3.1 VALUE PRICING STRATEGIES

Many different value pricing implementation strategies have been used or studied in various locations worldwide, many of which are described in Chapter 2. These strategies have been successfully applied to toll facilities, existing HOV lanes, and new highways, and can vary greatly according to the goals of the region, the existing configuration or operational strategy of the roadway facility or network, and other factors. The existing transportation system in the Dallas-Fort Worth Region can be categorized into three types of roadways: freeways, tollways, and HOV lanes. These roadway types are owned, operated and maintained by separate agencies, each having a specific mission relating to the types of facilities under its control. The Texas Department of Transportation (TxDOT) constructs and maintains the freeway network, which includes non-tolled, limited-access facilities. Tollways in this region are owned and operated by the Texas Turnpike Authority (TTA) and the North Texas Tollway Authority (NTTA), which are authorized to raise construction capital through the issuance of bonds, and to collect tolls to repay those bonds and to operate and maintain the facility. The HOV lanes are operated by Dallas Area Rapid Transit (DART) and are open to transit vehicles and HOVs, with the goal of improving transit travel times and encouraging ridesharing.

In the context of the Dallas-Fort Worth transportation network, value pricing projects could be developed with the following strategies:

- Pricing Existing HOV Lanes: “Selling” excess capacity on existing HOV facilities
- Applying Value Pricing on Tollways: Implementing variable tolls (by time of day, vehicle classification, congestion level, etc.) on an existing toll facility or designing a new tollway with variable tolls
- Pricing New Capacity on Freeways: Adding new priced lanes to existing freeways or constructing a partially managed new roadway.

3.1.1 Pricing Existing HOV Lanes

There are several operational interim HOV lanes in the Dallas-Fort Worth Region. Interim HOV lanes are currently in place on I.H. 35E (Stemmons Freeway), I.H. 635 (LBJ Freeway), I.H. 30 (East R.L. Thornton Freeway) and I.H. 35E/US 67 (South R.L. Thornton/Marvin D. Love Freeway), serving approximately 100,000 commuters each weekday. In addition, HOV lanes are part of many planned projects in the region, including US 75, SH 183, Loop 12, and SH 121. Extensions of each of the existing interim HOV lanes will also be considered under various future planning projects.

Several current value pricing facilities, including I-15 in San Diego, and I-10 (Katy Freeway) and US 290 (Northwest Freeway) in Houston, were formerly untolled HOV-2+ and HOV-3+ facilities. Through the I-15 Fastrak program, SOVs can now pay a toll for access to the HOV lanes. The QuickRide program on the Katy and Northwest freeways allows HOV-2 vehicles to pay a toll to use the HOV-3+ lanes. These programs provide examples of two ways to apply value pricing to HOV lanes through a “buy-in” program: selling excess capacity to single-occupant vehicles, and selling excess capacity to lower occupancy vehicles while keeping the lane strictly for HOV or transit use. These types of facilities are sometimes referred to as High Occupancy/Toll (HOT) lanes.
Because HOT lanes use the same travel lanes as existing HOV facilities, the additional infrastructure needs for HOV to HOT conversions tend to be relatively low. The most basic infrastructure requirements for a HOT lane include a lane separation and access method between the HOT and general purpose lanes, a way to enforce the occupancy and toll requirements of the facility, and a toll collection system. Therefore, the physical requirements of the HOT lane should be evaluated during the planning process. In addition, the costs associated with implementing value pricing and the projected revenues generated by the program must be evaluated during the study to determine if it is financially feasible.

### 3.1.2 Applying Value Pricing on Tollways

The transportation network in the Dallas-Fort Worth Region includes several important toll facilities, including the President George Bush Turnpike (PGBT) and Dallas North Tollway (DNT), which are owned and operated by the North Texas Tollway Authority (NTTA). Several additional toll facilities are currently the subject of NTTA planning studies, including SH 121/Southwest Parkway in Tarrant and Johnson Counties, the Trinity Parkway, and extensions of both the PGBT and DNT.

Tollways can be excellent candidates for value pricing. Much of the required infrastructure, including toll collection systems, enforcement systems, and the physical infrastructure required to support value pricing is fully integrated in the tollway system. As applied to existing toll facilities, value pricing programs typically require relatively small changes to the system to enhance its efficiency.

Additional capacity is not usually provided as part of tollway-based value pricing programs. Although general tollway improvements such as high-speed ETC lanes can be used to improve the overall efficiency of the facility, travel lanes, interchanges, frontage roads, toll plazas, and toll collection equipment can, in most cases, continue to operate in their existing configurations.

The principal changes to toll facilities are often limited to the systems upon which the toll collection method is based. Computer hardware and software would need to be reconfigured to accommodate variable toll rates, billing needs, and other details. Additional Intelligent Transportation Systems (ITS) devices, or modifications of existing systems, could also be required to monitor traffic conditions and the effectiveness of the program, especially if real-time, congestion-based tolling methods are used. In addition, the costs associated with implementing value pricing and the projected revenues generated by the program must be evaluated during the study to determine if it is financially feasible.

Motorists in the Dallas-Fort Worth area are already familiar with the concept of variable toll rates, since current NTTA tolls vary by vehicle class and use the TollTag system of toll collection. Many toll authorities have implemented or are studying value pricing programs that vary tolls by time-of-entry, congestion level, or distance traveled and vehicle class. On the toll bridges in Lee County, Florida, value pricing has been shown to consistently reduce peak hour congestion. The Port Authority of New York and New Jersey (PANYNJ) implemented a similar program on the toll bridges and tunnels under its control. The New Jersey Turnpike Authority (NJTA) has implemented tolls that vary by time-of-entry, in addition to distance traveled and vehicle class. These programs are described in Chapter 2, and the lessons learned from these projects are valuable tools for potential implementation of variable tolls in the Dallas-Fort Worth Region. To evaluate the potential benefits of new toll project, NTTA conducted a study of financial feasibility of varying tolls on its facilities. In combination with this study of value pricing as a congestion management tool, both studies yield important results for the region.

#### 3.1.3 Pricing New Capacity on Freeways

Another strategy for managing congestion using value pricing would be to price added capacity to an existing freeway or to construct a new freeway that is partially priced. This strategy could range from constructing separated, priced lanes in the available right-of-way in the existing median to constructing managed lanes to the outside of a facility. Allowing HOV’s to enter for free or for a discount would also be an option. Pricing new capacity on freeways could be used as a strategy when additional capacity is needed before all or some of the traditional sources of funding are available. Revenues generated by the priced facility or lanes would be used to pay back some or all of the construction bonds. For example, SR-91 was originally constructed by a private entity, the California Private Transportation Company (CPTC), with tolls repaying the investment in engineering, construction, and operational costs. The Orange County Transportation Authority has since purchased the facility and continues to finance...
this purchase through collected tolls.

