longer necessary. Project sponsors should consider ILEV policies carefully on new priced managed lane projects, as non-paying ILEVs take up priced managed lane capacity that could otherwise be sold to paying vehicles. This phenomenon limits available capacity and thereby drives prices up for other paying vehicles. Experience in states that have allowed ILEVs to use managed lanes also demonstrates that this policy is difficult to reverse once a precedent has been established.

2.3.5 Revenue Sharing

The disposition of project revenues is another important policy issue that will be of particular interest to the public. Decisions on the use of toll proceeds are often sensitive and should be addressed up front. As shown in Table 2-1, annual toll revenues and operating costs associated with priced managed lane projects vary greatly from facility to facility. Revenues from managed lanes may be used to cover the cost of operating the facilities. If there are excess proceeds, they may be used to pay for the initial implementation of the managed lanes or to support other transportation needs in the corridor or region. Close coordination with transit providers and the possible use project revenues to support transit improvements in the corridor is often an effective strategy to garner support for managed lane improvements from a wide cross section of stakeholders.

TABLE 2-1: ANNUAL TOLL REVENUE AND OPERATING COSTS FOR OPERATING PRICED MANAGED LANE FACILITIES

Facility	Region	State	Annual Revenues	Annual Operating Costs
I-15	Salt Lake City	UT	$500,000	$500,000
SR-167	Seattle	WA	$743,000	$843,000
I-35W	Minneapolis	MN	$751,000	$1,690,000
I-394	Minneapolis	MN	$1,600,000	$961,000
I-25	Denver	CO	$2,400,000	$1,500,000
I-15	San Diego	CA	$4,400,000	$4,400,000
I-10	Houston	TX	$8,000,000	$2,370,000
I-95	Miami	FL	$14,790,000	$7,630,000
SR-91	Orange County	CA	$41,246,000	$22,380,000
I-45 S	Houston	TX	NA	NA
I-680	Alameda County	CA	NA	NA
SR-237	San Jose	CA	NA	NA
I-85	Atlanta	GA	NA	NA
US 290	Houston	TX	NA	NA

Source: Parsons Brinckerhoff

Revenues for projects involving the conversion of an existing HOV facility to HOT operation should be expected to be modest and are often not adequate to offset operating costs. This is the case with the SH 167 near Seattle, the I-15 Express in Salt Lake City, and the I-35W MnPASS in Minneapolis. While the I-394 MnPASS in Minneapolis generates an operating profit of approximately $540,000 per year, this is offset by an annual payment of $1.5 million by the Minnesota Department of Transportation (MnDOT) to repay a capital loan account that was used to pay for the implementation of the project.

Two-lane HOT lane facilities, such as the I-25 in Denver may be expected to earn a modest operating profit. This 8-mile, two-lane reversible facility has annual revenues of $2.4 million and operating costs of $1.5 million. Under state law, excess revenues are permitted to be designated to transportation improvements in the corridor (including transit, vanpool, and carpool services) as well as reconstruction, expansion, and extension of the managed lanes. Under the right conditions, revenue from higher volume managed lanes with at least two lanes per direction can exceed operating costs by a significant amount. This is the case with projects such as the Katy Freeway managed manes in Houston and the I-95 Express in Miami, which have annual operating surpluses of $5.6 million and $7.1 million, respectively. In Houston the operating surplus is used to repay underlying debt that was used to cover a portion of the cost of building the new lanes, while in Miami nearly half of the operating surplus is used to support transit operations and the remainder is held in reserve accounts.

With annual revenues of over $41.2 million, the SR 91 generates the most revenue of operating U.S. managed lane facilities by far. Operating costs—including the repayment of underlying project debt—total nearly $22.4 million, leaving its sponsor—the Orange County Transportation Authority (OCTA)—with $18.9 million annual to support other transportation needs. While the SR 91's ability to generate revenue is exceptional given that it is the only high-capacity route through a mountain pass between large activity centers in Orange and Riverside Counties in California, other new managed lane facilities currently in implementation are also anticipated to generate significant amounts of revenue. These include the $2.0 billion I-495 Capital Beltway Project, which is adding four managed lanes to one of the most congested Interstate highway in the U.S. This project is being financed largely through the anticipated toll revenues. The same is also true of the $2.0 billion North Tarrant Express and the $2.6 I.H. 635 Managed Lanes, both of which are being implemented through P3 procurements in Dallas / Fort Worth.

2.3.6 Traffic and Revenue Forecasting for HOT Lanes

The Role of Modeling in developing Priced Managed Lane projects

Priced managed lanes share some aspects of both HOV lanes and toll roads. Like HOV lanes, they provide priority treatment for high-occupant vehicles. Like tolled roads, they provide premium service for paying motorists.

One of the unique aspects of planning for priced managed lanes is that planners must forecast demand levels for both high-occupant and single-occupant vehicles that buy in under a variety of pricing and occupancy requirement scenarios. This exercise serves a dual purpose: First, it allows to the project sponsor to determine the combination of pricing and occupancy requirements that maximizes transportation benefits for all motorists traveling in the priced managed lane corridor. Second, it allows the project sponsor to forecast revenue streams and then evaluate financing approaches.

Forecasting demand on the priced managed lane corridor is accomplished by using a travel demand forecasting model. Travel demand models are mathematical tools that estimate roadway and transit travel based on projected population levels, land use trends, and expected roadway and transit characteristics such as cost and travel time. A travel demand model will forecast the level of demand for the toll facility, the impacts of tolling and pricing on corridor and regional travel, and the impacts of tolling on different groups of travelers.

Forecasting travel demand for priced managed lanes is challenging because traditional travel models use simplified representations of pricing and have limited capabilities for predicting how travelers would change mode, route, departure time, destination, or trip frequency in response to pricing. In addition, forecasting demand for priced managed lanes is very sensitive to future conditions, such as land use, population growth, characteristics of alternative road and transit modes, and even macro-economic cycles. The complexity of the forecast is compounded by the sensitivity of demand for priced managed lanes to travel conditions in the general-purpose lane and to the extent to which multiple-occupant vehicle trips are made in the corridor. At a minimum, demand assessments must consider the difference between travel times in the priced managed lanes to those in the general-purpose lanes, because motorists will chose the priced manage lane only if the value of the time savings value exceeds the cost of the toll. They should also consider the value of time savings afforded by the HOT lane, as it is likely that motorists will chose the HOT lane if the time savings value exceeds the out-of-pocket cost required to achieve the savings. The array of factors affecting travel demand for HOT lanes and priced managed lanes is provided in Table 2-2.

TABLE 2-2: MANAGED LANE DEMAND FACTORS

Categories	Demand Factors
Price of HOT lane Service	• Toll or pricing structure as a function of time of day, vehicle occupancy, payment method, prevailing traffic levels on alternative facilities, etc. – affects all usage decisions including route choice, mode choice / carpooling attractiveness, time-of-day • Expected HOT lane travel time • "Membership cost" – the out-of-pocket, inconvenience, and/or opportunity cost of making the user eligible to use the facility (includes transponder, account deposit, setup fees, etc.)
Cost of Alternative "Free" Service	• Expected travel time on the parallel or alternate "free" route • Additional time cost associated with the congestion-related uncertainty of using a parallel free facility (inconvenience and frustration arising from the variation between the expected travel time before use and the actual "true" travel time after use)
Travel Characteristics	• Trip purpose, situational context – affects value of time, and thus willingness to pay out-of-pocket costs • Vehicle occupancy – affects willingness to pay via the net time savings value for the vehicle, and may impact the HOT lane price for the vehicle • Trip frequency – may affect willingness to buy into the HOT lane concept (obtain an account and automated vehicle identification equipment or becoming a HOT lane "member")
User Characteristics	• Risk profile of users (risk averse / risk neutral / risk receptive) – relates to willingness to pay for travel-time reliability • Income and other demographic user characteristics – affects value of time and risk aversion in both observable and un-observable ways

Desirable Travel Demand Model Characteristics

How well the model predicts demand for the priced managed lane and the resulting revenues depends on the structure of the model, how well it is calibrated and validated, and how it is applied to quantify the uncertainty inherent in any forecast of future economic activity. In the case of priced managed lanes, three model structural characteristics are most important: representation of relevant travel choice decisions, representation of travel costs, and representation of travelers' willingness to pay.

Relevant Travel Choices

The following first-order choices are the direct or immediate reactions that travelers may have to the presence of a priced managed lane:

- **Route Choice:** Switching from the general-purpose lane into the priced managed lane or switching from other roadways into the priced managed lane corridor.
- **Mode Choice:** Forming carpools to take advantage of the free facility, dissolving carpools because of the new ability to buy into better travel conditions, or switching to or from competitive transit modes.
- **Travel Time Choice:** Changing the time of travel in response to variable toll prices.

The travel demand model should explicitly capture all of these first-order responses.

Longer-term or second-order responses tend to be of a smaller magnitude, but over time they can also be significant. They include changing destinations, trip frequency, and even residential choice, among others. Travel demand models vary in their ability to represent both first-order and second-order responses to priced managed lanes. This effort should be commensurate with the level of analysis sought. A focus on a subset of first-order responses may be sufficient for preliminary feasibility studies, while an investment-grade study requires a better understanding of all choices and how they may vary under different land use, and economic assumptions.

Representation of Travel Costs

The cost of using priced managed lanes or alternate routes or modes includes not just the cost of the toll, but also the perceived value of travel time, fuel, vehicle maintenance and depreciation costs. The perception of these costs can also vary, depending on the length of the trip and the type of user. Traditional travel demand models employ relatively simple approach, while more advanced models take into account traveler perceptions based partly on studies conducted with managed lane users. [3]

Accurate representation of the out-of-pocket cost of using the priced managed lane is an important property of the travel demand model. The model must be able to distinguish the price differential across types of vehicles, vehicle occupancy, time-of-day, congestion levels, method of payment, entry and exit locations, and other relevant attributes. Of these attributes, accounting for the differences in toll prices inherent in a dynamic, variably priced system are by far the most challenging, due both to the frequency at which tolls change (as frequent as every 5 minutes) and value of the toll. Models that are not designed to handle these types of pricing schemes rarely have the ability to represent them accurately, and therefore require substantial modifications to the trip assignment step, as well as feedback to upper level models such as mode and destination choice.

Willingness to Pay

Willingness to pay refers to the tradeoff that travelers make between time and money, and it is a critical factor for priced managed lane applications. For the price of the toll, travelers are "buying" travel time savings or travel-time reliability or some other trip-related improvement. The value of time (VOT) can be thought of as the "price" of travel-time savings. The value of reliability (VOR) has a similar interpretation,

[3] Transportation Research Board (2012). Improving our Understanding of How Highway Congestion and Pricing Affect Travel Demand. Strategic Highway Research Program, Report No. S2-C04-RR.

but it measures willingness to pay for increased travel-time reliability for a given trip. Travelers have different VOTs and VORs, partly as a function of measurable personal, household, and trip characteristics (such as income, gender, worker status, trip purpose, etc.), and partly as a function of situational variables and other attributes that the forecaster cannot observe.

To reflect the diversity of VOT and VOR, travel demand models subdivide the population into groups with similar VOT and/or VOR. The greater the VOT (or VOR) stratification, the more accurate is the response of the model to tolls. The more advanced travel demand models use continuous VOT functions that reflect both observed and unobserved variability within the travel population. Appropriate market segmentation attributes include trip purpose, time of travel, household income, auto ownership, traveler gender, ownership of a transponder or toll pass, among others. The choice of market stratification variable is typically dictated by data availability; however, at a minimum a model used for managed lane analysis should be segmented by trip purpose, time of day and household income.

Data Used in Managed Lane Travel Demand Modeling

Travel demand models use a variety of data sources, including household travel surveys, population censuses, origin-destination surveys, and traffic counts, among others. These data, along with assumptions about the mathematical form of the model, are used to establish the parameters of the travel model and to validate its forecast for a base year (i.e., a year for which the traffic volumes in the study corridor are known). As discussed above, a critical parameter for forecasting priced managed lane demand is the travel population's willingness to pay. Willingness to pay for managed lanes can be measured empirically by observing the behavior of travelers in managed lane corridors, including both those that choose the managed lane and those that prefer to use the alternative routes or modes. These data can consist of observations of individuals' behavior or they can consist of historical traffic volume, travel time and toll series for all lanes in the managed corridor. Estimates of the elasticity of managed lane demand to travel time and tolls can be derived from the travel model (when disaggregate data are available), or from the historical traffic data (i.e., when only aggregate data are known).

However, in many regions priced managed lanes do not exist, thus precluding the use of revealed preference or historical data to develop the travel model. In these cases, modelers use relationships built with data from existing priced managed lane facilities, and/or employ stated preference surveys to gather information about potential users of the new facility. Stated preference surveys attempt to elicit willingness to pay information by asking travelers to state the travel choices they would make when presented with a set of hypothetical scenarios. The scenarios are designed so that a limited set of travel conditions (e.g., travel time, tolls, and reliability) for likely travel choices (e.g., a managed lane and a parallel mixed-flow lane) is varied and respondents are asked to indicate what they would most likely choose under those specified conditions. Under carefully constructed experimental designs and data analysis techniques, these types of surveys elicit willingness to pay information that can in turn inform a travel demand model.

Traffic and Revenue Forecasting Methods as Applied to Managed Lanes

Tools and Techniques

Various methods are available to forecast priced managed lane demand and revenues. Three of these methods are briefly described here: a sketch planning technique, trip-based models, and activity-based

models. These tools progressively offer a more rigorous framework for studying the travel time versus cost tradeoff posed by managed lane strategies. It should be noted that use of advanced demand modeling tools alone is not a sufficient condition for preparing "investment-grade" forecasts. These types of forecasts place a premium on identifying sources of uncertainty and their effect on managed lane demand.

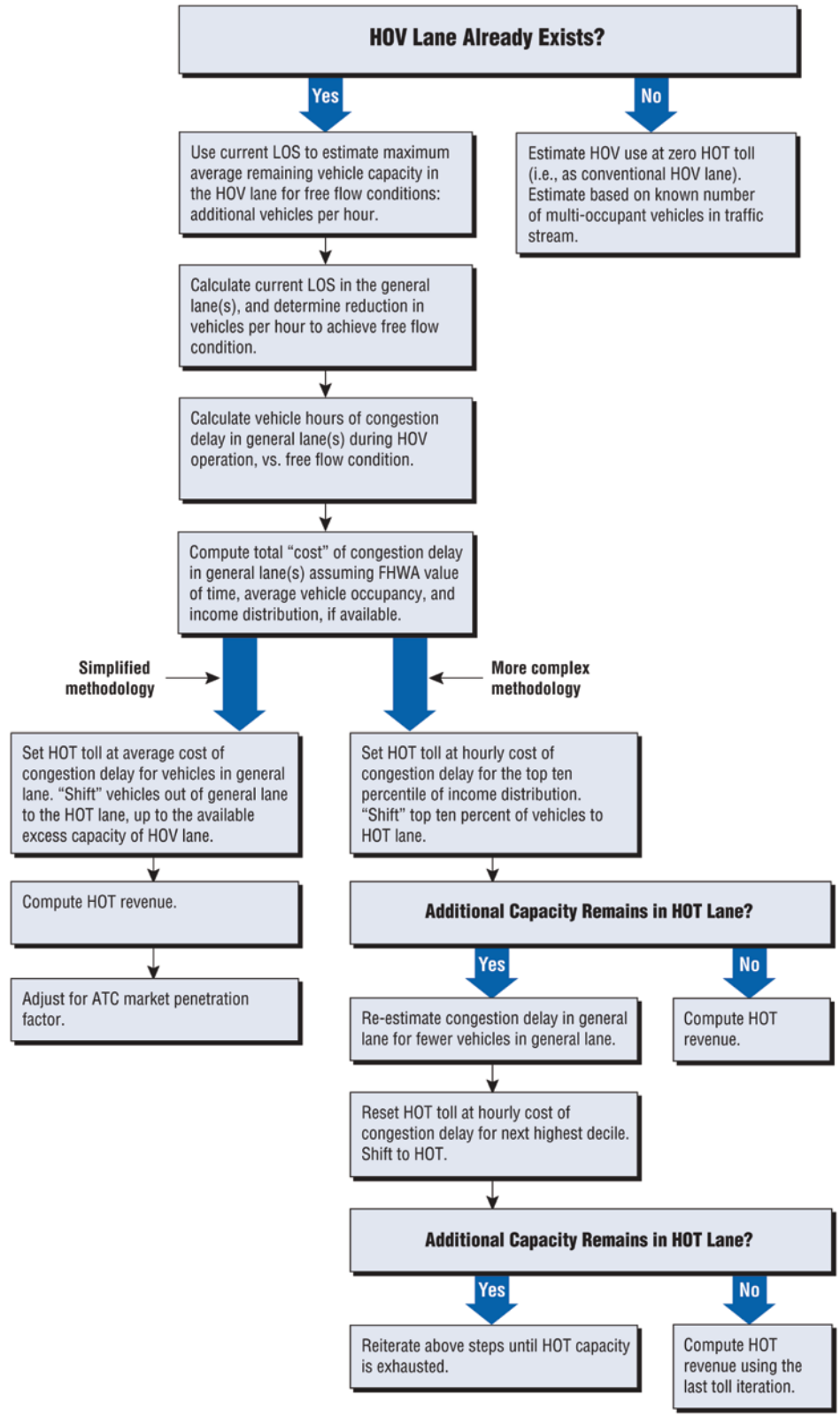
Sketch-Planning Tool

Figure 2-2 depicts a sketch-planning methodology that can be useful in preparing initial feasibility assessments of priced managed lanes and other surface transportation investments. The sketch-planning approach is less rigorous than a trip or activity-based demand model but can still provide helpful information to decision makers.

The sketch-planning model incorporates various situations the analyst may face, for example:

- A completely new priced managed lane facility is to be constructed adjacent to existing general-purpose lanes;
- An existing HOV lane is to be converted to a priced managed lane; and
- A new HOV lane is to be constructed, but with the intent of a possible conversion to priced managed lane at a later point if traffic conditions warrant.
- The methodology presented in Figure 2-2 estimates the priced managed lane traffic assuming that the demand for vehicle occupancy and origin-destination combination is constant. It does not account for queues and other conditions that affect priced managed lane operations in highly congested corridors. First, the modeler measures peak traffic on the general-purpose lanes and determines level of service. Using this information, the modeler estimates peak-period congestion delays and quantifies the cost of those delays based on hourly values of travel time. Then, based on the available capacity in the HOV lane (after "free" HOV vehicles are accounted for), eligible users are "shifted" to the HOT lane, just up to the point where free-flow conditions can be maintained in the HOT lane. The priced managed lane toll is estimated as the toll required to induce these many eligible users to shift—a lower toll would shift too many eligible users and cause congestion on the HOT lane, while a higher toll would preclude sufficient SOV users to shift to fill up the available HOV lane capacity. Priced managed lane revenues are then estimated after accounting for market penetration of electronic toll collection accounts.
- In a more complex, but perhaps more realistic version of this, priced managed lane tolls are repeatedly set to reflect the income distribution of SOV drivers in the general-purpose lane. Those SOV users at the top of the income distribution—who place the highest value on time—are shifted first, and a test is made to determine whether there is any remaining capacity in the HOT lane. This iterative process is repeated, and tolls set progressively downward, until the desired minimum level of service in the HOT lane is reached. This process determines an "optimal toll"—a process that mirrors a real world dynamic tolling process.
- Although not explicitly shown in Figure 2-2, this method should be applied for different time periods to capture differences in the congestion levels of the general-purpose lanes.

Figure 2-2: Priced Managed Lane Revenue Forecasting Process



Source: Parsons Brinckerhoff

Trip-Based Travel Demand Models

Fundamentally, a trip-based model forecasts priced managed lane demand in a manner similar to the sketch-planning method outlined above: by trading off travel-time savings against the value of the toll. However, there are important differences between a fully fledged regional model and the sketch-planning tool. Whereas the sketch-planning tool relies on a simple representation of the choice between the priced managed lane and the general-purpose lane, the regional model typically incorporates various choices, including mode choice, carpool formation, destination choice, and possibly time of day choice. Route choice includes both vehicles that are choosing between the priced managed lane and general-purpose lanes, as well as vehicles that are choosing between alternate routes, priced managed lanes, or general-purpose lanes. In cases where the priced managed lane spans multiple access and egress points, the trip-based model will determine whether vehicles change the points at which they enter or exit the corridor in response to the tolls charged (and resulting time savings achieved) on each route segment. A trip-based model can incorporate more complex generalized cost functions than the sketch-planning method.

A common alternative to a fully fledged regional model is to study the priced managed lane in isolation, in the same manner that the sketch-planning model does, but using a more complex HOT lane choice function than described above. By ignoring the destination and mode choice dimensions, these corridor-based models can apply greater realism to the representation of value of time over the entire population and travel-time variability, than a regional model is capable of doing.

Activity-Based Travel Demand Models

Activity-based travel models are also regional travel demand models that overcome many of the shortcomings of trip-based models. Activity-based models rely on a more behaviorally correct representation of travel choices, incorporating both long-term effects and short-term effects. Particularly relevant for modeling priced managed lane demand, these models are able to represent VOT and VOR as a unique attribute of each traveler in the population, rather than the average VOT or VOR used in trip-based models. This representation of distributed VOTs lends greater realism to forecasting optimal tolls—that is, the toll that equilibrates priced managed lane demand with the minimum desired level of service. In these models VOT is not just a function of income but also of taste variations and situational effects observed in the travel population. Activity-based models are also better equipped to model carpool formation since they can consider household composition and travel patterns for the entire household in the choice of mode. Another important advantage for modeling variably priced managed lanes is the finer time of day periods typically used by activity-based models, compared to trip-based models or sketch-planning tools.

Lessons Learned on Toll Traffic and Revenue Forecasting

Experience around the country with toll roads and transit systems indicates that demand projections and revenue forecasts are more likely to err on the high side. Overestimates of revenue potential can result in unexpected public expenditures or even project default. Therefore, it is preferable to build in reasonably conservative assumptions regarding travel demand characteristics and the underlying economic conditions that drive travel demand forecasts. Such assumptions are questioned as a matter of course in the due diligence reviews that private lenders require when they finance infrastructure projects. Similarly rating agencies focus closely on forecasting assumptions when rating project bonds.

The reasons for which toll projects fail to achieve the forecasted toll traffic and revenues vary from project to project. Numerous studies have identified and examined several sources of forecast error[4]. According to these sources, the top drivers of toll traffic and revenue forecast failure are:

- Poorly estimated VOTs, or reliance on a single VOT for the entire driver population;
- Economic downturns;
- Erroneous prediction of future land use conditions;
- Lower-than-predicted time savings;
- Additional competition (e.g., improvements to competing roads or the addition of new roads);
- Lower-than-anticipated truck usage;
- High variability in traffic volumes (by time of day or by day of the year);
- Complexity of the tolling regime;
- Underestimation of the duration and severity of the ramp-up period; and
- Use of a travel demand model developed for other planning purposes.

Three of these forecast failure drivers are particularly applicable to managed lane projects: poorly estimated VOTs, high variability in traffic volumes, and complexity of the toll regime.

Poorly estimated VOTs, in particular ignoring the presence of travelers that exhibit very high VOTs is problematic for priced managed lane projects because the optimal toll (and traffic and revenue) are highly dependent on these drivers. Models that use traditional market segmentation as opposed to distributed VOTs tend to under-estimate the number of high VOT users, which are the prime market of managed lane strategies. Traffic volume variability, such as is common in hyper congested corridors where managed lanes are attractive, results in travel-time savings that vary greatly over short periods of time. This type of travel-time variability is often ignored by models that forecast constant travel-time conditions over large (one to three hour) periods of time. Relying on average travel-time conditions over a relatively large time period ignores the travel-time variability that can make managed lanes attractive (or not) on the time scale in which the route choice decision is made. And finally, some priced managed lanes operate under quite complex tolling regimes, because the tolls are varying with the conditions in both the managed lane and the general-purpose lanes, in addition to discounts offered to certain types of users or payment methods. Capturing this level of complexity in a model expected to provide results in minutes or at most hours can be quite challenging, and therefore modelers tend to simplify the tolling regime. Over-simplifications of the tolling regime may lead to forecast failure, since the modeled conditions can be quite different from the actual travel conditions.

Given all the uncertainties and simplifications that are present in travel demand forecasting, it is recommended that analysts perform a risk analysis, whereby the impact of key modeling or project assumptions on toll traffic and revenues is examined in detail. Rather than providing a single point estimate of the expected traffic and revenue, a range of estimates is provided along with the assumptions that underpin these estimates.

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[4] Bain, R. and M. Wilkins. (2002) *Infrastructure Finance: Traffic Risk in Start-Up Toll Facilities*, Standard & Poor's, McGraw-Hill International (UK) Ltd., September 2002.; Flyvbjerg, B., M. K. Skamris Holm, and S. L. Buhl. (2005) *How (In)accurate Are Demand Forecasts in Public Works Projects: The Case of Transportation*, Journal of the American Planning Association, 71 (2), 131-146.; Flyvbjerg, B., M. K. Skamris Holm, and S. L. Buhl. (2006) *Inaccuracy in Traffic Forecasts. Transport Reviews*, 26 (1), 1-24.; George, C., W. Streeter, and S. Trommer. (2003) *Bliss, Heartburn, and Toll Road Forecasts*. Project Finance Special Report, Fitch Ratings, November 2003; George, C., S. Trommer, M. McDermott, G. Zurita, C. Lewis, L. Monnier, W. Streeter, E. Lopez, and C. Fuenalida. (2007) *Global Toll Road Rating Guidelines*. Criteria Report, Fitch Ratings, March 2007.

3 Organizational / Institutional Frameworks

In order to launch a priced managed lane project, there are several organizational issues that need to be resolved. These involve identifying a logical project sponsor, arranging funding, working out operational protocols, and determining what legal ramifications may be involved. Answers to these issues may not always be obvious. This chapter identifies the wide array of organizational and institutional issues that transportation professionals must address as they consider the implementation of priced managed lane projects.

3.1 Priced Managed Lanes Roles and Responsibilities

There is no set formula or norm for the institutional arrangements supporting priced managed lane projects, nor the assignment of roles and responsibilities to particular entities. Table 3-1 identifies a comprehensive list of activities undertaken for a typical priced managed lane project, divides them between project implementation and operations, and indicates the potential entities with responsibility. Not all activities will apply to every priced managed lane project. Institutional structures will depend on a variety of factors and are likely to vary from project to project. In some cases, a single agency, such as a state DOT, may be responsible for many of the activities noted in the table. In others, individual functions may be performed by individual agencies, private companies, or partnerships among them.

3.2 Project Sponsors

Identifying a project sponsor is one of the first and most important issues to resolve in implementing a priced managed lane project. The project sponsor plays the most significant role in project implementation. As shown in Table 3-1, a project sponsor can be responsible for nearly all activities during a priced managed lane project's development and operations. The project sponsor often will execute planning studies, submit applications and environmental documentation, and oversee the construction and possibly the ultimate operation of the facility. The implementing agency will need to be vested with, or obtain the legal authority to collect tolls, and it will need to function as a champion for the project to garner the critical public and political support needed to bring the project to fruition.

Experience has shown that a variety of project sponsors and operators may be involved. Most frequently, a state DOT acts as the project sponsor, but turnpike and toll road authorities, local transportation agencies and authorities, and public transit agencies can also sponsor or cosponsor a priced managed lane project. Often a long legacy of institutional relationships has already been established among project participants. Therefore, it is important to understand these relationships and determine if any pre-existing political or institutional issues should be addressed.

TABLE 3-1: PRICED MANAGED LANE PROJECT ACTIVITIES AND RESPONSIBILITIES

	State DOT*	Turnpike / Toll Authority*	MPO and Other Local Agencies*	Transit Agency*	Private Development Partner	Private Consultant Contractor	Law Enforcement Agency / Emergency Response
Project Development							
Planning / Technical Studies	X		X	X	X	X	
Education and Public Outreach	X	X	X	X	X	X	
Federal Programs and Grant Applications	X	X	X	X			
Environmental Review / Permitting	X	X		X		X	
Project Finance	X	X	X	X	X		
Contract Award and Administration	X	X	X	X	X		
Design	X				X	X	
Construction	X				X	X	
Operations							
Toll Collection and Billing	X	X			X	X	
Facility Operations	X	X		X	X	X	
Performance Monitoring / Management	X	X	X	X	X	X	
Maintenance Operations	X	X			X	X	
Enforcement		X		X			X
Incident Management						X	X
Customer Service	X	X	X	X	X	X	
Marketing	X	X	X	X	X	X	
Transit Operations			X	X			

Source: Parsons Brinckerhoff

* Potential project sponsor

3.2.1 State Departments of Transportation

As the primary providers of highway service and owner/operators of a majority of the nation's managed lane projects, DOTs are logical sponsors of new priced managed lane facilities. They have extensive experience in planning, designing, constructing, operating, and maintaining limited-access highways. They have the financial depth to contemplate building new highway capacity and to obtain the expensive toll collection and traffic monitoring systems that priced managed lane facilities require. DOTs also have the power of eminent domain and many DOTs are already operating HOV networks with extensive electronic traffic monitoring capabilities.

While state DOTs have a wealth of highway experience, they may not necessarily have the legal authority to levy tolls (see Section 3.4.1). They also may not be familiar with the operation of tolled facilities and the sophisticated electronic toll collection traffic monitoring systems that priced managed lane projects require, and in certain cases they may have limited legal authority to privatize these operations. Toll road operation also involves back-office activities including auditing, credit card billing, and customer service, all of which may be new activities for many DOTs.

3.2.2 Turnpike and Toll Road Authorities

As a precursor to the interstate highway program, many states developed turnpike and toll authorities with specific legislative charters to finance, build, and operate limited-access, high-speed highways. While the advent of the interstate program provided a dedicated federal motor fuel tax to provide funding for non-tolled highways, most legacy toll authorities continue to serve their original roles. Fiscal constraints beginning in the 1980s have led to renewed significance and presence of toll authorities, especially in fast growing areas such as California, Texas, Colorado, Florida, and North Carolina. Some of these authorities are state or county agencies, while others are joint entities formed by multiple jurisdictions.

In certain cases, the involvement of turnpike and toll authorities may facilitate the implementation of a priced managed lane project. In addition to engineering and construction experience, they are already vested with the legal authority to operate tolled highway facilities, thereby obviating the need to seek special authorizing legislation. Turnpike and toll authorities have the staff and systems in place to conduct all back-office revenue handling and accounting activities. In addition, many operate the advanced electronic toll collection and traffic monitoring systems that priced managed lane networks require.

While turnpike and toll road authorities offer natural advantages, they are not common in all areas across the country. In addition, if priced managed lanes were introduced along un-tolled highway segments, they would not involve roads already under the control of such authorities. Nonetheless, given that motorists are accustomed to paying tolls to turnpike and toll road authorities, their involvement in the operation of priced managed lane projects could help in gaining the public's understanding and acceptance of these potential projects.

3.2.3 Local Transportation Agencies and Authorities

In order to receive federal funding for transportation projects, all urbanized areas in the United States are required to establish an MPO. MPO status is designated by the United States Department of Transportation (USDOT) and is usually given to regional Councils of Government or other joint powers' authorities. These groups are generally governed by a board of elected officials representing municipal

governments within their jurisdictions, as well as county officials, and public agencies that operate transportation systems. State DOTs sit on all MPO boards *ex officio*. The organizational structure of MPOs varies around the country, and in certain cases, MPO status is given to county or municipal governments.

In some areas, local authorities have been created to assist MPOs in securing funding and implementing projects identified through the MPO. These transportation or funding authorities, created at the county or regional level under varying conditions, can help to study the merits of priced managed lanes and secure funding for their implementation. Once a project is operational, they may be responsible for disbursement of net revenues collected. County-level transportation agencies have been especially instrumental in California, where they serve in varying capacities, as state mandated Congestion Management Agencies that plan and fund projects at the county level, as administrators of county-level local option sales taxes devoted to transportation, as transit operators, and as combinations thereof.

Given their regional mandate and their planning function, MPOs and local transportation authorities may be logical sponsors of priced managed lane initiatives. They have commissioned several of the priced managed lane studies that have been carried out in California, the Phoenix region, the Washington, D.C., metropolitan region, and elsewhere. Their active and consistent support is also essential if a new priced managed lane facility is to be built, and local transportation authorities often play a primary role in the initial planning studies investigating the feasibility of such projects. Although most MPOs are likely to lack operating experience or tradition, some might play a further role in overseeing the implementation and operation of a priced managed lanes facility, such as with the I-15 Express Lanes in San Diego, where SANDAG has cosponsored the project in conjunction with the state DOT. County-level transportation agencies in California are also prominent sponsors of priced managed lane projects in the San Francisco Bay Area and Southern California.

3.2.4 Public Transit Agencies

Public transit agencies present interesting opportunities for participating in priced managed lane projects. Several transit agencies operate bus rapid transit or HOV facilities that have excess capacity that could be sold to carpoolers, vanpoolers, or single occupant vehicles and operate as a HOT facility. Utilizing additional roadway capacity for other vehicles can help win political and public support and may limit the need to add additional roadway capacity. In the same vein, the participation of transit agencies in priced managed lane projects sponsored by other agencies highlights the potential for priced managed lane projects to provide opportunities for promoting reliable mass transit improvements. Finally, transit agency involvement in the development of priced managed lanes may also help to introduce new sources of capital funds and in return, as with the I-15 in San Diego, I-25 in Denver, and 95 Express in Miami, priced managed lane revenues can provide important new revenues to support improved transit service.

It is important to note, however, that transit agencies would need to obtain the backing of the Federal Transit Administration (FTA) before being able to launch a priced managed lane project on their own. Approximately 80 of the 130 freeway HOV facilities in the U.S. are considered "fixed guideway miles" for the purposes of FTA's formula grant programs (Section 5307 and 5309). Generally in effect since Fiscal Year 2003 and clarified in the *Federal Register* in January 2007 (responding to Section 1121 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users [SAFETEA-LU]), FTA also classifies HOV lanes as fixed guideway miles for the purposes of funding formulas, thereby ensuring that federal transit funding is not decreased when existing HOV facilities are converted to priced operation. The converted facility must maintain certain operational performance standards, which may be higher

than generally required for priced managed lanes if the HOV facility was originally constructed using FTA capital grant funding. Facilities that were not eligible HOV lanes prior to being converted, non-HOV facilities converted to priced operation, and newly constructed priced managed lanes remain ineligible for inclusion as fixed guideway miles in FTA's funding formulas.

3.3 Other Entities

In addition to project sponsors, other important roles and responsibilities rest with the private sector, including consultants and contractors and with law enforcement and emergency response personnel.

3.3.1 The Private Sector

The fact that priced managed lane projects generate toll revenues also introduces the possibility that under the right conditions they could be financially independent or even profitable ventures of potential interest to private investors. Recent design-build-finance-operate-maintain P3 transactions involving priced managed lane projects have demonstrated private sector interest in large ($2 billion or more) reconstruction projects that incorporate the conversion and/or addition of priced managed lanes. Further information on project procurement and P3s can be found in Section 5.4.

Private sector involvement can be an attractive option for transportation agencies, as it provides access to additional sources of capital. This allows DOTs to reserve their own funds for other needs and often accelerate the implementation of partnership projects. Private operators are motivated to maximize efficiency in order to maximize profits and their services—both capital construction and roadway operation—can bring good value for money. On the down side, financing terms for private investors may not always be as attractive as those available to the public sector, and have the potential to offset other construction and long-term operational efficiencies.

A decision must be made to forgo using some or all revenue beyond paying for operations and maintenance for other purposes, such as supporting transit or other publicly provided transportation enhancements, and to offer it instead to a the private concessionaire. Agreements between a project's public sector sponsor and private partner dictate the terms of revenue distribution and use. In at least one current instance, regional policy in the Dallas-Fort Worth area dictates the terms of priced managed lane revenue beyond the level of profit assigned to the private concessionaire, annual debt service, and annual reserve funds set aside for operations and preventative maintenance. Excess revenue must remain in the counties in which the facility is located and returned to the local government and agency project funding partners in proportion to their original contributions for reinvestment in future transportation improvements.

Private consultants and contractors may play significant roles in both the project development and operational phases of a project, regardless of whether the project is procured as a P3. As with many large transportation improvement projects, technical studies, environmental review, and design may be performed by consultants. Construction services may be handled by private contractors. Specialized firms offer services in priced managed lane operations, maintenance, incident management, and back-office activities such as toll collection and billing, customer service, and marketing. Some or all of these activities may be contracted out to one or more private entities.

3.3.2 Law Enforcement and Emergency Response Entities

Enforcement is a critical activity in the operation of a priced managed lane facility both in terms of toll collection and occupancy requirements (see Section 7.3). These activities may be handled by the appropriate law enforcement agency, which could include the police force of a toll or turnpike authority, state highway patrol, or a local law enforcement agency. The decision on who will be the responsible enforcement entity likely will rest largely on established institutional protocols and precedents and may be prescribed by state law.

Incident management along a priced managed lane facility is also of critical importance to maintain the reliable trip users expect from the facility (see Section 7.4). A variety of entities may be involved in this function including the state DOT, state highway patrol, local emergency response units and/or private towing and recovery contractors. Individual responsibilities must be established in well developed protocols.

3.4 Federal Programs and Requirements

3.4.1 Tolling Programs

Two federal tolling programs and several pilot programs offer states opportunities to implement priced managed lanes on federal-aid highways. Current guidance on these programs is available on the FHWA Moving Ahead for Progress in the 21st Century (MAP-21) website, which is likely to be expanded as further guidance documents become available: http://www.fhwa.dot.gov/map21/guidance/guidetoll.cfm.

The FHWA Office of Innovative Program Delivery Road Pricing Revenue website (http://www.fhwa.dot.gov/ipd/revenue/road_pricing/tolling_pricing/) and the Office of Operations website (http://ops.fhwa.dot.gov/tolling_pricing/index.htm) also provide information and guidance on federal tolling programs.

Section 129 General Tolling Program. The passage of MAP-21 made significant changes to the federal Section 129 Tolling Program including tolling eligibilities and agreement requirements. These changes have relaxed the prior, general prohibition on the imposition of tolls on federal-aid highways and formalized provisions previously available through pilot programs. Public agencies may impose new tolls on federal-aid highways in the following cases:

- Initial construction of a new highway, bridge, or tunnel
- Initial construction of new lanes on highways, bridges, and tunnels (including Interstates) as long as the number of toll-free lanes is not reduced
- Reconstruction or replacement of a bridge or tunnel
- Reconstruction of a highway (other than an Interstate)
- Reconstruction, restoration, or rehabilitation of an Interstate highway as long as the number of toll-free lanes is not reduced

Prior to MAP-21's provisions taking effect on October 1, 2012, public authorities were required to execute a tolling agreement with FHWA to impose tolls on a federal-aid highway, but this requirement is no longer

required. For toll facilities that have executed Section 129 tolling agreements prior to October 1, 2012, the terms of those agreements will continue in force.

Section 166 HOV/HOT Lanes. Under Section 166 of Title 23, existing HOV lanes may be converted to tolled operation provided that the local MPO endorses the use and amount of tolls on the converted lanes. All tolls on new lanes must be variably priced and collected electronically in order to manage travel demand. To implement tolls on an existing HOV lane, project sponsors must demonstrate that the conditions on the facility are not already degraded and that the presence of paying vehicles will not cause conditions on facility to become degraded. Ongoing annual reporting documenting conditions on the converted lanes is also required, and if the HOV facility becomes degraded the sponsor must bring the facility into compliance either by increasing HOV occupancy requirements, increasing tolls, increasing capacity, or eliminating access to paying motorists. The prior requirement to execute a tolling agreement with FHWA for HOV lane conversion is no longer in place under MAP-21, same as with the Section 129 General Tolling Program.

Toll Pilot Programs. In addition to the two mainstream toll programs above, four toll pilot programs enacted prior to MAP-21 are managed by FHWA.

- **Value Pricing Pilot Program:** The Value Pricing Pilot Program (VPPP) was initially authorized in ISTEA as the Congestion Pricing Pilot Program and subsequently amended under other laws, most recently SAFETEA-LU. The program has encouraged implementation and evaluation of value pricing pilot projects to manage congestion on highways through tolling and other pricing mechanisms. The VPPP is limited to 15 slots, seven of which have been permanently reserved for state agencies that have executed tolling cooperative agreements under the VPPP. MAP-21 made no changes to the program, and no additional funds have been authorized after Fiscal Year 2012. However, FHWA encourages use of the Section 129 General Tolling Program and Section 166 HOV/HOT Lanes program wherever possible as opposed to the VPPP. MAP-21 guidance states that "requests for tolling authority under the VPPP will be limited to situations that cannot be accommodated under the mainstream tolling programs, such as the pricing of existing toll-free facilities without substantial reconstruction of those facilities."[5]
- **Express Lanes Demonstration Program:** The Express Lanes Demonstration Program, created in SAFETEA-LU, permitted tolling on up to 15 selected demonstration projects to manage congestion, reduce emissions in a non-attainment area, or finance new and existing Interstate lanes for the purposes of reducing congestion. Qualified projects under this program included those that implement variable pricing by time of day or level of traffic, as appropriate to manage congestion or improve air quality. The program expired on September 30, 2012, and qualified projects should proceed under the Section 129 General Tolling Program.
- **Interstate System Construction Toll Pilot Program:** The Interstate System Construction Toll Pilot Program was authorized under SAFETEA-LU to permit up to three existing Interstate facilities to be tolled for the purpose of financing the construction of new Interstate highways. Under MAP-21, the program has effectively been mainstreamed under the Section 129 General Tolling Program, and consequently, FHWA will no longer be accepting applications for this program.

[5] "Guidance on Section 129 General Tolling Program" Memorandum, FHWA, September 24, 2012.

- **Interstate System Reconstruction and Rehabilitation Pilot Program:** The Interstate System Reconstruction and Rehabilitation Pilot Program was authorized under TEA-21 to permit up to three existing Interstate facilities to be tolled to fund needed reconstruction or rehabilitation on Interstate corridors that could not otherwise be adequately maintained or functionally improved without the collection of tolls. MAP-21 does not make any changes to this program. In order to receive tolling authority under the program, project sponsors are required to have their program application approved by FHWA and to execute a tolling agreement. All three of the slots authorized for this program are conditionally reserved as of October 2012.

3.4.2 Major Project Requirements

Title 23 defines Major Projects as highway improvement requiring federal assistance that are over $500 million in cost. FHWA also has the discretion to designate a project with a total cost of less than $500 million as a Major Project in certain cases. At this scale, the processes and federal requirements involved in project delivery become more complex, rendering it more challenging, but ever more important, for the process to be well-managed. Several priced managed lane projects implemented to date as part of larger major reconstruction projects have qualified as Major Projects.

For federal funding to be authorized for the financing of a Major Project, the project owner must demonstrate to FHWA that the project has been carefully planned out, i.e. costs have been estimated as accurately and meticulously as possible; risks have been carefully considered and mitigated; financing requirements and strategies have been clearly defined; and the implementation of the project delivery has been carefully planned.

Through the different phases of project delivery, project owners are required to submit financial and management plans and are subject to undergo various FHWA review processes before federal funding can be released for the project. Additional information on Major Project requirements is available at http://www.fhwa.dot.gov/ipd/project_delivery/resources/index.htm.

3.4.3 Concepts of Operations

Although not required by FHWA as a part of a project's approvals process or tolling programs, Concepts of Operations (as introduced in Chapter 2; see Section 2.3.1) are highly recommended, especially for projects of greater operational complexity. In fact, some FHWA Division Offices, including California, require Concepts of Operations as part of its state-level project approvals process.

3.5 State Processes and Requirements for Tolling

3.5.1 State Models

Priced managed lane projects must comply with state and local laws on toll collection. The authority to collect tolls on state highways and other roads typically rests with designated turnpike or toll road authorities in states that have such agencies. However, toll collection may be limited to roadways already operated by these agencies. Obtaining authority for toll collection on newly developed roadways or previously un-tolled roadways may require approvals beyond the agency including a state legislative body.

For example, the North Carolina General Assembly in 2002 created the North Carolina Turnpike Authority (NCTA) in statute. Originally it authorized the NCTA to study, develop, construct, and operate up to three toll projects, and has since expanded authorization to nine. The NCTA's Board has adopted a process for studying, funding, and constructing a toll road project whereby "a recognized municipal, regional or local planning authority, or group of local elected officials or members of the General Assembly may submit a request to the NCTA Board of Directors to study building a project in their jurisdiction as a toll project."[6] However, any proposed toll road not included among the nine already authorized must be approved by the General Assembly.

In states without existing toll authorities, legislative authorization is necessary on a facility-specific or potentially broader programmatic or regionwide basis. The State of Washington provides an example of legislatively authorized toll collection on a facility-specific basis. The SR 167 HOT Lanes required administrative approval by the Washington Transportation Commission and legal approval by the State Legislature, which was passed during the 2005 legislative session. The four-year pilot project opened in May 2008 and was extended in March 2011 by the State Legislature until June 2013. More recently, the State Legislature approved the tolling of existing SR 520 Floating Bridge to help pay for its replacement. The replacement bridge will include two tolled general-purpose lanes and one non-tolled HOV lane in each direction.

3.5.2 Variable Pricing Authority

Trust agreements governing the operation of most toll roads only allow flat point-to-point toll rates (i.e., a consistently applied toll rate from point A to point B). If a priced managed lane project involves variably priced tolls, legislation may need to be drafted that establishes how and when toll rates can be changed and establishes the minimum acceptable traffic service levels in the priced managed lane.

These issues should be addressed in the enabling legislation that will establish the legal and regulatory framework for the priced managed lane facility. Because priced managed lane operations require a high degree of interagency cooperation and shared responsibility, enabling legislation should designate the operating agency or agencies and outline their specific responsibilities in such areas as construction, maintenance, toll collection accounting, and enforcement. If the priced managed lane facility were to be operated by a bi-state organization, approvals would be required from the United States Congress, as well as both state legislatures.

3.5.3 Public-Private Partnership Authority

Use of private financing mechanisms for transportation facilities can occur only when the necessary legal authority exists and governing legal principles and restrictions are observed. Local governments not only must have the legal power through constitutional or statutory provisions to finance transportation facilities, but they must also use this power within the legal restraints established by legislatures and courts. The methods of granting power and limitations on that power vary.

As of May 2012, 32 states and Puerto Rico have enacted P3 legislation designed to authorize state DOTs and other subdivisions of the state to enter into new forms of legal agreements with private entities

[6] "NCTA Project Approval Process," http://www.ncdot.gov/turnpike/download/turnpike_projects_Project_Approval_Process.pdf

in support of revenue-generating projects which are consistent with each state's overall transportation objectives. Recent research conducted for the Second Strategic Highway Research Program (SHRP 2) has determined that there is great variance among P3 authority granted through state legislation, constitutions, city charters, and other sources. This type of authorization must be in place before a priced managed lane concession can be awarded to a private investor. Further information on certain key legal concepts will be available upon publication of SHRP 2's *The Effect of Public-Private Partnerships and Non-Traditional Procurement Processes on Highway Planning, Environmental Review, and Collaborative Decision Making*.

3.6 Operational Arrangements

Once the priced managed lane facility is operational, a number of ongoing operational functions will be required. These involve facility operations and routine roadway maintenance, as well as toll collection and enforcement. These functions can pose differences from normal highway operation and are discussed in further detail below. Operational functions may be performed directly by the public sponsor or private partner of a priced managed lane facility, or contracted out to an outside vendor specializing in automated toll collection or facility management.

3.6.1 Toll Collection

All forms of priced managed lanes require the collection of tolls from some, if not all motorists using the facility. Moreover, in order to maintain time savings and ease of use and to comply with federal law, toll collection for priced managed lanes must be fully automated. As discussed in further detail in Chapter 6, the operation of automated tolling systems requires sophisticated equipment and expertise. Although some toll collection agencies maintain this expertise in-house, the majority rely on the services of outside contractors to maintain their automated toll collection systems.

If a priced managed lane project is sponsored by a state DOT, it is also conceivable that the DOT could vest responsibility for toll collection with a local turnpike or toll road authority with the appropriate expertise. Recently, this operational decision has also been required of priced managed lane projects being implemented as public-private partnerships on a concession basis. In this case, the private partner may have prior toll collection experience and assume the role itself, it may rely on an existing regional toll authority as stipulated in its concession agreement or required by policy, or it may retain the service of an outside contractor in the way a public agency would.

As one example, in the Dallas-Fort Worth region, several priced managed lane projects are sponsored by TxDOT and are being implemented by private partners through Comprehensive Development Agreements (CDA). In addition, the region has an existing network of toll roads operated by the North Texas Tollway Authority (NTTA). NTTA also maintains the right of first refusal to develop proposed tolled projects in the region when being pursued as a CDA. To clarify and simplify toll operations in the region, TxDOT and NTTA have in place the TxDOT/NTTA Regional Protocol, which states that NTTA will be the provider for toll collection service for at least the first five years of a Comprehensive Development Agreement, after which negotiations between NTTA and the private partner can take place with the option of choosing another alternative if they are not successful.

Toll Agency Legislation Checklist

The enabling legislation for any toll agency is unique, but there are many common provisions that are likely to be addressed, including the following:

- Creation of an authority or commission, including the legal name and nature of the newly created entity
- Scope, purpose, and function of the new entity
- Definition of terms
- Delineation of districts within which the entity operates
- Details about the entity's governing board, including the number, composition, selection or appointment process, compensation, and term of members, voting/procedural rules for governing board action, and meeting requirements
- The legal powers of the commission/authority, including the ability to establish rules and regulations, hire employees, sue and be sued, enter into contracts, construct facilities, acquire property, use the power of eminent domain, and impose fees
- The authority to issue and refund bonds and use tolls and revenues in associated trust indentures
- The authority to set and revise tolls and any applicable guidelines or formulas
- The ability to invest bond proceeds
- Administrative requirements, which may include periodic audits, competitive bidding, annual reports, public notice and/or hearing requirements
- Any constraints or rules on the use of funds
- The rights and remedies of bondholders
- Tax-exempt status of authority property and bonds
- The venue and jurisdiction of legal actions against the authority/commission
- Police powers
- Operating, maintenance, and repair obligations
- Relationship to other entities, e.g., for oversight, reporting, etc.

In addition to these typical provisions, an enabling act may have non-competition sections, which guarantee to the new entity that no new directly competing facility will be authorized by the state. Other legislation is likely to be required to cover issues such as the following:

- Signing to the road from the rest of the network
- Advertising controls on the road
- Operational procedures (such as arrangements for emergency vehicles and information disclosure rules, which are particularly important where tolls are levied electronically)
- Defining the enforcement regulations for nonpayment
- The use of cameras to enforce occupancy requirements
- Provisions for land acquisition and clearance
- Structure for involvement of the private sector in the provision of roads

3.6.2 Interoperability

Interoperability is a critical toll collection issue. Interoperable systems allow a single electronic toll account to be accepted at each interoperable facility. For toll roads, it is normally advantageous for automated toll collection systems to be interoperable from region to region. Existing interoperable networks in the U.S. include E-ZPass accepted in 14 states across the Northeast and Midwest, SunPass in Florida, TxTag in Texas, and FasTrak® in California. Interoperability is essential for regions that envision deploying an integrated network of priced managed lane facilities, such as South Florida and the San Francisco Bay Area.

Since late 2009, FHWA has required that any tolled facility operating under authority from the Value Pricing Program or the Express Lanes Demonstration Program maximize their system's interoperability and upgrade their ETC systems to the national standards whenever adopted. MAP-21 now mandates that all toll facilities on federal-aid highways shall implement technologies or business practices that provide for the interoperability of electronic toll collection programs by mid 2016. This would indicate that a federal standard for toll collection system interoperability will be established soon.

3.6.3 Enforcement

Increasingly, toll violation enforcement is being performed electronically using cameras that capture license plate images of vehicles that do not display a recognizable transponder. However, police presence is used to enforce occupancy requirements, as technology to automate vehicle occupancy verification is still experimental.

Planning for priced managed lanes should include early involvement of the appropriate police agencies. If the priced managed lane facility will pass through several jurisdictions where each may take an active investigative and enforcement role, then planning should include early agreements to establish response and enforcement protocols. If the priced managed lanes will be added to an existing facility, then the police agencies will have considerable experience on that roadway.

If the system will have a limited number of access and egress points, then agreements may be needed to consolidate enforcement responsibilities under a small number or one police agency. If only one police agency is involved, the transportation agency should request that a liaison be assigned to ensure continuity of input during the planning process. This early involvement can be invaluable for resolving design issues for enforcement locations, investigation sites, and enforceable signing. The police liaison can also be a significant help if law or procedure changes are needed before enforcement can be undertaken. As discussed in Section 7.3.1, procedures, processes, locations, and frequency of designated enforcement should be decided based on discussions with local enforcement personnel who are most familiar with the unique characteristics and needs of each corridor.

Additional information on enforcement issues is provided in Chapters 6 and 7. See Sections 6.6 and 7.3.

3.6.4 Maintenance

Responsibility for the physical maintenance of a priced managed lane is most likely to rest with the agency that maintains the corridor in which the facility is located. In most cases this is the state DOT, but other agencies could also be involved. Especially in the case of the sophisticated tolling systems

and infrastructure, on which the ability to collect tolls and maintain managed lane availability relies, specialized contractors may be employed. This is the case, for example, with the I-680 and the SR 237 / I-880 express lanes where Caltrans maintains the roadway but a private sector toll system integrator maintains the toll collection equipment and variable message signs. In order to operate priced managed lanes with a high degree of reliability, strict preventive maintenance protocols are necessary. Managed lane operators may also rely on ITS equipment maintained by other entities, in which case contractual performance guidance should be established between the operator and the appropriate entities. Overall, if multiple agencies are responsible for different operating aspects, maintenance agreements will need to be put into place identifying roles and responsibilities as well as reimbursement.

3.6.5 Concepts of Operations

Section 2.3.1 introduces and explains Concepts of Operations. They describe a facility's characteristics from the user's perspective and include details of the ongoing operational functions of the priced managed lane facility. They identify responsible entities and the relationships among them. Operating a priced managed lane adds new roles and complexities to standard highway operations, and a Concept of Operations can help clarify and integrate them into a single framework so that all responsible parties can understand their role, especially with back-office technical and administrative aspects.

4 Public Outreach

4.1 Public Outreach

Effective public outreach will help develop public awareness for the benefits of priced managed lanes as well as build political and popular support. When done effectively, public outreach can facilitate efforts to implement new projects. Public outreach can also provide valuable feedback to help decision makers evaluate a priced managed lanes proposal. Without a robust outreach program, the public may greet the introduction of a new priced managed lanes facility or conversion of an existing facility with indifference, caution or disdain. Similarly, marketing is critical to attracting users to the facility and meeting revenue goals.

Carefully planned and executed public outreach will help the public to 1) understand how a proposed priced managed lanes facility would work, 2) evaluate the advantages it might offer, 3) accept and use the facility as a new travel option, and 4) encourage travelers to become customers.

4.1.1 How Outreach for Priced Managed Lanes Projects Differs From Other Transportation Projects

While they will utilize many of the same techniques to exchange information, public outreach activities designed for priced managed lane initiatives need to be *different* from those designed for more conventional transportation improvements. This is especially true when converting or transitioning from free lanes to tolled lanes.

A priced managed lanes or tolled project's public outreach includes public involvement, government relations, media relations, and marketing strategies all rolled into one. Communications and marketing plans for priced managed lanes projects must be integrated to meet multiple objectives such as educating and informing the public, achieving or exceeding penetration and sales goals, and building support for the project among key political figures and opinion leaders.

In addition, any project that includes tolling or fees transforms the public into paying *customers*, who are concerned about their own finances and someone managing their accounts. Even more concern arises when these accounts are handled electronically. So, there are several communications plans that all have to integrate with each other, and take into consideration the sensitive nature of tolls and fees.

There will be pressure for the lanes to perform well. When priced managed lanes open to back-ups in the general-purpose lanes, severe public scrutiny or opposition, or confusion, constituents look to their elected leaders for help. There are examples where political leaders have stepped in and reduced tolls, delayed tolling, and modified operations, often reacting to outcry from their constituents. It is therefore essential to conduct sound research, educate the public and political leaders, and manage expectations from the very beginning of project inception.

While becoming more widespread in the United States, priced managed lanes are a fairly new concept in some places, and public outreach for new project proposals will necessarily involve a larger educational component than traditional transportation projects. Priced managed lanes are unlike conventional road improvements—such as roadway resurfacing or reconfiguring an

interchange—where the public may readily understand the future benefits. As discussed in Chapter 1, Section 3 of this Guide, priced managed lanes often have a number of complementary goals including traffic management, revenue generation, providing new travel choices and enhancing transit service.

4.2 Public Acceptance of Priced Managed Lanes: The Issues

During the public outreach process for a proposed priced managed lanes facility, certain issues not associated with conventional highway improvements may be of keen interest to the general public and particular stakeholder groups. It is helpful for project sponsors to be aware of these issues in advance and address them proactively during the public outreach process.

4.2.1 Issues

The following issues are likely to be of interest to the public:

- Project benefits and goals
- Travel impacts
- User fees
- Project cost and use of Funds
- Equity
- Geographic Equity
- Technology
- Enforcement

These issues are discussed in further detail below. Project sponsors may also wish to confer with colleagues in other regions that have pursued priced managed lane initiatives. These peer exchanges can provide valuable insight into the issues encountered, the public outreach approach followed, and what might have been done differently in hindsight.

Project Benefits and Goals

As with any investment of public funds, constituents and stakeholder groups have an immediate interest in the benefits that a priced managed lanes facility may bring and they will want to know why priced managed lanes are the best solution to address a given problem. Project sponsors who can discuss the specific advantages anticipated from a priced managed lanes facility can more easily communicate the project's rationale to a variety of public interests. Succinctly communicating the anticipated benefits through key messages plays an especially important role in regions where priced lane concepts may be new or not widely understood. Consider developing key messages that incorporate statements about the benefits of the project, such as those discussed in Chapter 1.

The public is generally supportive of projects that provide new priced managed lane capacity in congested corridors, as well as those such as the 95 Express in Miami or the I-10 Express in Los Angeles

that involve the conversion of existing HOV lanes to HOT operation together with the provision of new priced managed lanes. The public may be more skeptical of projects that involve the conversion of existing HOV lanes to HOT operation without the provision of new capacity. In this case, project sponsors will need to address the concerns of existing HOV drivers and transit users who will likely be concerned that the introduction of paying motorists on the managed lanes could compromise existing conditions.

Travel Impacts

Research has found that in priced managed lane corridors, very few drivers choose to use the priced lanes *all* the time. Instead, users may choose to pay to use the lanes when they want to guarantee their trip time or avoid congestion. At other times, drivers will choose the general-purpose lanes during congested conditions to avoid paying a toll. Even frequent managed lane users are likely to make many of their trips on the free general-purpose lanes, or choose alternate modes like transit on certain days. Managed lanes allow people the flexibility to choose the priced lanes for a reliable trip some days and other modes of transportation other days.

Accordingly, project planners may use the public outreach process to address how the proposed priced managed lanes will affect travel conditions for non-users and current HOV travelers. The travel impacts on adjacent facilities will depend on the nature of the facility itself.

User Fees

In addition to the potential benefits of revenue generated by a priced managed lanes facility, stakeholders will wish to know about the nature of the user fees themselves. Many questions are likely to arise:

- **"How much will it cost?"** The public will perhaps have the greatest interest in knowing how much it will cost to use the proposed facility. Because fees usually vary depending on the time of day and associated congestion levels, priced managed lanes involve an additional dimension for public outreach efforts. Informational materials, public presentations, and news articles discussing the proposed facility can explain its approach to tolls and how tolls can be paid. Project sponsors will need to ensure that all audiences understand the dynamics of the proposed tolling structure.
- **"If the price changes by the time of day, how will I know how much it costs?"** When tolls are based on time of day travel conditions, additional public education is needed. Materials and presentations can explain that the current toll will be clearly posted on digital message boards at all entrances to the facility. It is important to communicate that motorists will always be informed of the current toll rate before having to choose to enter the priced managed lanes. When posted clearly prior to entrances, this information allows drivers to decide whether or not to use the facility.
- **"Can you tell us now what the tolls will be?"** Although potential users may inquire about the proposed toll amounts, fee schedules are often developed in a project's later planning stages. In earlier planning stages, outreach efforts may discuss the potential range for fees, if appropriate. However, formulating an effective toll schedule often involves marketing surveys of potential users, and final toll levels may be undetermined in early phases. Moreover, once the facility opens, facility operators may have to adjust toll fees in order to control the level of traffic service on the facility. Where a facility uses real-time dynamic prices, tolls are posted but no advance toll schedule is used. Project planners can use the public outreach process to describe how fees are established and, where appropriate, to discuss overall ranges for the potential fees.

- **"Are drivers paying for premium service?"** The rationale for tolls on priced managed lanes differs from that of traditional tolls. Historically, tolls have been charged as a means to pay for the construction, operation and maintenance of the roads and bridges where they are collected. Priced managed lanes, however, have an added dimension. The fee paid by users not only allows the driver to use the facility, but also ensures the driver will benefit from a high level of traffic service. Public outreach efforts can convey the message that drivers are paying for time savings and trip time reliability. When explaining how congestion pricing works, project sponsors will need to tackle the difficult message that when the managed lanes are reaching capacity, the price will go up, and traffic will still be congested during the transition.
- **"Will I have to stop and wait in line at a toll booth?"** Stakeholders may also raise the issue of toll collection. Manual toll collection is associated by many with stops and long delays at toll plazas; however, high-speed ETC, also known as all-electronic tolling, is standard practice for all current priced managed lanes facilities. As a vital component of priced managed lanes, ETC deserves elaboration in the public outreach process. Motorists have a great stake in ETC's capacity for eliminating delays and making toll collection invisible and easy.

Congestion Pricing: A Familiar Concept

Although priced managed lanes or toll roads may not exist in a given region, the concept of paying a higher price during premium times does. For example, air passengers are accustomed to paying higher fares during high travel seasons when there is much demand for flights. In the case of managed lanes, drivers pay a higher price during peak travel times, and they get a reliable, less congested trip. While drivers may perceive tolls as a cost, many would value the travel time savings associated with the fees. If asked, "Would you pay two dollars to save 30 minutes on your evening commute?" many motorists would answer, "Yes."

Project Cost and Use of Funds

The public is normally interested in how the revenues generated by priced managed lanes will be used. While tolls are not popular, experience with existing priced managed lanes demonstrates that these projects are likely to garner greater support with the public when toll revenues are used to support the maintenance and operations of the project and other transportation needs in the priced corridor, including transit improvements.

The public may also be interested in the capital construction cost of the facility. They will want to know where the money to build the priced managed lanes is coming from and whether or not the project will be paid for from the toll proceeds. A common public sentiment is, "Since I've already paid my taxes for these road improvements, why do I have to pay (again) to use them?" Project teams have likened this to paying for utilities—we all pay taxes for energy, but those who use more pay more. Because priced managed lanes produce revenues, a number of policy questions and administrative issues come to the fore.

When it comes to priced managed lanes and tolling in general, a big question for the public is "What do my tolls pay for?" To gain public acceptance and understanding for priced-managed lanes, project

sponsors must clearly articulate the benefits and features that toll revenues will help fund. This may also make the point that what the public has already paid for with traditional gas tax funding has not been able to providing reliable trips. Most communities are more accepting if the generated revenues are used for a dedicated purpose, such as supporting transportation improvements.

Project Spotlight: I-15, San Diego, California

The I-15 Express Lanes facility in San Diego offers an example of an HOV lane conversion that includes an integral transit component. The 20-mile, state-of-the-art Express Lanes facility between SR 163 and SR 78 was completed in January 2012. The I-15 Express Lanes feature four lanes with a moveable barrier; multiple access points to the general-purpose highway lanes; and access ramps from transit centers providing high-frequency BRT service. The original 8-mile, reversible HOV lanes were funded partially with transit monies, and the initial project sponsors launched an express bus service as part of the original congestion pricing project. Today, I-15 FasTrak® toll revenues fund nearly $1 million per year of premium express bus service in the I-15 corridor. After facility operating expenses are settled, the California law that authorized the pricing demonstration requires any remaining revenues to be spent improving transit service in the I-15 corridor. This arrangement played a large role in the political acceptability of the project, and it is one way to address transit concerns when a priced managed lanes project involves an HOV-lane conversion and when the support of local transit authorities and other officials for the managed lane is important. To date, over $8 million have been channeled to improve corridor transit operations as a result. By dedicating all or a portion of net revenues to local transit services, a project may be perceived as more equitable and win greater approval. For more information on SANDAG, I-15 Express Lanes, visit: www.sandag.org/index.asp?projectid=34&fuseaction=projects.detail.

Equity

Because priced managed lanes provide paying drivers the opportunity to bypass congestion, some critics have asserted that these facilities favor higher income individuals (i.e. *Lexus Lanes*). In spite of this concern, priced managed lane usage data show that drivers in all income brackets use and support the facilities, albeit in different ways. Usage statistics seem to indicate that while most toll-paying customers have higher than average income, lower income drivers like the option of occasionally using priced lanes when time is of the essence and frequently use enhanced transit services that often are part of priced managed lane projects. Since congestion in the general-purpose lanes may decrease due to adding priced manages lanes, overall corridor congestion is generally reduced for all users.

Local political support plays a key role in building consensus for priced managed lane initiatives among the public. Where local constituents are concerned about equity, it is especially important to address in outreach efforts how the proposed project may impact people in different income ranges. Local officials and public figures who can defuse equity debates with usage data may be more successful project champions. Outreach efforts that listen to the public's concerns, address equity questions directly, and communicate experiences from operating managed lanes facilities can allay local concerns that priced lane benefits are enjoyed inequitably.

Jurisdictions conducting an environmental analysis for a congestion-pricing project may wonder how to evaluate the environmental justice effects of congestion-pricing. USDOT and FHWA require that environmental justice be considered for all phases of transportation planning and development, including the preparation of an EIS. According to USDOT and FHWA orders, federal

agencies are required to explicitly consider human health and environmental effects related to transportation projects that may have a disproportionately high and adverse effect on low-income and minority populations.

When conducting environmental justice analyses of a congestion-pricing projects, it is important to evaluate the benefits to and impacts on low-income and minority users. The Washington State Department of Transportation (WSDOT) collected information on the potential effects of tolling the existing State Route 520 Bridge on low-income and minority users by conducting a random sample telephone survey that oversampled low-income and minority populations, transit intercept surveys on buses crossing the SR 520 Bridge, and focus groups with low-income and minority populations.

Geographic Equity

Concerns may also arise if a proposed facility appears to favor one geographic region over another. For instance, the location of limited entry and exit points to the lanes may be contentious, as all communities may wish to have easy access to the facility. In this case, the public outreach process is the appropriate forum for community stakeholders, project planners, and politicians to address the issue. The collaborative nature of the public process can be used to identify measures to counter any geographic concerns. As discussed later in this chapter, some project sponsors have enlisted a regional advisory group of leaders and/or citizens to talk through the issues, see all sides, and reach consensus.

Project Spotlight: North Central Texas Council of Governments Regional Tolling Analysis

To determine the environmental justice impact of an expanding system of priced roadway facilities, including toll roads and managed lanes, in the Dallas-Fort Worth Metropolitan Area, the North Central Texas Council of Governments, working in conjunction with the Texas Department of Transportation, the North Texas Tollway Authority, and the Federal Highway Administration, developed technical methodologies, identified assessment metrics of potential impacts, and produced a final report of findings for the public, known as the Regional Tolling Analysis. This analysis is now in its second iteration, provides a companion analysis to support Mobility 2035: The Metropolitan Transportation Plan for North Central Texas. The need for the Regional Tolling Analysis was first identified as the Dallas-Fort Worth region began to rely more heavily on priced facilities in its long range planning efforts, both for financial reasons and as a method to actively manage travel demand. This expanded reliance on priced facilities generated concern of potentially negative impacts to environmental justice communities, in particular low-income residents. The collaboration between the regional transportation partners resulted in an analysis which provides quantitative results for the environmental justice study. These results have shown that no disproportionate or adverse impacts would be anticipated as a result of the implementation of the toll road and managed lane system, and therefore no mitigation efforts would be required. The results also served to validate the regional planning process, and the goals of avoiding or minimizing impacts, used in the development of Mobility 2035.

Technology Concerns

Electronic toll collection is standard in the United States, known in different regions by brand names such as E-ZPass and FasTrak®. Nonetheless, project planners should not assume that the public is familiar with this new technology. Public outreach efforts provide various opportunities to introduce the proposed

toll collection technology to potential users. Project sponsors need to explain how the proposed ETC system will work, including the role of an electronic transponder, the function of entry and exit gantries, the administration of pass-holder accounts, and the protection of individual privacy.

Although electronic toll collection has proven an effective and even popular tool with commuters, some perceive the electronic tracking of vehicles as an invasion of privacy. With the increased use of photo enforcement, this has become even more of an issue. Outreach materials should address this issue and provide detailed information on the mechanisms used to protect the privacy of motorists' movements, as well as their financial and credit card information. One-way tolling agencies have addressed this issue is by linking the transponder with a generic, internal account number that does not reveal the driver's identity. For example, California's FasTrak program allows customers to open an anonymous FasTrak account without requiring a customer's name, address or vehicle information. Customers are responsible for maintaining prepaid funds in their FasTrak account. Information on this program is available at: http://www.bayareafastrak.org/static/about/faq_general.shtml#14. Public outreach efforts can generate public confidence in the priced managed lanes technology by explaining how people's privacy is protected with these systems.

Additionally, once priced managed lanes open, the initial performance of the ETC system will be of paramount importance. If toll collection snags occur during the project's launch, users may be unforgiving. Public outreach should include clear information on how the technology will work, where to buy a transponder, how to update an ETC account, and how the system is working.

Enforcement

The traveling public will also want information on how the priced managed lanes will be enforcement. Project sponsors should emphasize the enforcement usually relies on a combination of automated systems to verify ETC transactions and visual inspections to enforce moving violations and occupancy requirements for non-paying users. Agencies sponsoring priced managed lane projects should coordinate early on with enforcement agencies as well as the local judicial system to agree upon enforcement strategies and policies and the degree to which state and local law allow these processes to be automated. A lack of upfront coordination could lead to misinformation and changes that could be detrimental to public support.

4.3 Project Champions and Their Role

Garnering support from one or more public figures can be one of the most instrumental factors in garnering support for a priced managed lanes project or its implementation. A project champion may be an elected official, a community leader, or private sector leader who effectively communicates an individual or organizational rationale for supporting the project. Although local departments of transportation, transportation authorities, and MPOs will likely serve as project sponsors, respected public figures who are not transportation professionals can play a critical role by publicly supporting the project.

Project champions can play a very public role or work behind-the-scenes to help move a project forward. Public champions may guide the development of priced manages lanes projects during critical public outreach processes. Educating and informing key spokespeople helps ensure they are ready to talk about the project in the face of opposition. In some cases, a project champion may also be

influential in political processes if the project requires legislative action or if it is debated in public elections. Project champions also act as effective coalition builders for a project, building consensus among different interest groups.

Because priced managed lanes must often receive approval at various stages and at various levels of government, it can be advantageous if several individuals champion the project. Some may be successful at building support for the initiative locally, and others may help to make a case for the project to governors, mayors, U.S. representatives and senators. Businesses can also be important project champions, especially those that depend on reliable transportation.

Early involvement by project champions can be helpful in gaining public support for priced managed lanes. A particular group or individual may step forward to express initial interest in and support of the proposal. Project sponsors should be proactive in seeking out potential project champions early in the public involvement process. In some cases, champions may come from organizations and interest groups that are non-traditional supporters of roadway projects. For instance, if a priced managed lanes project promises to deliver environmental benefits, groups like the Sierra Club may lend their support.

Elected officials may emerge as important project champions, making the inclusion of elected officials in outreach efforts important for project planning. When formulating a position, politicians may consider the project from numerous angles, including its impact on constituents and its effect on local governance and finance. Outreach to elected officials should discuss an array of issues about the proposed initiative, including any impacts that local constituents may experience as a result of the project. Other issues that elected officials may consider when deciding whether to back the project include the following:

- The disposition of toll revenues
- Increased public spending
- Increased public revenues
- Alternative financing scenarios
- Competing transportation needs
- Competing transportation projects
- The elected official's political capital
- The elected official's relationships with other officials and political jurisdictions

4.3.1 Identifying Potential Champions

Table 4-1 highlights some groups whose leaders may play the role of champion, depending on the circumstances of the project. When anticipating responses from different stakeholder groups, it is important to recognize that support for or opposition to a priced managed lanes project may depend on project circumstances. For example, a managed lane operation proposed to regulate over- or under-utilization of an existing HOV lane may be received differently by different groups than a proposed new lane addition.

TABLE 4-1: IDENTIFYING POTENTIAL PRICED MANAGED LANES CHAMPIONS

Group	Why they may support
Newspaper Editorial Boards and Local Media	Media support may come where the project rationale is well understood and where editorial boards believe the project benefits and deserves support of their readers.
Elected Officials	Elected officials may support the project if they favor the managed lanes' market-oriented approach or the project benefits, if they want an innovative project in their district, or if their constituents support the proposal.
American Automobile Association	Managed lane facilities may promise better mobility for their members.
Environmental Advocates	If a managed lane project converts an existing general-purpose lane, it could make single-occupant auto travel less attractive.
Taxi Associations	Taxis that use a managed lane may be able to generate more fares in less time during peak periods.
Transit Agencies; Transit Advocates	In corridors without existing preferential lane treatment for HOVs or transit, transit operators may support managed lanes due to transit time savings.
Emergency Medical Service / Police and Fire Departments	Managed lanes may enable emergency services to respond more quickly to incidents.
Rideshare Agencies, Transportation Management Associations	For an over utilized HOV lane changing from 2+ to 3+ HOT operation, managed lane tolling may enable the facility to recapture operational benefits.
Employers; Business Groups	Employers and business may support managed lanes for the potential to make transportation operations more efficient and to reduce delay time. Express delivery companies and other businesses that rely on predictable and efficient travel times may also be key project supporters.
Developers	Developers may support managed lane facilities that enhance access to office buildings, shopping centers, residences or other locations they own.
Neighborhood Associations	Area residents may support the managed lane facility if it enhances their mobility and travel options.

4.4 Building Consensus

Public outreach efforts establish meaningful processes for public participation in the planning and implementation of transportation projects and ensure that the different stakeholders have a voice in the planning process. This enables diverse interests involved to arrive at a transportation solution that is broadly accepted and beneficial. Ultimately, the goal of a public involvement program in support of a priced managed lanes project is to achieve consensus around and utilization of a program of action. While one segment of the population may strongly favor priced managed lanes as the solution, another segment may feel it derives little benefit from the proposed facility. As with any proposed transportation improvement, priced managed lanes may have documented potential for technical and operational success, but may not find unanimous approval among constituents in the corridor.

As discussed earlier, the backing of political champions is always an essential element in building political consensus. Greater involvement by local and regional officials and stakeholders, in early planning stages and onward, may increase the effectiveness of public outreach efforts. Including a broad spectrum of stakeholders in the public outreach can be critical. In many cases, a single decision maker, such as a governor or mayor, may be in a position to derail or bolster the proposed project. Greater involvement by local business leaders, community groups, and other public officials in project planning helps to ensure that key decision makers will consider the broad range of interests when they take a position on a proposed priced managed lanes project.

Achieving Consensus: Key Objectives

Project sponsors that manage inclusive, responsive and effective outreach to stakeholders establish their own legitimacy and the legitimacy of the technical analyses, decision-making, and public processes that support project implementation.

Be Responsive	Be Effective
■ Get to know all the potentially affected interests ■ Understand the project from their perspective ■ Identify all the relevant problems ■ Generate solutions ■ Articulate and clarify all key issues	■ Nurture and protect credibility ■ Have all communication received and understood by appropriate potentially affected interests ■ Receive and review all the information needed to understand the potentially affected interests ■ Search for common ground among polarized interests who have conflicting values ■ Mediate between conflicting interests

Project Snapshot: I-394 MnPASS Express Lanes

After a decade of public discussion and political debate, the I-394 MnPASS Express Lane, Minnesota's first HOT lane, opened in May 2005. The MnPASS project was designed to improve the efficiency of I-394 by increasing the person- and vehicle-carrying capabilities of existing HOV lanes; maintaining free flow speeds for transit and carpools; and using electronic toll collection -- tags/transponders and readers -- for dynamic pricing and electronic enforcement. While previous road pricing initiatives in Minnesota, as in other states, have provided opportunity for public feedback, that process tends to be confrontational and less than satisfying for all parties. Both citizens and politicians often feel comments and concerns are minimized and rarely taken seriously enough to alter project plans. Recognizing this deficiency, MnDOT formed the I-394 Express Lane Community Task Force to help citizens and stakeholders fully understand the project and its goals and to provide a more effective vehicle to give advice and guidance during the development of the project. This Task Force was a broad based group representing legislative, community and groups of special interest. Through this process, the task force members became an informed voice regarding the project and an essential part of an extensive education, outreach and public involvement process that was critical to the success of the I-394 MnPASS project.

In using the public outreach process to build consensus, planners should attempt to anticipate the concerns of specific interest groups. An understanding of what aspects of priced managed lanes projects may be more or less attractive to different groups can be valuable to project sponsors. Certain stakeholders and interest groups with a defined agenda may support or oppose a project depending on their priorities and how their town or county may be affected by the project. When sponsors understand constituents' concerns, the public outreach process can be tailored to ensure that those issues are addressed and to discuss how those concerns will or could be accommodated within the proposed project.

These objectives, as well as a stakeholder analysis that includes identification of interest groups with a potential specific interest in the project, should be included in initial project planning and outlined in the Communications Plan.

Stakeholders may possess a range of opinions about a project, but consensus on a course of action is more likely if the public has been engaged in discussions of all the issues and if stakeholders agree upon the following:

- A serious congestion problem exists and should be addressed. Conventional solutions like adding additional general-purpose lanes, building transit facilities, or applying short-term or site-specific transportation systems management strategies may not be sufficient.
- Travel-time reliability in the corridor is desirable.
- Given the sponsoring agency's mission, it is the right entity to address the situation.
- The sponsoring agency's approach and proposed solution to the problem is reasonable, sensible, responsible, and fair.
- The sponsoring agency listens to and cares about local stakeholders.

4.4.1 Stakeholder Identification

In reaching out to local communities; political groups and organizations; elected officials; and neighboring cities, towns, and counties, project planners should include all potential stakeholders. No segment of a community likes to be left out or surprised, and early efforts at inclusiveness will help to establish channels of communication at the outset of a priced managed lanes project.

Potential Stakeholders

When developing the project's communications plan, project planners should identify the various stakeholders who will be impacted by or may have an interest in the project. Local MPOs may be helpful in assembling a logical list of concerned parties. While priced managed lanes themselves have discrete locations, the facilities are part of a regional, multimodal transportation network that may cross multiple jurisdictional boundaries. As with any transportation improvement, coordination and cooperation among neighboring governments and related agencies can ease the planning and implementation of priced managed lanes. The list of stakeholders will vary from project to project, but concerned parties may include the following:

- Local residents
- Neighborhood groups and associations
- Elected officials

- Neighboring counties, municipalities, or towns
- Associations of governments
- Metropolitan planning organizations
- Area businesses
- Chambers of commerce
- Tourism representatives
- Developers
- Local and state departments of transportation
- Local and regional transportation providers
- Local and regional transit providers (public and private)
- Local and regional tolling authorities
- Rideshare coordinators
- Public agencies (for land use and air quality)
- Emergency service providers
- Environmental groups
- Transit rider groups
- Automobile clubs
- Taxi associations
- Labor interests
- Trucking interests
- Newspaper reporters
- Newspaper editorial boards
- Think tanks

Sharing Information

Keeping the variety of stakeholders well informed during the initial project planning, review, construction, implementation, and operation phases is important for consensus building. Project planners and spokespeople can use a variety of methods to keep stakeholders involved and informed. These may include the following:

- Advance notice for public meetings
- Public meetings
- Brainstorming sessions/group problem solving
- Email lists and newsletters
- Social media (e.g., Twitter, Facebook)
- Telephone information/service lines
- Project websites
- Walk-in office/customer service centers

Stakeholder coordination should continue throughout project implementation. Ensuring that technical work does not outpace constituency building is a prudent approach that keeps state, county and local politicians informed of project activities on a regular basis.