State Highway 183 is one example of a freeway in the Dallas-Fort Worth Region where this strategy was considered. Recently NTTA issued preliminary results of its study to add reversible toll lanes on SH 183 between Dallas and Fort Worth. These results indicated that toll lanes along SH 183 would raise about six percent of the projected $1.5 billion construction cost. Although these preliminary results suggest that tolls may not be the only source of funding needed for construction on this particular facility, further detailed studies of other freeways is warranted. This corridor, and possibly others in the Dallas-Forth Worth Region, is the subject of several studies in roadway privatization.

The additional infrastructure needs for adding new capacity would vary for each corridor in the Dallas-Fort Worth Region, based on how the new lanes are configured. Infrastructure improvement needs are dominated by issues of lane additions, physical separation, and access (at-grade or grade separation). In some cases, new lanes can be accommodated within the existing median; however, other alternatives may require additional right-of-way. Either instance may require modifications to existing bridge piers, signs, barriers, etc. In addition, infrastructure requirements are also dependent on the method of enforcement of the occupancy and toll requirements of the facility and the toll collection system. Clearly the physical requirements of new lanes would need to be evaluated during the planning and design process to determine the cost to design and construct the lanes, and to acquire right-of-way. Because one of the goals of this strategy is to pay for some portion of the new construction with the collection of tolls, an accurate cost estimate will dictate if the strategy is financially feasible.

3.2 GUIDING PRINCIPLES FOR THIS STUDY

3.2.1 How Value Pricing could be applied to HOV, Tollway, and Freeway Facilities

The three value pricing strategies described above would fall into two categories of implementation, Short-Term and Long-Term, depending upon the need for operational improvements and the timing and cost of planned improvements based on the region’s Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP). The timing and extent of improvements is also linked to the level of environmental planning needed under Major Investment Study (MIS) and the National Environmental Policy Act (NEPA) processes. For this study, the terms short-term and long-term as they relate to implementation of value pricing have been defined as follows:

**Short-term:**

- A facility that exists today and has capacity to support pricing (i.e., an HOV lane with excess capacity to sell to SOV or a static toll that could be varied by time of day) or one that is in design or under construction and with small modifications could support pricing (converting an HOV to a priced lane, adding new lanes in median, varying an existing toll). In general, little to no environmental planning would be needed. Ideally, a short-term project would serve as a demonstration of value pricing for the region because it could be implemented quickly to maximize the observation time.

**Long-term:**

- An existing facility that could support value pricing relatively easily if low cost modifications were made and little to no new right-of-way was required (e.g., existing or planned HOV or HOT lane constructed with full barrier, varying the toll on a tollway). Most likely a NEPA study would not be required, but could result in a Categorical Exclusion (CE) if it were. Projects that are identified as short-term projects, but are not implemented as demonstration projects would fall into this category.

- An existing or planned facility where it would be more challenging to incorporate value pricing and some new right-of-way would be needed (e.g., new capacity added in a median).

- An existing or planned facility where larger amounts of right-of-way and other environmental resources are required to design a managed facility (e.g., new HOT lanes added to the outside of an existing facility, a new fully managed freeway/new tollway).

Ultimately, a regional system of managed lanes would result, consisting of the existing and planned facilities described above.
### 3.2.2 Regional Policies

Several regional policies in the Dallas-Fort Worth Region have guided the development of this study in terms of how pricing could be applied for the various strategies. The current MTP, Mobility 2025 (Amended April 2005), makes specific recommendations for the incorporation of ‘managed’ lanes. Identified as HOV/M lanes in the MTP, the nature of these lanes is one where user fees are charged, resulting in higher levels of service and higher speeds. It is anticipated that the concept of HOV/M lanes will provide for increases in tolls for SOV users of these lanes thus improving mobility and enhancing revenue raising strategies. The primary goals of this toll management approach are to provide relatively congestion-free travel, reduce travel demand during peak periods, increase transportation system efficiency, and to find innovative ways to finance needed transportation improvements. The HOV/M lanes concept could allow for HOV vehicle occupancies to be increased through toll management strategies designed to encourage carpools and vanpools, and more so when air quality considerations warrant it. It is important to note that this concept will work best in corridors where congestion is expected, even on traditional toll facilities. Through a combination of toll and vehicle occupancy management strategies, capacity can be utilized efficiently thereby maximizing the person-movement capacity of the transportation system.

Recent state legislation, HB3588 and the Texas Transportation Commission support initiatives to look closer at user-fee applications to roadway financing, and the following policy positions of the Regional Transportation Council (RTC), have provided increased initiatives to consider the application of tolling on a broader scale:

- Adopted Policy – All new freeways on new rights-of-way should be studied as potential toll roads (February 1993 policy position)
- Adopted Short list of new freeways on new rights-of-way and express lanes for toll road consideration (March 1994)
- Agreement with TTA (predecessor to NTTA) to consider Value Pricing (May 1994)
- Adopted Managed HOV/Integrated Toll road concept as contained in Mobility 2020 (January 1998)
- RTC does not support converting existing free non-HOV/Managed lanes to Toll Roads (October 2003).

In addition, the RTC’s adopted Policy on excess toll revenue sharing with regard to TxDOT sponsored traditional toll projects (excludes managed lanes) is as follows:

- Excess toll revenue is defined as annual toll revenue after the bonds are paid off, and after annual reserve funds have been set aside to cover facility operational costs, anticipated preventive maintenance activities, and the expected cost of rehabilitation or reconstruction of the facility
- Excess toll revenue from individual projects may be used to help pay down the bonds on other toll projects, to ensure that TxDOT’s toll bond obligations in the region are met
- All excess revenue generated from individual toll projects shall remain in the TxDOT district in which that revenue-generating project is located
- All (or a portion of) the excess revenue generated from individual toll projects shall remain in the counties in which that revenue-generating project is located. These funds can be used to fund future projects either on or off the state system
- Projects funded with excess toll revenue should be selected in a cooperative TxDOT-RTC selection process which considers the desires of the cities and counties in which the revenue-generating project is located.
In 2005, the following new managed lane policy was adopted for the Dallas-Fort Worth region. The purpose of this policy is to establish a framework for the allocation of future revenue from managed lane toll projects in the North Central Texas region.

- The focus of this policy is TxDOT-sponsored managed lane toll projects.

- Excess toll revenue is defined as annual toll revenue after annual debt service, and after annual reserve funds have been set aside to cover facility operational costs, anticipated preventive maintenance activities, assigned profit and related expenses for the Comprehensive Development Agreement (CDA), and the expected cost of rehabilitation or reconstruction of the managed toll lanes.

- All excess revenue generated from an individual managed lane toll project shall remain in the TxDOT district in which that revenue-generating managed lane project is located.

- Local governments and transportation authorities shall be given the right to invest in a CDA project as a means to fund the facility as well as to generate local revenue.

- The excess revenue generated from an individual managed lane toll project shall remain in the counties in which that revenue-generating project is located. Excess revenue shall be returned to the funding partners in proportion to their shares and be used to fund future transportation projects.

- Regional Transportation Council shares will be put into air quality related and sustainable development programs and used to leverage federal transportation funds.

The region’s policies have indicated a strong move to increase mobility and the network’s efficiency through a variety of methods, including a broader potential use of pricing.
The screening criteria established to separate potential short-term and long-term consideration of value pricing are described below. To be considered in the short-term,

1. The facility needs to be identified in the adopted MTP with a recommendation as a HOV or Managed Facility.

AND

2. The facility is not an interim HOV facility or an existing tollway, but could support a new managed lane (or lanes) in the right-of-way (all freeways remain free, but new capacity could be priced).

AND

3. The facility would be in place or construction would be completed within five years.

### 3.4 10 FACILITY EVALUATION CRITERIA FOR SHORT-TERM AND LONG-TERM CONSIDERATION

All potential value pricing facilities would be evaluated based on the 10 evaluation criteria developed for this study. However, the evaluation criteria would be applied differently for short-term and long-term consideration. Moreover, some of the evaluation criteria take on more or less importance in each timeframe. For the short-term, one goal of applying these criteria would be to identify a demonstration project that can be implemented quickly and allow the region to gauge the benefits and challenges of value pricing. Likewise, for the long-term, these criteria would be used to evaluate value pricing alternatives within the project development process.

The 10 evaluation criteria are as follows:

1. Facility main lanes exceed LOS ‘E’
2. Facility subject to legislative/legal considerations
3. Facility supports managed lane(s) enforcement
4. Facility supports toll collection
5. Facility represents a potential candidate for incentive based pricing
6. Facility improvement minimizes construction disruption
7. Facility can be constructed or modified and open to traffic within a reasonable timeframe
8. Facility supports physical lane separation
9. Facility can be designed with minimal design exceptions
10. Facility supports ingress/egress directly to the managed lanes.

The remainder of this section provides the guidelines for applying the 10 evaluation criteria (quantitative and qualitative guidelines), as appropriate, and how they could be applied to evaluate the need for and potential for success of value pricing on HOV, tollway, or freeway facilities in the Dallas-Fort Worth Region. In the case of quantitative guidelines to evaluate and assess various types of facilities, thresholds are presented based on lessons learned from value pricing projects, accepted design standards, and team input.

#### 3.4.1 Facility Main Lanes Exceed LOS E

The criterion for evaluating the transportation system performance is based on the operational Level of Service (LOS) of the facility. The LOS is a qualitative measure of operating conditions, which a driver will experience while traveling on a particular roadway segment. The LOS reflects driver satisfaction with the following factors that influence the degree of congestion: speed and travel time, traffic interruptions, freedom to maneuver, perceived safety, driving comfort and convenience, and delays. The LOS is measured using a scale of the severity of congestion experienced by drivers. The LOS scale ranges from A to F, as defined in the 2000 Update to the Highway Capacity Manual, with LOS A representing free flow movement of traffic with low traffic volumes and high speeds and LOS F representing failure with stop-and-go congestion and long delays at signalized intersections. LOS B is in the range of stable flow with above average conditions. LOS C is normally utilized as a measure of average conditions for suburban and urban locations. LOS D occurs near a critical boundary where
traffic flows become unstable. At LOS E, the roadway is operating near capacity and day-to-day delays are very unpredictable.

The threshold for applying value pricing has been established as LOS E (at capacity). This LOS represents the condition where the roadway is operating at capacity and day-to-day delays are unpredictable. Because a facility is made up of segments that operate at different levels, the segments that have the worst operational characteristics would govern the entire facility. Often these segments operating at or above capacity “bleed” over into other segments.

For an HOV facility, this could mean that even with severe congestion in the parallel general purpose (unmanaged) lanes, the HOV lane is underutilized. In this case, the excess capacity in the HOV lane could be sold to single occupancy vehicles (SOV) or lower occupancy vehicles to become a High Occupancy Toll (HOT) lane. This method has been used on I-15 FasTrak program in San Diego, California, which allows solo drivers to pay a toll to use the HOV-2+ Express Lanes. Or, the demand for the HOV lane could exceed its capacity, as was the case in Houston on the Katy Freeway. In this case, increasing the occupancy requirement to HOV-3+ would return the HOV lane to free flow conditions. Then, excess capacity on the HOV-3+ facility could be sold to HOV-2+ or SOV’s. Other considerations for pricing a facility include improving trip reliability and predictability.

For a congested tollway, value pricing could be used to encourage drivers to choose off-peak periods by either raising the tolls during peak periods, or lowering the tolls during off peak periods. This was done successfully in Lee County, Florida by lowering tolls during the shoulder periods (the hours before and after each peak period) so that more drivers chose to use the facility during those times. For either type of facility, it is important that free-flow conditions be maintained to provide an incentive to both HOV’s and toll customers to continue to use it.

For a congested freeway, value pricing could be used with new capacity that is tolled that would reduce volumes in the main lanes and provide a benefit to travelers in the form of a choice to remain in the free lanes, which have an improved LOS, or to move to the toll lanes and experience free flow conditions.

For short-term evaluation, planners would need to look at existing traffic conditions to determine if the peak hour volumes in the main lanes exceed the hourly volumes to maintain free flow conditions. The MTP’s Freeway Segment Report, also know as the Mobility LOS analysis (MOBLOS) is the source of this data. Or, a facility-specific traffic study has been or could be easily conducted if additional information is required.

For the long-term projects, a travel demand forecasting and traffic operations analysis that codes value pricing into the model is recommended. The Dallas-Fort Worth Region has an excellent travel demand model capable of this type of analysis. Examples of travel demand data that may need to be refined to evaluate value pricing include screenline data and total weekday travel on major links in the travel corridors. The traffic analysis should also include a comparison of each alternative to the base case with respect to travel time savings, number of trips, number of peak hour trips, mode split variations, new HOV/transit trips, new solo trips, and congestion levels, to assess the changes in travel patterns in part caused by the value pricing strategies. Factors such as time of day, choice of route, and pattern of travel changes should be considered.

Based on the three strategies described previously, the following steps for evaluating the transportation system performance in the long-term include:

- Determine if an existing HOV lane is underutilized or congested or is projected to be underutilized or congested. If it is underutilized, excess capacity may be available to sell to lower occupancy vehicles. If the HOV is highly congested, raising the occupancy requirements and selling the new excess capacity could be evaluated

- Determine if the tollway is experiencing unacceptable levels of congestion during peak and non-peak periods, determine the usage by vehicle classification, and identify the potential causes of the congestion

- For a freeway, identify the locations of the most severe congestion and determine the limits of new capacity needed to satisfy the travel demand.

The methodology for carrying out these steps involves utilizing the travel demand model for the region. Traditional methods of traffic analysis would also be used to evaluate operations. In addition, a companion paper that describes the current practices for estimating demand with regional models
used around the country has been prepared for this study, Estimating Travel Demand (NCTCOG, 2004).

- Calculate the actual traffic volumes (automobile and transit) on the HOV lane for the peak and non-peak periods, and forecast the projected volumes for the design year. For facilities with existing HOV lanes, this would include traffic and operations data for HOV and General Purpose (GP) lanes (baseline condition), including vehicle counts, occupancy counts, LOS, and travel times.