4.4.2 Citizens' Advisory Committee/Community Task Force

One option for formalizing public participation is through a citizens' advisory committee. Such committees can be effective outreach tools and they may be particularly useful for priced managed lanes initiatives. Participants can be drawn from a variety of groups in the early planning stages, and the committee can help guide the public outreach process through later phases of planning and implementation. The group can be an important resource for identifying issues that outreach efforts should address and for connecting project sponsors with area community groups and other organized stakeholders. An advisory committee can also help to identify and recruit political champions.

4.4.3 Executive Advisory Committee

Some project sponsors have assembled a network of community leaders, inviting their input at key strategic points in the project progress. An executive-level advisory committee typically includes mayors, agency leaders, and other state and local elected officials. While these types of committees rarely have decision-making authority, their value is in representing their constituents, advising planners, and contributing to regional consensus. These committees may also be valuable in developing or maintaining regional consensus and helping to resolve conflicts between governments and agencies.

Figure 4-1 shows how different stakeholder groups, including an Executive Committee and Citizen Advisory Committee, can work together to help build consensus for a project.

Figure 4-1: Stakeholder Engagement Process for the I-405 Project in Washington State

Source: Washington State Department of Transportation

Project Snapshot: WSDOT I-405 Congestion Relief and Bus Rapid Transit Projects

The WSDOT Interstate 405 Congestion Relief and Bus Rapid Transit Projects incorporate highway improvement projects in Kirkland, Bellevue, and Renton, Washington. WSDOT worked with cities, counties, federal agencies, transit agencies and community groups to develop consensus for a long-term vision for the multi-modal redevelopment of I-405. This effort culminated in a three-year EIS development process that outlines transit, roadway and environmental investments including more than 300 improvements. The EIS received approval with the Record of Decision in October 2002 and now serves as a corridor master plan. The I-405 Master Plan calls for a system of managed lanes along the length of the corridor.

The program's strong public and political support led to $1.5 billion in new funds adopted through two major legislative actions and one major public vote. Today, the I-405 Congestion Relief and Bus Rapid Transit Projects are delivering ahead of time and under budget on a range of multi-modal transportation investments. Three committees, a Citizen Advisory Committee, Steering Committee and Executive Committee, included over 80 members who provided direction and feedback and helped promote a regional consensus for the program's decisions. The program serves as a good example of how a Citizen Advisory Committee can help build support for a project even in its early stages. The I-405 Citizen Advisory Committee included a wide range of business, environmental, freight, modal and neighborhood groups and was instrumental in facilitating the flow of information between committee members and the project management team, as well as the facilitation of a common understanding of program issues and decisions.

Early engagement by the Citizen Advisory Committee in the master planning process has led to continued support for subsequent improvements in the corridor, including the current NE 6th Street to I-5 Widening and Express Toll Lanes project. This project will include a dual express toll lane system from downtown Bellevue to Bothell/Woodinville and an existing carpool lane from SR 522 to I-5 will be converted to a single express toll (managed) lane, providing 17 miles of additional congestion relief. The project has been met with widespread community and elected official support because the benefits and tradeoffs of how improvements will fit into overall corridor improvements are largely understood and accepted.

Project Snapshot: WSDOT Eastside Corridor Tolling Study

In 2009, the Washington State Legislature asked WSDOT to conduct a study on the feasibility of adding up to two express toll lanes to I-405 that would connect with existing HOT lanes on SR 167 to form a seamless 50-mile Eastside Corridor. The end goal was to develop a set of funding and phasing principles that will guide future project implementation and help inform the Legislature as it grappled with the decision of whether or not to authorize tolling for the corridor. This was a fast track process that called for a lot of community input. As part of the study, the Legislature specifically directed WSDOT to confer with corridor communities and to conduct public work sessions and outreach. The greatest challenge was the size of the corridor—over 50 freeway miles and 20 communities. The outreach process was anchored by two advisory committees that provided input on public communications, policies and implementation strategies—an Executive Advisory Group (EAG) made up of legislators, mayors, transit officials and other elected officials and an Interagency Working Group that included technical staff from local jurisdictions and transit agencies. Focused outreach to the general public supported and informed discussion by these two groups. The role of the EAG was to:

- Identify issues vital to the Eastside Corridor tolling implementation process.
- Provide strategic advice to WSDOT on the implementation of toll lanes for policy consideration by the Governor and the Legislature.
- Act as project champions and assist in providing opportunities for public, business and civic group input.
- Advise WSDOT on the development of funding and phasing principles to help guide the budget and schedule objectives.
- Represent the governments and agencies they belong to and assist in building/maintaining a regional consensus and keeping their community informed.

Input from both groups was summarized in the final tolling study report that was delivered to the Governor and Legislature in January 2010.

4.5 Marketing and Refining the Concept

Ultimately, the success of a priced managed lanes facility will depend on drivers who are willing to pay to use it. In fact, some facilities refer to users as *subscribers*, *pass holders*, or *customers*, indicating that the facility has a clientele, and that drivers generally must acquire an electronic tag (transponder) for automated toll collection in order to use the facility.

Because priced managed lanes facilities are generally constructed within or parallel to existing roadways, drivers in the corridor may choose which facility to use: the general-purpose lanes or the tolled lanes. Project planners thus face a challenge that is unique in highway facility planning: to cultivate users for the facility. Most highway or transportation officials traditionally have not had to advertise or market their facilities, but marketing is an important element of priced managed lanes projects. For this reason, some transportation agencies developing priced managed lanes have sought the services of marketing professionals to develop and implement a marketing plan in conjunction with and parallel to the public outreach process.

The marketing aspect of priced managed lanes facility planning is directly related to project feasibility. Marketing efforts can address how and why drivers may opt to acquire a user tag and toll account, and under what circumstances they will choose to use the facility for a given trip. Marketing techniques can be used to increase the number of users, address customer satisfaction issues, and to keep drivers well informed of any planned operational changes.

At various phases of the priced managed lanes development process, project marketing efforts may need to focus on different issues. Although the basic marketing objectives outlined below follow a general chronological evolution, the answer to later questions may draw heavily from what is learned during earlier marketing and public outreach efforts.

When to Market?

Although marketing is often perceived as advertising a final product, priced managed lanes marketing is not a one-time venture. Marketing efforts will be more productive if they are employed well in advance of the facility's opening and if they continue after the facility begins operation. Early market research provides important opportunities to gauge the project's potential for success, as well as to improve the project's chances of success. From the earliest planning phases, multiple marketing opportunities exist to gather information from the public about potential usage and to provide information to the public about the proposed facility. Marketing efforts in later project phases, even after operations have begun, can assess user satisfaction, increase use, and attract additional users.

4.5.1 Developing and Implementing a Marketing Plan

To ensure the facility is a success, planners will target the ideal number of users it will take to reach congestion-management and/or revenue goals. Underlying these tactics is the need to subtly change the way the public perceives tolling and thus their behavior. Marketing and communications efforts help lay the foundation for acceptance of tolling as it becomes a key method for funding and maintaining large infrastructure projects in the future. Whether a state already has tolling or is starting a new tolling

program, it is likely they will need some form of a public education and/or marketing campaign. The state's toll policy status will help determine what type of marketing is required for the priced managed lanes, for example:

- **State has a well-established toll program –** Today, there are toll facilities in operation in 35 states and one US territory. Urban commuters in particular are more and more familiar with paying tolls. Education campaigns focus on awareness of the different kinds of tolling (variable, congestion pricing, flat rate) and the benefits, as well as targeting sales of transponders and accounts.
- **State has no tolled facilities –** The state may have tolled in the past, but currently has no tolled facilities. There will likely be some negative sentiment for tolling, so a strong education program will focus not only on the benefits of tolling, but also about how tolling works. A marketing campaign targeted at sales and/or opening of ETC accounts will have to start at the beginning of the tolling story and design a campaign that takes the customer through the entire evolution of the sales cycle.

A comprehensive marketing plan will direct the sales, marketing and education strategies, and be complementary to the public involvement plan. The marketing plan could include the following stages listed in chronological order.

Research

Learning about a project's customers will provide a foundation for the entire outreach process. Determining the level of awareness of and knowledge about tolling and priced managed lanes by different groups will provide direction for marketing initiatives and parallel public outreach efforts. For example, an initial "attitudes and awareness" survey of area households could gauge public knowledge of the managed lane concept, public attitudes towards congestion pricing, as well as preferences and behaviors. Research is also very valuable to determine why the road is being used by the customer. Is it to travel to work or to a baseball game? When we understand why the road is being traveled we are able to determine who would make good co-marketing partners and can use this information as a catalyst to build benefits and to connect with the customer. The survey can be done by random phone calls (statistically valid) or online. Focus group data can complement survey results by engaging in more detailed conversation with a sample group. This research will help identify what and how much education is needed, and how current educational efforts could be tailored to meet public needs.

Project Snapshot: 495 Express Lanes

Like any consumer product, priced managed lanes must be specifically defined to meet their customers' needs. Managed lanes are a choice for travelers and will not generate sufficient revenue unless the product they offer is something customers value, understand how to use, and can easily access. As a result, these projects must be designed as much by future users as they are by engineers and that process must begin early in the project development phase. The 495 Express Lanes team in Northern Virginia began conducting consumer research for the project a full five years before the anticipated opening of the lanes, including surveys, customer segmentation, in-depth interviews, and focus groups. This research has informed every element of the project's design and operations strategies, including how toll prices are communicated on digital message signs on the road, the location of entry and exit points, the enforcement program, marketing and communications tactics, and even the development of the tolling algorithm itself.

Determining the Market

One of the most important issues that must be addressed in the early planning phases for priced managed lanes projects is determining the market and overall feasibility of a proposed project. What corridors and origin-destination pairs would be appropriate for the facility? Who might use the facility under consideration? What factors might make a driver more or less willing to pay to use the facility? Where should access points be located or how should toll collection be managed? When this market exploration is done properly, project planners are more likely to design a project that the public wants to use. These inquiries also supply technical experts with the information necessary (i.e., volume and revenue assumptions) to assess the fundamental feasibility of different project alternatives.

4.5.2 Branding

While the federal *Manual on Uniform Traffic Control Devices* (2009 edition) requires all priced managed lanes to be referred to as "Express Lanes," there are many other issues that influence the branding of these facilities. How will the project fit within the state's existing toll program and ETC vendor? Will the lanes have a logo? What's the desired user experience? How will sponsors message the project to the public? These are all questions that fall under branding, that is, the name, term, sign, symbol or design, or a combination intended to identify an organization's goods and services and to differentiate them from others. The brand will help people identify the lanes, know what to call them, remember to use them, how to use them, and better understand the lanes' purpose and goals.

Project Snapshot: Dallas-Fort Worth Area Public Information Officer Working Group

In Dallas, the local MPO created a managed-lane public information officers' (PIO) working group to manage the public messaging for an HOV to HOT conversion project. The PIO working group consists of representatives from the North Central Texas Council of Governments, the Texas Department of Transportation, the Dallas Area Rapid Transit, the North Texas Tollway authority, and the PPP contractors who are developing the corridors and will operate them once open. One of the first tasks of this workgroup is to "brand" the new managed lane system and conduct extensive public outreach to ensure everyone understands why the evolution of these lanes is occurring and how the new facilities will operate. To begin the branding process a public competition will be held to name the new managed lane system.

4.5.3 Incentives

Providing incentives on tolls motivates the customer to use the priced managed lanes and to ultimately become familiar enough to create the habit of continued use. Incentives can range from a percentage off tolls to free trips. When putting together incentive strategies it is important to use the information from the research to determine how to motivate customers and then determine the feasibility for implementation. Duration, back-end implementation, outward facing promotion and potential revenue cost models need to be considered and thoroughly developed before incentives are determined and finalized.

Project Snapshot: Several Bay Area Projects – One FasTrak Brand

Due to vast experience with toll bridges, the Bay Area has a well-established brand for electronic toll systems. The I-680 express lane and 880/237 express lane have been able to tap into a strong overall brand seamlessly. This is demonstrated on the following websites where each facility prominently features FasTrak images:

- FasTrak website: http://www.bayareafastrak.org/static/about/faq_express.shtml and http://www.bayareafastrak.org/static/news/index.shtml#1
- http://www.bayareafastrak.org/static/about/index.shtml
- 880/237 website: http://www.vta.org/expresslanes/SR_237_project.html I-680
- Sunol Express Lane website: http://www.680expresslane.org/Home.asp

4.5.4 Advertising

Depending on a project's transponder penetration goals and public education target audiences, there could be a need for paid advertising. When engaging in paid advertising it is important that project sponsors know their customers well and that they put together a paid media campaign that reaches them as efficiently as possible to make the best use of resources. When negotiating paid media it is important to ask those that you will be buying media with to provide the project with additional added-value. These media outlets are all valued members of the community and it is in their best interest that this message reaches their customers as well. Toll giveaways, and other promotions can be negotiated at the point of media purchase. It is important for project sponsors to let these outlets know that you are looking for a true partner in the process. It is also important to make sure advertising includes ethnic media sources when needed.

4.5.5 Public Relations

Earned media can lay the groundwork for the customer to buy into the priced manage lane product. Pitching local reporters on stories that demonstrate the value of the time drivers can save using the lanes will help increase the chances they will cover the project and promote the program. Pitch outlets can include print, radio, television, web, or social media. Potential incentives and outreach partners find a great deal of value in being a part of the story and earned media. It is also very important to keep an ongoing line of communication with key outlets and reporters. This will ensure the facts and key milestones of the proposed project are properly reported.

4.5.6 Toll Launch Communications

The four weeks prior to tolling and the four weeks post toll launch is the key timeframe for transponder sales and account sign ups. This is generally the period of time where there needs to be a heightened awareness of anything that could generate negative coverage or affect public perception of the priced managed lanes. Media and crisis training sessions are vital to proactively address key tolling messages and potential problems that can occur around the time of toll launch (too many people signing up at once, system errors, delays, increased congestion, etc.). These trainings are usually part of the crisis communications plan developed prior to toll launch.

4.5.7 Maintaining Customer Loyalty

Once a facility is operational, continued communication with customers must be a priority. Facility managers need to keep their current customers happy and informed of any facility changes, promotions or incentives that are being offered. For example, within one year of opening, a facility may require adjustments to the toll schedule to manage current traffic levels. Established lines of communication with customers can be used to describe what changes are anticipated and why they may be necessary. Some facilities have relied on regular e-newsletters, customer emails, and web updates. Your loyal customer is someone that you want to keep and inspire to continue to use these lanes. A customer loyalty program would roll out key incentives for continued and increased use of the facility. Incentives could be as simple as a "free cup of coffee for your morning drive" to special pricing for someone who uses the road a determined number of times per month.

A regular (biennial) customer satisfaction survey is also a good way to collect information from users. It could be distributed to customers who hold electronic tolling accounts and customers who have received bills for using the toll facility.

Continued marketing is also encouraged to increase the number of facility users. For tolled facilities that provide congestion relief, it is a good idea to provide potential users with an opportunity to try the facility and experience the benefits. If they have a good first experience, they are more likely to come back.

For facilities with electronic tolling, it is important to provide incentives that encourage users to establish electronic toll accounts. These programs offer examples of customer loyalty programs and incentives:

- In response to concerns raised at public meetings and other community outreach, Metro in Los Angeles, California created a demonstration Toll Credit Program. The purpose of the program was to make it more affordable for households with low incomes to use the express lanes on I-10 and I-110. Qualifying Los Angeles County residents (households with three or more members and an annual income of $35,000 or less) received a credit for establishing an electronic tolling account and waiver for the monthly maintenance fee.
- WSDOT conducted cross-promotions with local retailers and entertainment venues to encourage customers to establish electronic toll accounts. For example, one partner offered a discount on oil changes for customers who showed their Good to Go!™ electronic tolling transponder. Stadiums and convention centers in the Seattle metro area conducted outreach to their customers and season ticket holders and offered special promotions and discounts for people who established electronic toll accounts.

4.5.8 Marketing Tools

Marketing professionals offer a range of services and methods for reaching your customer to meet the needs of priced managed lanes facility planning. Because players change, particularly in the political realm, it is important to put some turnkey systems in place that allow project owners and operators to continue to market projects and report performance for years to come. This also should include customer satisfaction measures.

The following list, while not exhaustive, provides various examples of marketing tools that may apply in priced managed lanes planning, implementation and operation. Stakeholders can use these to provide ongoing marketing of the project during timeframes and periods as resources are available for promotion:

- Telephone and paper surveys
- Focus groups
- Direct mailings
- Project websites
- Project newsletters
- Radio and television ads
- Media coverage
- Social media
- Video and visualizations

4.5.9 Strategic Partnerships

Partnerships with the media, retail, entertainment venues, and sports teams can support transponder sales. The broader the communications reach, the greater access that is provided to traditionally underserved communities, including the unbanked. Local area venues create an opportunity to reach a large group of people in an organized way. Season ticket holders and visitors of large venues near the project may be using the roadways frequently, and will be interested in learning about the project and the benefits of a ETC account. Usually, when strategic partnerships are developed participating organizations are provided with promotional materials to distribute to their members as they choose. Goals for these outreach efforts are typically:

- Cross-promoting and messaging a partner's current advertising.
- Implementing project toolkits with language on how to promote ETC accounts and all electronic tolling to customers.
- Providing a booth or table at games and events to sign-up attendees for the project's interested parties list or to open accounts.
- Offering promotions and/or incentives to customers at events or through newsletters, emails, web/ address links and other outreach activities.
- Promoting a "know before you go" e-mail and the need for a transponder to bypass congestion to a venue or event.

Project Snapshot: North Central Texas Council of Governments

The planning, design, funding, construction, operation, and enforcement of the current HOV, soon to be managed lanes, in the Dallas-Fort Worth area have been a true partnership for over 20 years. The MPO (North Central Texas Council of Governments) got the ball rolling by making HOV facilities a major component of the metropolitan transportation plan in 1986. Discussions with potential implementation partners resulted in a strategic development partnership between NCTCOG, the Texas Department of Transportation, and Dallas Area Rapid Transit. Funding came from federal CMAQ funds with local contributions from DART. TxDOT took the lead in the design and construction while DART is responsible for daily operations and enforcement. With the upcoming evolution of the current HOV lanes to managed facilities, the North Texas Tollway Authority will be added as the toll collection and processing partner. In addition, Private developers have brought financial equity to the table and are currently constructing two managed lane corridors under PPP agreements. When these new facilities open, the developer will also be responsible for the daily operation while NTTA will maintain toll collection responsibilities.

4.5.10 Social Media

Today, social media moves faster and penetrates deeper than traditional media. Social media allows for conversations over shared issues to occur between parties who have never even met. And, social media can be used to reach large groups of people to communicate a shared belief and a call to action. Project sponsors need to be keenly aware of social media both as a useful public education and marketing tool for promoting project benefits, and as a grassroots public engagement tool that can be used for or against priced managed lanes.

Once a social media movement is on its way, it is difficult, but not impossible, to stop it or slow it down. Proactive social media on the front end of a priced managed lanes project allows project sponsors an opportunity to engage their audiences in two-way conversations and to present facts into the tolling conversation (see tollfacts.com). Used as one of the tools in the communications toolbox, social media can be effective at bringing clarity around tolling, and engaging the public and stakeholders to push project messages out to their followers – influencing public opinion, managed lane usage, and encouraging transponder sales.

Project sponsors should monitor social media channels and be proactive about addressing or responding to misinformation. Often, third party information can influence public opinion for or against a project. It is important to engage in the conversation and to stay on top of what is being said on Twitter, Facebook, blogs, and other social media platforms.

Increasingly, smartphone apps are being developed by private entities and third parties to provide commuters with timely relevant information on tolled roads and travel choices.

It makes sense to partner with familiar businesses, organizations and personalities to help carry project messages through intuitive social networks. For example, the public would most likely not elect to "like" tolling on Facebook, but they may choose to receive relevant managed lane travel-time updates from the local traffic reporter or their employer on Twitter. Through a "Social Media Toolkit" project sponsors can offer key fact-based messages in the appropriate voice for local partners to and helps advertise key priced managed lane messages through trusted social media channels.

Social media tools and channels that have been incorporated into marketing and public education programs include blogs, Twitter, Facebook, Flickr and YouTube.

Blogs

Project sponsors can post regular updates, news releases and media coverage to a blog. The blog drives traffic to the website and related content (webcams, Flickr feeds, video, etc.). Comments allow for ongoing questions and answers. Options include the following:

- Sharing project-related content on an existing blog, and
- Acquiring a unique blog domain to be used solely for the purpose of project updates.

Facebook

Project sponsors can share information and links about priced managed lanes including video, visualizations, promotions, and photos. Some information lives on the Facebook site and other information is linked from sources including the State DOT, community partners, YouTube, and Flickr.

Twitter

Project sponsors send out alerts and updates related to the project. Tweets can direct people to a customer service center, inform people about ETC sign-up dates, remind drivers of toll rates, and provide information about toll launch and sign-up milestones. Tweets could also support partner promotions and build a Twitter following for the toll program.

Flickr

Project sponsors share visuals of signage, technology, facilities, customer service centers, and project benefits.

YouTube

Project sponsors have shared informational presentations, fun videos, and educational information explaining tolling benefits and providing practical illustrations of how the tolling technology works.

Project Snapshot: WSDOT 520 Good to Go! Tolling Twitter Promotions

With the impending start of tolling on the SR 520 Bridge, which links Seattle to communities on the east side of Lake Washington, WSDOT was looking to boost retail sales of its Good To Go! Pass. As part of a larger marketing campaign, WSDOT used social media to reach out to drivers and encourage them to purchase and install a Good To Go! Pass. It conceptualized, built and implemented a series of Twitter promotions for the launch of Good To Go! Pass retail sales and partnered with Seattle's Major League Soccer team, the Sounders FC, the Seattle Seahawks, and Safeway grocery stores, to provide incentives for the promotions. WSDOT created the promotions via a custom Twitter contest platform, hosting a branded promotion page, third party Twitter application and back-end database (to store contestant information and provide contest entry statistics). Contestants were driven to a Twitter sweepstakes micro-site and asked to tweet a pre-written message about tolling on SR 520 to be automatically entered to win partner incentives such as sports gear and gift cards. Prizes were awarded daily, and users were encouraged to enter daily for a new chance to win. The Twitter promotions were a huge success, earning a coveted Twitter "Trending Topic" position in Seattle with the #g2go hash tag for the Sounders promotion. With nearly 800 individual Twitter status updates from contestants, and a total reach of 130,322 people (# of contestants x their combined # of Twitter followers) the promotion provided great visibility for Good To Go!. WSDOT's @GoodtogoWSDOT account garnered 671 new Twitter followers as a direct result of the promotions.

4.5.11 Existing Public Outreach Resources

Public Perceptions of Road Pricing

Public Perceptions of Pricing Existing Roads and Other Transportation Policies: The Texas Perspective (2006) – http://www.trb-pricing.org/docs/06-0934.pdf – This paper highlights key issues related to public perceptions about pricing existing facilities, based on statewide surveys and focus groups in Texas. Results suggest that if there are clear benefits to tolling an existing facility, there is likely to be at least some support, especially from frequent users.

Gaining Public Support for Congestion Charging: Lessons from a Referendum in Edinburgh (2006) – http://www.trb-pricing.org/docs/06-2047.pdf – This paper examines why the public rejected a congestion-pricing plan in Edinburgh, Scotland. Specifically, it discusses some of the public awareness of attitudes about the proposed plan. The paper also provides some ideas for how things could have been done differently to gain public acceptance.

NCHRP Synthesis 377: Compilation of Public Opinion Data on Tolls and Road Pricing (2008) – http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_377.pdf – This study summarizes and analyzes public opinion on tolling and road pricing across the U.S. and internationally. It compiles existing data from public opinion research, and it reviews how the public feels about tolls and road pricing. In particular, it addresses the following key questions:

- What is the overall public opinion concerning charging for the use of roads?
- Is there widespread support or focused opposition?
- What factors are associated with its acceptance or rejection?

New York City's Congestion Pricing Experience and Implications for Road Pricing Acceptance in the United States (2010) – http://www.nyc.gov/html/dot/downloads/pdf/schaller_paper_2010trb.pdf – This paper analyzes how Mayor Bloomberg's 2007 congestion pricing proposal gained widespread public support but was ultimately blocked in the State Legislature. The central conclusion is that, given the power of even small groups of auto users to block congestion pricing projects, supporters need to work on changing how motorists view the effect of pricing on them personally.

Strategies and Tactics for Public Outreach on Road Pricing

Minnesota Value Pricing Outreach and Education (2006) – http://www.hhh.umn.edu/img/assets/20844/Final%20Report%20102606.pdf – Congestion pricing in Minnesota failed to gain public approval for more than a decade. After several Minnesota congestion-pricing projects failed because of a lack of public support, the MnDOT tried a new public outreach strategy that led to successful approval of a major congestion-pricing project. This report describes the public outreach and educating activities that MnDOT undertook to build public and political support for this congestion-pricing project. It also summarizes five communications-related lessons that could be applied to other congestion-pricing projects across the U.S.

Discussing High-Occupancy Toll Lanes with the Denver, Colorado Public (2007) – http://pubsindex.trb.org/view.aspx?id=803562 – This paper outlines the Colorado Department of Transportation's public outreach to evaluate public perceptions regarding managed lanes. The paper provides lessons learned regarding messaging and outreach tactics to build public acceptance of priced managed lanes.

Evaluation and Performance Measurement of Congestion Pricing Projects (2011) – http://www.trb.org/Main/Blurbs/166596.aspx – This material is designed for practitioners involved in planning, designing, and operating congestion-pricing projects or practitioners considering implementation of such projects. The report is designed to help practitioners understand how and when to put evaluation and performance measurement programs in place as well as how to identify and develop appropriate performance measures, collect necessary data, evaluate performance, and communicate results.

5 Finance and Procurement

5.1 Funding and Financing Priced Managed Lane Projects

In many respects, paying for the cost of a priced managed lane project is not unlike paying for any other transportation improvement project. A wide range of federal, state, and local funding sources and financing tools can be used to pay for priced managed lane improvement. Projects may use a combination of federal-aid program and state match funding like most transportation improvements, or rely partially or substantially on toll-backed debt financing. In addition, private equity and additional financing options available to private sector participants can be used for projects implemented on a P3 basis.

The one characteristic distinguishing priced managed lane projects from typical highway improvement projects is that they generate toll revenue. However, as shown earlier in Table 2-1, the amount of revenue can vary significantly. The amount of revenue priced managed lane projects generate determines the degree to which projects can pay for themselves, support a debt-financed package, cover ongoing operational and maintenance costs, or generate excess revenue for reinvestment by the project sponsor or retention by a private development partner.

5.1.1 Project Scale

It is helpful to characterize priced managed lane projects as Small, Medium, or Large, based on project scale and cost. Where a project falls along the scale/cost spectrum can help inform project funding and financing considerations. Table 5-1 presents general project and financial characteristics of Small, Medium, and Large priced managed lane projects. The scale of priced managed lane projects is driven largely by whether they involve the conversion of existing highway capacity to tolled operation or the expansion of existing corridors. The capacity for revenue generation is driven by the scope of the projects, congestion in the corridor, and the willingness of motorists to pay to avoid it. Projects with two or more priced lanes per direction are more likely to generate significant cash flows. The capacity for revenue generation has a substantial influence on the extent to which projects can be debt financed and whether they might attract private sector interest. In this case, projects would need to generate sufficient revenue to cover ongoing operations and major maintenance costs, and generate excess revenue available for return on a private sector equity position. Conversely, some smaller projects may require ongoing subsidies to pay for operations and maintenance.

TABLE 5-1: THREE PRICED MANAGED LANE PROJECT SCALES AND COST IMPLICATIONS

	General Characteristics	Funding/ Financing	Procurement	Typical Capital Cost Range
Small *(Example: SR 167 HOT Lanes)*	• Single lane • HOV2 free service generally provided (since it involves conversion of existing HOV lane) • Operational enhancement emphasizing throughput • Revenue generation may not cover operations and maintenance (O&M) costs	Pay-as-you-go, substantially grant funded	Traditional, accommodated in DOT work program	$5–50 million
Medium *(Example: I-95 Express Lanes)*	• Potential capacity enhancement • May not generate excess revenue	Mix of grant funding, dedicated and traditional resources, potential use of debt	Potential for greater private involvement (e.g. design-build)	$50–500 million
Large *(Example: 495 Express Lanes)*	• Multilane • Incorporated within capacity enhancement • Emphasis on revenue in combination with operational characteristics	Debt financed	Candidate for P3, potentially multiphase	$500 million+

5.1.2 Lifecycle Project Costs

Capital Costs. Capital costs include all implementation costs related to the design and construction of the project, including right-of-way acquisition and utilities relocation. For priced managed lane projects, this cost can vary from several million dollars to over $2 billion, depending on the scale of the project as presented in Table 5-1. A simple HOV-to-HOT conversion, like the $18 million SR 167 HOT Lanes may involve only the purchase and installation of electronic toll collection equipment, other related ITS infrastructure, signage, and restriping the existing HOV lane to provide six northbound access zones and four southbound access zones. The $1.3 billion I-15 Express Lanes incurred significant capital costs from the construction of two to four additional travel lanes, direct-access ramps to park-and-ride lots, overpass reconstruction, and a moveable barrier that allows HOT lane reconfiguration in the predominant direction of travel, along with ETC and ITS equipment and signage.

Financing Costs. Financing costs are relevant to projects that use finance tools to help pay for a project's capital costs. These are the associated fees paid to financial advisors, rating agencies, banks, lawyers, and other institutions involved in evaluating, arranging, or issuing individual or packaged debt and credit instruments. In addition, the interest paid on any loan made to the project is a financing cost. Typically financing costs are considered together with capital costs in defining a total project cost during implementation. These costs can be substantial but potentially worth the price of alternatively delaying project implementation or not implementing the project at all. As one example, the financing costs for the 495 Express Lanes represent about 25 percent of the total $2.1 billion project cost (capital plus financing).

Operations and Maintenance (O&M) Costs. O&M costs are a key consideration to a priced managed lane project because the success of the facility depends greatly on continuous, high-quality operation that involves managing user access and determining and collecting the appropriate toll. In addition, there is often an expectation of a higher level of customer service with priced managed lane facilities, including lane availability, condition, and incident response. Major maintenance costs can be significant considerations as well, since the upgrade or replacement of toll collection equipment as technology advances may be necessary over a mid- or long-term operational period. O&M costs need to be estimated and programmed carefully and a determination made whether toll revenue can and will be used to pay for these costs or if supplemental resources will be necessary. Forecasted usage, toll increase (or decrease) policies, and vehicular exemptions need to be taken into account. Conceivably, a budget independent of toll revenue may also be established to pay for O&M.

5.2 Revenue Sources

5.2.1 Traditional Federal and State Funding

Traditional federal and state funding includes federal and state motor fuel taxes and other state motor vehicle fees and taxes, such as vehicle registration and driver's license fees. Funding allocations for these monies generally follow a formulaic process prescribed at the state level that takes into account population, roadway mileage, and need-based metrics.

In urban areas of 50,000 or more people, MPOs manage decisions about which projects to fund, based on their transportation planning and programming process. Elsewhere, state departments of transportation manage these decisions. Priced managed lane projects may receive funding from these traditional sources in the same manner as any other improvement project considered in transportation planning and financial programming processes. Further information on these processes is available at http://www.planning.dot.gov/documents/BriefingBook/BBook.htm.

5.2.2 Discretionary Grants

Historically, many priced managed lane projects relied in part on federal grants through the Value Pricing Pilot Program, but with the expansion of tolling authority under MAP-21 (see Section 3.4.1) and no additional funds authorized after Fiscal Year 2012, the program is not expected to be a significant source of future funding.

Several recently implemented projects also received funding as part of the one-time Urban Partnership Agreement (UPA) and Congestion Reduction Demonstration (CRD) programs initiated in late 2006 and late 2007, respectively. The UPA and CRD programs were one-time programs funded by USDOT using miscellaneous discretionary grant funds authorized by Congress, rather than programs specifically funded through periodic federal transportation authorization legislation. The programs have provided funding to priced managed lane projects in Atlanta, Los Angeles, Miami, and Minneapolis. Further information is available at http://www.upa.dot.gov/index.htm.

The American Reinvestment and Recovery Act of 2009 introduced the Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grant program. The discretionary TIGER grant program awards funds on a competitive basis for projects that will have a significant impact on the Nation, a metropolitan area, or region. TIGER awards have supported priced managed lane projects in Denver (U.S. 36 Managed Lanes), Virginia (I-95 HOT Lanes), and Riverside County, California (SR 91 Express Lanes extension) by providing funding to leverage a potential federal Transportation Finance and Innovation Act (TIFIA) loan (see Section 5.3.2). Additional information on TIGER grants is available at http://www.dot.gov/tiger/.

5.2.3 Tolls

A natural source of funding for priced managed lanes are the tolls charged for access to the facility. Clearly, toll revenue does not accrue until the facility is operational, and for this reason, is often devoted to ongoing facility operations and maintenance costs. In the case of a network of tolled facilities or managed lanes, toll revenue from existing facilities can be pooled and used to fund a new priced managed lane project on an upfront basis. Facilities with an appropriate level of revenue generation can use tolls in a debt financing capacity to support the issuance of bonds or other credit extended to the project. Bonds and other debt instruments are then paid back over time from future toll proceeds.

5.2.4 Other Revenue Sources

Other revenue sources beyond traditional sources, grant programs, and tolls come from the state and local levels. One of the most noteworthy is state or local sales tax measures. A sales tax measure, often approved by voters, is typically dedicated to transportation purposes and frequently to a specified program of projects. Local sales taxes are popular in California where they are levied at the county level, upon approval by two-thirds of voters, for a prescribed length of time and a prescribed set of projects. The I-15 Express Lanes, I-680 Express Lanes, I-580 Express Lanes, and SR 237 Express Lanes are all beneficiaries of local option sales tax measures.

Value capture revenues are another potential source of funds generated at the local level, although to date, they have not been used to fund priced managed lane projects. Value capture mechanisms capitalize on increased land value attributed to specific transportation improvements that enhance accessibility to desirable destinations such as jobs and schools. The revenue generated can help finance the transportation improvement, or it can go toward further transportation investment, spurring a new round of increased accessibility and land value. Among the options for value capture are:

- **Special Assessments:** A tax assessed on parcels identified as receiving a direct and unique benefit as a result of the public improvement, typically assessed as a fraction of the estimated benefit per development unit.
- **Tax Increment Financing:** A special provision in state law that allows the diversion of the property tax increment derived from the increase in property value over a base year to a fund used to pay off capital bonds for public improvements within a tax increment financing district.
- **Development Impact Fees:** One-time charges levied on new development to help recover growth-related public service costs for off-site services such as local roads, schools, or parks.

For additional information on state revenue sources, see:
http://www.fhwa.dot.gov/ipd/revenue/non_pricing/sources_tools/state.htm.

For additional information on local revenue sources, see:
http://www.fhwa.dot.gov/ipd/revenue/non_pricing/sources_tools/local.htm.

5.3 Financing Tools

5.3.1 Leveraging Revenues

As noted earlier, priced managed lane projects have the ability to leverage expected toll revenues to help finance a portion or all of a project's implementation costs. Project finance is typically used with large capital projects where using a "pay-as-you-go" approach is not a viable option. Not all priced managed lane projects generate sufficient revenue to support the issuance of toll-backed debt, however. Revenues from those categorized as Small would generally be considered insufficient, those categorized as Medium may have the potential for some toll-backed debt, and those categorized as Large may be expected to generate sufficient revenue to attract private sector investment. Private sector project financing often includes one or more forms of debt issuance, as well as an equity contribution expected to be recouped over time from the facility's toll proceeds.

It should be emphasized that financing tools do not replace revenue and can only be used when there is a viable revenue source (tolls in the case of priced managed lanes) to make debt-service payments or provide returns on equity. An investment-grade traffic and revenue study is necessary for the issuance of debt backed by the project's toll revenues.

5.3.2 Federal Credit Assistance

Several forms of federal credit assistance are available to project sponsors of priced managed lanes including TIFIA, state infrastructure banks (SIBs), and Section 129 loans.

Transportation Infrastructure Finance and Innovation Act (TIFIA). Federal credit assistance is available to priced managed lane project sponsors through the TIFIA program, which provides federal direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance. The TIFIA program is designed to fill market gaps and by providing improved access to capital markets, flexible repayment terms, and interest rates that are often more favorable than those found in private capital markets. TIFIA can help advance projects that otherwise might be delayed or deferred because of size, complexity, or uncertainty over the timing of revenues. The information that follows reflects the process and requirements of the TIFIA program as implemented by MAP-21.

In order to quality for support from the TIFIA program, projects must have a capital cost of at least the lesser of $50 million ($25 million in the case of a rural project) or 33.3 percent of a state's federal highway assistance for its most recently complete fiscal year. In the case of ITS improvements, the minimum is $15 million. TIFIA credit assistance is limited to a maximum of 49 percent of the total eligible project costs. Projects must have environmental clearance prior to funding obligation and senior debt must be rated investment grade. All TIFIA projects must be supported in whole or in part from user

charges or other dedicated non-federal dedicated revenue sources. The exact terms for each loan are negotiated between the USDOT and the borrower, based on the project economics, the cost and revenue profile of the project, and any other relevant factors.

Applications are accepted on a rolling basis under which eligible projects must receive assistance, provided adequate funds are available to cover the associated subsidy cost. It is also possible to enter into a master credit agreement, which is an early contingent commitment of TIFIA credit assistance for single projects or a program of projects secured by a common security pledge. The master credit agreement locks in the contingent commitment so long as financial close occurs within three years.

Several priced managed lane projects have used TIFIA to date including the 495 Express Lanes in Northern Virginia (see the Appendix of priced managed lane profiles), the North Tarrant Express near Fort Worth, Texas (see http://www.fhwa.dot.gov/ipd/project_profiles/tx_north_tarrant.htm), and the LBJ Express near Dallas, Texas (see http://www.fhwa.dot.gov/ipd/project_profiles/tx_lbj635.htm). Each of these projects has used TIFIA in combination with private activity bonds and private equity, which are discussed in sections that follow.

Additional information is available at the USDOT's TIFIA website: http://www.fhwa.dot.gov/ipd/tifia/index.htm.

State Infrastructure Banks. State Infrastructure Banks are revolving infrastructure investment funds for surface transportation that are established and administered by states. A SIB, much like a private bank, can offer a range of loans and credit assistance enhancement products to public and private sponsors of highway construction projects. SIBs are capitalized with federal-aid surface transportation funds and matching State funds. (Several states have established SIBs or separate SIB accounts capitalized solely with state funds.) As loans or other credit assistance forms are repaid to the SIB, its initial capital is replenished and can be used to support a new cycle of projects. All repayments are considered to be federal funds and the requirements of Title 23 of the United States Code apply to SIB repayments from federal and non-federal sources alike.

SIBs give states the capacity to make more efficient use of its transportation funds and significantly leverage federal resources by attracting non-federal public and private investment. Alternatively, SIB capital can be used as collateral to borrow in the bond market or to establish a guaranteed reserve fund. Loan demand, timing of needs, and debt financing considerations are factors to be weighed by states in evaluating a leveraged SIB approach.

To date, no priced managed lane project has received credit assistance from a SIB. Additional information on SIBs is available at http://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_credit_assistance/sibs/.

Section 129 Loans. Section 129 of Title 23 allows federal participation in a state loan to support projects with dedicated revenue stream including tolls, excise taxes, sales taxes, real property taxes, motor vehicle taxes, incremental property taxes, or other beneficiary fees.

Similar to state infrastructure banks, Section 129 loans allow states to leverage additional transportation resources and recycle assistance to other eligible projects. States have the flexibility to negotiate interest rates and other terms of Section 129 loans. When a loan is repaid, the state is required to use the funds for a Title 23 eligible project or credit enhancement activities, such as the purchase of insurance or a

capital reserve to improve credit market access or lower interest rate costs for a Title 23 eligible project. One important distinction between SIB and Section 129 loans is that projects that receive assistance from repaid Section 129 loans are not required to meet the same number of federal requirements as those using SIB loans.

To date, no priced managed lane project has used a Section 129 loan. Additional information is available at http://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_credit_assistance/section_129/.