- Calculate the excess capacity of the HOV lane based on existing and future conditions. Typically LOS C/D equates to between 1600 and 1800 vehicles per hour. Therefore, the excess capacity would equal the difference between the actual volume and the volume corresponding to free flow conditions.

Once it is determined that there is excess capacity available to sell to lower occupancy vehicles, the next step would be to evaluate what effect this has on the corridor. Because the effects do not lie completely within the HOT lane itself, a travel demand modeling exercise would be needed to evaluate the effect on the network.

For toll facilities, the applicability of value pricing would be determined based on peak period demand on the toll road. If a given facility is experiencing severe congestion in the peak hour, increasing tolls is an option to reduce the demand by shifting some of the demand into the shoulder periods. However, if the facility has significant congestion throughout the entire peak period, higher peak toll rates may have only limited impact. Key elements of this analysis would include:

- Identifying the nature of congestion. Does it occur throughout the tollway, only at toll collection points, or at other locations?
- Identifying peak periods and shoulder periods (either side of peak) and traffic volumes associated with each period
- Determining the amount of peak-period traffic that should be “shifted” from peak to shoulder periods to improve peak period operations

Value pricing is typically applied to a toll facility in the form of a “fixed-rate” peak surcharge or off-peak discount rather than a variable toll based on congestion. Ideally, toll roads should provide an acceptable level of service of either LOS C or D. However, it is most important for the facility to provide a travel time savings in comparison to the adjacent competing non-tolled facilities. As an example, the New Jersey Turnpike has segments that experience significant congestion, but the lack of any reasonable alternatives prevents diversion away from the toll road.

Each of these strategies is intended to influence the departure time choices of tollway users. The sensitivity of these users to the price of the trip, and the resulting demand on the roadway, is described by the toll elasticity of the facility. The behavior of users is most easily influenced by tolls on facilities that are more sensitive to changes in toll rate, or show a higher level of toll elasticity. On these facilities, drivers could be shifted out of the peak period with relatively small changes in toll rate. On facilities with inelastic tolls, the peak-period toll increases or off-peak toll discounts that would affect the departure-time choice of drivers could be unreasonably large, and potentially infeasible from a political or public opinion perspective.

If the effect of tolls is sufficiently elastic to affect the departure-time choice of drivers, some users can be shifted from peak periods to off-peak periods. This effectively “flattens” the peak period and decreases the volume during the most congested hours, with no required increase in capacity. This congestion relief is the main benefit of implementing a value pricing program on a tolled facility. Observations of existing value pricing projects indicate that changes in peak pricing clearly influence the temporal distribution of trips, shifting traffic away from periods with the highest charges.

The regional model would be used to determine the impact on the tolled facility and the adjacent non-tolled facilities. The overall evaluation process would focus on the change in travel time and vehicle trips within the area of influence of the facility. As an initial step, the model would be used to determine the impacted area using time savings for individual origin-destination zonal pairs as a mechanism to identify the area of influence. This analysis would be conducted separately by time period (peak and off-peak) so that the impacts can be quantified for both the peak period and overall daily levels of travel.
With the influence areas established for each time period, the regional model would then be used to present measures of effectiveness in terms of travel times, auto occupancy, overall person travel, and transit usage. Generally, value pricing for toll roads may shift traffic by time period from the peak to the shoulder periods, decreasing travel times for drivers in both the peak and shoulder periods. Increased toll rates could be expected to have a positive impact on carpooling and transit service utilizing the toll road. However, some of the tolled traffic may also divert back to the non-tolled facilities in response to the increased tolls.

Like other value pricing strategies, new priced lanes on a freeway would be required to operate at free-flow conditions, typically at LOS C/D or better, to justify the toll. Therefore, a methodology similar to those used in other value pricing studies to evaluate adding new priced capacity to a freeway consists of the following steps:

- Calculate the existing traffic volumes (automobile and transit) for the peak and non-peak periods, and forecast the projected volumes for the design year. This existing data collection could include traffic and operations data such as vehicle counts, occupancy counts, LOS, and travel times.

- Using regional modeling tools, estimate the traffic volume that would shift to tolled express lanes based on local value-of-time estimates and travel time savings, since drivers will tend to choose the toll lane if the time savings value exceeds the out-of-pocket cost required to pay the toll.

- Calculate the needed capacity based on existing and future conditions, the estimated traffic shift, and maintaining free flow conditions. Typically free flow, or LOS C/D, equates to between 1,600 and 1,800 vehicles per hour (or less for a non-separated system), which can be used to determine the optimum number of tolled lanes for the facility.

Following the SR-91 example, tolls ideally would be set as a function of the congestion on the parallel, general purpose lanes. Tolls could also be applied to other vehicle types such as trucks in order to maximize revenue, although significant congestion would have to exist in order to divert truck traffic.

Generally, toll rates would be established based on the particular conditions that exist in each corridor. It is anticipated that the toll rates would vary by season, time of day and, within the peak period, by level of congestion. Toll rates would also be established for the various vehicle types permitted to use the facility. Based on experience with other facilities, toll rates within the peak hour would be expected to be four or five times the toll rate of the off-peak period.

For example, tolls on SR-91 vary from $1.05 during the late evening and early morning to $7.00 during the PM peak on Thursdays and Fridays. The Orange County Transportation Authority (OCTA), the operator of the facility, has estimated that the maximum number of vehicles that can predictably travel through the SR-91 Express Lanes at free-flow speeds is about 3,400 vehicles per hour per direction, or 1,700 vehicles per lane. Congestion may occur as usage approaches or exceeds these volumes. OCTA adjusts tolls as necessary by monitoring volumes on each hourly time segment over 12-week periods. If vehicle volumes (per direction, per hour) begin to approach levels where speeds could slow, tolls may be adjusted. The most recent toll adjustment increased the Thursday and Friday PM peak tolls by $1.50, to the current $7.00.

3.4.2 Facility Subject to Legislative/Legal Considerations

It is possible that legislation, guidance, or policies must be clarified, created, or modified to allow the implementation of value pricing in a region or on a facility. Or, policies related to tolls may require modification or clarification. In addition, environmental laws or regulations may affect implementation of value pricing. Therefore a team of legal and policy advisors should be established to research and resolve any legislative needs or policies related to value pricing as part of an implementation plan. For example, if tolls will be collected on a formerly free facility, such as a HOV lane, it is possible that the owner of the HOV lane does not have legal jurisdiction to collect tolls. In this case, the regional toll authority may need to be involved in the toll collection portion of the project, requiring either legislation or a memorandum of understanding between the agencies. Or, there may be other policies that govern whether a free facility can be priced.

Recent legislation greatly expands the possibilities for pricing in Texas. Several resolutions and
policies related to tollways and managed lanes are currently in place in the Dallas-Fort Worth Region. In 1994, the Texas Turnpike Authority was requested to study potential toll roads for consideration of value pricing strategies, including varying prices by time of day and auto occupancy. Future toll roads and all new freeways or new alignments will be assessed as potential tollways through the metropolitan transportation planning process, to offset a portion of the cost of construction, management and/or operation. Mobility 2025 (amended April 2005) also recommended that all planned two-lane HOV lanes be used during off-peak periods as SOV express lanes or toll lanes to provide additional needed capacity and a potential source of revenue. Further clarification of the regulations governing pricing may be needed for each demonstration project.

In addition, the HOV lanes on I.H. 30, I.H. 35E, I.H. 635, and I.H. 35E/US 67 are operated by DART and are currently interim HOV lanes. Therefore, the requirements for implementing value pricing on an “interim HOV” are different from the requirements of a permanent HOV facility. Specifically, interim HOV lanes do not utilize full barrier systems to separate the managed lanes from the general purpose lanes, which is an undesirable condition for a value pricing strategy. Therefore, unless specifically modified, interim HOV lanes would not be considered for value pricing implementation.

Like many tollways throughout the country, including portions of the President George Bush Turnpike (PGBT) and the Dallas North Tollway (DNT), existing bond covenants prohibit discounting tolls on tolled facilities. Therefore, if value pricing is desirable on one of the existing tollways, the bond covenant restriction must be considered. NTTA’s and TTA’s input is critical to determining how value pricing could be implemented on a tollway in both the short-term and long-term. Future toll road bond covenants will likely be written with flexibility to one day incorporate a managed lane philosophy. However, the PGBT and DNT would not be considered for value pricing implementation in the short-term.

Environmental Regulations and Air Quality

Environmental regulations must also be evaluated for the implementation of transportation projects, although depending upon the type of project; a National Environmental Policy Act (NEPA) study may not be required. For example, I-10 (Katy Freeway) in Houston and I-15 in San Diego determined that their value pricing programs did not require NEPA documentation because the value pricing programs were congestion management tools, and the implementation of these facilities would be beneficial to the environment by increasing ridesharing and roadway capacity efficiency. The I-15 project team also highlighted the transit improvements that were funded by revenues generated by the project. Environmental lobby groups supported both projects, and the Federal Highway Administration leaders were in agreement with the agencies that no environmental studies were required.

The 1990 Clean Air Act and Amendments require the Dallas-Fort Worth Region to carry out a structured, multi-year approach to attaining federal clean air standards. Federal highway funding aid can be withheld as one of the sanctions imposed for failure to meet these requirements. Also, the region must show that its transportation plans and programs are in conformity with the region’s clean air plans. Finally, the region’s clean air plans include transportation control measures intended to reduce emissions from mobile sources, which are given a special, priority status for federal-aid funding in the region’s annual Transportation Improvement Program (TIP). The TIP is then adopted by the state and called the Statewide Transportation Improvement Program (STIP). The Dallas-Fort Worth metropolitan region exceeds Federal air pollution standards, classifying it as a non-attainment area according to the Clean Air Act and Amendments of 1990. The U.S. Department of Transportation cannot fund, authorize, or approve Federal actions to support programs or projects that are not first found to conform to the Clean Air Act requirements. Specifically in the case of HOV lanes, the addition of SOV capacity would be prohibited unless the project is introduced into the region’s Transportation Improvement Plan (TIP) to bring the region into conformity with air pollution standards. The relationship between managed lanes and air quality can be modeled for particular projects. There may be a slight increase in Vehicle Miles of Travel (VMT). However, there may also be a slight decrease in hot spot and idle vehicle emissions. As an example, the air quality analysis conducted as part of San Diego’s I-15 HOT program found that, during the first three years of operation, the program seemed to moderate emission levels along I-15 during the study period. Current air quality modeling for the Dallas-Fort Worth Region indicates that the same positive results would be expected.

In order for the region to receive federal transportation funds, NCTCOG, the Metropolitan Planning Organization (MPO) for the Dallas-Fort Worth Region, must adopt a financially constrained transportation plan and
a TIP that conforms with the region’s air quality plans. For the FHWA to make a conformity determination, the region’s transportation planners must show that the emissions projected to result from implementation of the transportation plans and programs are within motor vehicle emissions budgets that are developed as part of the required air quality plans. Environmental impacts and issues are often best understood as a result of a comprehensive planning analysis.

**Agency Responsibilities**

A value pricing project combines characteristics of freeway, HOV lanes, and tollways. In the Dallas-Fort Worth Region, these facilities are operated by TxDOT, DART, and NTTA, respectively. It is likely that each agency will contribute to the implementation strategy based on its area of expertise and purpose. Early in the planning process, a determination needs to be made regarding the roles of the agencies in the planning, implementation, monitoring, and enforcement of a managed (HOV/M) lane. It is possible that the legislature would want to legally establish the operating agency or agencies and specific responsibilities such as maintenance, enforcement, and toll collection. It is also advised that project officials and local stakeholders cooperatively develop legislation to direct the allowable uses for revenues from the facility, as the use of revenue can be a major issue in determining the fairness and acceptability of a program. Short of legislation, the consortium of agencies should work through the value pricing plans and develop a memorandum of understanding that includes how the agencies would work together to design, implement operate and maintain the facility.

Other programs have also used enabling legislation to outline how and when toll rates can change and to establish a minimum acceptable level of service in the priced lane to ensure time savings availability. The Federal Highway Administration’s Guide for HOT Lane Development provides some guidance for potential legislative requirements. Although enabling legislation can vary widely depending on local conditions and requirements, there are many common provisions that are likely to be addressed, including:

- 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:

- Signing the managed portion of the road to designate that it is different 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 non-payment
- 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.

**Equity**

The goal of value pricing is to provide the opportunity for users to save time and increase mobility by paying a toll based on the value of their trip. Value pricing programs in place or under study around the country have yielded a lively debate about whether this value of time or toll is inequitable to travelers of lower economic status. Studies have shown that the facilities that currently collect a fee based on time of travel or occupancy have not just attracted high-income motorists. SR-91 in Orange County, California, was the first value pricing facility in the United States and has been thoroughly studied over the years it has been in operation. According to user surveys, those who use the SR-91 Express Lanes on any given day were found to be an economically diverse group. Commuters in high-income groups were just over twice as likely as commuters in low-income groups to be frequent toll lane users (23% compared to 10%). Although a clear correlation was found between income and frequency of toll lane use, 50% of the highest income travelers (> $100,000 annual household income) report they never or infrequently use the toll lanes while 25% of the lowest income travelers (< $25,000 annual household income) report they use the toll lanes on a frequent basis (50% or more of the time). These statistics indicate that users’ value of time spent in traffic is not directly related to income. It also shows that people value their time differently day-to-day, depending on daily commitments such as daycare, second jobs, or other appointments. This day-to-day decision ultimately provides all motorists with an equal choice.

In addition to equity associated with driver choices, it is important to consider how shifts in traffic that result from implementing a toll on a previously free facility affect the surrounding network. For example, would local roads become more congested as a result of pricing? Would traffic be diverted to communities with low-income or minority populations? The travel demand forecasts would be used to measure the effects of value pricing on the surrounding roadway network and a comparison of baseline and future conditions would reveal patterns of traffic shifts.