5.3.3 Bonding and Debt Instruments

Several bonding and debt instrument options are available to priced managed lane project sponsors. These include municipal debt in the form of revenue bonds and Grant Anticipation Revenue Vehicle (GARVEE) bonds backed by future federal-aid funds, as well as private activity bonds and commercial bank loans in the case where a private sector partner is responsible for arranging project financing.

Revenue Bonds. Bonding is the primary financial tool available to state and local governments to raise financing covering the cost of public works projects of all types. State and local governments are able to issue debt using the municipal bond market where the interest income earned by the holders of these bonds is exempt from federal tax, as well as state and local taxes if the bonds are issued in the investor's state of residence. As a result of the tax-exempt status of the income investors receive from municipal bonds, investors are usually willing to accept lower interest rate payments compared to other types of borrowing with comparable risk. This makes municipal debt particularly attractive to state and local governments, as the interest rates are lower than other debt options.

In the case of priced managed lane projects, municipal bonds can take the form of revenue bonds backed by future toll proceeds, which are used to make interest and principal payments to the bondholders.

GARVEE Bonds. GARVEEs are a form of debt repayable with future proceeds from federal-aid highway funds received by states under Section 122 of Title 23 of the U.S. Code. GARVEE bonds require state enabling legislation, which can be project specific or enable the use of GARVEEs to finance projects on a programmatic basis. GARVEE bonds are a state obligation even though they leverage federal-aid funding. GARVEE bonds may be used to cover the entire cost of projects or larger improvement programs; they are also often combined with other debt and funding mechanisms for larger projects.

Further information on GARVEE bonds is available at http://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_debt_financing/garvees/index.htm.

Private Activity Bonds. Private Activity Bonds (PABs) are debt instruments issued by State or local governments whose proceeds are used to construct projects with significant private involvement. PABs have long provided a low-cost financing option for various types of public-benefit infrastructure projects, such as ports and water and sewer projects. However, transportation infrastructure had not been eligible for Private Activity Bond financing until the passage of SAFETEA-LU, which added highway and freight transfer facilities to the types of privately developed and operated projects for which PABs may be issued. SAFETEA-LU placed a national volume cap of $15 billion for these facilities, which was unchanged by MAP-21. Private activity is permitted on highway improvement projects while maintaining the tax-exempt status of the bonds. In this manner, private participation in transportation infrastructure is encouraged because borrowing costs are reduced relative to standard commercial debt. In

addition, PABs have been an attractive source of capital in a tight credit market where the issuance of commercial debt has been curtailed.

The three priced managed lane project examples that have used TIFIA credit assistance have done so in combination with PABs: the 495 Express Lanes in Northern Virginia (see the Appendix of priced managed lane profiles), the North Tarrant Express near Fort Worth, Texas (see http://www.fhwa.dot.gov/ipd/project_profiles/tx_north_tarrant.htm), and the LBJ Express near Dallas, Texas (see http://www.fhwa.dot.gov/ipd/project_profiles/tx_lbj635.htm).

Additional information on PABs is available at http://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_debt_financing/private_activity_bonds/index.htm.

Commercial Bank Loans. Private sponsors of priced managed lane projects may borrow money from a commercial bank or more likely a syndicate of commercial banks. Borrowing costs to private sponsors, however, are typically greater than to public sponsors, and especially in a tight credit market, PABs have been a more attractive source of debt. To date, no priced managed lane projects have used commercial bank loans as a part of a financing package.

5.3.4 Availability Payments

Availability payments are made to a private concessionaire by a public project sponsor based on project milestones or facility performance standards in exchange for particular services. They can be used to compensate the private partner for the design, construction, operation, and maintenance of a priced managed lane facility and can be subject to reduction in the event of not meeting a stipulated performance target. Federal-aid grants may be used to pay the capital portion of availability payment installments.

Availability payments may be an attractive option to priced managed lane project sponsors who would like to capitalize on private sector expertise in the delivery and operation of the facility but wish to retain control over toll rates and collection. Availability payments are also used when toll revenue itself may be insufficient to cover the full cost of construction and operation. This situation may arise on a project with high costs and low revenue potential or with a priced managed lane project that seeks to balance the potentially divergent goals of maximum revenue generation and maximum utilization.

More information on availability payments is available at the American Association of State Highway and Transportation Officials (AASHTO) Center for Excellence in Project Finance: http://www.transportation-finance.org/funding_financing/financing/other_finance_mechanisms/availability_payments.aspx. The 595Express in Fort Lauderdale, Florida is being implemented under an availability payment contract (see the Priced Managed Lane Profiles Appendix).

5.4 Procurement Options

The range of procurement options available to priced managed lane projects is the same as for any transportation improvement project, from traditional DBB to those involving greater private involvement, including DB, design-build-operate-maintain (DBOM), and DBFOM. The applicability of an option with greater private involvement depends on certain project characteristics and, more generally, its scale.

Small projects would likely only be delivered via traditional DBB. Medium projects may benefit from a DB or DBOM strategy. Large projects may be additionally suited to DBFOM procurements.

Other non-traditional procurement options exist, but only the most common are reviewed here. More comprehensive information is available at FHWA's P3 website.[7]

In addition to the procurement strategy descriptions that follow, Figure 5-1 summarizes which party (public or private) is responsible for certain project delivery components for each strategy. Figure 5-2 summarizes risk allocation associated with project delivery components for each strategy.

Figure 5-1: Delivery Models and Responsibilities

Delivery Strategy	Traditional D-B-B (not a P3)	D-B	DBOM	DBFOM
Design & Construction	Public and/or Private (Public may do design)	Mostly Private (Public may do ~30% design in-house)	Mostly Private (Public may do ~30% design in-house)	Mostly Private (Public may do ~30% design in-house)
Operations & Maintenance	Public	Public	Private	Private
Ownership	Public	Public	Public	Public
Finance	Public	Public	Public	Public and Private (or only Private)
Who bears risk?	Mostly Public	Public & Private	Public & Private	Mostly Private

Source: Federal Highway Administration

[7] http://www.fhwa.dot.gov/ipd/p3/index.htm

Figure 5-2: Delivery Models and Risk Allocations

	Project Risks Fully or Partially Transferred to Private Sector					
Alternative P3 Approaches	Finance	Design	Construction	Maintenance	Operations	Traffic-Revenue
Traditional Design-Bid-Build Procurement		✓*	✓*			
Design-Build		✓	✓			
Design-Build-Operate-Maintain (DBOM)		✓	✓	✓	✓	✓
Design-Build-Finance-Operate-Maintain (DBFOM, or DBFO)	✓	✓	✓	✓	✓	✓ **

Source: Federal Highway Administration
* Limited risk transfer
** Traffic revenue risk retained by public sector in availability payment concession

5.4.1 Design-Bid-Build

Design-bid-Build is the traditional project delivery method where DOTs enter into separate contracts to design improvements and then construct them. The design contract will define the project to 100 percent completion and prepare detailed construction documents. A construction contract then follows, where prequalified contractors are invited to submit bids to construct the project, with the award going to that contractor providing the lowest price. Given that design and construction activities are undertaken by separate entities, it does not incentivize them to coordinate the two activities and seek out design refinements that could reduce construction costs or accelerate construction.

5.4.2 Design-Build

Design-build is a project delivery method that combines separate services into a single contract. With design-build procurements, project sponsors execute a single, fixed-fee contract for both engineering services and construction with a private sector design-builder. Bidders submit fixed-price proposals and the ultimate contract award is made on a best value approach taking into account cost together with the qualifications of the bidders and the relative merit of their proposals.

Given that the award of design-build contracts is driven by cost, design-builders seek to develop cost effective designs that are well suited to their construction techniques. They also look for opportunities to accelerate the completion of the project by overlapping design and construction activities and optimizing the sequencing of construction activities. The fixed-price contract structure is an effective means to transfer cost overrun risks to the private sector. Many design-build contracts also specify completion dates along with penalties in the event that these deadlines are not met, thereby transferring completion risk to the private sector.

5.4.3 Design-Build-Operate Maintain

The DBOM model is an integrated partnership that combines the design and construction responsibilities of design-build procurements with operations and maintenance. These project components are procured from the private sector in a single contract with financing secured by the public sector.

This process transfers design, construction, operations, and maintenance risk to the private sector. However, the degree to which operations and maintenance risk is transferred is driven by the length of the operations period. With longer operations periods, this risk transfer may incentivize the private designer-builder-operator to make upfront capital investments to avoid more costly repairs at a later time. It also reduces the risk that issues could go unnoticed or unattended and then deteriorate into much more costly situations.

5.4.4 Design-Build-Finance-Operate-Maintain

With the DBFOM approach, responsibilities for designing, building, financing, and operating are bundled together and transferred to a private sector developer. There is a great deal of variety in DBFOM arrangements in the United States, and especially the degree to which financial responsibilities are actually transferred to the private sector. One commonality with all DBFOM projects is that they are either partly or wholly financed by debt leveraging revenue streams dedicated to the project. Tolls are the most common revenue source. However, availability payments may also be used funded through taxes and/or tolls. Future revenues are leveraged to issue bonds or other debt that provide funds for capital and project development costs. They are also often supplemented by public sector grants in the form of money or contributions in kind, such as right-of-way.

While public agencies sponsoring DBFOM projects retain full ownership and ultimate control, DBFOM procurements transfer the maximum risk to the private sector. They are long-term arrangements commonly lasting 30 to 50 years or more.

6 Design

6.1 Design

Design considerations for priced managed lanes will inevitably be driven by the corridors in which they are located. Of the 14 priced managed lane facilities that were operational in May 2012, all but one were built in corridors with pre-existing HOV lanes. As a result, their designs differ significantly as they required the retrofitting of highway corridors with constrained design settings and that included earlier design exceptions that were previously approved for a specific set of operation rules and requirements. A few operational facilities, including the I-10 Managed Lanes in Houston and the I-15 Express Lanes in San Diego, involved reconstruction of the corridor segments where the HOV lanes existed. For these and other projects where new lanes were constructed, the physical design and construction of the lanes is similar to that of any full standard highway improvement, incorporating few trade-offs between lane width, shoulder width, access, and physical separation. Most other projects have involved the retrofit of existing HOV facilities involving significant design exceptions.

6.1.1 How Design of Managed Lanes Differs From General-Purpose Lanes

As with general-purpose lanes, the design and construction of managed lanes involves a variety of improvements to widen or otherwise alter the existing roadway, including utility coordination and relocation, the installation of drainage systems, earthwork, paving, the construction of ramps, overpasses and bridges, and adding appropriate signage and striping. In some cases new express lanes have been built within the median by removing shoulders. In others such as IH 10 in Houston and I-15 in San Diego, new right-of-way may be needed. In either case, modifications to some components of the existing roadway are likely.

Outside of new lane construction, the conversion of an existing general-purpose or HOV lane to priced managed lane use can be less complicated if the prior design is found to be able to support tolled traffic without safety ramifications. About half the HOV lanes in the United States have been able to apply full design standards commonly found in the AASHTO Green Book and AASHTO's *2004 Guide for High Occupancy Vehicle Facilities*, and this would likely support any mix of traffic. However many projects have been implemented in very tight design settings where lane and shoulder widths may be reduced. A safety analysis may be required to determine what design and/or operational changes may be needed in order to support a changes in traffic volume if involving an HOV lane conversion. For added capacity, such analysis will likely focus on the access locations of this separate roadway system.

In order to provide better traffic service levels, support higher traffic volumes and discourage toll violations, managed lanes are typically accompanied by some form of access control, particularly for non-barrier-separated projects that may have been operating on a part-time (i.e., peak period only) basis. However, recent projects in Utah and Minnesota have utilized a more continuous access policy that allows for greater ingress and egress opportunities across greater lengths of the facilities.

As shown in Table 6-1, the basic cross section components of managed lanes are similar to those of general-purpose and HOV lanes. To date all priced managed lanes existing or proposed are configured next to the center median barrier to serve longer distance trips. Some utilize HOV lanes that were

implemented by converting median shoulders. The design of priced managed lanes may also require full roadway reconstruction, but often such projects must fit within an existing freeway. Existing roadway constraints may limit the ability to meet standards. In many cases, right-of-way limitations and bridge structures make it impossible to meet all desired design standards. Compromises, often codified as design exceptions, are often required that involve prudently justified deviations from desired practice. Specific design may also depend on local conditions, accepted practice and other issues. Realizing that applying desirable design elements may not always be possible, this guide includes horizontal design attributes that brackets both desirable elements and reduced elements often applied in constrained settings. Such trade-offs have been practiced for more than 40 years on managed lane designs, so there is considerable operational experience associated with many of these elements.

TABLE 6-1: MANAGED LANE CROSS SECTIONS

Cross Section Element	Typical dimensions found in Professional Design Guidance
Lane Width	12 feet (3.7 meters)
Shoulder Width (Right and Left)	10 feet (3.0 meters) preferable 2 feet (0.6 meters) minimum (dependent on number of lanes, type of operation, sight distance) 14 feet (4.3 meters) for enforcement / apprehension
Buffer Width (if desired for non-barrier-separated operation)	2 to 4 feet (0.6 to 1.2 meters)
Sight Distance	Standard stopping sight distance for facility type
Safety considerations	Crash attenuation for exposed barrier ends Transition treatments with HOV or general-purpose lanes Adequate access opening lengths (minimum 1,200 feet [366 meters])

Source: AASHTO, *Guide for High Occupancy Vehicle (HOV) Facilities*, October 2004

The physical configuration and operation of managed lane installations varies greatly and is driven by travel demand and physical constraints. They may involve single or dual (or even greater) directional lanes operated on a concurrent (with the flow of traffic) or reversible-flow (inbound in the AM, outbound in the PM) basis. Concurrent operations typically provide one lane in each direction, regardless of the traffic peaking that may occur, and as such, these lane designs are symmetrically oriented around the median centerline. Reversible operations on freeways require full concrete barrier separation. Cross sections for these different configurations are provided in the figures below.

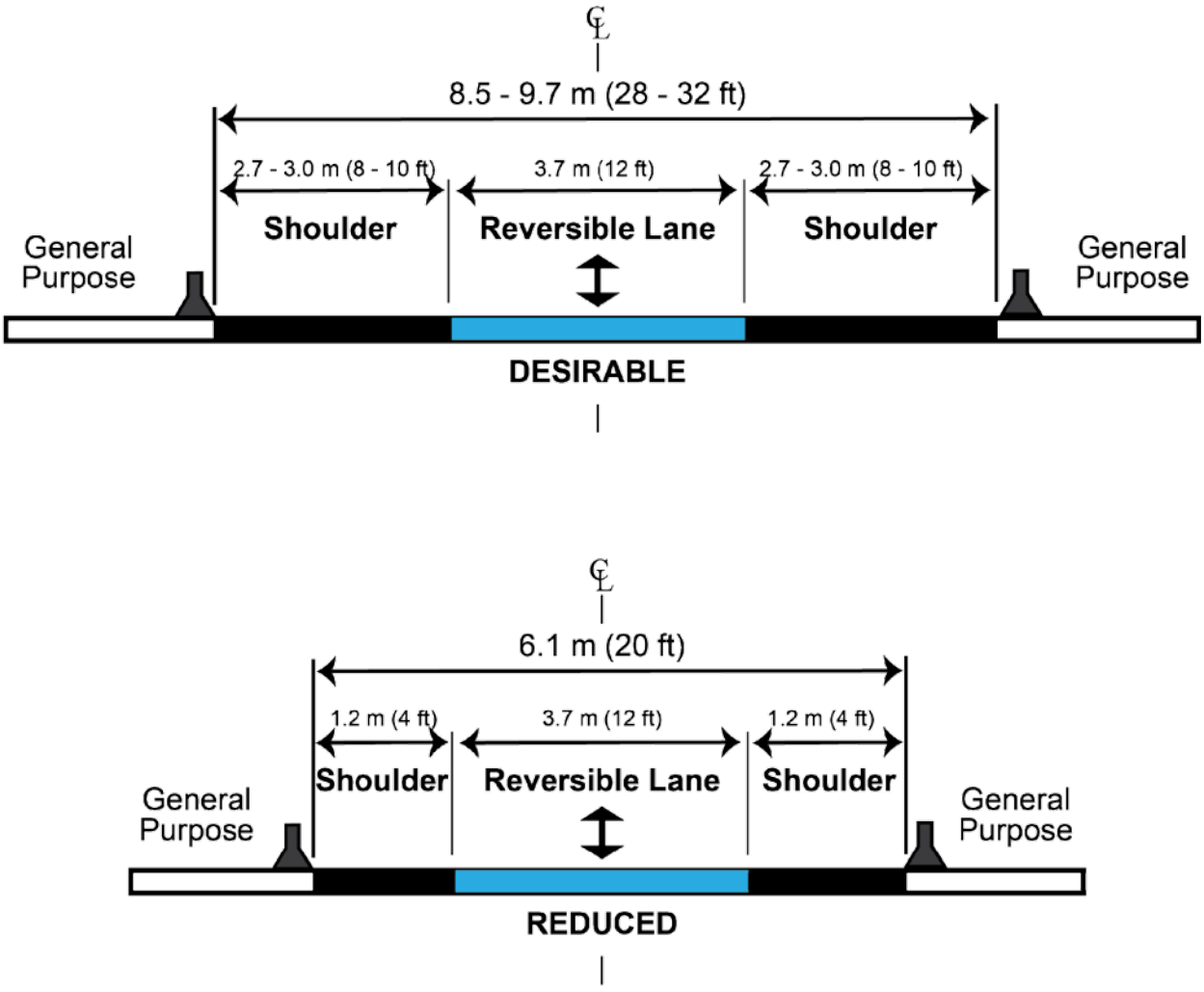
Figures 6-1, 6-2, and 6-3 provide representative cross sections for concurrent-flow and reversible-flow managed lanes. These dimensions are reflected in guidance found in National Cooperative Highway Research Program (NCHRP) 414, HOV Systems Manual and AASHTO HOV Design Guide, and correspond to current practice for many HOV lane treatments nationwide. *Desired* designs generally reflect those associated with a permanent or new facility, and typically meet all AASHTO and local design standards. *Reduced* designs reflect an inability to meet desired criteria due to a variety of constraints that have generally been determined to be very difficult or impossible to address. Consideration of reduced designs should be considered on a case-by-case basis based on sound engineering practice and in context with operational objectives and trade-offs. The reduced elements presented in this Guide, while found on some and perhaps many projects nationally, are not intended as a prescribed standard of practice.

Figure 6-1 shows cross sections for a single lane reversible priced managed lane facility located in the median of an existing highway, such as projects operating on various freeways in Houston.

Figure 6-2 provides similar information for a two-lane, reversible-flow, median facility similar to that found on I-394 in Minneapolis, I-25 in Denver, and the first generation I-15 facility in San Diego (1995-2011).

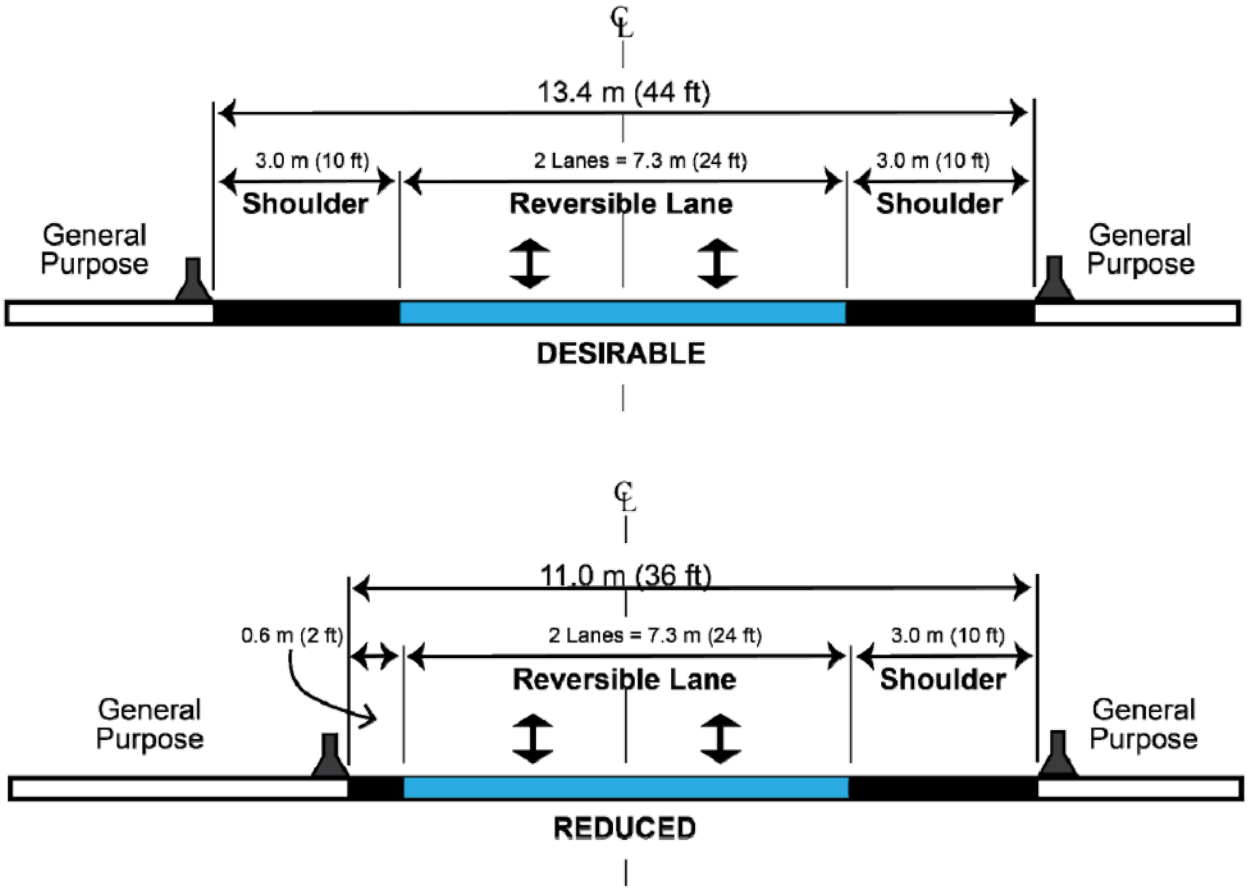
Finally, Figure 6-3 shows typical cross sections for a dual-lane concurrent-flow facility similar to the SR 91 Express Lanes in Orange County, California and I-95 Express Lanes in Miami, Florida.

Figure 6-1: Cross Section for a Single Lane Reversible-Flow Priced Managed Lane



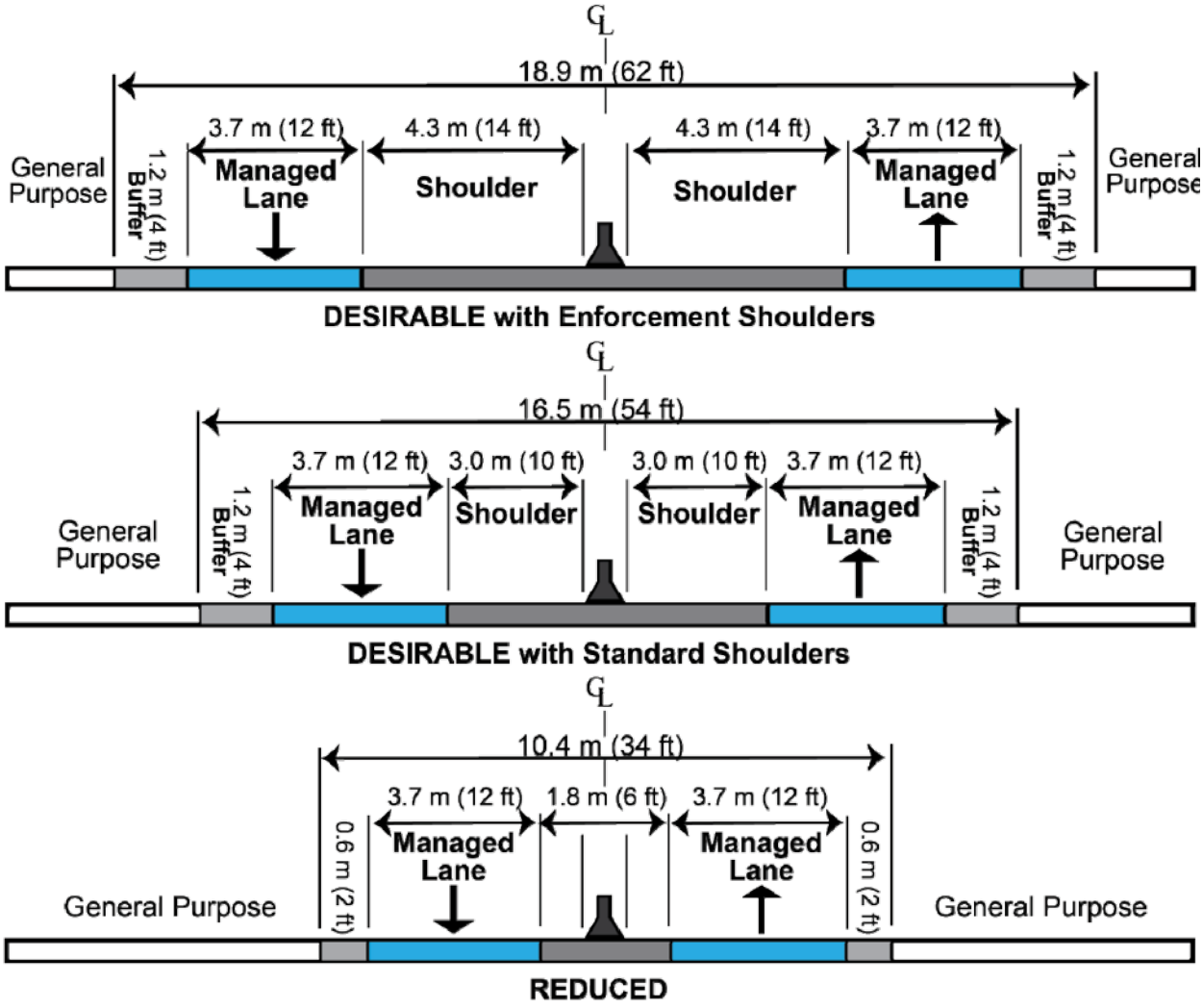
Source: Parsons Brinckerhoff based on the AASHTO, *Guide for High Occupancy Vehicle (HOV) Facilities*, October 2004

Figure 6-2: Cross Section for a Dual-Lane Reversible-Flow Priced Managed Lane



Source: Parsons Brinckerhoff based on the AASHTO, *Guide for High Occupancy Vehicle (HOV) Facilities*, October 2004

Figure 6-3: Cross Section for Dual-Lane Concurrent-Flow Priced Managed Lane



Source: Parsons Brinckerhoff based on the AASHTO, *Guide for High Occupancy Vehicle (HOV) Facilities*, October 2004

6.2 Access

Access to a managed lane facility, and the extent to which it is controlled, is a fundamental issue in designing and operating managed lanes. Cost, operational, safety, and enforcement trade-offs associated with the different levels of access control must be considered. There are multiple approaches to providing access to managed lanes: continuous, restricted at-grade access, and grade-separated access. Recently there has also been interest in continuous access where motorists could enter or exit priced managed lanes at any point. The use of continuous access for priced lanes has implications on the number of tolling points, ETC installations and enforcement practices. While tolls are often collected downstream of access points, additional access points in intermediate locations are now also common on newer priced managed lane facilities. This follows a 30-year legacy of intermediate access on HOV lanes.

6.2.1 At-grade Access

There are three commonly used types of restricted at-grade access for managed lanes:

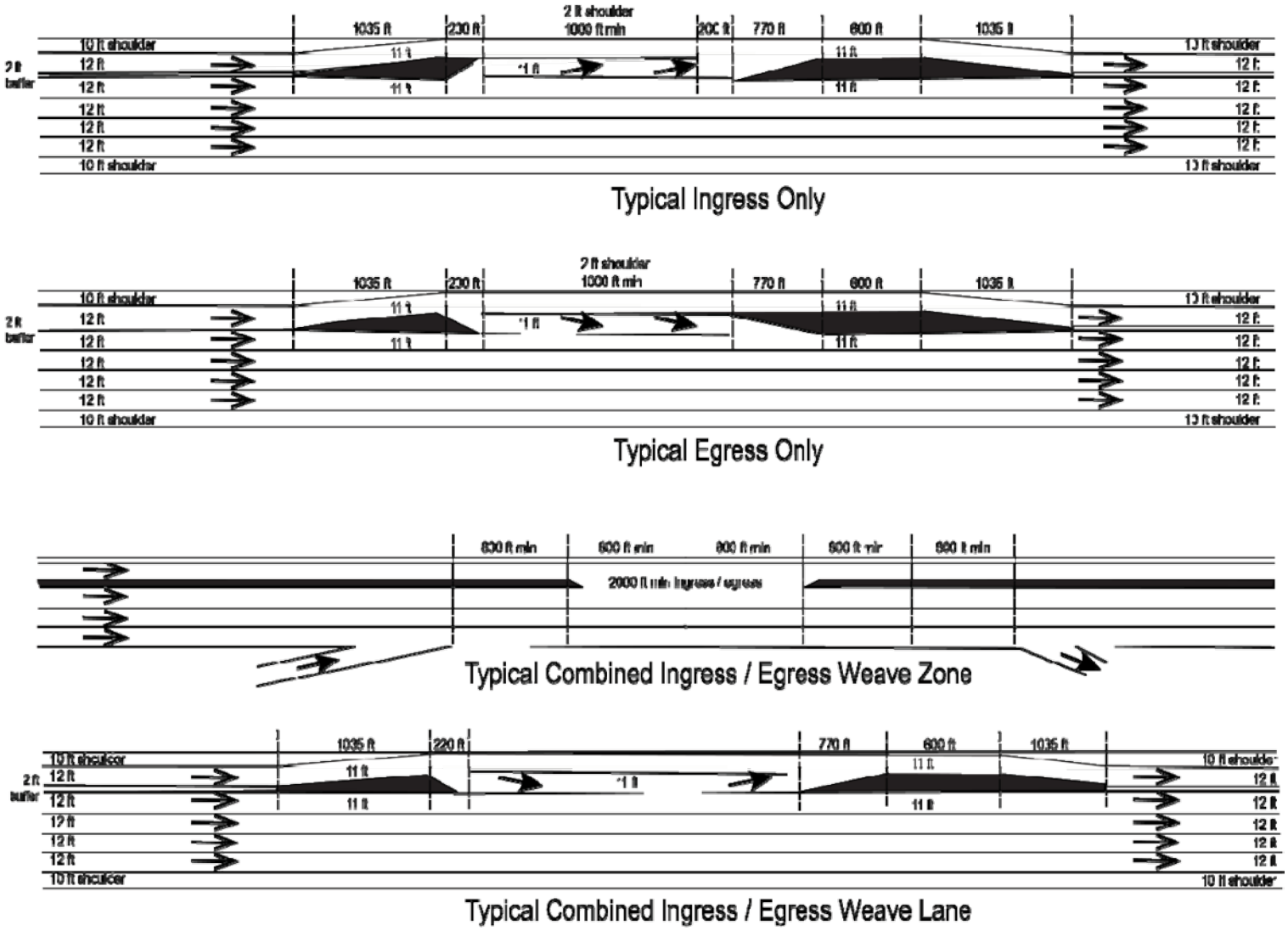
- **Weave Zones.** This type of access is generally used on facilities that use buffer separation. A short break in the buffer striping allows for simultaneous ingress and egress. Figure 6-4 shows weave zone access to the SR-167 Express Lanes in the Seattle area. Weave zones are the most common form of at-grade access used on priced managed lane facilities in the United States.

Figure 6-4: Weave Zone Access Treatment, SR-167 Express Lanes, Seattle, WA

Source: Washington State Department of Transportation

- **Weave Lanes.** This type of access allows for both ingress or egress, but is facilitated by a lane designated for the weave. The inclusion of a weave lane minimizes the potential for unstable flow along the weave due to the speed differential between the managed lane and general-purpose lanes. Weave lanes are the primary form of access on barrier-separated facilities (due to the need to segregate opposing flow movements with barriers) and may be found on the I-15 Express Lanes in San Diego.
- **Slip ramps.** Separated ingress and egress utilizing dedicated acceleration and deceleration lanes. This design separates operational maneuvers and provides drivers with a better opportunity to adjust their speed to match that of the traffic stream into which they are merging. This further reduces the potential for unstable flow. Given that a variety of at-grade slip ramp design approaches may be used, Caltrans has developed access guidance to help support more consistent use of these access treatments (Figure 6-5). Slip ramps may be found on the I-680 Express lanes in Alameda County, California (2010), shown in Figure 6-6 shows slip ramp access to the I-10 Katy Freeway HOT lanes in Houston (2008), which are separated from the general-purpose lanes by pylons.

Figure 6-5: Managed Lane Slip Ramp Design Alternatives



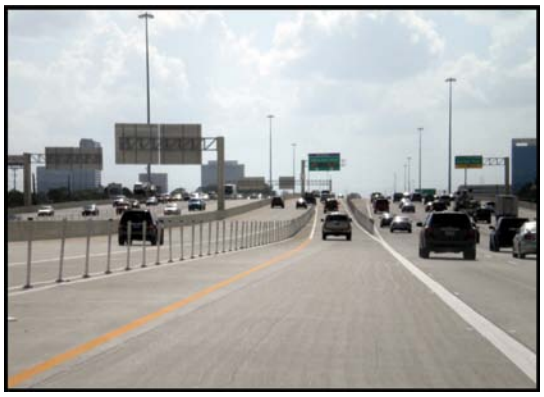
Source: Caltrans Traffic Operations Policy Directive, March 2011

The type of at-grade access opening that is selected will depend upon the existing and planned roadway geometrics and the amount of traffic expected to use the opening. In all cases, openings should be located and designed in a way that will not produce adverse impacts to the managed lanes and the parallel highway lanes. The locations of at-grade access openings need to be closely coordinated with highway entrance and exit ramps and allow adequate room for motorists to complete weaving movements when moving between the general-purpose and managed lanes and an entrance or exit ramp. For example, as of 2011, Caltrans recommends a buffer/barrier opening of at least 2,000 feet, and a weaving distance of at least 800 feet per lane between the upstream and downstream ramps and the opening.[8] When determining the locations of slip ramps, local topography, lines of sight, and operating characteristics of adjacent lanes need to be taken into consideration. Where heavy weaving between the managed lanes and interchange ramps is expected, grade-separated access may be desirable based on traffic engineering analysis of the demand and roadway geometrics. This may be especially true where multilane managed lane treatments are being considered.

Figure 6-6: Slip Ramp Access to the I-680 HOT Lane, Alameda County, CA

Source: Parsons Brinckerhoff

Figure 6-7: Slip Ramp Access to the I-10 Katy Freeway HOT Lanes in Houston



Source: Parsons Brinckerhoff

Restricted at-grade access to a striped or barrier-separated managed lane is a cost effective approach to providing controlled access to the managed lane facility. At-grade access opening control ingress and egress to and from the managed lane, minimize traffic service impacts in the managed lane, and control weaving movements on the parallel highway. While they limit the need for expensive ramp structures, they may require additional pavement area, and can require modifications to existing bridges and sign structures. Because access is limited to certain locations upstream and downstream of interchange ramps, there is the potential for bottlenecks to form near access points.

6.2.2 Near-Continuous Access

Several projects have moved forward with less restriction on access, employing more limited areas where traffic cannot weave back and forth between the managed lane and the general-purpose lanes. The first project to apply this access approach was the I-394 MnPASS project in Minneapolis, shown in Figure 6-8 More recent projects include I-35W in Minneapolis and I-15 in Salt Lake City. I-15 is 42 miles long and provides 19 access points. The access points are marked by white skip striping, while

[8] HOV Guidelines for Planning, Design, and Operations, Traffic Operations Policy Directive, California Department of Transportation, April 2011.

the rest of the express lanes are marked with double-solid white lines. The access points range from 3,000 to 9,000 feet long, giving plenty of space for users to enter and exit the lanes regardless of the prevailing operating condition in mixed-flow lanes. Given the number of access points and length of access zones, essentially half of the project length allows continuous access, and the frequency provides one managed access for every interchange ramp on the right side. I-35W has an even greater percentage of near-continuous access lane-miles—with over 70 percent of the facility featuring this design.

Figure 6-8: Near Continuous Access on I-35W in Minneapolis

Source: Minnesota Department of Transportation

In both cases, frequent and appropriately located toll zones limit violations, and the violation levels to date have been acceptable without added enforcement. Additionally, near-continuous access designs permit weaves between the managed lanes and general purposes to be more distributed, thereby reducing the effect of conflict at access openings. Finally, the need for signage is reduced, which in turn can be a positive effect upon capital cost requirements.

A number of project sponsors are exploring this approach to access control on managed lane conversions in the San Francisco Bay Area, Phoenix, Seattle, and Minneapolis / St. Paul.

6.2.3 Grade-Separated Access

Conventional wisdom in highway engineering holds that the greatest efficiency, safety, and capacity is achieved when conflicting movements are grade separated. Grade-separated access for managed lanes is generally reserved for high volume movements and those serving linkages to transit facilities. Their inclusion can be found in any project design since they greatly reduce weaving and merging movements for vehicles entering or exiting a facility. In addition, the ramps provide acceleration and deceleration areas, which allow high-speed merges and diverges. Grade-separated options include median drop ramps from overpasses or direct freeway-to-arterial or freeway-to-freeway connections. Figure 6-9 illustrates a freeway-to-freeway connection in Miami, FL for the I-95 Express Lanes. Figure 6-10 shows a direct connection ramp from the I-10 HOV lane in downtown Phoenix to the local street grid, while Figure 6-11 shows the direct HOT-HOV connector from the I-110 south of Los Angeles to I-105, which provides the main highway connection between downtown Los Angeles and Los Angeles International Airport (LAX). Layouts for these examples and others can be found in the HOV guides listed later in this section. Many multilane priced managed lane facilities being planned or built in Georgia, Virginia, Florida, and Texas are relying on grade-separated access, in keeping with their high anticipated volumes associated with ingress and egress.

Access and egress to and from managed lanes should be located and designed to minimize conflicts with mainline general-purpose traffic. As with other highway facilities, managed lane access and egress, whether it be continuous or restricted or direct-access features, should meet local practice and to the extent possible, reflect guidance provided by AASHTO. A summary of project design elements is provided in Table 6-2.

Figure 6-9: I-95 Express Direct Connector Ramp in Miami

Source: Parsons Brinckerhoff

Figure 6-10: HOV Direct Connector Ramp to Downtown Phoenix

Source: Parsons Brinckerhoff

Figure 6-11: I-110-I-105 HOV Direct Connector Ramp in Los Angeles

Source: Parsons Brinckerhoff

TABLE 6-2: SUMMARY OF MANAGED LANE DESIGN ATTRIBUTES

Project/Route	Type of Operation	Intermediate Access Attributes	Tolling Attributes	Separation
SR 91, Orange County	ETL, 2 lanes each direction (full time)	None	One tolling zone	Traffic channelizers
I-15 extension, San Diego	HOT, 2 lanes each direction, with center lanes reversible (convertible to 2-2 or 3-1)	At 10 locations northbound and 8 locations southbound, combined egress/ingress with continuous transition lane in-between; plus five (grade-separated) direct-access ramps	Distance-based tolls (skewed, per-mile dynamic pricing). Toll zones located between access locations and at all entrance locations. Price varies by location	Southern 16 miles has fixed concrete barriers with significant number of intermediate at-grade slip ramps in each direction. Moveable median barrier in Express lanes. Northern 4 miles are buffer separated.
US 290, Houston	1 lane reversible	Only through DARs	Fixed price, only one toll zone	Concrete barriers
I-10, Houston, open 3/09	ETL, 2 lanes each direction (full time after 3/09)	At 2 locations, combined egress/ingress with continuous transition lane in-between	Toll zones between access locations with declaration lanes	Traffic channelizers
I-15, Salt Lake City	1 concurrent lane each direction (full time)	Frequent (2-mile spacing) and long (3000-9000 ft) weave access zones. 400- ft avg. Buffer frequently violated. Used to be continuous access for HOV only.	Fixed monthly fee with permit, will transition to dynamic pricing at tolling zones	None, paint markings only
I-25, Denver	Mostly 2 lanes reversible (part-time)	Only through DARs	One tolling zone with declaration lane	Concrete barriers
I-394, Minneapolis	Mostly 1 concurrent lane, 2 lanes reversible last 4 miles (part-time, peak direction)	2-3 in each direction; weave zone	Toll zones between access locations	None in concurrent section, paint markings only, reversible section has concrete barriers.
SR 167, Seattle area	1 concurrent lane each direction (part-time)	5 northbound, 4 southbound; weave zone	Toll zones to assemble trips between access locations	None, paint markings only
I-95, Miami	ETL, 2 lanes each direction (full time)	None in Phase 1	Single toll zone in Phase 1	Traffic channelizers
I-10 (El Monte) Los Angeles, open 2013	Mostly 2 concurrent lanes each direction (full time)	Combined ingress/egress weave zones, no transition lanes	Toll zones between access locations	Concurrent section has paint markings only; separated section is in an independent right-of-way.
I-110 (Harbor) Los Angeles, open 2012	1-2 concurrent lanes each direction (full time)	Combined ingress/egress weave zones, transition lanes being added through restriping	Toll zones between access locations	Concurrent section has paint markings only; elevated section is independent.
I-95, Maryland	1 barriered lane each direction (full time)	Very limited-several slip ramps through barrier alignment	Several toll zones	Concrete barriers

TABLE 6-2: SUMMARY OF MANAGED LANE DESIGN ATTRIBUTES (CONTINUED)

Project/Route	Type of Operation	Intermediate Access Attributes	Tolling Attributes	Separation
I-85 Atlanta, open 2011 (I-75 being studied)	1 concurrent lane each direction (full time)	May remove some intermediate access openings, frequent vehicle readers and cameras, weave lanes, no transition lanes	Frequent toll zones	None, paint markings only
I-15, Provo	1 lane each direction	Access zones similar to other portions of I-15 HOT lanes, weave lanes, no transition lanes	Toll zones between access locations	None, paint markings only
I-35W, Minneapolis	Northbound median shoulder (part-time)	None	Single toll zone	None in concurrent section, paint markings only
I-77, Charlotte (study pending)	1 concurrent lane each direction (full time likely)	Multiple access locations each direction	Toll zones between access locations	Either paint stripe only or traffic channelizers
I-95, Miami Phase 2, open 2011	ETL, 2 lanes each direction (full time)	Yes, to be determined	Toll zones between access locations	Traffic channelizers
I-680, Santa Clara Co., open 2011	1 concurrent lane each direction (part time)	Separate ingress and egress with transition lanes	Toll zones between access locations	None, paint markings only
SR 237/I-880, open March 2012	1 lane each direction (part-time)	None, however transition lanes are envisioned at the transitions to HOV on either end (TBD)	Single toll zone	Separate viaduct-barriers
I-495, Virginia	2 concurrent lanes each direction (full time)	DARs only due to high anticipated weaving volumes	Toll zones strategically located between DARs	Traffic channelizers

Source: Parsons Brinckerhoff
Legend:
ETL=Express toll lanes (all vehicles carry transponders)
HOT=High-occupancy/toll lanes (HOVs free with min occupancy but they may be required to carry transponders)
DAR=Direct-access ramp

6.3 Separation Treatments

The design of most managed lane projects is dominated by the access and physical separation issues from general-purpose lanes. The managed lane facilities currently in operation typically utilize either painted buffers or concrete barriers or pylons—also known as tubular markers or stanchions—to separate the priced lanes from the general-purpose lanes and designate entry and exit points. The earliest priced managed lane facilities implemented in the United States all featured continues concrete barriers. However, the success of the I-394 MnPass lanes which opened in 2005 and featured eight miles of painted buffers has led to several new projects that do not have solid buffers. For example, the I-35W managed lanes which opened in Minneapolis in 2010 use a near-continuous access policy, with skip striping to designate access, while the I-85 Express lane in Atlanta incorporates a camera-based "virtual barrier system" to discourage weaving.

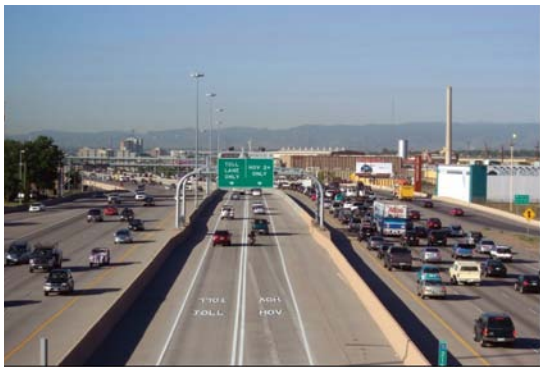
The following sections focus on aspects of managed lane projects that are not likely to arise during the design of general-purpose highway lanes. Discussions of specialized signage and toll plaza requirements are also provided.

6.3.1 Concrete Barrier Separation

Physical barriers provide more positive access control and are more effective at reducing violations and maintaining premium traffic service; however, they can add significant cost to a project and may not be able to be accommodated within available right-of-way. Physical barriers may also pose safety hazards where intermediate access requires a break in a concrete barrier alignment. High-speed differentials between the general-purpose lanes and managed lanes often exist, and concrete barriers also help maintain a safe operation by preventing potential violators from inadvertently crossing into a non-barrier-separated managed lane and disrupting traffic flows.

Continuous concrete barriers, such as Jersey barriers or moveable barrier systems, are a permanent and durable type of barrier and have been used for separation on a number of managed lane facilities around the country (Figure 6-12).

Figure 6-12: I-25 Express Denver Concrete Barrier Separation



Source: Parsons Brinckerhoff

However, the presence of barriers is likely to increase response time for emergency vehicles accessing the managed lane. Concrete barriers can also complicate snow removal, unless sufficient storage reservoirs are provided in the shoulder. Exposed barrier ends at access points should also be buffered to protect motorists.

The installation of concrete barriers usually requires roadway modifications, as adequate shoulders next to each barrier alignment are needed. Based on AASHTO guidance, shows in Table 6-1, a minimum 4-foot shoulder is generally recommended between the managed lane and the barrier, while a 10-foot shoulder

is usually preferred between the general-purpose lane and the barrier.[9] This guidance is shown in Figures 6-1, 6-2, and 6-3. Because of their right-of-way requirements, continuous concrete barriers are more costly to build than other separation options. As a result, most newer managed lanes projects do not use concrete barrier separation. However, barrier separation is commonly found on reversible lane projects that require positive separation due to oncoming traffic conditions.

Useful HOV Resources

Given the extremely close overlap between the physical design of managed and HOV lanes, those seeking detailed information on the physical design of managed lanes are directed to take advantage of the wealth of existing information on HOV design.

There are several excellent resources providing detailed information on the design of HOV lanes.

- *Guide for High Occupancy Vehicle (HOV) Facilities*, American Association of State Highway and Transportation Officials: Washington, D.C., October 2004. Chapter 3 provides detailed design guidance for the implementation of HOV lanes, and by association, priced managed lanes.
- *High Occupancy Vehicle Planning and Design Guidelines*, California Department of Transportation: Sacramento, CA 2003. The Caltrans HOV design guidance is contained within Chapter 3 of this publication; however, the Department has since updated the design in 2011 to reflect latest practices and experiences of facilities in California.
- *HOV Systems Manual*, National Cooperative Highway Research Program (NCHRP) Report 414, Transportation Research Board, National Research Council, National Academy Press: Washington, D.C., 1998. Chapter 6 of the NCHRP report addresses design issues for managed lanes built within existing highways and in separate rights of way. The manual discusses the design features of barrier separated, concurrent flow, and contraflow managed lanes, as well as multiple access treatment. Sample cross sections, signing and pavements markings are presented.
- Fuhs, Charles A., *High Occupancy Vehicle Facilities: A Planning, Operation, and Design Manual*, New York: Parsons Brinckerhoff, December 1990. Also an industry standard, the Fuhs manual is organized in three main sections paralleling the decision making process for implementing managed lanes: planning, design, and operation. Among other areas, the design section provides comprehensive information on cross section requirements for various configurations, enforcement, signing and pavement markings.

6.3.2 Pylon Separation

Tubular markers, also called pylons, channelizers, or stanchions, provide another separation option for buffer-separated managed lanes. These markers consist of a series of highly visible, reflective, lightweight plastic tubes that are approximately 3 feet in height, are placed at regular intervals, and cost $60 to $70 each. While they perform a greater psychological function than striping alone, they do not provide the physical protection of a concrete barrier. Their primary advantages are that they require less right-of-way than concrete barriers and are therefore less expensive. However, anecdotal experience from the SR 91 Express Lanes in Orange County and the I-95 Express Lanes in Miami indicate that 30 to 50 percent of the markers may need to be replaced within any given year, thereby increasing ongoing operations and maintenance expenditure as compared to barriers.

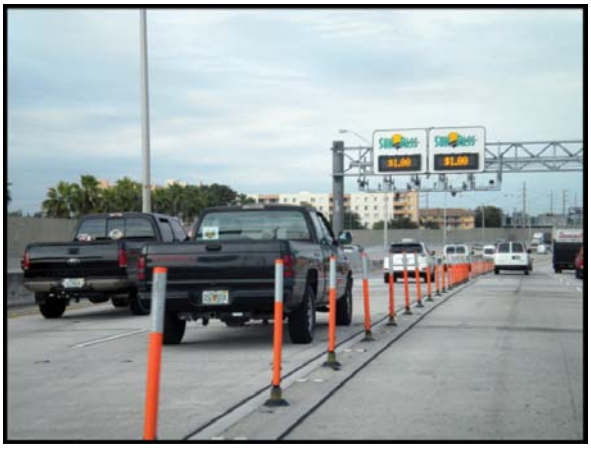
[9] AASHTO, *Guide for High Occupancy Vehicle Facilities*, 2004.

There are two primary types of tubular marker systems:

- Pylons affixed to a mountable plastic raised curb (Figure 6-13); and
- Individual plastic pylons attached to the roadway with adhesive Figure 6-14).

Pylons help distinguish the managed lanes and promote easier enforcement, but may not prevent errant buffer crossing and speed differential issues. They also allow emergency and maintenance vehicles to drive over them to take advantage of the higher travel speeds in the managed lane. Based on the experience of HOV and managed lane programs in California, 20-foot spacing between pylons is recommended.[10]

Figure 6-13: Mountable Raised Curb Pylon Separation on the I-95 Express



Source: Parsons Brinckerhoff

Figure 6-14: Individual Pylon Separation on the SR 91 Express Lanes

Source: Parsons Brinckerhoff

At some access transition zones in San Diego, pneumatically controlled or electronically operated pylons that retract into the ground have also been employed, but few such systems are anticipated in the future as they exhibit higher installation and maintenance costs.

Mountable curb markers feature a 10- to 12-inch-wide, 4-inch-high curb that supports vertical round or flat markers with reflective sheeting. The markers bounce back into place if they have been hit. The markers do not damage vehicles crossing them, but do make a loud banging noise. The mountable curb markers are designed to enable emergency vehicle access and to stand up under winter conditions. Although mountable curb markers are used by many highway departments to maintain traffic around construction sites, they have not been widely tested in high-speed lane separation situations.

Maintenance Issues

There are maintenance issues associated with all types of pylons. Experience shows that the displacement rate for traditional pylons is roughly 10 percent every 60 to 90 days, which means they have a limited life cycle and little opportunity to be repaired and. Although generally durable, the adhesive-mounted plastic pylons can only be hit a certain number of times before they cease to bounce back up. They can also be hit with such force that the units dislodge from the pavement. The New York Thruway Authority has used pre-drilled holes in the pavement to attach pylons in an effort to prevent pavement damage, but found the loss ratio to be the same as for the glued units. Dislodged plastic

[10] *High Occupancy Vehicle Facilities: A Planning, Operation, and Design Manual,* Parsons Brinckerhoff, 1990.

pylons also present a possible traffic hazard if they are displaced into the travel lanes and therefore add to traffic and liability risk.

Similarly, the mountable curb pylons are often damaged on impact, but their replacement rate is 10 to 15 percent per year, which is less than for adhesive-mounted pylons. For both types, the plastic pylons tend to turn black in color from the tires of vehicles that strike them. The cost of the traditional pylons is approximately $45 (2011 dollars) per unit. Therefore, depending on spacing and frequency of replacement, both the capital and maintenance costs are high for tubular barriers. Moreover, retractable pylons require considerable maintenance to remove debris and provide for their operability. As with other systems they require replacement after a number of hits at a slightly greater cost (due to their design).

Snow removal is also an issue in many locations and presents two problems when pylons are used. As the snow is plowed, it is pushed into the adjacent lane because of the lack of a physical barrier. This means that the adjacent lane is not properly cleared. Also, snow removal equipment often damages pylons, either by plowing snow onto the posts or by hitting them.

6.3.3 Buffer Separation with At-Grade Access

The speed differential created often needs to be mitigated. Many HOV lanes dating from the 1990s have employed a painted buffer typically four feet in width to help promote driver sight distance. Buffers varying from a minimum of 1 to 4 feet (Orange County CA, Atlanta and Miami) to 15+ feet (I-10 Houston) have been implemented on about half the priced managed lanes. Other projects have opted to retain a single or dual solid stripe treatment without a designated buffer. Pavement marking separation is wider than standard and sometimes involves some overlap onto travel lanes on either side if space is limited. Solid stripes are employed to discourage buffer crossing except in designated areas. At-grade access may be provided in the form of a weave zone (Figure 6-4), weave lane (Figure 6-5), or a slip ramp (Figures 6-6 and 6-7).

The advantages of buffer treatments are improved sight distance and more visibility to discourage buffer crossing where access is restricted. Disadvantages are the wider pavement section required and potential confusion if priced managed lanes are not operated full time.

Example projects include SR 167 in the Seattle area, I-680 in Alameda County, I-10 and I-110 in Los Angeles, I-85 in Atlanta and portions of I-394 and I-35W in Minneapolis.

6.4 Tolling Provisions

6.4.1 Electronic Toll Collection Systems

Priced managed lanes rely on ETC systems for the collection and processing of toll payments. ETC keeps traffic flowing and benefits motorists by allowing them to pay tolls without having to stop at a toll booth and make a cash transaction. Most of the existing ETC systems in use today in the United States are based on radio-frequency identification (RFID) technology communicating in the 815 MHz frequency range. While no national interoperability standard has emerged, MAP-21 passed in July 2012 calls for all toll facilities on federal-aid highways to implement technologies and business practices that facilitate the interoperability of ETC systems. To date, the largest interoperable systems include E-ZPass on the East Coast, Sun Pass in Florida,

and FasTrak® in California. ETC systems all utilize similar technologies that function generally as follows:

- RFID antennas, with specially designed readers, are installed above tolling points on overhead gantries that span the specially designated toll lanes (Figure 6-15).
- Vehicles equipped with a transponder or toll tag (Figure 6-16) pass under the antennas, and when detected, are interrogated by the reader to provide their unique transponder identification (ID) number.
- The transponder ID is then stored locally in a roadside controller, along with a time stamp and other basic information like the lane number and the location/plaza ID. The controller is basically a rack-mounted computer with special software that is installed in a roadside cabinet and connected to the RFID readers in a local area network.
- The roadside controllers, which are computer systems housed with a cabinet and including all necessary power, telecommunications, protection and storage to control lane equipment such as toll rate signs and communications components, periodically transmit the data that is gathered from the RFID antennas/readers to a back-office "host controller" via wide-area network (WAN). The WAN can use any combination of fiber optic, copper, or wireless communications and may rely on leased communications and the "cloud" to complete the connection between the lane and host computers.
- The back-end host computer consists of several components that serve as a central database to manage accounts for toll payment, including an account management system that matches transponder transactions to registered user accounts and maintains the financial ledger.

Figure 6-15: Radio-Frequency Identification Reader Antennae

Source: Parsons Brinckerhoff

Figure 6-16: Different Windshield-Mounted Electronic Toll Collection Transponders

Source: Parsons Brinckerhoff, Atkins Global

6.4.2 Violation Enforcement Systems

In addition to basic ETC components, most toll roads, and some managed lanes, also utilize photo-enforcement systems to increase accuracy and reduce the chance of missed transactions (Figure 6-17). Since RFID systems are susceptible to missed transactions due to a variety of environmental conditions, video enforcement is seen as a way to protect revenue streams and ensure that close to 100 percent of all trips on the toll road result in a paid transaction.

Figure 6-17: Enforcement Cameras on the West Park Expressway in Houston

Source: Parsons Brinckerhoff

While the basic components of a video toll/violation enforcement system are the same, there is no single national standard today for processing violation images, although at least one organization (the Alliance for Toll Interoperability) is now espousing the concept of a central clearinghouse for all North American toll roads. The basic components of a video toll/violation enforcement system are as follows:

- Photo-enforcement cameras, with built-in or external triggers and lights, are installed above tolling points on overhead gantries that span the specially designated toll lanes.
- Vehicles equipped with license plates pass under the cameras in a "transaction envelope," and when triggered, the cameras photograph the license plate and store one or more image(s) of the license plate.
- The license plate images are then stored locally in a roadside controller, along with a time stamp and other basic information like the lane number and the location/plaza ID. The violation image controller is connected to the camera(s) via the local area network, and is usually a separate computer than the toll controller but can be mounted in the same roadside enclosure.
- The violation image controllers periodically transmit the image data to the back-office host computer via the WAN. More bandwidth is usually needed to transmit the larger image files than the text-only toll transaction data.
- The back-end computer consists of a violation processing module that contains image review software and an automatic license plate recognition (ALPR) function. ALPR uses optical character recognition algorithms to convert image data into text, using license plate character patterns based on certain confidence levels of the software. In general, between 80-90 percent of all images can be converted to text with ALPR, although most agencies require humans to review each image before issuing a violation notice to the offender.
- A violation noticing application is usually included in the software to handle the citation process and to track resolution of the violation through payment or dismissal. Violation payments are reconciled with the same account management system as the primary toll accounts.

When administered proactively, ALPR serves as a primary means of "pay by plate" in which toll invoices are mailed to vehicle owners, thereby eliminating the requirement that a motorist carry a transponder. However, "pay by plate" is a more expensive method of toll collection for administration purposes, and is often accompanied by an administrative surcharge. Additionally, the use of ALPR in managed lanes is still questionable, in that only one facility nationwide has begun to require eligible HOVs to register their license plate, thus making it impossible to ascertain the vehicle's occupancy status from the license plate image alone. Other strategies to mitigate this limitation are beginning to emerge and include carpool registration, switchable transponders, that allow the driver to declare the number of occupants in the vehicle, among other means.

6.4.3 Requirements for Variable Pricing

The use of variable pricing on priced managed lanes requires additional infrastructure and communications abilities. Since pricing is used to maintain a specified operational threshold, the toll system needs to either be based on a schedule that reflects typical peak demand curves, or it needs to be dynamic and receive real-time traffic input to calculate the toll rate. This real-time traffic information is obtained using loop detectors or other devices capable of detecting characteristics such as traffic volume and speed. A tolling algorithm then uses these characteristics to calculate the appropriate toll to charge. The toll can be raised or lowered in response to traffic conditions as appropriate to influence managed lane operations. However, business rules need to advise customers of the prevailing toll rate. This is typically done upstream of entry points using dynamic signing elements in accordance with guidance found in the 2009 MUTCD. The prevailing price a customer sees when making a choice to use the lane should be guaranteed once they enter. For this reason, the tolling system design opens a customer transaction envelope at the first toll point, but does not process the completed trip transaction until the vehicle passes one or more downstream tolling gantries and the transaction is closed.

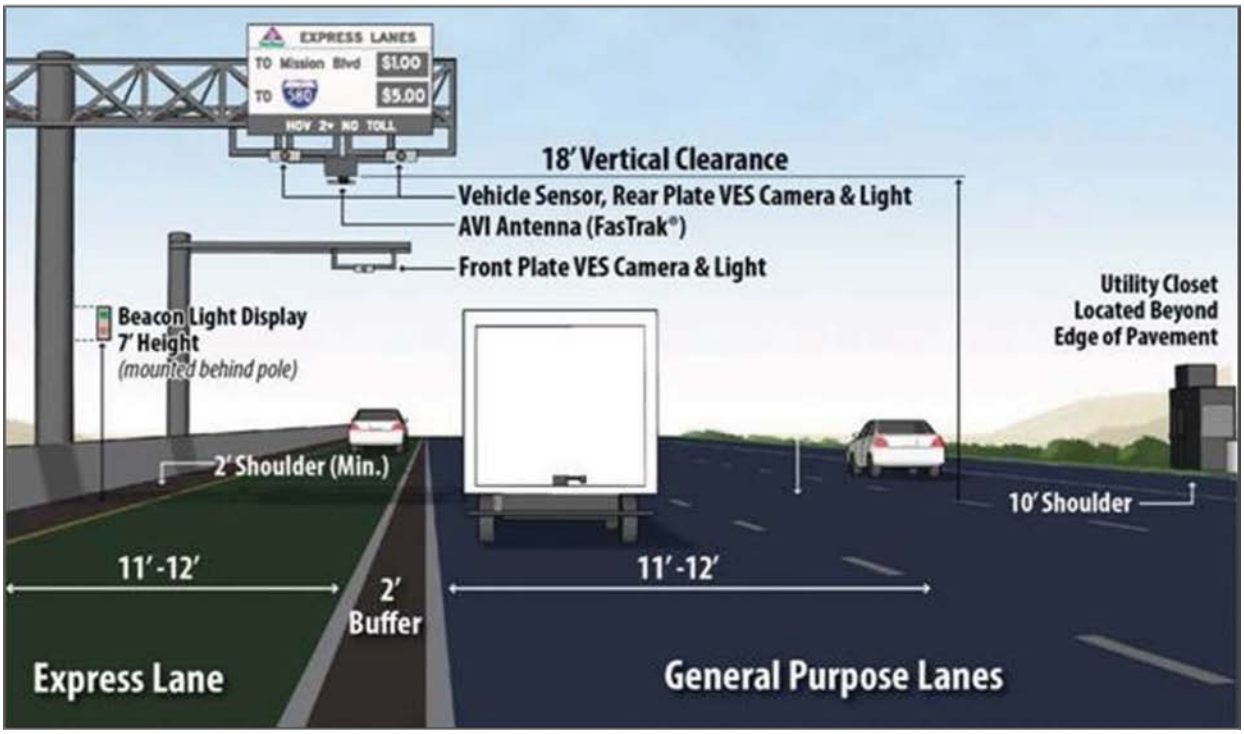
6.4.4 Typical Toll Zone Design

Priced managed lane toll zones will be equipped with all necessary infrastructure to identify vehicles, process toll transactions, identify and photograph license plates of potential violators, and inform enforcement personnel as to account status through strategically placed beacons. In the typical toll zone configuration, a vertical post with counter-balanced cantilevered horizontal arms will serve as the toll gantry (see Figure 6-18). In this system, a minimum of 18-foot vertical clearance will be provided between the automated vehicle identification antenna, the transponder reader, and rear-plate-facing license plate image camera on the mast arm. A transaction status indicator beacon will be mounted on the column supporting the toll collection gantry, approximately seven feet from the roadway surface. Many toll zones will also have a designated area for adjacent enforcement personnel monitoring. The availability and placement of these observation locations will generally be in the vicinity of the toll reader and beacons. Sufficient lighting will be present to support license plate recognition and image capture, as well as safety for structural illumination.

All of the priced managed lane toll zone components need regular access for preventative maintenance and other in-field connectivity. To provide this access, all components should be housed collectively in hardened and protected utility cabinets with sufficient controls to prevent tampering, preserve safety for maintenance personnel, and provide easy access. It is preferable that these cabinets be placed as far as possible from the travelway and beyond the clear zone. The cabinet must have an access door and be

located within 200 feet of the gantry post. Sufficient conduits underneath the general-purpose lanes must be installed to the gantries.

Figure 6-18: Typical Managed Lane Toll Zone Design



Source: Parsons Brinckerhoff

6.5 Signage

Accurate, informative signs are essential in explaining operational procedures of managed lane facilities and ensuring safe access and egress from the managed lanes. Managed lane signs should provide motorists with information on the following:

- Access and egress locations
- Distances to ramps
- Occupancy requirements
- Operating hours
- Cost
- Enforcement issues

In addition, motorists need to be given adequate time to decide whether or not to use the managed lane facility and then be able to access the facility safely. This requires that the proper information be provided so that motorists are able to make informed, real-time decisions on whether or not to use the facility.

Signage for managed lanes should generally adhere to the standards prescribed for special-use facilities in the federal *Manual on Uniform Traffic Control Devices* (2009 edition) Section 2B-49 and 50.

6.5.1 Access and Egress Signage

Good signage is critical to directing motorists to access and egress locations on barrier-separated facilities. In order to access interchanges, the corresponding buffer opening must be placed several thousand feet upstream of the exit ramp. Drivers need to be directed to the buffer openings providing access to their desired interchange. The sequence of signs for access to managed lanes is provided in the 2009 MUTCD.

6.5.2 Variable Message Signs

Managed lane signage systems must also provide motorists with information on toll levels. Good signage is particularly important when variable tolls are involved. These can involve either time-of-day tolls or a dynamic pricing system that changes price according to the level of congestion in the parallel general-purpose lanes and/or the availability of excess capacity on the managed lane(s).

When this is the case, variable message signs are the best way to provide motorists with accurate and current information. Variable message signs can also provide motorists with other information, such as general travel conditions, and enforcement policies.[11] When variable or dynamic pricing is used, at least one variable message sign should be placed before all entrance points to the managed lane in order to provide drivers with the basic information they need in order to determine whether or not they will use the facility. In addition, the outermost entrance locations or those spaced more than two miles apart may warrant the placement of two or more variable message signs that display the toll rate information so users have sufficient time to make a decision about whether or not to use the HOT lane. These signs operate in parallel and are usually controlled from an operations or traffic control center. Figure 6-19 shows a variable message sign providing toll rate information to specific destinations on the I-95 Express in Miami. Chapter 2G of the 2009 MUTCD provides comprehensive information on managed lane signage.[12] In particular Figures 2G-21 through 2G-24 in the 2009 MUTCD show examples of the sequence of guide signs for various configurations of initial and intermediate entrances to priced managed lanes.

Figure 6-19: Variable Message Sign on the I-95 Express in Miami

Source: Parsons Brinckerhoff

[11] HOT lane operators have contemplated displaying anticipated travel times savings together with toll levels in order to help motorists make the decision whether or not to use the HOT lane, but have generally decided against this, given that the actual time savings experienced by motorists could differ.

[12] http://mutcd.fhwa.dot.gov/htm/2009/part2/part2g.htm

6.6 Enforcement Areas

Managed lane facilities should also include locations from which enforcement officers can monitor traffic and identify unauthorized vehicles. In order to see occupants properly during hours of darkness or inclement weather, lighting is required at observation points. The enforcement areas should be large enough to accommodate the need for enforcement officers to accelerate to the speed limit before entering traffic. The areas should be wide enough to accommodate safety enforcement action and may be located near tolling points, allowing officers to monitor traffic as it enters the facility and provide a visual deterrent to would be offenders (Figure 6-20). Barrier-separated facilities will require less enforcement presence than would be required for a roadway that is not physically separated.

Figure 6-20: Enforcement Area on I-45 in Houston

Source: Parsons Brinckerhoff

The primary reason that facilities for on-site enforcement are recommended near the access points is that current technologies—both video and thermal—cannot accurately discern the number of occupants in large numbers of vehicles traveling at highway speeds. Moreover, the presence of an officer is a useful deterrent for misuse by those who want to abuse the system. Enforcement issues are addressed in further detail in Section 7.3.

7 Operations and Maintenance

Implementing a priced managed lane facility entails a long-term, annual commitment to operations and maintenance. This commitment to operations works hand in hand with a customer-centric focus, whereby the use of this facility is dependent upon the quality of service provided by the operator. While many aspects of priced managed lanes operations are no different than other aspects of general freeway operations, there are some unique components that are required to preserve lane service reliability and travel speed benefits, notably tolling, ITS, and communications infrastructure. These components are highly interdependent and must be maintained in working condition and operated to a high level of reliability. Disruptions and failures of equipment, procedures, operations, and functions can have a detrimental impact upon safety, system capacity, revenue, compliance and throughput, all of which may eliminate, negate, or compromise the benefits of the priced managed lanes.

Over time, the traffic and toll operations of priced managed lanes offer implementing agencies an opportunity to refine and enhance the core service provided by these facilities. Operations and maintenance stakeholders serve a critical role in the development process of any new toll system, at the same time provide revised and enhanced requirements to the planning process for more future toll systems.

7.1 Facility Operations

The success of priced managed lanes depends upon the ability to closely monitor and manage operations in order to maintain a high level of traffic service and travel-time reliability. Managed lane traffic and operations performance involving tolling depends on the variable pricing algorithms that regulate demand, as well as the ability to monitor system performance and detect and respond to changing conditions throughout the corridor. Operators must establish processes for monitoring traffic conditions, responding to traffic incidents and enforcing tolling and occupancy requirements. At least initially, there is a high likelihood that managers may have to closely monitor how the algorithm responds to changing conditions and override selected functions of the system until its performance is adequately tested. This can occur during the testing period as well as in the first weeks of operation. Over time, it may be necessary to revise adopted processes, to ensure that they are consistent with regional and statewide management policies. The specifics of these processes can be expected to vary from project to project.

7.1.1 Traffic Operations and Management

The operation of priced managed lanes involves a number of situations that require a management response:

- Increased traffic volumes and densities in the adjacent general-purpose lanes and/or in the managed lanes beyond algorithm limits.
- Non-recurring events, such as minor incidents and crashes on the managed lanes, which can slow or shut down managed lane operations in a particular location due to design constraints.
- Non-recurring events on the general-purpose lanes, which will influence speeds and headways and may create shock demand for the managed lanes' performance-limited capacity.
- Events of any kind on nearby corridors that likewise shift demand in unpredictable ways.

Federal and some state laws require that priced managed lane projects have a clearly defined set of operational goals. These goals form the basis for a performance monitoring program. For each goal, the operating agency should also identify performance measures and related monitoring and data collection needs. Table 7-1 provides example goals and performance measures for priced managed lane operations.

TABLE 7-1: GOALS AND PERFORMANCE MEASURES FOR PRICED MANAGED LANE OPERATIONS

Goal	Possible Performance Measures
Improve Mobility	• Average speeds • Person or vehicular throughput • Average travel times • Rates of violation
Increase Reliability	• Speed or travel-time variation • Transit "on time" performance • Incident clearance times
Improve Safety	• Number of incidents by type • Incident response times
Decrease Environmental Impacts	• Vehicle miles traveled • Fuel consumption • Quantities of exhaust pollutants
Preservation of Revenue	• Gross and net revenue generation • Operations costs • Revenue leakage • Refunds for customer service • Refunds for diversion into managed lanes

Monitoring equipment includes systems to collect and process the necessary data to assess priced managed lane performance. At a minimum, roadway detection devices must be capable of frequently and reliably collecting speed, volume, and throughout the project. Operators and algorithms evaluate operating conditions on the facility based on speed and volume characteristics and determine whether the toll or other operating policies need to be modified to ensure optimal performance. For dynamically priced systems, the toll-setting algorithm uses real-time speed and volume data. Operators also look at speed and volume trends over a daily, weekly, or monthly basis to evaluate the performance of fixed by time-of-day pricing strategies.

There are a variety of technologies available to detect traffic conditions at specific points along the corridor. Data collection equipment should be chosen based on cost, accuracy, reliability, maintainability, and the ability to integrate technologies with existing equipment.

Traffic monitoring equipment serve a critical function of alerting managed lane operators to the presence of traffic disruptions. Non-recurring traffic disruptions—such as debris on the roadway or collisions—may warrant a change in toll rates on dynamically priced systems, incident information on variable message signs, and in certain cases, temporary lane closure.

Traffic cameras also serve a critical toll operations role, by confirming that appropriate toll rates and other informational messages are correctly functioning and displayed on variable message signs. Monitoring equipment may also alert operators to the existence of recurring traffic disruptions (i.e., significant slowing at access points), which may warrant a different type of management response.

The level of roadway detection and monitoring capability on priced managed lanes may need to be more extensive than that found on other general-purpose lanes and maintained at a high level of functional reliability. Functional requirements for the detection and monitoring system need to be defined and implemented as part of the ITS and tolling integration systems that support the operations of the priced managed lanes. The functionality and accuracy of monitoring equipment should be tested at regular intervals to ensure that reported data is reliable. This is particularly important for systems that incorporate dynamic pricing algorithms that rely on accurate traffic data to properly set the toll rates.

7.2 Toll Operations

Federal law generally prohibits the imposition of tolls by states on federally funded facilities. Under the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and further mainstreamed by MAP-21, Congress permits exceptions to this general prohibition. The current law permits states and other qualifying agencies to implement tolls on federal-aid highways, tunnels, and bridges that are not on the interstate system. Additionally, on all federal-aid highways including the interstate system, states may implement tolling as a component of either new lanes of capacity or converted HOV lanes, both referred to in this guide as priced managed lanes. This law provides the specifications for the operation of tolling on managed lanes. Federal provisions and guidance for tolling are likely to change over time. The FHWA MAP-21 webpage provides guidance and questions and answers on tolling and is the best repository of current information on tolling and federal practice at the time of this writing.

7.2.1 Toll Policy and Exemptions

In particular, states may allow certain vehicles access to the managed lanes without paying a toll: buses, vanpools, motorcycles, energy-efficient vehicles (Environmental Protection Agency-certified hybrids), and inherently low-emission vehicles (ILEVs). All other vehicles must either meet the occupancy requirement (as carpools) or pay a variably priced toll that meets federal requirements. In order to proceed with a HOT lane implementation, the sponsoring and operating agencies must agree to the following:

- Establish a program for enrolling customers.
- Automatically collect tolls from customers (through payments from accounts associated with electronic toll collection and/or license plate recognition).
- Enforce violations.
- Vary the toll rate to manage demand (both fixed variable and dynamic pricing systems are eligible).
- Measure, monitor, and report achievement of performance standards.

In accordance with 23 U.S.C. 166(b)(4), states are required to monitor the impact of SOVs on the operation of priced managed lanes to ensure that the performance of the lanes is not degraded. A managed lane is considered degraded if it fails to operate at a speed of more than 45 mph 90 percent of the time over a consecutive 180-day period during morning and evening peak hour periods. If this occurs, the use by toll-paying vehicles other than HOVs would be restricted until such time as the managed lane is no longer degraded. Actions to improve the performance of the managed lane include enhancing enforcement, altering access by ILEVs and hybrids, increasing occupancy, establishing tolls (if not already

done), and raising tolls on additional vehicle classes. The implementation of tolls on a managed lane requires the development and execution of a toll agreement between the state DOT and FHWA, which will contractually obligate the state to distribute revenues to eligible expenses. These provisions remain unchanged under MAP-21.

Two forms of pricing systems have been implemented and are consistent with the federal guidance: fixed variable pricing and dynamic pricing.

Fixed Variable Pricing

Using variable tolls that change at predetermined times of the day has proven to be an effective means of maintaining congestion-free travel in priced managed lanes. Tolls in the priced managed lane are changed on a published schedule, and no pricing algorithm is needed. As regular monitoring reveals that lanes are becoming congested, or are being underutilized, a new toll schedule is developed and published. Transponders are required and, as tolls are collected in the lane, a back-office operation is necessary for real-time toll collection.

The I-25 Express Lanes in Denver, various managed lanes in Houston, and the SR-91 Express Lanes in Orange County (California) each utilize a fixed schedule of toll rates that vary by time of day. In all cases, the fixed variable pricing system has been sufficient for managing congestion in the managed lanes.

Dynamic Pricing

Dynamic pricing is the most sophisticated and complex priced managed lane toll operations. It is also the system that is most capable of maximizing throughput while maintaining congestion-free conditions in the priced managed lane. Dynamic pricing uses real-time volume and speed information from the facility to vary the toll imposed in the managed lane in increments as small as five minutes. When congestion increases, the toll increases. As congestion lessens, tolls are reduced. The toll rate is used as a meter to control the flow of traffic on the managed lanes and maintain free-flow conditions. As tolls increase, the number of paying users decreases and vice versa. Pricing is normally set using a computerized system with a dynamic pricing algorithm. In initial months of implementation, though, the facility's pricing can be manually controlled from the back office until confidence in the algorithm is assured.

Dynamic pricing requires a significant amount of in-lane equipment as well as a back-office operation to handle transactions, traffic monitoring, and manage the pricing algorithm. Vehicles using the facility and paying the toll must be equipped with a transponder. From an enforcement and revenue perspective, it may desirable (but certainly not necessary based on current experience) to require all vehicles, including carpools, to carry a transponder even if they are allowed free use.

Hybrid Variable Pricing

Finally, it should be noted that operators can mix the two identified types of variable pricing. In one example, such as on I-635 in Dallas, the priced managed lane facility may open with fixed variable pricing so as to provide actuarial data on user response to pricing. This approach is especially helpful for the ongoing tuning of the dynamic pricing algorithm. In turn, the operator uses this actuarial data to refine the parameters of the dynamic pricing algorithm before its deployment in the field. For operators specifying a hybrid pricing solution, the fixed variable pricing scheme is in use for at least 6 months. After

toll commencement, the pricing algorithm can operate as a shadow to the fixed pricing, and continue to be tuned, yielding a more stable and mature dynamic pricing system at conversion.

Conversely, other operators have chosen to adopt a permanent hybrid system. On SR-167 in Seattle, for example, WSDOT has chosen to implement a fixed variable pricing schedule as the default pricing system on the facility. Dynamic pricing operates only when traffic patterns warrant a shift from the fixed schedule. This has the benefit of providing travelers with greater predictability of toll rates, yet preserves the operational benefits that dynamic pricing provides the system.

7.2.2 System Operations

Federal law requires the use of ETC on all priced managed lane facilities. In addition to the design specifications as described in Chapter 6, additional system parameters should be addressed towards achieving this system. The operating agency will need to establish a protocol for distributing transponders to and a financial/accounting system to reconcile patron accounts and toll payments attributed to other agencies where reciprocity has been established for toll payments. These functions, whether facilitated by public or private entities, could be performed by that agency or potentially outsourced.

Operating a customer service center coupled with a toll processing center (often called a "back office") is an essential component for achieving these system operations requirements. Processing tolls and maintain customer accounts involves the creation of software and human capital solutions designed to accommodate the acquisition of traffic and transaction data, assembly of tolls, processing of toll transactions to accounts, and invoicing of customers. Although many operational managed lanes utilize pre-existing toll road systems for customer service and back-office functions, there are nuances to the conduct of priced managed lanes that differ significantly from traditional toll roads. As such, regardless of the chosen processing entity, it should be well understood and codified under operational documentation that priced managed lanes must account for assembled toll trips, not single point toll transactions, and do so without incurring cumulative transaction costs for the assembly. Additionally, the operations of dynamic pricing introduces a disproportionately higher level of complexity—from maintaining the performance of the toll algorithm, to ensuring the correct prices are displayed to customers, to creating and sustaining linkages between toll, traffic, and incident operations, and finally to providing a reasonable basis by which customers may manage charges to their accounts.

For customer service, motorists generally establish accounts and obtain transponders by telephone or over the Internet. In certain cases, they are also available at a customer service center or through brokers, such as grocery stores and other third parties. Payment policies also need to be established; operating agencies find it to their advantage to require users to pay via credit or debit accounts.[13] Similarly, priced managed lane operators will also need to determine whether or not motorists should be required to pay a fee to obtain the transponder itself, or, an additional surcharge if using alternative toll collection systems, such as those associated with ALPRs. Achieving desired transponder penetration in the customer base is a critical function for the priced managed lanes operator, which often involves identifying the correct mix of incentives and requirements. In certain cases, priced managed lane operators may use a regionwide automated toll collection system. If this is the case, the agency will need to adhere to the distribution policies and window placement guidelines established by the regional consortium of tolling agencies that use the technology.

[13] In order to avoid unfair equity bias against individuals who do not have credit cards or bank accounts many operators also accept cash towards prepaid accounts.

Given that all tolls are collected electronically and involve no cash transactions, internal accounting procedures for priced managed lanes are simpler than those required by legacy toll facilities that still collect tolls from cashiers or automated coin machines. Reporting functions associated with toll operations, including reconciliation and auditing, can be challenging with a simple toll system, let alone a dynamically priced, trip-based, priced managed lanes toll system. Operators must also account for general system monitoring and reporting, especially for performance monitoring of the system, as MAP-21 established an annually reporting requirement to the USDOT for all priced managed lane operators. As back-office software solutions are developed, subsystems should also be developed to automate reports.