In terms of equity associated with tollways, value pricing on tollways is applied to more efficiently allocate limited roadway capacity by varying the tolls by time of day, congestion level, vehicle class, or other characteristics. It is important to note that the tollways in the Dallas-Fort Worth Region are already entirely tolled as opposed to toll son portions of a facility. Users currently choose to use these facilities knowing that they already priced, and the application of value pricing does not decrease the availability of routes in the corridor or physically limit the choices available to a motorist.

When variable tolls are implemented on a toll facility, the toll schedule is adjusted in some way to create higher tolls in the peak periods and lower tolls in the off-peak period or depending upon congestion levels, creating a toll differential. The LeeWay program in Lee County, Florida implemented an off-peak discount, leaving the peak tolls at the previous rate. The off-peak discount is funded through the FHWA Value Pricing Pilot Program, and because the toll rates actually decreased overall, equity concerns were relatively minor.

Due to fiscal constraints, the most common method of creating a toll differential between the peak and off-peak periods is to increase peak period tolls. This approach could create equity concerns because studies have shown that in some cases lower-income motorists have less ability to adjust their work.
schedules and time of travel to avoid a toll. Often, as in the case of the New Jersey Turnpike value pricing program, variable tolls are implemented in conjunction with toll increase for all users. In 2001, tolls on the New Jersey Turnpike increased 5 percent for off-peak drivers, but increased over 18% for peak-period drivers. If equity remains a concern, income-based discounts or other programs could be considered. The existing NCTCOG model would need to be revised to provide separate toll values by income group, so that the diversion model could reflect the discounts.

The issue of equity associated with adding new capacity to freeways is similar. As noted, even though value pricing has proven to be equitable in other areas, it is still necessary to evaluate how shifts in traffic that result from implementing toll pricing affect the surrounding network. Equity concerns are often best understood as a result of a comprehensive planning analysis.

The SR-91 project in Orange County, California dealt with additional equity concerns. Because the project was initially created as a public-private partnership between Caltrans and the California Public Transportation Company (CPTC), initial agreements included a no-compete clause. To ensure that the private investment could be repaid through collected tolls, freeway expansion on the adjacent SR-91 general purpose lanes was prohibited. In response to political and public pressure for freeway expansion, the Orange County Transportation Authority purchased the managed facility, and transportation agencies are planning expansion of the adjacent freeway. The SR-91 case illustrates the need for toll lane operators to be aware of and responsive to concerns of all users of corridors on which pricing is implemented.

A concept called “FAIR” (Fast and Intertwined Regular) lanes attempts to overcome public resistance and address the equity issues has been the subject of study throughout the United States. Under this idea, congested freeways are separated into fast lanes and regular lanes. The fast lanes are electronically tolled, with tolls set dynamically in real time to ensure that traffic moves at the maximum allowable free-flow speed. Users of the regular lanes still face congested conditions but are eligible to receive credits if their vehicles have electronic toll tags. Accumulated credits can be used as toll payments on days they choose to use the fast lanes, or as payment for transit or para-transit (shuttle van) services.

### 3.4.3 Facility Supports Enforcement

Enforcement is essential to the success of a managed facility, and should be highly visible, frequent, and impose penalties that are strict enough to deter future violation and minimize the evasion of road tolls. Value pricing facilities rely on travel time savings to attract users to the facility. Violators degrade the performance of the facility by occupying roadway capacity that is managed and allocated for HOV, tolled, and other specific types of users. Public trust in the facility can also decrease if paying users perceive an unacceptable rate of violations. Because the loss of revenue is at stake (in addition to a degradation of service due to excess traffic), enforcement of a priced lane can be even more critical than that of an HOV lane. Therefore, the additional costs and training of this more intense enforcement method, including additional enforcement areas and more police need to be considered in the full cost of the program. In addition, violators negatively affect the revenue collection of the facility, effectively taking funds that are allocated for operational costs, facility improvements, and other uses.

Reported nationwide HOV violation rates typically range from 5 to 40 percent. HOV lanes with high violation rates can be especially suited to conversion to HOV/M lanes. Charging a toll in addition to the occupancy restriction increases the importance of enforcement. Additional enforcement usually incorporates increased visual patrols to verify vehicle occupancy and some form of electronic detection and photographic record of vehicles not using the appropriate toll transponder. Revenues generated by the HOV/M lane, especially those resulting from enforcement activities, usually fund these increased enforcement efforts. HOV lane violation rates on Dallas HOV facilities are comparably low, ranging from approximately one percent on I.H. 30 to three to six percent on the concurrent flow facilities. While these violation rates are typically lower than those experienced on other facilities nationwide, it is likely that they could be further reduced through increased enforcement made possible through a value pricing program. Currently, officers set up stationary patrols at designated enforcement zones along the existing HOV lanes. These enforcement zones consist of wide paved areas near the HOV lane access points, from which vehicle occupancy is determined visually. The fine for HOV violation on DART HOV lanes is $287 (2005 data).

For example, one of the positive benefits on the I-15 program in San Diego has been the significant reduction in SOV violators, the result of
increased California Highway Patrol (CHP) enforcement funded by the project. The HOV violation rate for California has a “first offense” fine of $271. In October 1996, illegal SOV’s comprised 17 percent of total vehicles on the HOV lanes. Throughout the ExpressPass and FasTrakTM program phases, violation rates have ranged between three and five percent of total traffic, whereas typical HOV lane violation rates throughout California range between five and ten percent.

For tollways, the existing NTTA enforcement programs could continue to be used in conjunction with a value pricing program. Toll plazas include traditional coin and change-made collection methods, along with the TollTag ETC program. Rates for both manual and automated collection methods could be varied according to time-of-day. Toll plaza lanes also include an automated enforcement system. When vehicles pass through toll lanes without correctly paying the toll, an image of the vehicle’s license plate is captured and a violation notice is sent to the registered owner by mail.

In general, the evaluation of enforcement needs would consist of strategically locating enforcement areas. Also, it must be determined if enforcement officers assigned to a facility would be willing and capable of accommodating the additional requirements needed to enforce a managed lane. The enforcement personnel must be visible on the roadway to implement the rules/restrictions as well as provide severe penalties (based on legislation) if the driver is caught violating any of the roadway rules. Enforcement encompasses the steps taken to minimize the evasion of road tolls, albeit technical, operational or legal. The enforcement areas should be stationed on a wide shoulder for enforcement activities. A clear view of oncoming vehicles is essential so that officers can both verify the occupancy of HOV’s and determine the presence of a toll tag or permit for paying vehicles. Sufficient distance between the enforcement area and the next downstream exit will aid in apprehending violators.

For value pricing implementation on HOV facilities, existing enforcement strategies can typically be used. However, enforcement can be much more complicated on priced lanes because enforcement officers must also verify the presence of a permit or transponder for those vehicles paying to use the lane in addition to inspecting vehicles for occupancy. Current electronic surveillance methods may not be adequate to ensure detection of all violators. Therefore, enforcement areas would be needed to allow officers to park safely while monitoring the priced lane and for violators to pull over safely, while not slowing traffic in the lane. An enforcement officer could be notified when a non-transponder vehicle passes through the enforcement area and could then visually inspect the vehicle for appropriate occupancy.