The back-office systems are capable of instigating credit card transactions, generating invoices, and compiling detailed reports allowing agency officials to track all financial activity and performance metrics as required under federal, state, and other laws or policies. If the priced managed lane operator is participating in a regionwide automated toll collection system, the facility will be assigned a use code that will be included in all transactions in order to distinguish it from other tolled facilities. In such cases, the facilities share the same transponder technology, same accounting database, and same outlets for purchasing and subscribing to the various programs (although there are some unique exceptions to this at each locale). Experience shows that use of priced managed lanes is made more convenient if the transponders for a project are the same as for other toll facilities in a given locale or region. Furthermore, MAP-21 has established that the United States will have a nationally interoperable toll payment system by September 2016.

7.3 Enforcement Operations

Enforcement of moving violations are generally no different for priced managed lanes than they are for other freeway enforcement activities. Speeding, illegal crossing of solid white lines (such as buffer separations), and other associated infractions are pursued and apprehended as consistent with each state's statutes and procedures.

In the context of priced managed lanes, the primary enforcement functions are to maintain desired traffic service levels, maximize compliance with user policies and minimize revenue leakage. This is primarily accomplished through robust vehicle occupancy rate and toll evasion enforcement. Without effective enforcement strategies and countermeasures to minimize willful violations of pricing and occupancy policies, the financial integrity and credit worthiness of the priced managed lane may be jeopardized. Visible enforcement efforts also promote and maintain public acceptance of managed lanes.

Agencies sponsoring priced managed lane projects should coordinate early on with enforcement agencies as well as the local judicial system to agree upon enforcement strategies and policies and the degree to which state and local law allow these processes to be automated or safely addressed with field personnel. Enforcement issues can also be vetted through concept of operations process described in Section 2.3.1.

7.3.1 Manual Enforcement

Manual enforcement involves placing police officers in the field to monitor traffic and apprehend violators of various infractions. On some priced managed lanes, visible beacons are installed in toll zones to assist officers with identifying vehicles that have not successfully processed a toll transaction. In turn, the officers observe passing vehicles allowed free use to ensure that they meet the occupancy requirements

for the facility in lieu of toll payment. Some projects provide designated enforcement monitoring zones requiring specific design attention; others provide shoulders, hand-held technologies and other provisions to allow some of the enforcement activities to occur more randomly along the corridor or even from roving patrols. This level of enforcement need not be present at all operational times. Indeed, as indicated in the case studies, some operating agencies use targeted, part-time patrols during peak periods, which has been sufficient in generating acceptable rates of compliance. In most situations, operational facilities use toll revenue and enforcement fines to cover the incremental costs necessary to provide for the increased levels of enforcement.

Due to the unique attributes of each corridor, specific enforcement needs may vary. The level and magnitude of enforcement needed is based on the design and operational characteristics of each individual corridor. As a result, operating agencies will determine procedures, processes, locations, and frequency of designated enforcement based on discussions with local enforcement personnel who are most familiar with the unique characteristics and needs of each corridor.

7.3.2 Automated Enforcement

Automated enforcement strategies complement manual activities by limiting in-field enforcement personnel's responsibilities to occupancy verification and other traffic violations (i.e., illegal buffer crossings). Increasingly, ALPR systems are used concurrent with electronic toll collection to enforce toll violations. On the I-95 Express Lanes, SR-91 Express Lanes, and I-25 Express Lanes, cameras capture license plate images of vehicles that do not display a recognizable transponder. The license plate images of these vehicles are used to determine whether the vehicle is registered to an account, in which case the toll is automatically deducted. If the vehicle license plate is not associated with an active account then the license plate number is processed through the Department of Motor Vehicles database to locate an address to send an invoice to collect payment. In this way, ALPR removes the responsibility of toll violation enforcement from officers in the field.

The use of ALPR requires a way to identify vehicle occupancy since a picture of a license plate alone cannot do this. Identification can be done through vehicle registration or occupancy declaration. The use of occupancy self-declaration ("switchable") transponders is one method increasingly endorsed by priced managed lane operations, including upcoming implementations on I-10 and I-110 in Los Angeles, I-495 in northern Virginia, and I-25 and U.S. 36 in Denver. Drivers will self-declare their vehicle occupancy using a switching mechanism on the transponder, and the toll system will recognize the occupancy setting and assess the appropriate toll. Although this process avoids the requirement of constructing declaration lanes and allows for automated enforcement opportunities, this approach requires that all carpool users register and carry the switchable transponder. Non-switchable transponders will also work on these managed lanes, although they will not allow users to declare as an HOV or receive toll-free access.

Although the use of ALPR and switchable transponders automate toll violation enforcement, police officers will still need to perform occupancy enforcement. Since technology to automate vehicle occupancy verification is still experimental and will likely not be available for large-scale implementation in the near future, police officers will still need to verify the occupancy of vehicles that self-declare as carpools. Operating agencies have deployed an in-field beacon on toll gantries that alert observing police officers to the status of the transponder read for each toll transaction. These beacons contain a set of lights that indicate whether an HOV transaction was processed, signaling the need for the police officer to inspect the vehicle and confirm that it meets occupancy requirements.

The principal benefit of this system is to remove the responsibility of enforcing tag misreads and non-reads from police officers, yielding:

- Increased effectiveness and safety of violation enforcement. Toll collection enforcement would be via ALPR technologies, allowing enforcement personnel to concentrate solely on occupancy enforcement. This represents a simplification of enforcement over contemporary operations, reducing total number of personnel required to maintain enforcement operations, and reduces the absolute number of vehicles per lane for which enforcement personnel must observe occupancies. Furthermore, the number of improper traffic stops can be reduced when the user has a tag misread and appears to be a violator.
- Maintained travel-time benefit for carpoolers and bus riders. Regular carpoolers and bus riders benefit from a better level of service. Reducing the number of violators and placing a value upon all use of the priced managed lanes helps the facility operate at its best performance for the original beneficiaries of the managed lanes concept.
- Improved viability of the facilities. In the short term, violations artificially increase the toll rate, as violators remove available capacity for sale. In the long term, violators decrease the available capacity for HOVs, as significant violations may force the conversion of the facilities to higher occupancy classifications. As a result, reducing the number of violators through the enforcement program benefits the facilities in both the short-term and long-term.

7.3.3 Moving Violations

Besides toll and occupancy violation, police officers enforce other moving violations to maintain safety and enhanced operating conditions. The implementation of priced managed lanes adds new and unique enforcement duties to their responsibilities. From both a safety and financial perspective, one of the most important of these new responsibilities will be the enforcement of priced managed lane access to ensure that vehicles enter and exit only at designated locations, such as breaks in buffer or barrier separation.

Illegal buffer crossings pose a safety risk for vehicles in both the priced managed lanes and the adjacent general-purpose lanes, and can represent a source of revenue leakage if vehicles bypass toll zones to avoid payment. However, WSDOT and MnDOT have operated priced managed lanes with minimal buffer separation for years on SR-167 and I-394, and on neither facility has there been substantial reported revenue loss due to weaving. Additionally, research on SR-167 by WSDOT indicates that illegal buffer crossings are more typically found with drivers entering the managed lane, rather than illegally existing the facility. Part of these findings may be based upon the conversion of previously continuous access HOV lanes to buffer-separated managed lanes. For these and other situations like them, informative marketing and signage is necessary to educate drivers about the locations of priced managed lane access points to minimize buffer crossings that are a result of driver confusion.

7.4 Incident Management

Effective and responsive incident management protocols are critical for the successful operation of priced managed lanes. In order to provide reliable, time-saving travel for users, not only must priced managed lanes maintain enhanced operating conditions during recurring congested periods, but they must also be managed effectively during non-recurring events or incidents to ensure that users are not adversely

affected. And since many of these users will be toll-paying customers, it is important that the value of the managed lanes be maintained so customers can enjoy the benefits for which they paid. Without incident management protocols, the integrity and reputation of the priced managed lanes can be compromised leading to low public acceptance and reduced revenue potential.

Priced managed lanes must be equipped with incident surveillance and detection equipment, monitored by observant (and preferably dedicated) staff at least during periods of peak demand, and staffed with trained and experienced responders with drills and exercises to improve responsiveness and safety. If construction is anticipated in the proximity of the priced managed lanes, operators should incorporate 24-hour service patrols, temporary collision investigation sites, immediate-tow rules and procedures, and agreements with construction contractors to assist in clearance of debris.

The incident management process provides coordination among the various agencies responsible for incident management functions to ensure safe and efficient responses. The intention is to ensure that incidents that affect priced managed lane operations are handled efficiently and are properly communicated to operators. The following describes a typical incident response plan for priced managed lanes:

- **Detection.** The focal point for initial awareness of an emergency incident or situation is likely to be the local police dispatch system, which is staffed 24/7 and fields calls from police officers and citizens via the 911 emergency system. However, the automated sensing capabilities of the priced managed lanes introduces a secondary level of incident awareness, depending upon the coverage of the sensing equipment and frequency of system interaction with managed lane users within the facility.
- **Categorization.** Police dispatch will categorize the incident and create a new entry that reflects the description as provided. Priced managed lane operators will be alerted by either active monitoring of the dispatch log or direct lines of communication within a traffic management center (TMC). In some instances, courtesy patrols may address the incident before a report has been made to police dispatch. If there is no discernible effect on traffic flow nor need for police presence at the site, these incidents may be cleared without being logged.
- **Response.** Incident response is dictated by the severity of the incident, which can generally be classified as minor or major. Minor incidents such as a stalled vehicle or minor debris on the roadway will likely not require a manual override of managed lane operations to execute a response. However, it is important that managed lane operators receive detailed information about the time and location of the incident in case there are adverse impacts on operations during incident response. Major incidents such as injury accidents or hazardous spills may require the police responders to use the managed lanes to divert traffic while the response is being executed. In these cases, managed lane operators will need to initiate a manual override of tolling equipment to display the appropriate information about the use of the lane. The implications of diversion and override decisions upon revenue and facility performance should be identified in operations documentation.
- **Clearance.** Throughout the clearance of the incident, the police officer or other responsible responder is in control and will initiate all necessary actions, as applicable, to address the emergency or situation that has arisen. After the conclusion of the event, it is vital that records are kept as information is passed, decisions are made, and the incident/situation develops. Once normal operations resume, the managed lane operators return to normal operating mode and normal signage. In many circumstances, the police officer may briefly use the managed lanes to provide

access to emergency responders, or may direct general traffic into managed lanes. Although these situations do not typically escalate to police dispatch, the managed lane operators may still require knowledge of these actions and/or observations in order to properly process account adjustments. The incident management plan and concept of operations for the priced managed lanes facility should identify a communication protocol for these situations.

- **Accounting.** At the conclusion of the incident, some projects have policies where they try to address tolls charged to customers either in response to customers filing complaints or proactively through a review of the event log. Practices vary widely based on current experiences.

7.5 Maintenance Operations

Maintenance of the toll equipment, software, traffic sensing, and related toll enforcement systems for priced managed lanes requires specialized attention, which may be specific in nature to the technology deployed by the tolling integrator and systems vendor for each facility. This technology may also be employed in other lanes of the roadway. For example, dynamic tolling requires collecting significant amounts of data across multiple lanes of traffic (managed lanes and general-purpose lanes) in order to operate effectively. Maintenance on toll collection equipment is usually conducted at night during periods of low utilization when lanes can be closed. These tightly integrated systems require a high level of reliability and preventative maintenance. Performing preventative maintenance helps avoid unforeseen equipment outages. Every attempt should be made to provide maintenance access off the roadway to equipment cabinets so that access to devices does not requiring lane closures. In addition, adding in redundancy—more toll readers and detectors than are needed—is another strategy being used on project such as I-85 in Atlanta in order to avoid outages.

In addition to the tolling and enforcement systems, priced managed lane corridors feature virtually continuous installation of ITS technologies, including sensor loops, independent closed-circuit television (CCTV) systems for traffic / incident monitoring, ramp metering, active traffic management, and other traffic control systems, often under the purview of the region's traffic management center. Typically, the priced managed lane operator will have no role in the maintenance of regional ITSs, unless the TMC and managed lane operator are integrated with one another. Similarly, issues pertaining to communications networks can affect the priced managed lane operator. In these situations, the operator and the appropriate entities should establish appropriate performance guidelines within the facility's concept of operations and interagency agreements.

7.6 Supporting Technologies

Increasingly, priced managed lanes may be implemented concurrent with other efforts for transportation systems, management, and operations.

7.6.1 Active Traffic Management

Whereas priced managed lane facility design often involves design trade-offs, future managed lane networks may rely upon an aggressive deployment of ATM strategies, such as hard shoulder running, to complement the use of pricing for capacity expansion and overall corridor operations. Based upon established practice in Europe and demonstrated initially on I-5 in Seattle (as seen in Figure 7-1), ATM has since been deployed on I-35W in Minneapolis and I-90 and State Route 520 in Seattle with support from the UPA and CRD programs. ATM is useful as a safety and operational mitigation device in the use of shoulder lanes for priced managed lanes. Priced managed lane operations are able to benefit from selective application of available ATM strategies, notably connector and ramp metering, lane control signals, queue warning, and variable speed limits (speed harmonization).

Figure 7-1: Active Traffic Management Deployed on I-5 in Seattle

Source: Parsons Brinckerhoff

Altogether, the use of speed harmonization, queue warning, connector and ramp metering, and lane control signalization constitutes a managed corridor, whereby traffic patterns are affected across all lanes of travel. This managed corridor, though, may still benefit from priced managed lanes within the corridor. Much like a similar application implemented along I-35W in Minneapolis, these managed corridor treatments increase efficiency and improve operational safety. As applied on I-35W, the inside shoulder is expanded to 14 feet, with use allowed for eligible traffic during peak periods, reverting to breakdown / refuge only in off-peak periods. Coordinated Active Traffic Management and Transportation Demand Management is used to manage flows, and provide warnings of downstream incidents. Additionally, emergency refuge areas are constructed every ¼-mile whenever an interchange is not available downstream. This design section not only assists in implementing a managed lane, but it also serves as a mitigating tool for safety concerns.

7.6.2 Integrated Corridor Management

One notable development concerning traffic management and the provision of priced managed lanes is ICM. Transportation corridors often contain excess capacity along parallel routes, in the nonpeak direction on freeways and arterials, and in buses, vanpools, and passenger vehicles. Efficient use of this capacity can help manage congestion throughout the corridor. ICM optimizes the use of existing infrastructure assets and leverages unused capacity. With ICM, transportation professionals manage the transportation corridor as a multimodal system, rather than taking the more traditional approach of managing individual assets.

ICM strategies provide travelers with information encompassing the entire transportation network in order to enable the proactive multimodal management of infrastructure assets. Travelers dynamically shift to alternative transportation options—even during a trip—in response to changing traffic conditions. For example, while driving in a future ICM corridor, a traveler could be informed in advance of congestion ahead on that route and alternative transportation options, such as a nearby transit facility's location,

timing, and parking availability. Priced managed lanes are integral to this concept, as they provide enhanced levels of service within the roadway infrastructure that can be accessed and leveraged by the ICM system.

Transportation corridors often contain unused capacity in the form of parallel routes, the nonpeak direction on freeways and arterials, single-occupant vehicles, and transit services that could be leveraged to help manage congestion. Traffic information today is often fragmented, outdated or not completely useful. ICM is a strategy that seeks to optimize the use of existing infrastructure assets and leverage unused capacity along our nation's urban corridors. With ICM, transportation professionals manage the transportation corridor as a multimodal system—rather than taking the more traditional approach of managing individual assets. The USDOT has called ICM "the next logical step in congestion management."

Since 2007, the USDOT has partnered with various sites to develop, deploy and evaluate ICM concepts in eight of our nation's busiest corridors. In 2009, U.S. 75 in Dallas and I-15 in San Diego were selected to actively demonstrate and evaluate ICM strategies. In both cases, the corridors will incorporate a combination of HOV, tolling, value pricing, active traffic management, and transit services (Dallas focusing on light rail whereas San Diego will incorporate bus rapid transit).

The USDOT ICM Initiative aims to advance the state of the practice in transportation corridor operations to manage congestion. This initiative will provide the institutional guidance, operational capabilities, ITS technology and technical methods needed for effective ICM systems. In an ICM corridor, because of proactive multimodal management of infrastructure assets, travelers and shippers could receive information that encompasses the entire transportation network. Travelers could then dynamically shift to alternative transportation options—even during a trip—in response to changing traffic conditions. For example, while driving in a future ICM corridor, a traveler could be informed in advance of congestion ahead on that route and be informed of alternative transportation options such as a nearby transit facility's location, timing and parking availability.

7.7 Transit Operations

Riders on buses and vanpools within priced managed lanes are users and beneficiaries of their operational performance. Improvements to travel times and travel-time reliability for buses help increase transit ridership and lower transit providers costs to transit providers. In certain situations the revenue generated by priced managed lanes may also be used to fund enhanced transit services. In fact, with many operating facilities, demonstrating an improvement in transit capacity and service was critical to gaining public support for the managed lanes. As such, operators may coordinate plans for enhancing transit service with the development of priced managed lane improvements. These improvements may include BRT, as well as other technology-dependent strategies to improve service and provide better information to transit riders. Coordination with transit providers is facilitated through the concepts of operations described earlier in Section 2.3.1. Under the right conditions transit improvements leverage the benefits of priced managed lanes, but this requires close coordination and often the deployment of the strategies described below.

7.7.1 Dynamic Transit Operations

Dynamic transit operations overall seek to expand transportation options by leveraging available services from multiple modes of transportation. Travelers are able to request a trip via a handheld mobile device and have itineraries containing multiple transportation services (public transportation modes, private transportation services, shared ride, walking and biking) sent to them via the same handheld device. This type of enhanced traveler information builds upon existing technology systems such as computer-aided dispatch/automatic vehicle location systems and automated scheduling software, all of which have been a mainstay for transit operations. However, in order to facilitate dynamic transit operations they need to be expanded to incorporate business and organizational structures that aim to better coordinate transportation services in a region. Once implemented, this form of dynamic transit operations will enhance communications with travelers to enable them receive the broadest range of travel options when making a trip.

Priced managed lanes directly contribute to specific travel-time reliability and assurance such that dynamic transit operations can occur. The intent is to improve rider satisfaction and reduce expected trip time for multimodal travelers by increasing the probability of automatic intermodal or intramodal connections. This strategy protects transfers between both transit (e.g., bus, subway, and commuter rail) and non-transit (e.g., shared-ride modes) modes, and facilitates coordination between multiple agencies to accomplish the tasks. In certain situations, integration with other dynamic transit operational strategies may be required to coordinate connections between transit and non-transit modes. Dynamic transit operations is an element of USDOT's Connected Vehicle Initiative.

7.7.2 Real-Time Ridematching/Dynamic Ridesharing

Today, slightly more than 10 percent of Americans commute to work by carpool, and carpooling rates have declined steadily since 1980, when 20 percent of Americans shared rides for the journey to work.[14] The decline in carpooling levels is most commonly attributed to the fact that workers today have increasingly variable work schedules that can change on a daily or weekly basis. Unpredictable work schedules are incompatible with fixed plans required for traditional carpooling.

Today's ubiquitous information and communications technologies provide a platform from which a new range of dynamic ridematching[15] services have emerged to facilitate the formation of carpools in "real-time." Real-time ridematching (RTR) matches drivers and riders at the time of (during or directly prior to) the taking of a trip. Unlike traditional ridesharing. RTR does not require commuters to commit to a single carpool with fixed routes and schedules, rather it facilitates the matching of riders and drivers on an ad-hoc basis, based on availability of seats and a common origin-destination pattern. While these services greatly expand options for commuters, they do not modify the basic dynamics of prearranged carpools, which still requires substantial coordination among participants and severely constrains schedule flexibility.

[14] In order to avoid unfair equity bias against individuals who do not have credit cards or bank accounts many operators also accept cash towards prepaid accounts..

[15] Dynamic ridesharing is defined as a market package as ATIS8 in the National IT Architecture. See, "The National ITS Architecture." Version 6.0, May 2007 update.

The primary enabler of RTR today is smartphone technology, which permits the matching of riders and drivers in real-time through the coalescence of location-based services, cashless payment, incentives and rewards tracking, secure identification, matching by affinities and relationships, and user ratings/ crowdsourcing (Figure 7-2). RTR represents the natural technological evolution of carpooling and has the promise of substantial social and environmental benefits. If technology is the enabler of RTR, then incentives are the catalyst to making it succeed. Success in a RTR program is dependent upon creating an incentive for drivers to abandon their single-occupancy vehicle habits, and to share their seats with riders that they may not know. Combining direct financial incentives with the convenience of real-time matching of riders and drivers has the potential to dramatically decrease the number of single-occupancy vehicles on the road.

RTR has the potential compliment priced managed lane facilities as it gives single occupant motorists the opportunity to carpool with ride sharers, thereby allowing them to use the priced managed lane at no cost or for a reduced fee.

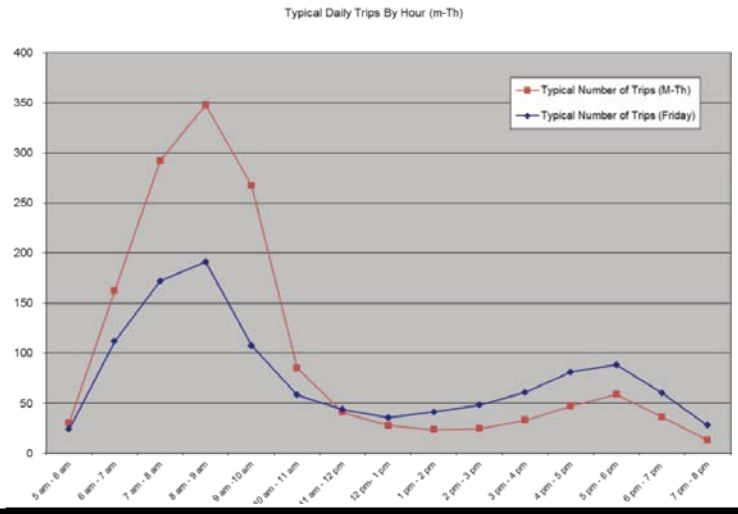
Figure 7-2: A Ridematching Smartphone Application used in Seattle

Source: Avego

Appendix
Priced Managed Lane Profiles

I-680 SB Express Lane
Alameda County California

BASIC DESCRIPTION:	
Description	The I-680 SB Express Lane involved the conversion of an existing 14-mile HOV lane to HOT operation. It extends from Highway 84 in Alameda County to Highway 237 in Santa Clara County. The Express Lane has three entry and exit points and is separated from general-purpose lanes by new double-solid striping. Overhead electronic signs indicate entry and exit points and current toll rates.
Location	Southbound on Interstate 680, between State Route 84 (south of the City of Pleasanton) in Alameda County, to State Route 237 in the City of Milpitas, in Santa Clara County, California
Project Sponsor	Sunol Smart Carpool Lane Joint Powers Authority, a partnership of the Alameda County Transportation Commission (Alameda CTC), the Santa Clara Valley Transportation Authority (VTA), and the California Department of Transportation (Caltrans)
Project Delivery Method	Traditional Design-Bid-Build
Status	Operational since September 20, 2010
Number of Lanes	One
Length	Approximately 14 miles
Opening Date	September 20, 2010
New Construction or Conversion	HOV-to-HOV/Express Lane conversion
Environmental Approvals	Categorical Exemption/Categorical Exclusion, February 2006
Separation Treatment	2-foot double-white buffer stripe
Number of Points of Access / Egress	Three (3) ingress and three (3) egress locations in the southbound direction
Moveable or Reversible Lanes	n/a
Transit / Park-and-Ride Facilities	Existing transit service in I-680 corridor is unchanged
Other Innovations	Use of dynamic pricing, including value of time algorithm that compares the difference in travel speed and volumes in the General-Purpose lanes and the Express Lane, and sets the toll accordingly.
STAKEHOLDERS	
Project Sponsor	Sunol Smart Carpool Lane Joint Powers Authority. Alameda CTC is the managing agency
Private Development Partner	n/a
Transit Partners	Central Contra Costa Transit Authority (CCCTA), Livermore Amador Valley Transit Authority (LAVTA WHEELS), San Joaquin Regional Transit District (RTD), and Santa Clara Valley Transit Authority (VTA)
Enforcement Agency	California Highway Patrol (CHP)
Back-Office Operator	Electronic Transaction Consultants Corporation (ETCC)
Other Local Partners	Caltrans, VTA, CHP, Bay Area Toll Authority (BATA)
IMPLEMENTATION COSTS	
Capital Construction Cost	$26 million (does not include cost for initial construction of HOV lan**e)**
Technology Costs	Approximately $5 million
Total Capital Cost	Approximately $26 million.
Project Cost with Financing	$0
Other Complementary Investments	Auxiliary lanes, ramp metering, closed-circuit television (CCTV) and traffic sensors
UTILIZATION	
ADT Un-tolled	Approximately 13,000 vehicles per day
ADT Tolled	Approximately 2,000 vehicles per day
Total ADT	Approximately 15,000 vehicles per day
Hourly Operational Capacity	1,850 vph, including HOV users

Peaking Characteristics	
FINANCIAL INFORMATION	
	PROJECT FUNDING Funding by Fund Source ($ X 1,000) Measure B $ 15,197 Federal $ 5,437 State $ 8,000 Regional $ 0 Local $ 8,000 Other $ 0 **TOTAL Revenues: $ 36,634**
Type of Financing	n/a
Revenue Source	Federal, State and Local
Sources of Capital Funding	State- STIP-RIP: $8M Local: $18M
Federal Grants and Credit Enhancements	VPPL: $3.4M; HP21: $2M
Financial Status	Not Available
Annual Operating Costs	Approximately $2.4 million
Annual Revenue Generation	Approximately $1 million
Use of Revenues	System maintenance and operations; roadway maintenance, toll collection and customer service enforcement; and management costs
Other Subsidies	Project funds (available programmed funds)
Operational Policies	
Occupancy Requirements	HOV 2+ travel free with no registration requirement SOV must pay the dynamic per-mile toll for each trip using a valid FasTrak® transponder (all ETC/open road tolling)

Type of Pricing	Dynamic pricing. Price is based on entry and exit location pair. Pricing algorithm factors "value of time" based on calculated difference in speed and volumes between SB Express Lane and General-Purpose lanes. A motorist will always pay the amount for their trip that was displayed on the Variable Toll Message sign prior to entering the Express Lane.
Maximum Price	$7.50
Minimum Price	$0.30
Hours of Operation	15 hours a day, on weekdays, from 5 a.m. to 8 p.m. The lane is "open to all" at night and on weekends.
Toll Exempted Vehicles	Motorcycles, HOV 2+, and certain qualified low-emission (currently CNG) and zero-emission (e.g., Nissan Leaf, Chevy Volt) electric vehicles certified by California Air Resources Board (ARB) with valid California Department of Motor Vehicles white decal go for free. All others must pay the toll.
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	California FasTrak, subject to California Title 21 Specification for Automatic Vehicle Identification Equipment
Type of Transponder	Title 21-compliant (currently Sirit, Inc./Federal Signal and TransCore/ AmTech manufacture certified Title 21 tags)
Existing Regional Toll Operator	Bay Area Toll Authority (BATA), processes transactions and manages Customer Relations Management (CRM) aspects of the project. ETCC captures transactions under contract to Alameda CTC.
Complementary Operations Systems	Adaptive ramp metering, vehicle detection stations every ½ mile, freeway changeable message signs
Operation Center	I-680 SB Express Lane operations managed by Alameda CTC and consultant staff, and staffed by ETCC maintenance personnel; Regional FasTrak Customer Service Center (RCSC) managed by MTC/BATA; Regional freeway operations managed by Caltrans District 4 Traffic Management Center (TMC)
Video Enforcement Authority	n/a
Occupancy Enforcement Procedures	Currently, reliant on CHP for routine patrol (i.e., visual observation) although considering other enforcement strategies
Fine Levels	Currently, minimum $381 fine per first offense, HOV violation.
Violation Rates	Estimated to be above 20% of all traffic using the Express Lane
TRANSIT SERVICES	
New Transit Services	None to date
New Transit Facilities	None to date
Daily Transit Utilization	Not Available
PROJECT CONTACT	
	Kanda "Raj" I-680 SB Express Lane Operations and Maintenance Manager (925) 330-8355 **Kanda.raj@kimley-horn.com** Steward Ng ACTC Deputy Director of Programming & Projects **stewarding@alamedactc.org** **http://www.680expresslane.org/I-680.asp**

Notes: Information gathered through readily available web information, and not validated by the Alameda CTC or its representatives.

I-10 ExpressLanes
Los Angeles, California

BASIC DESCRIPTION:	
Description	The I-10 Metro ExpressLanes is a pilot, one-year demonstration program to convert the 14.2- mile El Monte Busway on I-10 to HOT operation. The ExpressLanes will provide one lane in each direction west of I-710 and will be expanded to two lanes within the existing right-of-way east of I-710.
Location	Los Angeles, California
Project Sponsor	Los Angeles County Metropolitan Transportation Authority (Metro)
Project Delivery Method	DBOM
Status	Under construction
Number of Lanes	1 each direction west of I-710/2 each direction east of I-710
Length	14.2 miles
Opening Date	February 2013
New Construction or Conversion	Conversion
Environmental Approvals	Environmental Impact Report/Environmental Assessment (EIR/EA) Approved June 2010
Separation Treatment	Separate alignment west of I-710/painted buffer east of I-710
Number of Points of Access / Egress	6 westbound/5 eastbound
Moveable or Reversible Lanes	No
Transit / Park-and-Ride Facilities	3 inline transit stations with park and ride
Other Innovations	Interconnected transit services with I-110; switchable transponder for HOV occupancy declaration
STAKEHOLDERS	
Project Sponsor	Metro
Private Development Partner	DBOM team led by Atkinson Construction with ACS and AECOM
Transit Partners	Metro, Foothill Transit, Metrolink
Enforcement Agency	California Highway Patrol
Back-Office Operator	ACS (contractor to Metro)
Other Local Partners	Caltrans, City of Los Angeles
IMPLEMENTATION COSTS	
Capital Construction Cost	
Technology Costs	
Total Capital Cost	$79 Million (also includes I-110 corridor)
Project Cost with Financing	
Other Complementary Investments	
UTILIZATION	
ADT Un-tolled	
ADT Tolled	
Total ADT	13,206 WB/10,975 EB on existing single HOV lane (2008)
Hourly Operational Capacity	Approximately 1,650 vphpl
Peaking Characteristics	Double AM WB and PM EB peak reflecting change in occupancy thresholds; extended peak duration
FINANCIAL INFORMATION	
Type of Financing	USDOT CRD Grant, local matching funds
Revenue Source	
Sources of Capital Funding	
Federal Grants and Credit Enhancements	$210 million USDOT CRD grant (includes I-110)
Financial Status	
Annual Operating Costs	
Annual Revenue Generation	

Use of Revenues	
Other Subsidies	
OPERATIONAL POLICIES	
Occupancy Requirements	3+ during peak period (6-9AM/3-7PM M-F), 2+ all other times
Type of Pricing	Variable dynamic pricing
Maximum Price	$0.25 per mile
Minimum Price	$1.40 per mile
Hours of Operation	24/7
Toll Exempted Vehicles	Eligible HOV, transit and other buses, emergency services
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	RFID transponder with switchable self-declaration capability; LPR capture for secondary/enforcement
Type of Transponder	Sirit Title 21 with switchable capability
Existing Regional Toll Operator	No
Complementary Operations Systems	Caltrans RITS
Operation Center	Contracted with DBOM
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	All users required to carry transponder, regardless of toll paying; visual enforcement by CHP at toll locations with enforcement beacons indicating transponder declaration status
Fine Levels	$380 minimum for HOV Occupancy Violation per CVC 21655.5(b)
Violation Rates	<7.4% for existing HOV during peak period (3+)
TRANSIT SERVICES	
New Transit Services	Metro SilverLine BRT service interconnecting I-10 and I-110
New Transit Facilities	Reconstructed El Monte Transit Center; new SilverLine bus maintenance depot; proposed in line station at Patsaouras Plaza
Daily Transit Utilization	
PROJECT CONTACT	
Stephanie Wiggins Executive Officer for ExpressLanes Demonstration Project Metro 213-922-1023 WIGGINSS@metro.net http://www.metro.net/projects/expresslanes/	

I-110 ExpressLanes
Los Angeles, California

BASIC DESCRIPTION	
Description	The I-110 ExpressLanes is a pilot, one-year demonstration program converting 10.8 miles of existing HOV on I-110 to HOT operation. These include one lane in each direction south of I-105 and two lanes in each direction on a dedicated elevated facility north of I-105.
Location	Los Angeles, California
Project Sponsor	Los Angeles County Metropolitan Transportation Authority (Metro)
Project Delivery Method	DBOM
Status	Under construction
Number of Lanes	1 each direction south of I-105/2 each direction north of I-105
Length	10.8 miles
Opening Date	October 2012
New Construction or Conversion	Conversion
Environmental Approvals	Environmental Impact Report/Environmental Assessment (EIR/EA) Approved June 2010
Separation Treatment	Elevated section north of 56th St/painted buffer south of 56th St.
Number of Points of Access / Egress	6 northbound/7 southbound
Moveable or Reversible Lanes	No
Transit / Park-and-Ride Facilities	5 inline transit stations with park and ride
Other Innovations	Interconnected transit services with I-10; switchable transponder for HOV occupancy declaration
STAKEHOLDERS	
Project Sponsor	Metro
Private Development Partner	DBOM team led by Atkinson Construction with ACS and AECOM
Transit Partners	Metro, Orange County Transportation Authority (OCTA), City of Los Angeles Department of Transportation, Gardena Bus Lines, Torrance Transit
Enforcement Agency	California Highway Patrol
Back-Office Operator	ACS (contractor to Metro)
Other Local Partners	Caltrans, City of Los Angeles
IMPLEMENTATION COSTS	
Capital Construction Cost	
Technology Costs	
Total Capital Cost	$79 Million (also includes I-10 corridor)
Project Cost with Financing	
Other Complementary Investments	
UTILIZATION	**Under construction**
ADT Un-tolled	
ADT Tolled	
Total ADT	28,533 NB/27,490 SB in existing dual HOV lane (2008)
Hourly Operational Capacity	Approximately 1,650 vphpl
Peaking Characteristics	Extended peak-period duration
FINANCIAL INFORMATION	
Type of Financing	USDOT CRD Grant, local matching funds
Revenue Source	
Sources of Capital Funding	
Federal Grants and Credit Enhancements	$210 million USDOT CRD grant (includes I-10)
Financial Status	
Annual Operating Costs	

Annual Revenue Generation	
Use of Revenues	
Other Subsidies	
OPERATIONAL POLICIES	
Occupancy Requirements	2+
Type of Pricing	Variable dynamic pricing
Maximum Price	$0.25 per mile
Minimum Price	$1.40 per mile
Hours of Operation	24/7
Toll Exempted Vehicles	Eligible HOV, transit and other buses, emergency services
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	RFID transponder with switchable self declaration capability; LPR capture for secondary/enforcement
Type of Transponder	Sirit Title 21 with switchable capability
Existing Regional Toll Operator	No
Complementary Operations Systems	Caltrans RITS
Operation Center	Contracted with DBOM
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	All users required to carry transponder, regardless of toll paying; visual enforcement by CHP at toll locations with enforcement beacons indicating transponder declaration status
Fine Levels	$380 minimum for HOV Occupancy Violation per CVC 21655.5(b)
Violation Rates	<2.3% for existing HOV during peak period
TRANSIT SERVICES	
New Transit Services	Metro SilverLine BRT service interconnecting I-10 and I-110
New Transit Facilities	Safety and security enhancements at I-110 transit stations
Daily Transit Utilization	
PROJECT CONTACT	
Stephanie Wiggins Executive Officer for ExpressLanes Demonstration Project Metro 213-922-1023 WIGGINSS@metro.net http://www.metro.net/projects/expresslanes/	

SR-91 Express
Orange County, California

BASIC DESCRIPTION	
Description	The 91 Express Lanes consists of 40 lane-miles within the median of the Riverside Freeway (SR-91) in Orange County, CA. The eastern terminus of the toll road is the Orange-Riverside County Line and the western terminus is the intersection with the Costa Mesa Freeway (SR-55). Facility was originally constructed for approximately $135 million as a private for-profit investment. In January 2003, a public agency, the Orange County Transportation Authority (OCTA), purchased the operating franchise for $207.5 million.
Location	Orange County, California
Project Sponsor	Orange County Transportation Authority
Project Delivery Method	Public Private Partnership
Status	Operational
Number of Lanes	4 Express Lanes (2 in each direction)
Length	10 miles
Opening Date	December 1995
New Construction or Conversion	New construction
Environmental Approvals	Completed
Separation Treatment	Barrier separated
Number of Points of Access / Egress	No intermediate access
Moveable or Reversible Lanes	No
Transit / Park-and-Ride Facilities	Yes
Other Innovations	FasTrak transponders and prepaid accounts; customer assistance patrol (dedicated tow trucks); traffic operations center (TOC)
STAKEHOLDERS	
Project Sponsor	Orange County Transportation Authority
Private Development Partner	Originally built and constructed by the California Private Transportation Company, whose franchise agreement was bought out in January 2003.
Transit Partners	Orange County Transportation Authority, Riverside Transit Agency
Enforcement Agency	California Highway Patrol
Back-Office Operator	Cofiroute USA
Other Local Partners	Caltrans, cities of Anaheim, Corona, and Riverside
IMPLEMENTATION COSTS	
Capital Construction Cost	
Technology Costs	
Total Capital Cost	$135 million (2005 $)
Project Cost with Financing	
Other Complementary Investments	
UTILIZATION	
ADT Un-tolled	
ADT Tolled	
Total ADT	32,873 (2011 annual average daily transactions)
Hourly Operational Capacity	3,800 vehicles per direction
Peaking Characteristics	6-8 am westbound; 4-6 pm eastbound

FINANCIAL INFORMATION	
Type of Financing	Toll Road Revenue Refunding Bonds and Internal Borrowing
Revenue Source	Toll and Non-Toll Revenues
Sources of Capital Funding	Toll and Non-Toll Revenues
Federal Grants and Credit Enhancements	N/A
Financial Status	2.0 Debt Service Coverage Ratio for FY 2011
Annual Operating Costs	$22,381,682 (thru June 30, 2011)
Annual Revenue Generation	$41,245,590 (thru June 30, 2011) – Excluding Interest
Use of Revenues	Management and operational services; Debt Service Capital Expenditures Administrative overhead; Other operating expenses; Insurance claims and premiums; Professional services; General and administrative; Depreciation and amortization; Interest expense
Other Subsidies	N/A
OPERATIONAL POLICIES	
Occupancy Requirements	None
Type of Pricing	Variable tolls by time of day
Maximum Price	$9.75
Minimum Price	$1.30
Hours of Operation	24/7
Toll Exempted Vehicles	Account holders with 3 or more people traveling in their vehicle travel toll-free except Eastbound, Monday through Friday from 4-6 pm. During this peak time carpools of three or more receive a 50% discount on the posted toll. Special Access Accounts are available for customers who always drive with three or more people in their vehicle, drive a motorcycle, a zero-emission vehicle, or have a disabled veteran or disabled person license place issued by the Department of Motor Vehicles.
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Toll collection is all-electronic using radio frequency identification (RFID) technology.
Type of Transponder	FasTrak
Existing Regional Toll Operator	Cofiroute USA
Complementary Operations Systems	Yes
Operation Center	Yes
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	The toll road is a limited-access, open road facility with two lanes in each direction. A third lane in each direction is provided at the toll plazas for identification of high-occupancy vehicles. Access is restricted to the east and west ends of the road and controlled by 3 feet tall, yellow delineators (channelizers) spaced 12 feet apart. There is one toll collection point (toll plaza) in each direction located approximately 6 miles from the western terminus. Each customer's vehicle is required to have a transponder which is read by the toll collection equipment at the toll plaza. In addition, optical character recognition cameras are used for enforcement.

Fine Levels	Each violation is assessed a $25 processing fee in addition to the amount of the toll. If you fail to respond to the first Notice of Toll Evasion, a second Notice will be mailed to you with an additional $30 processing fee. If you fail to respond to these notices, the penalty can escalate to up to $100 for the first violation, $150 for the second violation and up to $200 for each additional violation within one year.
Violation Rates	
TRANSIT SERVICES	
New Transit Services	New inter-county express bus services between Riverside and Orange counties.
New Transit Facilities	
Daily Transit Utilization	15 Daily Express Bus Trips
PROJECT CONTACT	
Kirk Avila 91 Express Lanes General Manager Orange County Transportation Authority (714) 560-5674 KAvila@octa.net http://www.91expresslanes.com/	

I-15 Express Lanes
San Diego, California

BASIC DESCRIPTION	
Description	The I-15 Express Lanes is a 20-mile HOT lane facility providing two travel lanes in each direction. It replaces an 8-mile two-lane reversible-flow facility that was converted from HOV operation in 1996 as the United States' second HOT lane. It was expanded in three segments between 2005 and 2012. It uses skewed, per-mile dynamic pricing.
Location	Interstate 15, between State Route 52 and State Route 78, in the Cities of San Diego and Escondido in San Diego County, CA
Project Sponsor	I-15 Express Lanes were jointly developed and are operated by the San Diego Association of Governments (SANDAG) and the California Department of Transportation (Caltrans), District 11
Project Delivery Method	Phased project delivery.
Status	Construction completed 2012. Operational as HOV 1988, HOT 1996, HOT with ETC 1998, and Expanded facility open to traffic January 2012. 20-mile, 4-lane concurrent-flow HOT lanes with moveable barrier/center reversible lanes.
Number of Lanes	4
Length	20 miles
Opening Date	January 2012 (original facility openings in 1988 and 1996/98)
New Construction or Conversion	Both. Original HOV-to-HOT conversion and significant expansion new construction in 2000's. Conversion of the original 8 mile segment between I-15/SR 163 merge and SR 56. New construction from SR 56 to SR 78 (12 miles)
Environmental Approvals	CEQA Mitigated Negative Declaration / NEPA FONSI (document on Caltrans web site at http://www.dot.ca.gov/dist11/I15managed/I-15/I-15.htm)
Separation Treatment	Barrier-separated southern 16 miles, with moveable center barrier (reversible center lanes); buffer-separated northern segment (4 miles)
Number of Points of Access / Egress	10 northbound ingress from GP lanes; 8 southbound ingress from GP lanes; 5 NB/SB ingress from BRTC/DAR connectors
Moveable or Reversible Lanes	Yes, southern 16 miles
Transit / Park-and-Ride Facilities	Yes, integrated bus rapid transit (BRT) system with four completed and one planned BRT Station/park-and-ride lots having direct-access ramps (DAR) connections to Express Lanes.
Other Innovations	World's first use of dynamic pricing in tolling application; first HOV-to-HOT conversion (1996); moveable barrier; innovative use of signage integrating travel time and toll rate information with static Guide and Regulatory sign elements (installed under MUTCD Experimentation prior to 2009 Federal MUTCD update); innovative project financing and delivery methods (GARVEE bond, Design-Sequence/Design Build) and Transit innovations (integrated BRTC/DAR system)
STAKEHOLDERS	
Project Sponsor	SANDAG/Caltrans
Private Development Partner	n/a
Transit Partners	Metropolitan Transit System (MTS); North County Transit District (NCTD)
Enforcement Agency	California Highway Patrol (CHP)
Back-Office Operator	Currently, TransCore, L.P.
Other Local Partners	Cities of San Diego, Poway, and Escondido
IMPLEMENTATION COSTS	
Capital Construction Cost	$1.3 Billion (2009 dollars)
Technology Costs	$27 Million (2009 dollars) for 2nd generation ETC system
Total Capital Cost	$1.3 Billion (2009 dollars), including transit and highway improvements

Project Cost with Financing	$1.3 Billion (only general revenue bonds were sold, no use of toll revenue to repay bonds was considered)
Other Complementary Investments	Transit BRT system enhancements including new vehicles, stations, structured parking facilities, and BRT operational improvements, etc.
UTILIZATION	Note: all utilization data below derived from February 21, 2012 SANDAG FasTrak Project Management Team agenda report: www.sandag.org/uploads/meetingid/meetingid_3338_14008.pdf
ADT Un-tolled	22,026
ADT Tolled	5,530
Total ADT	27,556
Hourly Operational Capacity	Based upon a February 5, 1999 meeting between SANDAG and Caltrans District 11, it was agreed to use 1,632 passenger vehicles per hour per lane (VPHPL) as the maximum design flow rate for the I-15 Express Lanes. Applying a heavy vehicles adjustment factor of 0.93 results in a maximum design operational capacity of 304 vehicles per six-minute period per direction (for two-lane section) or effectively 3,000 VPH NB and 3,000 VPH SB for the expanded 20-mile, 4-lane Express Lanes facility.
Peaking Characteristics	Need to request this data from Chris (no longer included in PMT reports)
FINANCIAL INFORMATION	
Type of Financing	TransNet (local, ½-cent sales tax): $241 Million; GARVEE bonds: $197 Million; California Voter Initiative Proposition 42 Corridor Mobility Improvement Account: $350 Million.
Revenue Source	Other sources include CMAQ, TCRP, RSTP, local sources (tolls and fines).
Sources of Capital Funding	Sales Tax, GARVEE bonds, CMIA bonds
Federal Grants and Credit Enhancements	CMAQ, TCRP, RSTP.
Financial Status	Project is completed
Annual Operating Costs	Approximately $4.4 million[a]
Annual Revenue Generation	Approximately $4.4 million1
Use of Revenues	SANDAG Salaries, Benefits and Indirect Expenses: $135,053; Other Direct Costs: $350,050; Professional/Contracted Services, i.e., TransCore System Operations and Maintenance: $2,854,042; Materials and Equipment: $230,0001
Other Subsidies	Transit Subsidy: $800,0001
OPERATIONAL POLICIES	
Occupancy Requirements	HOV 2+ travel free with no registration requirement SOV must pay the dynamic per-mile toll for each trip using a valid FasTrak transponder (all ETC/open road tolling)
Type of Pricing	Dynamic, skewed per-mile tolls (i.e., price varies by entrance location and is a rate per mile multiplied by the distance of travel for that trip). A motorist will always pay the amount for their trip that was displayed (or inferred) on the Variable Toll Message sign prior to entering the Express Lanes. Rates vary as often as every six minutes, a variable that is configurable (but has not changed since the initial facility conversion to dynamic pricing in 1998)
Maximum Price	Currently, $8.00, policy maximum
Minimum Price	Currently, $0.50, policy minimum toll per trip
Hours of Operation	As of January 2012, the 20-mile facility is 24/7/365 operation

Toll Exempted Vehicles	Motorcycles, HOV 2+, and certain qualified low-emission (currently compressed natural gas [CNG]) and zero-emission (e.g., Nissan Leaf, Chevy Volt) electric vehicles certified by California Air Resources Board with valid California Department of Motor Vehicles white decal go for free. All others must pay the toll.
Trucks Allowed?	Note: Trucks with 3 or more axles and heavy vehicles with Gross Vehicle Weights in excess of 5,000 lbs. are currently prohibited from using the I-15 Express Lanes, although SANDAG is currently studying the possible use of the Express Lanes for heavy-vehicle goods movement during certain times of day
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	California FasTrak, subject to California Title 21 Specification for Automatic Vehicle Identification Equipment
Type of Transponder	Title 21-compliant (currently Sirit, Inc./Federal Signal and TransCore/ AmTech manufacture certified Title 21 tags)
Existing Regional Toll Operator	SANDAG, directly operated under contract by TransCore.
Complimentary Operations Systems	Adaptive ramp metering, vehicle detection stations every ½ mile, freeway changeable message signs, ICM system for arterial/freeway/ transit coordination, Regional Transit Management Systems
Operation Center	I-15 FasTrak operations managed by TransCore, regional freeway operations managed by Caltrans District 11 TMC
Video Enforcement Authority	n/a. SANDAG has installed photo-enforcement cameras at selected tolling points on the I-15 Express Lanes and is currently evaluating violation enforcement strategies
Occupancy Enforcement Procedures	Currently, reliant on CHP for routine patrol (i.e., visual observation) although significant planning for advanced violation enforcement approaches has been studied and planned and SANDAG is field testing solutions before selecting a permanent violation enforcement strategy/ approach.
Fine Levels	Currently, minimum $401 fine per first offense, HOV violation in San Diego County.
Violation Rates	Estimated to be between 5-15% of all traffic using the Express Lanes (up to 5,000 vehicles per day)
TRANSIT SERVICES	
New Transit Services	Enhanced BRT system will launch in 2013. Existing/legacy (Premium) Commuter Express routes serving inland north San Diego County since early 1990's continue to be high performing and attract a large percentage of choice riders.
New Transit Facilities	Four newly constructed bus rapid transit centers were added as a component of the recent expansion of the I-15 Express Lanes facility. Each station has direct-access ramp connectors to the Express Lanes, park-and-ride surface lots and at least three of the lots will also have structured parking added in 2013, and include kiss-and-ride, local bus connections, and other passenger amenities (e.g., real-time information feeds). The Escondido Transit Center will also be served by the I-15 BRT service and is approximately 1 mile from the northernmost DAR ramp at Hale Avenue and includes connection to NCTD's SPRINTER light-rail transit line serving the SR 78 corridor.

Daily Transit Utilization

Ridership on I-15 Commuter Express routes have been steadily rising since the late 1990's and totaled approximately 300,000 one-way passenger trips in FY 2011 (represents approximately 1,200 daily transit trips or roughly 600 unique riders). Additional local express bus routes accounted for another 70-90,000 trips in FY 2009-2011. Important to note these services only operate on weekdays during peak commute hours, and the future BRT service will operate all day, high-speed and high frequency service during peak hours. Below is a pasted in table courtesy of SANDAG showing I-15 corridor express bus utilization for FY 2008 through FY 2011:

Route #	FY11	FY10	FY09	FY08
Route 810	146,763	128,714	114,387	97,869
Route 820	46,892	50,864	51,200	45,274
Route 850	46,224	47,025	62,866	65,362
Route 860	38,699	43,164	61,844	59,643
Route 880 (March-June, FY09)	17,504	29,936	2,209	N/A
PREMIUM EXPRESS TOTAL	296,082	299,703	292,506	268,148
Route 210	74,866	85,834	88,121	75,947
CORRIDOR TOTAL	370,948	385,537	380,627	344,095

PROJECT CONTACTs

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(619) 699-6958 or sjo@sandag.org
Gustavo Dallarda, Caltrans District 11, I-15 Corridor Director
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http://fastrak.511sd.com/san-diego-toll-roads/i-15-express-lanes

[a] Annual Revenue Generation and Operating Costs derived from SANDAG FY 2013 Annual Budget and Overall Work Program, Smart Mobility Programs and Services, Work Element #33103.00 - I-15 FasTrak Value Pricing Program, page 128, www.sandag.org/uploads/publicationid/FY13Budget.pdf.

SR 237/I-880 Express
Santa Clara County, California

BASIC DESCRIPTION:	
Description	The express lanes along the SR 237 and I-880 corridor in Santa Clara County extend for 5.5 mile from a point south of Dixon Landing Road on I-880 to North First Street on SR 237. The express lanes opened in March 2012 and involved the conversion of an existing HOV facility.
Location	SR 237: I-880 to North First Street I-880: SR 237 to Dixon Landing City of Milpitas, San Jose, Santa Clara County, California
Project Sponsor	Santa Clara Valley Transportation Authority (VTA)
Project Delivery Method	Design-Bid-Build
Status	Opened March 20, 2012
Number of Lanes	SR 237: 1 Express Lane, 2 General-Purpose Lanes, 1 Auxiliary Lane per direction I-880: 1 Express Lane, 3 General-Purpose Lanes, 2 Auxiliary Lanes (SB direction) 1 Express Lane, 4 General-Purpose Lanes, 2 Auxiliary Lanes (NB direction)
Length	11 miles I-880 SB to SR 237 WB – 7 miles SR 237 EB to I-880 NB – 4 miles
Year Opened	2012
New Construction or Conversion	Conversion
Environmental Approvals	Categorical Exemption/ Categorical Exclusion (CE/CE)
Separation Treatment	Double-white lines with 2ft buffer on SR 237 and 2ft to 4ft buffer on I-880
Number of Points of Access / Egress	1 Access / Egress point in each direction
Moveable or Reversible Lanes	N/A
Transit / Park-and-Ride Facilities	N/A
Other Innovations	Conversion of HOV-to-HOV direct connectors to Express connectors Use of WiMax for ETS Communication Network
STAKEHOLDERS	
Project Sponsor	Santa Clara Valley Transportation Authority (VTA)
Private Development Partner	N/A
Transit Partners	Santa Clara Valley Transportation Authority (VTA is the transit provider for light rail, buses and Para-transit in Santa Clara County)
Enforcement Agency	California Highway Patrol (CHP)
Back-Office Operator	Bay Area Toll Authority (BATA)
Other Local Partners	California Department of Transportation (Caltrans)
IMPLEMENTATION COSTS	
Capital Construction Cost	$2.7 mil
Technology Costs	$2.9 mil
Total Capital Cost	$5.6 mil
Project Cost with Financing	$11.8 mil (No Financing)
Other Complementary Investments	N/A
Utilization	Part-time operations I-880 SB to SR 237 WB: 5am to 10am; 3pm to 7pm SR 237 EB to I-880 NB: 5am to 9am; 3pm to 7pm
ADT Un-tolled	7,300 vehicles (9 hours of operation)
ADT Tolled	1,900 vehicles (9 hours of operation)

Total ADT	9,200 vehicles (9 hours of operation)
Hourly Operational Capacity	1,650 vphpl
Peaking Characteristics	7am – 10am; 4:30pm – 7:00pm
FINANCIAL INFORMATION	
Type of Financing	Federal, Local
Revenue Source	Toll
Sources of Capital Funding	Federal (ARRA, VPPP), Local
Federal Grants and Credit Enhancements	Federal (ARRA, VPPP)
Financial Status	Funding Complete
Annual Operating Costs	$ 600,000 (Forecast)
Annual Revenue Generation	$150,000 (March 20, 2012 to May 31, 2012)
Use of Revenues	Operations & Maintenance, Enforcement, Improvements in Corridor including transit
Other Subsidies	N/A
OPERATIONAL POLICIES	
Occupancy Requirements	HOV 2+ free; single occupant vehicle pays toll
Type of Pricing	Dynamic
Maximum Price	No policy restriction
Minimum Price	$0.30
Hours of Operation	I-880 SB to SR 237 WB: 5am to 10am; 3pm to 7pm SR 237 EB to I-880 NB: 5am to 9am; 3pm to 7pm
Toll Exempted Vehicles	All eligible HOV vehicles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Electronic Toll Collection
Type of Transponder	FasTrak – California Transponder
Existing Regional Toll Operator	VTA for SR 237 Express Lanes; BATA for Bay area toll bridges; Golden Gate Bridge Authority(GGBA) for Golden Gate bridge; Alameda County Transportation Commission (ACTC)/ VTA for I-680 Express Lanes
Complementary Operations Systems	Freeway service patrol supported by Caltrans Highway Patrol (CHP) and Caltrans Transportation Management Center
Operation Center	Santa Clara Valley Transportation Authority (VTA)
Video Enforcement Authority	Have authority but not implemented yet
Occupancy Enforcement Procedures	CHP Visual Enforcement
Fine Levels	$481+
Violation Rates	Not available yet
TRANSIT SERVICES	
New Transit Services	VTA provides existing express bus and regular bus services in Santa Clara County
New Transit Facilities	N/A
Daily Transit Utilization	Express Bus Route 104, 120, Extensive charter bus usage by major employers including Cisco, Google
Signage	2 Dynamic Message Signs
Performance Monitoring	Ongoing
PROJECT CONTACT	
Murali Ramanujam Transportation Engineering Manager Santa Clara Valley Transportation Authority Phone: 408-952-8905; murali.ramanujam@vta.org http://www.vta.org/expresslanes/SR_237_project.html	

I-25 Express Lanes
Denver, Colorado

BASIC DESCRIPTION	
Description	The Express Lanes includes seven miles of the I-25 HOV lanes, between Downtown Denver and US 36. At this time, solo drivers/toll-paying vehicles are not allowed to use the US 36 HOV lanes until the lanes start to merge to I-25 near Pecos. Anything west of Pecos is for HOV vehicles only.
Location	Denver, Colorado
Project Sponsor	Colorado Department of Transportation, Colorado Tolling Enterprise (now High Performance Transportation Enterprise)
Project Delivery Method	HOV Conversion, developed and funded solely by the Colorado DOT under DBB
Status	Operational
Number of Lanes	2 (reversible) mainline; 1 reversible direct-access ramp to downtown Denver; 1 reversible direct-access ramp to U.S. 36
Length	7 miles
Opening Date	June 2006
New Construction or Conversion	Conversion
Environmental Approvals	Categorical Exclusion
Separation Treatment	Concrete Barrier (reversible with gates)
Number of Points of Access / Egress	South Terminus: 5 (1 southbound I-25 mainline, 1 northbound I-25 mainline, 1 northbound at 20th Avenue, 1 southbound at 19th Avenue, 1 bus-only to Denver Union Station) North Terminus: 5 (1 northbound I-25 mainline, 1 southbound I-25 mainline, 1 westbound U.S. 36 mainline, 1 eastbound from U.S. 36 mainline, 1 reversible at 70th Avenue) Intermediate: None
Moveable or Reversible Lanes	2 Reversible lanes (mainline), 1 Reversible lanes (on 3 direct-access ramps)
Transit / Park-and-Ride Facilities	Direct-access bus ramp to Denver Union Terminal. No park-n-rides directly on managed lane facility, although many exist in corridor north / west of the managed lanes.
Other Innovations	Toll pricing in peak-period features a price floor equal to the prevailing express bus route fare. In the past six years, the toll in the peak period has increased due to the fare increase.
STAKEHOLDERS	
Project Sponsor	Colorado Department of Transportation, Colorado Tolling Enterprise (now High Performance Transportation Enterprise)
Private Development Partner	None; however, one is currently being procured to include back-office operations and extension of the facility north and west
Transit Partners	Regional Transportation District
Enforcement Agency	Colorado Highway Patrol; City and County of Denver Police Department; Adams County Sherriff (all have jurisdiction)
Back-Office Operator	E-470 Public Highway Authority under contract to HPTE
Other Local Partners	Denver Regional Council of Governments, FHWA, Federal Transit Administration (original HOV lanes funded under a full funding grant agreement [FFGA])
IMPLEMENTATION COSTS	
Capital Construction Cost	$7.2 million
Technology Costs	$1.8 million
Total Capital Cost	$9 million
Project Cost with Financing	Financing costs not identified; however, a loan was issued by CDOT to the HPTE, repaid in full in 2010
Other Complementary Investments	

UTILIZATION	
ADT Un-tolled	8,400
ADT Tolled	3,900 (3,400 transponder, 500 license plate toll)
Total ADT	11,800
Hourly Operational Capacity	1600 vphpl
Peaking Characteristics	AM Peak Hour: 400 transponder toll, 50 license plate toll, 600 non-toll PM Peak Hour: 350 transponder toll, 50 license plate toll, 850 non-toll
FINANCIAL INFORMATION	
Type of Financing	Federal Grant ($2.8 million); Public Loan from CDOT to HPTE ($6.0 million)
Revenue Source	Colorado Department of Transportation operating funds
Sources of Capital Funding	Unknown
Federal Grants and Credit Enhancements	$2.8 million
Financial Status	Debt is retired; currently profitable
Annual Operating Costs	$1.5 million
Annual Revenue Generation	$2.4 million
Use of Revenues	Snow plowing, State Patrol, Back office, Marketing / outreach, CDOT Staff, Equipment replacement and upgrades, Pavement Maintenance, Courtesy Patrol. Excess revenues are permitted, under state law, to be designated to transportation improvements in the corridor, including transit, vanpool, and carpool services as well as reconstruction, expansion, and extension.
Other Subsidies	None. Self-sufficient
OPERATIONAL POLICIES	
Occupancy Requirements	HOV-2+ toll free (vehicles must use declaration lane in toll zone to avoid toll payment)
Type of Pricing	Static Schedule (preset variable pricing by time-of-day)
Maximum Price	$4.00
Minimum Price	$0.50
Hours of Operation	Lanes are open to southbound traffic from 5:00 a.m. to 10:00 a.m., and by northbound traffic from 12 noon to 3:00 a.m.
Toll Exempted Vehicles	HOV-2+, buses, ILEV with registration, motorcycles, emergency vehicles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Opening – 2012: Title 21 compliant transponder 2011 – ongoing: ISO 18000 6C compliant transponder 2008 – ongoing: License Plate Recognition
Type of Transponder	Title 21 (2006 – 2012); ISO 18000 6C (2011 – current)
Existing Regional Toll Operator	E-470 Public Highway Authority
Complementary Operations Systems	NA
Operation Center	Corridor monitoring facility (independent TMC operated by CDOT for the I-25 Express Lanes)
Video Enforcement Authority	E-470 Public Highway Authority
Occupancy Enforcement Procedures	Electronic tolling is administered at a single toll collection zone in the 7-mile stretch. At this point HOV and SOV must separate into marked lanes to declare their eligibility. Buses may use either lane. Police personnel monitor the HOV lane only, as all vehicles entering the toll lane will be captured by license plate recognition for non-compliance.
Fine Levels	$5 surcharge for LPT, $15 collection fee for unpaid bills, $25 civil penalty after 3 month, $20 court fee after 4 months
Violation Rates	1%

TRANSIT SERVICES	
New Transit Services	None
New Transit Facilities	None
Daily Transit Utilization	Unknown
PROJECT CONTACT	
Colorado High Performance Transportation Enterprise Kari.Grant@dot.state.co.us 303-757-9380 http://www.coloradodot.info/travel/tolling/i-25-hov-express-lanes	

I-95 Express Lanes
Miami, Florida

BASIC DESCRIPTION:	
Description	The 21-mile I-95 express facility converts a single HOV lane into two high-occupancy toll (HOT) lanes in each direction by narrowing the travel lanes from 12' to 11' and narrowing the shoulders. Construction includes some bridge and interchange improvements to maintain continuity of the dual managed lane facility. The project is being constructed in phases. Phase one is open and phase two will be completed in late 2014.
Location	Miami-Dade and Broward Counties, Florida
Project Sponsor	Florida Department of Transportation
Project Delivery Method	Design, Build, Finance
Status	Operational:[a] Phase 1A Runs northbound on I-95 from just north of I-395/SR-836 to the Golden Glades area just north of NW 151st Street in Miami-Dade County. Phase 1B runs southbound on I-95 from just south of Miami Gardens Drive/NW 186th Street to just north of I-395/SR-836. Under Construction[b]: Phase 2 will extend the express lanes to provide a continuous facility between I-395/SR-836 in Miami-Dade County and Broward Boulevard in Broward County. The project began construction in November 2011 with a tentative completion date of late 2014.
Number of Lanes	Two in each direction
Length	Currently open: 7.3 miles both directions without the 1 lane Flyover; ~9.5 miles with the Flyover Completed Project: 22 miles, both directions[c]
Opening Date	Phase 1A: December, 2008 Phase 1B: January, 2010 Phase 2: Late 2014 (scheduled)
New Construction or Conversion	Conversion of one HOV lane and addition of one additional lane in each direction
Environmental Approvals	Type 2 – Categorical Exclusion FHWA Concurrence on August 15, 2007
Separation Treatment	Flexible Plastic Pylons
Number of Points of Access / Egress[d]	Access Egress Current Phase 1 NB 3 3 After Phase 2 NB 5 5 Current Phase 1 SB 3 1 After Phase 2 NB 5 3
Moveable or Reversible Lanes	No
Transit / Park-and-Ride Facilities	Yes
Other Innovations	Congestion Pricing, Ridesharing Incentives, Ramp Metering, New BRT Service, All Electronic Tolling
STAKEHOLDERS	
Project Sponsor	Florida Department of Transportation (FDOT)
Private Development Partner	Federal Communications Commission CO - MCM JV
Transit Partners	Miami-Dade & Broward County Transit
Enforcement Agency	Toll Violations – Florida's Turnpike Enterprise Occupancy Violations - Florida Highway Patrol
Back-Office Operator	Florida's Turnpike Enterprise

Other Local Partners	The Metropolitan Planning Organizations of Miami-Dade & Broward Counties, Florida's Turnpike Enterprise, Miami-Dade Expressway Authority and South Florida Commuter Services.
IMPLEMENTATION COSTS	
Capital Construction Cost	The Phase 1 construction cost was approximately $132 million.[e]
Technology Costs	Technology including communications, back-office, and ramp metering equipment were in place prior to conversion
Total Capital Cost	$132 million
Project Cost with Financing	NA
Other Complementary Investments	None
UTILIZATION	
ADT Un-tolled	1,000
ADT Tolled	59,000
Total ADT	60,000[f]
Hourly Operational Capacity	2700 to 3300 vehicles per direction[g]
Peaking Characteristics	Weekdays – AM Peak (6AM to 9AM); PM Peak (4PM to 7PM)
FINANCIAL INFORMATION	
Type of Financing	Design, Build, Finance with some of the cost being carried by the contractor.[h]
Revenue Source	$35 million was allocated by the Florida Legislature. The balance of funding will come from future toll revenues and FDOT work program money.[i]
Sources of Capital Funding	Federal Grant, allocation form Florida Legislature, Contractor Financing, Toll Revenue, FDOT Work Program
Federal Grants and Credit Enhancements	The project received $62.9 million from a USDOT UPA grant, of which $19.5 million was for transit.[j]
Financial Status	
Annual Operating Costs	$7.63Million[k]
Annual Revenue Generation	$14.79 Million – projected FY 2011/12[l]
Use of Revenues (FY 2011/12)	$3.61 Million Transit $0.03 Million $0.50 Million Phase 2 build out $4.00 Million R&R Reserve/Sinking Account ($0.97) Million Escrow
Other Subsidies	None
OPERATIONAL POLICIES	
Occupancy Requirements	HOV status requires three or more occupants
Type of Pricing	Dynamic Tolling
Maximum Price	$7.10[m]
Minimum Price	$0.25[n]
Hours of Operation	Continuous
Toll Exempted Vehicles	Registered carpools of three or more passengers, South Florida vanpools and registered hybrid vehicles can drive toll-free, but they must be registered with South Florida Commuter Services. Motorcycles can use the express lanes toll-free and do not need to register.[o]
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Transponder
Type of Transponder	TransCore
Existing Regional Toll Operator	SunPass (Florida's Turnpike Enterprise)
Complementary Operations Systems	All SunPass facilities including Miami-Dade Expressway Facilities, and Tampa Hillsborough Expressway Authority's Selmon Expressway, Orlando-Orange County Expressway Authority Facilities, and LeeWay Facilities in Lee County, Florida.
Operation Center	Sunguide Transportation Management Center FDOT District 6
Video Enforcement Authority	Florida's Turnpike Enterprise (SunPass)

Occupancy Enforcement Procedures	Window Placard for exempt vehicles – Florida Highway Patrol Enforces for Occupancy
Fine Levels	$100
Violation Rates	Not Available
TRANSIT SERVICES	
New Transit Services	95X - connects various locations in northern Miami-Dade County with various locations downtown.[p] Route 195 (Dade-Broward Express - Sheridan Street.)[q] Route 195 (Dade-Broward Express - Broward Boulevard)[r] Route 107 (Pines Boulevard Express)[s]
New Transit Facilities	Addition of 535 parking spaces to the Golden Glades Park and Ride Lot[t]
Daily Transit Utilization	2937 Riders (based on Jan-Apr 2010)[u]
PROJECT CONTACT	
Mr. Rory Santana, P.E., PTOE rory.santana@dot.state.fl.us. http://www.95express.com/	

[a] http://www.95express.com/home/FAQ.shtm - Accessed April 16, 2012

[b] Ibid

[c] http://ops.fhwa.dot.gov/freewaymgmt/publications/documents/nrpc0610/workshop_materials/case_studies/miami.pdf, Accessed April 18, 2012

[d] 4/23 email from Rory Santana

[e] 95 Express Annual Report (Covering July 1, 2010 through June 30, 2011)

[f] Conversation with Rory Santana

[g] Based on observed capacities while maintaining stable flow per Rory Santana

[h] 95 Express Annual Report (Covering July 1, 2010 through June 30, 2011)

[i] Ibid.

[j] 95 Express Annual Report (Covering July 1, 2010 through June 30, 2011)

[k] FDOT Data

[l] FDOT Data

[m] Express Annual Report (Covering July 1, 2010 through June 30, 2011)

[n] Ibid

[o] 95 Express Annual Report (Covering July 1, 2010 through June 30, 2011)

[p] Miami Urban Partnership Agreement (UPA) Project Phase 1 Transit Evaluation Report FINAL Report Number: FTA- FL- 26-7110.2011.1 January 2011

[q] Ibid

[r] Ibid

[s] Ibid

[t] Ibid

[u] Ibid

I-85 Express Lanes
Gwinnett and Dekalb Counties, Georgia

BASIC DESCRIPTION	
Description	The I-85 Express Lanes involved the conversion of approximately 16 miles of existing High Occupancy Vehicle (HOV) lanes to HOT lanes (Express Lanes) to help improve mobility and provide reliable trip times through value pricing. Concurrent transit projects implemented, include two new Park-and-Ride lots, and 36 new commuter coaches.
Location	I-85 North, Gwinnett and Dekalb Counties
Project Sponsor	State Road and Tollway Authority , Georgia Department of Transportation
Project Delivery Method	Design, bid, build for civil construction and Design-Build for tolling system
Status	Open to traffic
Number of Lanes	1 lane in each direction
Length	15.5 miles
Opening Date	September 30, 2011
New Construction or Conversion	Conversion, HOV2+ to HOT3+
Environmental Approvals	NEPA Environmental Assessment, FONSI
Separation Treatment	Painted buffer separation, double-white lines with discrete entry/exit weave zones
Number of Points of Access / Egress	7 Southbound and 7 Northbound
Moveable or Reversible Lanes	N/A
Transit / Park-and-Ride Facilities	6 Xpress Park-and-Ride lots along the I-85 corridor. As part of project, 2 new Park-and-Ride Lots were added and expansion took place at 2 existing Park-and-Ride Lots for a total of 2,200 new parking spaces. 36 new commuter coaches were added.
Other Innovations	Gantry Control Access enforcement for double-white line violations and use of mobile Automatic License Plate to aid with occupancy enforcement
STAKEHOLDERS	
Project Sponsor	State Road and Tollway Authority (SRTA) and Georgia Department of transportation (GDOT)
Private Development Partner	N/A
Transit Partners	Georgia Regional Transportation Authority (GRTA)
Enforcement Agency	Georgia Department of Public Safety
Back-Office Operator	Electronic Toll Collection Corporation
Other Local Partners	Atlanta Regional Commission, Gwinnett County, City of Atlanta, Georgia Institute of Technology, Metropolitan Atlanta Regional Transportation Authority (MARTA)
IMPLEMENTATION COSTS	
Capital Construction Cost	$21 million
Technology Costs	$23 million
Total Capital Cost	$60 million
Project Cost with Financing	$60 million
Other Complementary Investments	$122 million in transit projects in the Atlanta region
UTILIZATION	
ADT Un-tolled	In first year of operation, 14-18%
ADT Tolled	In first year of operation, 82-86%
Total ADT	In first year of operation, 18,800 trips
Hourly Operational Capacity	1,800-2,000 vehicle per hours in the Express Lanes
Peaking Characteristics	Longer full corridor trips and higher toll rates in AM, shorter length trips and low toll rates in PM

FINANCIAL INFORMATION	
Type of Financing	FHWA/RITA grant, FHWA federal program funds, State funds (i.e. motor fuel tax, General Obligation bonds)
Revenue Source	Tolls
Sources of Capital Funding	FHWA/RITA Intelligent Transportation System Operational Test to Mitigate Congestion grant, State funds (i.e. motor fuel tax, General Obligation bonds)
Federal Grants and Credit Enhancements	FHWA/RITA Intelligent Transportation System Operational Test to Mitigate Congestion grant
Financial Status	In first year of operation, TBD
Annual Operating Costs	In first year of operation, TBD
Annual Revenue Generation	In first year of operation, TBD
Use of Revenues	Operation and maintenance, per the Section 166(c) of Title 23, United States Code
Other Subsidies	
OPERATIONAL POLICIES	
Occupancy Requirements	HOV3+
Type of Pricing	Dynamic and distanced based
Maximum Price	In first year of operation and ramp-up phase, $5.00 for 15.5 mile ($0.32/mile) in AM
Minimum Price	$.03 for 3 mile ($0.01/mile) during off-peak and weekends
Hours of Operation	24 hours, 7 days a week
Toll Exempted Vehicles	Registered vehicles only: HOV3+, motorcycles, transit, emergency vehicles, alternative fuel vehicles (AFV) with AFV license plates
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	All Electronic Tolling, transponders and license plates
Type of Transponder	6c protocol passive sticker transponder and legacy Transcore Super Ego protocol passive sticker transponder
Existing Regional Toll Operator	SRTA
Complementary Operations Systems	N/A
Operation Center	GDOT Traffic Management Center and SRTA Toll Operations Center
Video Enforcement Authority	SRTA
Occupancy Enforcement Procedures	Occupancy enforcement is handled by police officers in the field. All vehicles must register and use a Peach Pass transponders to use the Express Lanes. Drivers must self-declare their vehicles, via phone or internet, at least 15 minutes prior to using the Express Lanes if they are going to be in non-toll HOV3+ status. This self-declaration allows police officers to use mobile Automatic License Plate Reader systems to identify vehicles registered as non-toll HOV3+. These ALPRs use cameras mounted on police vehicles that "read" license plates of vehicle in the Express Lanes to notify police officers if a passing vehicle is registered as an HOV3+ vehicle. For vehicles identified as being registered HOV3+, the police officer does a visual check and pulls vehicles over that do not have 3 or more occupants and issues an occupancy violation.
Fine Levels	1st offense $75; 2nd offense $100; 3rd offense $150 and 1 point on driver license
Violation Rates	In first year of operation, TBD
TRANSIT SERVICES	
New Transit Services	36 new commuter coaches, 3 new GRTA Xpress routes
New Transit Facilities	2 new Park-and-Ride Lots and expansion at 2 existing Park-and-Ride Lots, total of 2,200 new parking spaces.
Daily Transit Utilization	In first year of operation, TBD
PROJECT CONTACT	
Patrick Vu, SRTA, (404) 893-6130, patrickvu@georgiatolls.com Ben Rabun, GDOT, (404) 631-1008, brabun@dot.ga.gov http://www.georgiatolls.com/programs/i-85-express-lanes/	

I-95 Express Toll Lane
Baltimore, Maryland

BASIC DESCRIPTION	
Description	The Maryland Transportation Authority (MDTA) is adding eight miles of Express Toll Lanes (ETLs) on the most congested portion of I-95 north of Baltimore City. This 8-mile segment stretches from the I-895 (N) split in east Baltimore City, to north of MD 43 in White Marsh features two ETL lanes in each direction. It is the first segment of what is envisioned as a 30-mile ETL facility.
Location	I-95 Express Toll Lanes (ETLs) just north of Baltimore, MD
Project Sponsor	Maryland Transportation Authority (MDTA)
Project Delivery Method	Design-Bid-Build (DBB)
Status	Under Construction
Number of Lanes	4 GP lanes and 2 ETS Lanes northbound and southbound
Length	Approximately 8 miles
Opening Date	Late 2014
New Construction or Conversion	New construction along existing alignment
Environmental Approvals	FONSI
Separation Treatment	Positive separation with Concrete Barriers
Number of Points of Access / Egress	Current: Southern termini at I-895, northern termini at MD 43 and north of MD 43. Additional access at I-695 may be added at a later date.
Moveable or Reversible Lanes	No
Transit / Park-and-Ride Facilities	Buses allowed on ETLs
Other Innovations	Emergency turnarounds and barrier opening between GP/ETLs in each direction
STAKEHOLDERS	
Project Sponsor	MDTA
Private Development Partner	None
Transit Partners	None
Enforcement Agency	Maryland State Police and MDTA Police
Back-Office Operator	N/A
Other Local Partners	N/A
IMPLEMENTATION COSTS	
Capital Construction Cost	$866 million
Technology Costs	$6 million
Total Capital Cost	$1.03 billion
Project Cost with Financing	TBD. MDTA bonds are generally not issued for individual projects. Financing cost (including interest on bonds) will depend upon ultimate mix of proceeds used from different bond issuances.
Other Complementary Investments	N/A
UTILIZATION	
ADT Un-tolled	194,500 vehicles along mainline I-95 (2025)[a]
ADT Tolled	33,000 vehicles along mainline I-95 (2025)[b]
Total ADT	227,500 vehicles along mainline I-95 (2025) 2
Hourly Operational Capacity	23,220 vehicles along mainline I-95 – GP & ETLs (2025) 2
Peaking Characteristics	Commuter - Morning (6-9am) and Evening (3-6pm) rush
FINANCIAL INFORMATION	
Type of Financing	Funded by the MDTA using MDTA issued toll revenue bonds and cash contributions
Revenue Source	MDTA system toll revenues
Sources of Capital Funding	MDTA system wide toll revenue backed bond proceeds and cash contributions
Federal Grants and Credit Enhancements	N/A

Financial Status	See below
Annual Operating Costs	Varies: in current 6 year capital program period (FY 2012 through FY 2017) figures vary from $0.6 million in FY 2012 to estimated $4.00 million in FY 2017
Annual Revenue Generation	Varies: in current 6 year capital program period (FY 2012 through FY 2017) figures vary from $2.0 million in FY 2015 to estimated $3.55 million in FY 2017. *Notes:* *Additional traffic and revenue forecasts to be performed prior to setting toll rates and opening of project in FY 15.* *Revenues in initial years ramp up gradually.* *Project is not financed on a stand-alone basis – project is financed on a system wide basis – all MDTA revenues and costs are consolidated.*
Use of Revenues	Revenues from all MDTA projects are consolidated pledged for use in repayment of MDTA system bonds and are used for operating and capital expenses and debt service payments. Projects are not financed on a stand-alone basis – project is financed on a system wide basis – all MDTA revenues and costs are consolidated.
Other Subsidies	N/A
OPERATIONAL POLICIES	
Occupancy Requirements	None
Type of Pricing	Variable/Time of Day
Maximum Price	TBD
Minimum Price	TBD
Hours of Operation	24/7
Toll Exempted Vehicles	Limited exemptions per MDTA Trust Agreement; examples: emergency responders, state owned vehicles.
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Transponder or video toll
Type of Transponder	E-ZPass
Existing Regional Toll Operator	MDTA
Complementary Operations Systems	N/A
Operation Center	AOC North
Video Enforcement Authority	MDTA
Occupancy Enforcement Procedures	None
Fine Levels	TBD
Violation Rates	TBD
TRANSIT SERVICES	
New Transit Services	Working w/ Maryland Transit Administration to provide improved express bus service
New Transit Facilities	No
Daily Transit Utilization	TBD
PROJECT CONTACT	
David A. LaBella, P.E. (410-931-0808) http://i-95expresstolllanes.com/	

[a] ADT figures are from a 2006 traffic study. These figures may differ from more recent Traffic and Revenue Forecasts.

[b] Ibid.