In addition, ITS can be a valuable tool in enforcing value pricing programs. Many ITS elements, such as detection and surveillance equipment, are integral parts of an electronic toll collection system. Variable message signs can communicate hours of operation and other details, or communicate dynamic prices if this strategy is employed. In addition to enforcement, other uses for ITS, such as detecting and verifying incidents and communicating weather and pavement details, can be used to enhance the operation of a managed facility. Many of finer grain details of an enforcement plan can best be determined once conceptual design is completed as part of a planning exercise.

### 3.4.4 Facility Supports Toll Collection

The implementation of a toll collection system can be one of the greatest challenges and expenses in applying value pricing to an existing free facility. Typically, electronic toll collection (ETC) is preferable to toll plazas or permits. ETC systems allow instantaneous collection of tolls at or near highway speeds and require fewer geometric changes to the facility. Still, ETC systems require extensive specialized infrastructure that may be difficult to retrofit to an existing facility. Most ETC systems use antennas, mounted on overhead gantries, to read uniquely identifiable windshield-mounted toll tags. Antennas must be placed near entrances and exits if tolls are distance-based, but can be located with more flexibility if a flat toll is collected. The antennas require a source of electricity and a method to relay vehicle data to a processing facility, where the appropriate charge can be billed to an individual user. Fortunately, many motorists in the Dallas-Fort Worth area are already familiar with the NTTA’s TollTag system. ETC systems developed for managed lanes in the Dallas-Fort Worth area could be integrated with the existing TollTag system, using the same system architecture, communications equipment, and billing methods. TollTag has been widely accepted by the public and can currently be used on all NTTA facilities, Dallas-Fort Worth International Airport (DFW) parking facilities, and Harris County Toll Road Authority (HCTRA) facilities in Houston.

Planned facilities also require these ETC elements. However, they may be more fully integrated into the design of the facility. For example, antennas can be
integrated with sign bridges, and data cables between antenna sites and the central facility can be installed along the roadway during construction. ITS components such as variable message signs and in-pavement traffic counters can be installed more easily. The provision of a toll collection system should be considered early in the design process.

Toll facilities such as the President George Bush Turnpike, the Dallas North Tollway have the advantage of already having a toll collection infrastructure in place, which can typically be modified to incorporate dynamic or static toll changes quite easily through software changes. Coordination with the toll authority (NTTA) is critical in evaluating these modifications.

With respect to design issues, the major infrastructure needed to support toll collection efforts includes ETC antennae and overhead gantries. In addition, the ability to provide a seamless interaction with other toll collection efforts would make the managed lanes easier and more convenient to use. Therefore, future corridor studies should take into consideration the physical requirements of toll collection equipment and the availability of payment technology. It is possible that nearby facility that incorporates some, if not all, of these features would provide an easier method to “string” the facilities together.

While some interim and pilot projects have used permit-based systems, high-speed ETC systems are the preferred method of toll collection on managed facilities, especially in a region with a successful tolling system. Tolls can be collected at free-flow speeds, and windshield-mounted transponders can be distributed to a large number of drivers, many of whom may choose to use the facility only occasionally. Drivers have the flexibility to choose on a daily basis whether they want to bypass the congestion of the general purpose lanes in exchange for a toll.

ETC systems are a significant technological and financial component of free to tolled lane conversions. Typically, the equipment is mounted overhead on sign bridges or existing overpass bridges. Where existing structures are not available, dedicated overhead gantries support the transponder detectors at various intervals along the roadway. For comparison, the ETC system used on eight-mile-long I-15 HOT lane facility in San Diego had an estimated capital cost in 2001 of over $11 million.

Recent advances in toll collection technology have further increased the functionality and convenience of ETC systems. Transcore, a developer of toll collection technology, introduced the “TagTeller,” which allows automated distribution of electronic toll tags. Similar to an ATM machine, the TagTeller accepts cash, credit cards, and debit cards, and can be installed at drive-up, walk-up, and in-lane locations. The machine can be used to open new accounts, replenish existing accounts, pay violations, and perform other routine account maintenance tasks, and can also distribute ETC tags. Tags are potentially interoperable with other transportation or transit networks, and could provide a simple way for occasional or visiting roadway users to access an ETC system.

### 3.4.5 Facility Represents a Potential Candidate for Incentive Based Pricing

Value pricing is an incentive based program in and of itself. By introducing price to encourage changes in travel behavior, value pricing programs are a way to manage demand by encouraging travelers to use the facility in off peak or shoulder periods or to carpool or use transit. Incentive programs that include additional promotions are an innovative way to make value pricing even more beneficial and attractive to the region by increasing use of the priced facilities and enhancing revenues and mobility. The SR-91 project used this concept to promote value pricing in an untested market. The original owner of the facility, along with local businesses, offered a variety of discounts to encourage the use of the SR-91 Express Lanes. Some of the incentives included discounts on the purchase of gasoline and $1,000 in prepaid tolls offered by home builders with the purchase of a new home. In the Dallas-Fort Worth Region, providing incentives to encourage the use of priced lanes or to support their implementation could be used to help meet various goals of a value pricing program. The two basic goals of value pricing include:

- Managing demand
- Marketing the managed facility

Using incentives to managed demand is a popular technique in many urban regions of the United States. Incentives for carpooling, vanpooling, and transit use sponsored by federal, state, and local agencies have met with success and have encouraged the use of alternate modes of travel in highly congested areas. These types of incentives could also prove successful in...
conjunction with a managed lane. Examples could include offering carpoolers, vanpoolers, or transit riders the ability to earn credits for riding a bus or using the managed lanes or even discounts on vans purchased predominantly for vanpooling.

Offering incentives to use the managed lanes is a concept that has not been employed on a large scale to date in the transportation industry. However, incentive programs are used in many other industries to reward program participants. For example, the retail grocery industry uses coupons to encourage people to buy particular products at a discount. Many sales companies offer incentives to employees to meet or exceed sales quotas, often in the form of monetary rewards, vacations, or discounts on products. Restaurants offer frequent buyer cards (buy 10 meals, get one free). One of the most popular types of award programs is the frequent flyer programs offered by most airlines. Frequent flyer programs date back to 1981, when American Airlines launched AAdvantage. Since then, the number of programs has increased substantially and now includes hotels and rental car companies, with more than 80 million people participating in one program or another. Frequent flyer programs have been lauded as one of the most successful marketing programs ever developed, and are actually a subset of a larger class of related marketing approaches known as loyalty marketing.

Extending the concept of loyalty marketing to value pricing and establishing an incentive based program unique to managed facilities the Dallas-Fort Worth region would be the first of its kind and would help to set the standard for implementing value pricing programs elsewhere. However, the concept would be similar to previous loyalty marketing programs: encourage repeat business by rewarding customers for their loyalty. Goals of such an incentive program would be:

- To advertise and market the program to attract and retain customers
- To provide a benefit or reward to users of the program, beyond the travel time savings
- To solicit support from the local business community by allowing them the opportunity to advertise their services, particularly services that depend on access to or from the priced facility.