I-35W MnPASS
Minneapolis, Minnesota

BASIC DESCRIPTION	
Description	The I-35W MnPASS is a 16-mile HOT facility providing one lane in each direction. It includes six miles of converted HOV lanes, six miles of new HOT lanes developed along with Crosstown Commons reconstruction, two miles of new construction NB, and two miles of priced dynamic shoulder lanes, which are the first of their kind to operate in the United States.
Location	Minneapolis, Minnesota and southern suburbs in Hennepin and Scott Counties
Project Sponsor	Minnesota Department of Transportation
Project Delivery Method	Design-Build and Design-Bid-Build
Status	Open since 2009
Number of Lanes	Northbound: 14 miles of single lane directional; 2 miles of northbound priced dynamic shoulder lanes Southbound: 11 miles of single lane directional
Length	Total length is 16 miles
Opening Date	September, 2009
New Construction or Conversion	6 miles of converted HOV lanes in both directions, 6 miles of new HOT lanes developed along with Crosstown Commons reconstruction, 2 miles of new construction NB, 2 mile of priced dynamic shoulder lanes
Environmental Approvals	Environmental Assessment
Separation Treatment	Single-lane directional sections are separated with two foot double-white stripe buffer. It is always illegal to cross a double-white stripe buffer. However, 75% of the distance is open access which is designated with a single skip stripe.
Number of Points of Access / Egress	See above description of separation treatment
Moveable or Reversible Lanes	N/A
Transit / Park-and-Ride Facilities	Two park-and-ride lots existed in the corridor prior to MnPASS conversion. Additionally, one park-and-ride facility was located and developed in the south I-35W corridor with MnPASS. Express bus service was added into downtown Minneapolis.
Other Innovations	Uses fully dynamic pricing, multiple segment pricing, read/write transponders
STAKEHOLDERS	
Project Sponsor	Minnesota Department of Transportation
Private Development Partner	Wilbur Smith consortium with SRF Consultants, Cofiroute USA, and Raytheon Corporation
Transit Partners	Metro Transit
Enforcement Agency	State Patrol
Back-Office Operator	Cofiroute USA through Wilbur Smith
Other Local Partners	Many partners were involved in the development of the I-35W UPA project.
IMPLEMENTATION COSTS	
Capital Construction Cost	$48 million
Technology Costs	$18 million in sign gantries, tolling infrastructure, freeway management system enhancements and intelligent lane control signals.
Total Capital Cost	$66 million
Project Cost with Financing	
Other Complementary Investments	
UTILIZATION	
ADT Un-tolled	
ADT Tolled	About 4000 vehicles per day

Total ADT	52,000 (South End) to 198,000 (North end near downtown)
Hourly Operational Capacity	In peak period the lane is priced to accommodate about 1500 vehicles per hour in order to ensure a high level of service (50-55 mph) for transit and carpools
Peaking Characteristics	20 percent of the vehicles in peak period are toll-paying MnPASS customers
FINANCIAL INFORMATION	
Type of Financing	State funds
Revenue Source	
Sources of Capital Funding	
Federal Grants and Credit Enhancements	Urban Partnership Agreement
Financial Status	
Annual Operating Costs	$1.69 million in FY11
Annual Revenue Generation	$751,300 in FY 11
Use of Revenues	Operations
Other Subsidies	
OPERATIONAL POLICIES	
Occupancy Requirements	HOV 2+ are free and do not require transponder
Type of Pricing	Fully dynamic when facility is priced (peak periods only)
Maximum Price	$8.00 total
Minimum Price	$0.25 per segment
Hours of Operation	6:00 AM to 10:00 AM; 2:00 PM to 7:00 PM
Toll Exempted Vehicles	Transit, HOVs , motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Read-Write Transponders
Type of Transponder	Raytheon
Existing Regional Toll Operator	Cofiroute USA
Complementary Operations Systems	Freeway Management System including ramp meters, CCTV and dynamic message signs. Managed lanes systems including Intelligent Lane Control Signals (ILCS)
Operation Center	Regional Transportation Management Center
Video Enforcement Authority	Minnesota does not permit video enforcement
Occupancy Enforcement Procedures	Visual enforcement is primary means
Fine Levels	$142 per violation, considered a petty misdemeanor
Violation Rates	Around 5-8 percent of lane users are violators
TRANSIT SERVICES	
New Transit Services	Express transit service levels are extremely good in the corridor. Although no new service was added when the project was developed, transit service is always evolving and being tweaked.
New Transit Facilities	Existing park and rides were enhanced after project was implemented. An online bus station was added at 46th St. as an independent project.
Daily Transit Utilization	There are currently about 9,000 transit trips per day in the corridor.
PROJECT CONTACT	
Kenneth R. Buckeye Value Pricing Program Manager Minnesota Department of Transportation http://www.mnpass.org/index%2035w.html	

I-394 MnPASS
Minneapolis, Minnesota

BASIC DESCRIPTION	
Description	Minnesota implemented I-394 *MnPASS* by converting the existing high-occupancy vehicle (HOV) lane into the state's first high-occupancy toll (HOT) lane. The lanes, which are dynamically priced, remain free to HOVs and motorcyclists during peak hours, and are free to all users in off-peak periods. The facility provides 8 miles of single lane directional HOT lanes and a 3-mile, two-lane reversible-flow section.
Location	Minneapolis, Minnesota and western suburbs in Hennepin County
Project Sponsor	Minnesota Department of Transportation
Project Delivery Method	Design-build / ITS hybrid project development
Status	Open since 2005
Number of Lanes	8 miles of single lane directional; 3 miles of double lane reversible
Length	Total length is 11 miles
Opening Date	May, 2005
New Construction or Conversion	HOV Conversion
Environmental Approvals	Categorical Exclusion
Separation Treatment	Single lane directional sections are separated with two foot double-white stripe buffer. It is always illegal to cross a double-white stripe buffer. Twenty five percent of the distance is open access which is designated with a single skip stripe. Reversible section is separated with Jersey barriers
Number of Points of Access / Egress	Five access points eastbound, six access points westbound
Moveable or Reversible Lanes	Three miles of reversible lanes
Transit / Park-and-Ride Facilities	Three park-and-ride facilities located in the corridor provide express bus service into downtown Minneapolis
Other Innovations	Uses fully dynamic pricing, multiple segment pricing, read/write transponders, enforcement transponder readers for enforcement agencies
STAKEHOLDERS	
Project Sponsor	Minnesota Department of Transportation
Private Development Partner	Wilbur Smith consortium with SRF Consultants, Cofiroute USA, and Raytheon Corporation
Transit Partners	Metro Transit
Enforcement Agency	State Patrol and local officials
Back-Office Operator	Cofiroute USA through agreement with Wilbur Smith
Other Local Partners	N/A
IMPLEMENTATION COSTS	
Capital Construction Cost	Nominal capital costs for restriping
Technology Costs	$10 million
Total Capital Cost	$10 million
Project Cost with Financing	
Other Complementary Investments	$2 million in 0.75 mile auxiliary lane development to enhance performance in bottleneck area
UTILIZATION	
ADT Un-tolled	
ADT Tolled	About 4000-5000 vehicles per day
Total ADT	78,000 (West end) to 148,000 (East end near downtown)
Hourly Operational Capacity	In peak period the lane is priced to accommodate about 1500 vehicles per hour in order to ensure a high level of service (50-55 mph) for transit and carpools

Peaking Characteristics	20 percent of the vehicles in peak period are toll-paying MnPASS customers
FINANCIAL INFORMATION	
Type of Financing	State funds
Revenue Source	
Sources of Capital Funding	Initial sources of capital for development were from MnDOT owned parking garage accounts and road construction funds for auxiliary lane
Federal Grants and Credit Enhancements	Value Pricing Pilot Program funds provided $500,000 for planning, outreach and education
Financial Status	Authorizing legislation required capital account to be repaid first. Capital funds will be repaid by FY 2014.
Annual Operating Costs	FY'11: $961,000
Annual Revenue Generation	FY'11: $1.6 million
Use of Revenues	Operations including utilities, enforcement, customer service
Other Subsidies	$1.5 million to repay capital loan account
OPERATIONAL POLICIES	
Occupancy Requirements	HOV 2+ are free and do not require transponder
Type of Pricing	Fully dynamic when facility is priced (peak periods only)
Maximum Price	$8.00 total
Minimum Price	$0.25 per segment
Hours of Operation	6:00 AM to 10:00 AM; 2:00 PM to 7:00 PM
Toll Exempted Vehicles	Transit, HOVs, motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Read-Write Transponders
Type of Transponder	Raytheon
Existing Regional Toll Operator	Cofiroute USA through Wilbur Smith
Complementary Operations Systems	Freeway Management System including ramp metering, CCTV
Operation Center	Regional Transportation Management Center
Video Enforcement Authority	Minnesota does not permit video enforcement
Occupancy Enforcement Procedures	Visual enforcement is primary means. State troopers are equipped with transponder readers to aid in enforcement.
Fine Levels	$142 per violation, considered a petty misdemeanor
Violation Rates	Around 5-8 percent of lane users are violators
TRANSIT SERVICES	
New Transit Services	Express transit service levels are extremely good in the corridor. Although no new service was added when the project was developed, transit service is always evolving and being tweaked.
New Transit Facilities	Existing park and rides were enhanced after project was implemented.
Daily Transit Utilization	There are currently about 9,500 daily transit riders in the corridor.
PROJECT CONTACT	
Kenneth R. Buckeye Value Pricing Program Manager Minnesota Department of Transportation http://www.mnpass.org/index%20394.html	

IH 45 South (Gulf)
Houston, Texas

BASIC DESCRIPTION	
Description	The HI 45 South Gulf Freeway HOT lane is a single-lane, 15.5 mile reversible-flow facility. It involved the conversion of an existing HOV lane and opened to tolled operation in February 2012.
Location	Houston, TX
Project Sponsor	Metropolitan Transit Authority of Harris County (METRO)
Project Delivery Method	Design-Build
Status	Open
Number of Lanes	One (reversible)
Length	15.5 miles
Opening Date	February 2012
New Construction or Conversion	Conversion
Environmental Approvals	Category X
Separation Treatment	Barriers (required due to reversible operation)
Number of Points of Access / Egress	7 including termini
Moveable or Reversible Lanes	Reversible
Transit / Park-and-Ride Facilities	Yes, at interchanges and further out corridor: park-and-ride lots and transit centers
Other Innovations	Direct-access ramps with some transit facilities
STAKEHOLDERS	
Project Sponsor	Houston METRO
Private Development Partner	none
Transit Partners	none
Enforcement Agency	Houston METRO police
Back-Office Operator	TransCore
Other Local Partners	TxDOT for interagency agreement to operate on freeway and for routine and long-term pavement and structure maintenance
IMPLEMENTATION COSTS	For tolling and traffic control devices only—-prior reversible lane construction occurred between 1980 and 1986
Capital Construction Cost	
Technology Costs (tolling system)	
Total Capital Cost	
Project Cost with Financing	
Other Complementary Investments	NA
UTILIZATION	
ADT Un-tolled (est.)	
ADT Tolled (est.)	
Total ADT (est.)	
Hourly Operational Capacity	About 1500 vph
Peaking Characteristics (est.) **Peak hour:** **Peak period:**	
FINANCIAL INFORMATION	
Type of Financing	None, funded by METRO and a federal grant
Revenue Source	NA
Sources of Capital Funding	
Federal Grants and Credit Enhancements	
Financial Status	Funded
Annual Operating Costs (est.)	
Annual Revenue Generation (est.)	

Use of Revenues	Policy is to cover O&M from revenues first. Any excess revenue is split 50/50 between Houston Metro and TxDOT
Other Subsidies	None
OPERATIONAL POLICIES	
Occupancy Requirements	2+ HOVs are free
Type of Pricing	Variable
Maximum Price	Authorized up to $10, rarely will exceed $4.50
Minimum Price	$1.00
Hours of Operation	5-11am inbound, 1-8 pm outbound, however the HOT lane is closed to tolling 7-8 am and 4-6 pm
Toll Exempted Vehicles	Metro police, EMS, HOVs/motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	ETC
Type of Transponder	Read only, RF sticker
Existing Regional Toll Operator	Yes, HCTRA, but METRO operates tolling for these projects
Complementary Operations Systems	New reversible gates and traffic monitoring capability
Operation Center	Reversible gates are controlled from Houston TransStar regional traffic operation center
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	Declaration lanes for free users at entrances
Fine Levels	$75-$250
Violation Rates	Insufficient data available from first two months of operation
TRANSIT SERVICES	
New Transit Services	None implemented in conjunction with this conversion
New Transit Facilities	None implemented with this conversion
Daily Transit Utilization	Number of bus trips daily:
PROJECT CONTACT	
Nader Mirjamali Houston Metro 713-652-4375 nader.mirjamali@ridemetro.org http://www.ridemetro.org/Services/HOTLanes/45SouthHOT.aspx	

IH 45 N (North Freeway)
Houston, Texas

BASIC DESCRIPTION	
Description	The HI 45 North Gulf Freeway HOT lane is a single-lane, 20.6- mile reversible-flow facility. It involves the conversion of an existing HOV lane and opened to tolled operation in September 2012.
Location	Houston, TX
Project Sponsor	Metropolitan Transit Authority of Harris County (METRO)
Project Delivery Method	Design-Build
Status	Under construction
Number of Lanes	One (reversible)
Length	20.6 miles
Opening Date (est.)	September 2012
New Construction or Conversion	Conversion
Environmental Approvals	Environmental assessment, Category X
Separation Treatment	Barriers (required due to reversible operation)
Number of Points of Access / Egress	11 including termini
Moveable or Reversible Lanes	Reversible
Transit / Park-and-Ride Facilities	Yes, park-and-ride lots and transit centers
Other Innovations	Direct-access ramps with some transit facilities
Project Sponsor	Houston METRO
Private Development Partner	none
Transit Partners	none
Enforcement Agency	Houston METRO police
Back-Office Operator	Houston METRO (TransCore under contract)
Other Local Partners	TxDOT for interagency agreement to operate on freeway and for routine and long-term pavement and structure maintenance
IMPLEMENTATION COSTS	For tolling and traffic control devices only—-prior reversible lane construction occurred in phases between 1984 and 1998
Capital Construction Cost (est.)	
Technology Costs-tolling system (est.)	
Total Capital Cost (est.)	
Project Cost with Financing	NA
Other Complementary Investments	NA
UTILIZATION	
ADT Un-tolled (est.)	
ADT Tolled (est.)	
Total ADT (est.)	
Hourly Operational Capacity	About 1500 vph
Peaking Characteristics **Peak hour:** **Peak period:**	
FINANCIAL INFORMATION	
Type of Financing	NA
Revenue Source	NA
Sources of Capital Funding	
Federal Grants and Credit Enhancements	
Financial Status	funded
Annual Operating Costs (est.)	
Annual Revenue Generation (est.)	NA

Use of Revenues	Policy is to pay O&M cost first from revenues. Any excess revenue is split 50/50 between Houston METRO and TxDOT.
Other Subsidies	NA
OPERATIONAL POLICIES	
Occupancy Requirements	2+ use lane for free
Type of Pricing	Variable
Maximum Price/trip	Authorized to $10, rarely will exceed $4.50
Minimum Price/trip	$1.00
Hours of Operation	5-11am inbound, 2-8pm outbound
Toll Exempted Vehicles	police, EMS, HOVs/motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	ETC
Type of Transponder	Read only, RF sticker
Existing Regional Toll Operator	Yes, HCTRA, but METRO operates tolling for these projects
Complementary Operations Systems	Will include new reversible gates and traffic monitoring capability
Operation Center	New gates and roadway monitoring is capable of being controlled from the regional traffic operation center
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	Declaration lanes for free users at entrances
Fine Levels	$75-$250
Violation Rates	Not open at this time, no violation data available
TRANSIT SERVICES	
New Transit Services	no
New Transit Facilities	no
Daily Transit Utilization	Number of bus trips daily:
PROJECT CONTACT	
Nader Mirjamali, Houston Metro 713-652-4375 nader.mirjamali@ridemetro.org http://www.ridemetro.org/Services/HOTLanes.aspx	

Katy Managed Lanes
Houston, Texas

BASIC DESCRIPTION:	
Description	The Katy Managed Lanes are a 12-mile HOT facility providing two travel lanes in each direction in the median of I-10 between SH6 and SH 610. The new lanes replaced an existing single-lane reversible-flow HOT lane. It is separated from the general-purpose lanes by pylons.
Location	Houston/Harris County, Texas
Project Sponsor	Texas Department of Transportation
Project Delivery Method	Design-Bid-Build
Status	Operational
Number of Lanes	(2) Two Travel Lanes in Each Direction
Length	12 Miles
Opening Date	October 2008; Began Tolling April 2009
New Construction or Conversion	New Construction
Environmental Approvals	Final Environmental Impact Statement (FEIS)
Separation Treatment	Flexible delineators (candlesticks) between main lanes
Number of Points of Access / Egress	East Bound - 5 Access Points/ 6 Egress Points; West Bound - 6 Access Points/ 4 Egress Points
Moveable or Reversible Lanes	NONE
Transit / Park-and-Ride Facilities	Addicks Park-and-Ride (West End) and Northwest Transit Center (East End)
Other Innovations	Dynamic Message Signs, Violation Enforcement
STAKEHOLDERS	
Project Sponsor	Texas Department of Transportation
Private Development Partner	None
Transit Partners	METRO
Enforcement Agency	Harris County
Back-Office Operator	Harris County Toll Road Authority (HCTRA)
Other Local Partners	Transtar
IMPLEMENTATION COSTS	
Capital Construction Cost	$255.4 M (HCTRA's Contribution to Managed Lanes)
Technology Costs	$10.6 M
Total Capital Cost	$266 M
Project Cost with Financing	NA
Other Complementary Investments	NA
UTILIZATION	
ADT Un-tolled	5,201 vpd
ADT Tolled	8,307 vpd
Total ADT	13,508 vpd
Hourly Operational Capacity	2,200 vehicles per hour per lane
Peaking Characteristics	Weekday Morning Peak Hours (6 am – 8 am) and Weekday Evening Peak Hours (4 pm – 6 pm)
FINANCIAL INFORMATION	
Type of Financing	Senior Lien Revenue Bonds
Revenue Source	Tolls
Sources of Capital Funding	Senior Lien Revenue Bonds
Federal Grants and Credit Enhancements	NA
Financial Status	Good Standing
Annual Operating Costs	$2.37 M
Annual Revenue Generation	$8.0 M
Use of Revenues	Operations/Maintenance/Debt Services
Other Subsidies	NA

OPERATIONAL POLICIES	
Occupancy Requirements	SOVs and two-person high-occupancy vehicles (HOV 2+)
Type of Pricing	Value Pricing
Maximum Price	$21.00 for 3+ axles and $4.00 for 2-axle vehicles for entire trip (3 tolling points during peak hours.)
Minimum Price	$7.00 for 3+ axles and $1.00 for 2-axle vehicles (3 tolling points during off-peak hours.)
Hours of Operation	24 hours, HOV hours 5 am -11 am and 2 pm -8 pm.
Toll Exempted Vehicles	HOV 2+, METRO Buses, and Motorcycles during HOV hours, Monday through Friday, 5 am – 11 am and 2 pm – 8 pm
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Electronic Toll Collection
Type of Transponder	American Trucking Association Dedicated Short Range Communications (DSRC)
Existing Regional Toll Operator	HCTRA
Complementary Operations Systems	None
Operation Center	HCTRA
Video Enforcement Authority	HCTRA
Occupancy Enforcement Procedures	Observation Booths
Fine Levels	Posted Toll Rate + 25% + Administration Fee
Violation Rates	<1% for tolls
TRANSIT SERVICES	
New Transit Services	Existing Only
New Transit Facilities	Existing Only
Daily Transit Utilization	211 Buses Per Day
PROJECT CONTACT	
Anil Mirmira, P.E. Tolling Systems Engineer P: 713-587-7868 E: anil.mirmira@hctra.org https://www.hctra.org/katymanagedlanes/	

US 59 North (Eastex Freeway)
Houston, Texas

BASIC DESCRIPTION	
Description	The US 59 North is a 20-mile, single-lane, reversible-flow HOT lane with 9 access points slated to open in November 2012.
Location	Houston, TX
Project Sponsor	Metropolitan Transit Authority of Harris County (METRO)
Project Delivery Method	Design-Build
Status	Under construction
Number of Lanes	One (reversible) expandable to two-way in the future
Length	20 miles
Opening Date	November 2012 estimated
New Construction or Conversion	Conversion
Environmental Approvals	Environmental assessment, Category X
Separation Treatment	Barriers (required due to reversible operation)
Number of Points of Access / Egress	9 including termini
Moveable or Reversible Lanes	Reversible
Transit / Park-and-Ride Facilities	Yes, park-and-ride lots and transit centers
Other Innovations	Direct-access ramps with some transit facilities
STAKEHOLDERS	
Project Sponsor	Houston METRO
Private Development Partner	none
Transit Partners	None (METRO is the transit agency)
Enforcement Agency	Houston METRO police
Back-Office Operator	Houston METRO (TransCore under contract)
Other Local Partners	TxDOT for interagency agreement to operate on freeway and for routine and long-term pavement and structure maintenance
IMPLEMENTATION COSTS	For tolling system only. Prior construction occurred between 1995 and 2002.
Capital Construction Cost	
Technology Costs (tolling system)	
Total Capital Cost	
Project Cost with Financing	NA
Other Complementary Investments	NA
UTILIZATION	
ADT Un-tolled (est.)	
ADT Tolled (est.)	
Total ADT (est.)	
Hourly Operational Capacity	About 1500 vph
Peaking Characteristics (est.) **Peak hour:** **Peak period:**	
FINANCIAL INFORMATION	
Type of Financing	NA
Revenue Source	NA
Sources of Capital Funding	
Federal Grants and Credit Enhancements	
Financial Status	Under construction
Annual Operating Costs (est.)	
Annual Revenue Generation (est.)	
Use of Revenues	Policy is to pay O&M first. Any excess revenue is split 50/50 between Houston Metro and TxDOT
Other Subsidies	None

OPERATIONAL POLICIES	
Occupancy Requirements	2+ use express lane for free
Type of Pricing	Variable
Maximum Price	Authorized to $10, rarely will exceed $4.50
Minimum Price	$1.00
Hours of Operation	5-11am inbound, 2-8pm outbound
Toll Exempted Vehicles	police, EMS, HOVs/motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	ETC
Type of Transponder	Read only, RF sticker
Existing Regional Toll Operator	Yes, HCTRA, but Metro operates tolling for these projects
Complementary Operations Systems	New gates and roadway monitoring capable of being controlled from the regional traffic operation center
Operation Center	Reversible gates will be controlled from Houston TranStar regional traffic operation center
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	Declaration lanes at entrances
Fine Levels	$75 to $250
Violation Rates	Not open for tolling at this time, so no violation data available
TRANSIT SERVICES	
New Transit Services	No
New Transit Facilities	No
Daily Transit Utilization	Number of bus trips daily:
PROJECT CONTACT	
Nader Mirjamali Houston Metro 713-652-4375 nader.mirjamali@ridemetro.org http://www.ridemetro.org/Services/HOTLanes.aspx	

US 59 South (Southwest Freeway)
Houston, Texas

BASIC DESCRIPTION	
Description	US 59 South is a 23.3 mile HOT lane facility. It includes a single reversible lane for 15.3 miles and one concurrent lane in each direction for 8 miles. It opened to service in July 2012 and involved the conversion of an existing HOV facility.
Location	Houston, TX
Project Sponsor	Metropolitan Transit Authority of Harris County (METRO)
Project Delivery Method	Design-Build
Status	Under construction
Number of Lanes	One (reversible) for 15.3 miles, concurrent for 8 miles
Length	23.3 miles
Opening Date	July 2012
New Construction or Conversion	Conversion
Environmental Approvals	Environmental assessment, Category X
Separation Treatment	Barriers (required due to reversible operation)
Number of Points of Access / Egress	13 including termini
Moveable or Reversible Lanes	Mostly reversible, with a segment of concurrent lane design on the outer end
Transit / Park-and-Ride Facilities	Yes, park-and-ride lots and transit centers
Other Innovations	Direct-access ramps with some transit facilities
STAKEHOLDERS	
Project Sponsor	Houston METRO
Private Development Partner	None
Transit Partners	None
Enforcement Agency	Houston METRO police
Back-Office Operator	Houston METRO (TransCore under contract)
Other Local Partners	TxDOT for interagency agreement to operate on freeway and for routine and long-term pavement and structure maintenance
IMPLEMENTATION COSTS	
Capital Construction Cost	
Technology Costs-tolling system	
Total Capital Cost	
Project Cost with Financing	NA
Other Complementary Investments	NA
UTILIZATION	
ADT Un-tolled (est.)	
ADT Tolled (est.)	
Total ADT (est.)	
Hourly Operational Capacity	About 1500 vph
Peaking Characteristics **Peak hour:** **Peak period:**	
FINANCIAL INFORMATION	
Type of Financing	NA
Revenue Source	NA
Sources of Capital Funding	
Federal Grants and Credit Enhancements	
Financial Status	Funded
Annual Operating Costs (est.)	
Annual Revenue Generation (est.)	

Use of Revenues	Policy is to pay O&M first. Any excess revenue is split 50/50 between Houston METRO and TxDOT.
Other Subsidies	None
OPERATIONAL POLICIES	
Occupancy Requirements	2+ use lane for free
Type of Pricing	Variable
Maximum Price	Authorized up to $10, rarely will exceed $4.50
Minimum Price	$1.00
Hours of Operation	5-11am inbound, 2-8pm outbound
Toll Exempted Vehicles	police, EMS, HOVs/motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	ETC
Type of Transponder	Read only, RF sticker
Existing Regional Toll Operator	Yes, HCTRA, but METRO operates tolling for these projects
Complementary Operations Systems	New reversible gates and traffic monitoring capable of being controlled from the regional traffic operation center
Operation Center	Reversible gates will be controlled from Houston TranStar regional traffic operation center
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	Declaration lanes for free users at entrances
Fine Levels	$75-$250
Violation Rates	Not open for tolling at this time; no violation data is available
TRANSIT SERVICES	
New Transit Services	No
New Transit Facilities	No
Daily Transit Utilization	Number of bus trips daily:
PROJECT CONTACT	
Nader Mirjamali Houston Metro 713-652-4375 nader.mirjamali@ridemetro.org http://www.ridemetro.org/Services/HOTLanes/59SouthHOT.aspx	

US 290 (Northwest Freeway)
Houston, Texas

Surveyed April 2012

Note: Tolling is not operable at the time of this survey. Some information represents estimates.

BASIC DESCRIPTION	
Description	The US 290 HOT lane is a 14-mile, single lane, reversible-flow facility scheduled to open in the fall of 2012.
Location	Houston, TX
Project Sponsor	Metropolitan Transit Authority of Harris County (METRO)
Project Delivery Method	Conventional: Design-Bid-Build
Status	Under construction*
Number of Lanes	One (reversible)
Length	14 miles
Opening Date	October 2012
New Construction or Conversion	Conversion
Environmental Approvals	Environmental Assessment (EA), Cat X
Separation Treatment	Barriers (required due to reversible operation)
Number of Points of Access / Egress	7 including termini
Moveable or Reversible Lanes	Reversible
Transit / Park-and-Ride Facilities	Yes, at interchanges and further out corridor: park-and-ride lots and transit centers
Other Innovations	Direct-access ramps with some transit facilities
STAKEHOLDERS	
Project Sponsor	Houston METRO
Private Development Partner	none
Transit Partners	none
Enforcement Agency	Houston METRO police
Back-Office Operator	Houston METRO (TransCore under contract)
Other Local Partners	TxDOT for interagency agreement to operate on freeway and for routine and long-term pavement and structure maintenance
IMPLEMENTATION COSTS	**For tolling and traffic control devices only—-prior reversible lane construction occurred between 1980 and 1986**
Capital Construction Cost	
Technology Costs-toll system	
Total Capital Cost	
Project Cost with Financing	NA
Other Complementary Investments	NA
UTILIZATION	
ADT Un-tolled (est.)	
ADT Tolled (est.)	
Total ADT (est.)	
Hourly Operational Capacity	About 1500 vph
Peaking Characteristics (est.) **Peak hour:** **peak period:**	
FINANCIAL INFORMATION	
Type of Financing	NA
Revenue Source	NA
Sources of Capital Funding	
Federal Grants and Credit Enhancements	
Financial Status	Funded

Annual Operating Costs (est.)	
Annual Revenue Generation (est.)	
Use of Revenues	Policy is to cover O&M first. Any excess revenue is split 50/50 between Houston METRO and TxDOT
Other Subsidies	None
OPERATIONAL POLICIES	
Occupancy Requirements	2+ except 645-800am inbound when requirement is 3+
Type of Pricing	Variable
Maximum Price/trip	$10.00 authorized but typically $4.50
Minimum Price/trip	$1.00
Hours of Operation	5-11 am inbound, 2-8pm outbound
Toll Exempted Vehicles	Police, EMS, HOVs/motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	ETC
Type of Transponder	Read only, RF sticker
Existing Regional Toll Operator	Yes, HCTRA, but METRO operates tolling for these projects
Complementary Operations Systems	New reversible gates and traffic monitoring controlled from a regional traffic operation center
Operation Center	Reversible gates will be controlled from Houston TranStar regional traffic operation center
Video Enforcement Authority	Yes
Occupancy Enforcement Procedures	Declaration lanes at entrances
Fine Levels	$75-$250
Violation Rates	Not open for tolling at this time; no violation data available
TRANSIT SERVICES	
New Transit Services	No
New Transit Facilities	No
Daily Transit Utilization	Number of bus trips daily:
PROJECT CONTACT	
Nader Mirjamali, Houston Metro 713-652-4375 nader.mirjamali@ridemetro.org http://www.ridemetro.org/Services/HOTLanes.aspx	

* Tolling is currently being added to an existing HOV operation. Accordingly, demand and revenue information is estimated and not based on actual performance.

I-15 Express Lanes Utah
Davis, Salt Land and Utah Counties, Utah

BASIC DESCRIPTION	
Description	The I-15 Express Lanes provide one HOT lane in each direction across a 40 mile segment of I-15 between Lehi Main Street to 2300 North in Salt Lake City and Parrish Lane in Centerville to Layton Parkway. It will be extended by an additional 44 miles in December 2012.
Location	I-15, Davis, Salt Lake and Utah Counties, Utah, United States
Project Sponsor	Utah Department of Transportation (UDOT)
Project Delivery Method	Design-Build-Maintain
Status	80 lane miles operational; 44 new lane-miles coming on by December 2012
Number of Lanes	One lane each direction
Length	40 miles
Opening Date	August 23, 2010
New Construction or Conversion	Conversion of HOV lanes
Environmental Approvals	Cat-EX
Separation Treatment	Two-foot buffer
Number of Points of Access / Egress	41
Moveable or Reversible Lanes	No
Transit / Park-and-Ride Facilities	None
Other Innovations	Dynamic Pricing; zone pricing (four existing zones both directions: North Davis, Salt Lake, South Valley and North Utah County Zones)
STAKEHOLDERS	
Project Sponsor	Utah Department of Transportation
Private Development Partner	N/A
Transit Partners	N/A
Enforcement Agency	Utah Highway Patrol
Back-Office Operator	TransCore and Electronic Transaction Consultants Corp.
Other Local Partners	
IMPLEMENTATION COSTS	
Capital Construction Cost	Federal highway funds helped finance the introduction of HOV lanes as part of the I-15 reconstruction project and other large projects currently in process (Lehi to Spanish Fork and Layton to Ogden). However, lane-widening costs have been financed mostly with state funds. The state paid $42 million to extend lanes from the Utah County line to Orem and $69 million for lanes from Farmington to Layton. Salt Lake County paid $33 million to widen lanes from 10600 South to the Utah County line.
Technology Costs	The cost to install fiber and traffic monitoring stations (TMS) is incidental to the Express Lanes as fiber and TMS were planned regardless of our venture into electronically collecting tolls and converting the HOV lanes to Express Lanes.
Total Capital Cost	Unknown but at least $150+M
Project Cost with Financing	$16.4M
Other Complementary Investments	The installation of overhead Variable Message signs was also incidental to the Express Lanes but we do utilize them for Express Lane messaging (e.g., Minutes to 10600 South, Express 9, Mainline 11)
UTILIZATION	
ADT Un-tolled	173,400
ADT Tolled	13,000
Total ADT	186,400
Hourly Operational Capacity	1675 vehicles per hour
Peaking Characteristics	See attached graph/monthly report.

FINANCIAL INFORMATION	
Type of Financing	Federal
Revenue Source	Equity Bonus
Sources of Capital Funding	Toll Revenue
Federal Grants and Credit Enhancements	None
Financial Status	Good standing
Annual Operating Costs	$600,000
Annual Revenue Generation	$500,000
Use of Revenues	By state law, the toll revenue is used to operate and maintain the lanes.
Other Subsidies	Toll revenue banked during temporarily authorized monthly sticker program – $50/month for unlimited use of Express Lane (September 2006 to August 2010)
OPERATIONAL POLICIES	
Occupancy Requirements	Two or more
Type of Pricing	Dynamic
Maximum Price	$4.00 each direction
Minimum Price	$0.25
Hours of Operation	24 hours a day, 7 days a week
Toll Exempted Vehicles	Motorcycles, Buses, Clean Fuel Stickered vehicles (UDOT performs the qualification for each clean fuel stickered vehicle.)
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	ISO 18000 6C
Type of Transponder	Switchable on/off (not battery powered)
Existing Regional Toll Operator	UDOT
Complementary Operations Systems	Performance Measurement System (PeMS)
Operation Center	UDOT Traffic Operation Center
Video Enforcement Authority	N/A
Occupancy Enforcement Procedures	Visual
Fine Levels	$92
Violation Rates	17% during peak hour
TRANSIT SERVICES	
New Transit Services	Unknown
New Transit Facilities	Unknown
Daily Transit Utilization	Unknown
PROJECT CONTACT	
John Haigwood jhaigwood@utah.gov (801) 887-3738 http://www.udot.utah.gov/expresslanes/	

I-495 Express Lanes
Fairfax County, Virginia

Description	The I-495 Express Lanes is a $2.1 billion public-private partnership sponsored by the Virginia Department of Transportation (VDOT) to widen an 11-mile segment of the Capital Beltway in Northern Virginia between the I-95 / I-395 Springfield Interchange and Old Dominion Drive, north of the Dulles Toll Road, providing two new managed lanes in each direction.
Location	Northern Virginia
Project Sponsor	Virginia Department of Transportation
Project Delivery Method	Public Private Partnerships
Status	Under Construction (Scheduled to Open in December 2012)
Number of Lanes	4 (2 in each direction)
Length	14 miles
Opening Date	December 2012
New Construction or Conversion	Improvements/Conversion
Environmental Approvals	FONSI issued by FHWA
Separation Treatment	Bollards/Barrier
Number of Points of Access / Egress	16
Moveable or Reversible Lanes	Moveable (2 in each direction)
Transit / Park-and-Ride Facilities	None
Other Innovations	Dynamic tolling
STAKEHOLDERS	
Project Sponsor	Virginia Department of Transportation
Private Development Partner	Fluor Transurban (Capital Beltway Express)
Transit Partners	MWAA, WMATA
Enforcement Agency	Virginia Department of Transportation / FHWA
Back-Office Operator	Transurban
Other Local Partners	Local regulatory agencies, Jurisdictions
Capital Construction Cost	$1508 million
Technology Costs	
Total Capital Cost	$1508 million
Project Cost with Financing	$2006 million
Other Complementary Investments	
UTILIZATION	
ADT Un-tolled	Not currently under operations phase
ADT Tolled	Not currently under operations phase
Total ADT	Not currently under operations phase
Hourly Operational Capacity	Min. Avg. Operating Speed Limit of 45mph for 90% of time over 180 Consecutive days during morning and/or evening weekday peak hours needs to be maintained
Peaking Characteristics	—
FINANCIAL INFORMATION	
Type of Financing	TIFIA, PABs, Private equity, VDOT Contribution
Revenue Source	Toll Revenue from the users
Sources of Capital Funding	TIFIA, PABs, Private equity, VDOT Contribution
Federal Grants and Credit Enhancements	TIFIA
Financial Status	90% of DB cost
Annual Operating Costs	Not currently under operations phase
Annual Revenue Generation	Not currently under operations phase

Use of Revenues	O&M, Major Maintenance, distribution to holders of Equity
Other Subsidies	VDOT Contribution of $409M
OPERATIONAL POLICIES	
Occupancy Requirements	Min. Avg. Operating Speed Limit of 45mph for 90% of time over 180 Consecutive days during morning and /or evening weekday peak hours
Type of Pricing	Dynamic Pricing based on Congestion Levels
Maximum Price	Not applicable to dynamic pricing regime
Minimum Price	Not applicable to dynamic pricing regime
Hours of Operation	24x7
Toll Exempted Vehicles	HOV 3+, Emergency Vehicles, Buses and Motorcycles
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	Electronic Tolling
Type of Transponder	E Flex RFID
Existing Regional Toll Operator	—
Complementary Operations Systems	—
Operation Center	Concessionaire will have a separate TOC to monitor the Traffic with In Service Availability of at least 99.995%
Video Enforcement Authority	License Plate Enforcement Allowed for Toll Violations
Occupancy Enforcement Procedures	Officer in Person
Fine Levels	HOV fines Starts from $500 - $2000
Violation Rates	Not currently under operations phase
TRANSIT SERVICES	
New Transit Services	MWAA, WMATA and other local transit agencies
New Transit Facilities	None as a part of the project
Daily Transit Utilization	—
PROJECT CONTACT	
Larry Cloyed, Project Manager 495 Express Lanes Virginia Department of Transportation 6363 Walker Lane, Alexandria, VA 22310 571-722-6014 http://www.495expresslanes.com	

SR 167 HOT Lanes
Auburn to Renton, Washington State

BASIC DESCRIPTION	
Description	The SR 167 HOT lanes provide one HOT lane in each direction of SR 167 between Renton and Auburn in southern Kings County. The northbound lane, approximately 11 miles in length, begins at 15th Street SW in Auburn and terminates at I-405 in Renton, while the southbound lane, nine miles in length, begins at I-405 and terminates at 15th Street NW. The two general-purpose lanes in each direction remain toll-free and open to all vehicles.
Location	SR 167 (Auburn to Renton, Washington State)
Project Sponsor	Washington State Department of Transportation (WSDOT)
Project Delivery Method	Design-Bid-Build for civil infrastructure (signing, striping etc) and design-build for toll equipment.
Status	Operational
Number of Lanes	Single lane; one northbound and one southbound
Length	Approximately 9 miles
Opening Date	May 3rd, 2008
New Construction or Conversion	Conversion of existing HOV lanes
Environmental Approvals	Documented CE
Separation Treatment	Striped 2 foot buffer
Number of Points of Access / Egress	10
Moveable or Reversible Lanes	NA
Transit / Park-and-Ride Facilities	Off corridor park & ride lots for transit and heavy rail
Other Innovations	
STAKEHOLDERS	
Project Sponsor	WSDOT
Private Development Partner	NA
Transit Partners	King County Metro and Sound Transit
Enforcement Agency	Washington State Patrol
Back-Office Operator	Currently ETCC; Previously TransCore
Other Local Partners	Cities of Auburn, Kent, & Renton
IMPLEMENTATION COSTS	
Capital Construction Cost	$10.2 M
Technology Costs	$ 4.5 M
Total Capital Cost	$18.0 M
Project Cost with Financing	N/A
Other Complementary Investments	
UTILIZATION	
ADT Un-tolled	8,000 (Tue – Thu, March 2012)
ADT Tolled	3,519 trips (Tue – Thu, March 2012)
Total ADT	121,000 (Tue – Thu)
Hourly Operational Capacity	
Peaking Characteristics	Northbound 7 – 8 AM, Southbound 4 – 5 PM
FINANCIAL INFORMATION	
Type of Financing	N/A
Revenue Source	State and Federally funded
Sources of Capital Funding	Gas Tax & Federal dollars
Federal Grants and Credit Enhancements	VPPP w/Toll credits
Financial Status	Revenue covering operations and maintenance costs in 2012
Annual Operating Costs	$843,000 (FY2011)
Annual Revenue Generation	$743,000 (FY2011)
Use of Revenues	Operations and Maintenance

Other Subsidies	
OPERATIONAL POLICIES	
Occupancy Requirements	2+
Type of Pricing	Dynamic
Maximum Price	$9.00
Minimum Price	$0.50
Hours of Operation	5 AM to 7 PM everyday
Toll Exempted Vehicles	Transit, Agency Vanpools, motorcycles and 2+ carpools
TECHNOLOGY AND ENFORCEMENT	
Toll Collection Technology	RFID, ORT
Type of Transponder	SeGo, 6C
Existing Regional Toll Operator	WSDOT
Complementary Operations Systems	SR 520 Floating Bridge, Tacoma Narrows Bridge
Operation Center	Customer Service Center
Video Enforcement Authority	N/A
Occupancy Enforcement Procedures	WSP and HERO Program
Fine Levels	$124.00
Violation Rates	Negligible
TRANSIT SERVICES	
New Transit Services	N/A
New Transit Facilities	N/A
Daily Transit Utilization	Average of 10,000 (Sound Transit)
PROJECT CONTACT	
Tyler Patterson (WSDOT) PatterT@WSDOT.WA.GOV <PatterT@wsdot.wa.gov> 206-716-1134 http://www.wsdot.wa.gov/Tolling/SR167HotLanes/default.htm	

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