Once the goal or goals of incentive based pricing are established for a particular facility, planners can work with local businesses to identify an appropriate incentive. Some examples of incentives that could be applicable for a particular value pricing program include:

- Discounted access to the managed lanes themselves (i.e., get a free trip for every 15 trips or reduced fee days)
- Frequent flyer miles
- Baseball or football tickets
- Discounts coupons for restaurants
- Discount coupons for rental cars
- Passes to area attractions like Six Flags
- Discounts on goods or services.

It is recommended that there be one type of incentive per facility to start so that the program is simple, yet effective to implement and monitor. If a particular incentive can be linked to the facility itself, such as awarding frequent flyer miles to motorists who use congested roadways leading to DFW Airport, it is likely that the airlines would also realize a benefit and be more inclined to partner with the managed facility owner to develop a program that can benefit both parties as well as the public. This partnering outreach could begin soon after the concept of the managed lane is developed, providing maximum time to fully develop the concept and create and implement a marketing plan. Although any facility may be a candidate for an incentive based pricing, this program could also be considered a pilot application of an innovative concept.

3.4.6 Facility Improvement Minimizes Construction Disruption

Three categories of construction were identified for the purposes of evaluating the potential to disrupt traffic on the facility main lanes while the priced lanes are being constructed:
• Full reconstruction of a facility
• Partial reconstruction of a facility
• Adding new capacity within the median of an existing facility (“median shaving”).

These types of projects would incur varying degrees of disruption to the surrounding traffic. Note that applying value pricing to an existing toll road by varying the toll would require little or no construction. Minimizing construction disruption is one goal of the implementing agency in reducing the inconvenience to motorists while a value pricing project is being constructed.

A full reconstruction would include adding new lanes and shoulders to a facility, bridge widening or replacement, new interchange construction, adding enforcement areas and physical lane separation (see section 3.4.8 for a discussion of physical lane separation) between the managed and main lanes, and generally any construction activities that require full lane closures for extended periods of time. Full reconstruction projects are likely to be the most disruptive to traffic using the facility or corridor and would require new rights-of-way.

A partial reconstruction would be less disruptive, but may require some lane closures for short periods of time to add shoulders and enforcement areas, and physical lane separation. Some new right-of-way may be needed.

Median shaving would be the least disruptive because all new construction would be added in the median of the facility. Some disruption to the main lanes may occur if some of the main lane shoulders need to be narrowed to ensure adequate lanes widths for the managed lanes. Although many of these issues can be better identified during the planning phase, many may not be resolved until a more detailed level of design is completed.

3.4.7 Facility can be Constructed or Modified and Open to Traffic Within a Reasonable Timeframe

The implementation schedule for a facility is a crucial evaluation criteria for determining whether the project will fall into the category of potential demonstration project. Although a cutoff of five years has been selected as a screening criteria to separate short-term consideration from long-term consideration, the ultimate open to traffic date is a factor in the success of a project (i.e., projects completed sooner have a more immediate benefit). Therefore, this criteria is based solely on the amount of time needed to open a priced facility to traffic, which is ultimately dependent on the type of construction anticipated (see section 3.4.6 above). This criteria is more critical for selecting a demonstration project because one of the goals of a demonstration project is to learn as much as possible about the viability of value pricing in the region. For long range planning purposes, the timing of project implementation is tied to the MTP, TIP, STIP, and ultimately to funding availability and priorities in the region. This criteria may be used to prioritize projects based on how quickly they can be implemented, but not necessarily by their level of benefit.

3.4.8 Facility Supports Physical Lane Separation

A lane separation strategy is a key part of the implementation of a value pricing program. The need to evaluate methods of lane separation is more apparent on a HOV/M lane than on a tollway, where occupancy is typically not a consideration. Separation of general purpose and managed lanes enhances the overall operation of a managed facility. Large speed differentials, which tend to increase the occurrence and severity of rear-end and sideswipe collisions, could be created between the managed and general purpose lanes during periods of heavy congestion in the general purpose lanes. Lane separation also prevents or prohibits the mixing of these different users. Additionally, enforcement activities are simplified when violators are confined to the managed portion of the facility.

Several methods are available to separate traffic on the managed lanes and general purpose lanes and prevent movement between the two uses. Three common methods include barrier separation, buffer separation, and contiguous (no separation). On barrier-separated facilities, a concrete barrier or plastic pylons is used to divide the two types of traffic. A moveable concrete barrier, such as the “zipper” used on the existing contraflow I.H. 30 HOV lane, can be used effectively to separate off-peak direction and peak direction travel. Buffer separated facilities use a paved buffer, sometimes with flexible pylons or other semi permanent devices, to separate the lanes. Examples of lane separation types are shown in Figure 3-2.

The manner in which drivers move between the general purpose and managed lanes largely depends on the type of separation used on the facility. Barrier and buffer separation require designated entrances and exits at points along the facility, usually near key interchanges. Contiguous lanes
require no specified access points because traffic can freely move in and out of the lane; however, these also can encourage more violation of the priced lanes. In addition, contiguous lanes, with their noted higher crash rates and violations, will increase recurrent congestion, cause more blockage of the managed lane itself, and reduce reliability.

The separation strategy chosen for a managed lane has a significant effect on the ways users can access the managed portion of the facility. For this study, interim HOV lanes will not be considered for short-term or long-term projects because they are not barrier separated. However, they will be considered when permanent corridor/facility improvements are recommended in the MTP.

Typically, most managed lanes are in the median area of the larger facility so that users of the general purpose lanes (usually the majority of traffic) can directly access the interchange ramps. However, users of the managed lane must cross the general purpose lanes, either by grade-separated flyover ramps, wishbone ramps, or by at-grade slip ramps. Grade-separated or wishbone ramps eliminate at-grade conflicts, but greatly increase the right-of-way needs and construction costs of the facility. Users can enter or exit a contiguous managed lane at any point and must simply allow enough distance to complete the at-grade weave to or from the interchange ramp. In any of these cases, studies to determine if any time advantage that was gained by using the managed lane is damaged by having to “weave” with general use traffic.

If buffer or barrier separation is used, dedicated access points between the managed and general purpose lanes must be provided. These access points need to be located far enough upstream or downstream to allow for a safe weave between the interchange ramps and the managed lanes. Various sources, including the California Department of Transportation (Caltrans) HOV Design Guidelines, recommend providing at least 1000 feet per lane between upstream and downstream entrance ramps.

While some value pricing studies have considered implementing pricing programs on non-separated facilities, this approach can complicate the toll collection and enforcement efforts on the facility. In most cases, program operators will wish to add lane separation, usually in the form of concrete barriers or plastic pylons, between the managed and general purpose lanes. Adding lane separation also requires the development of an access strategy. The widening associated with these additional features could impact existing bridges, interchanges, median areas, and service roads, and could create significant right-of-way impacts given the confines of an urban roadway.

Based on AASHTO’s A Policy on Geometric Design of Highways and Streets (Chapter VIII, Freeways), the HOT lane side of a concrete barrier would require a minimum four-foot shoulder and the general purpose lane side of the barrier could require a ten-foot shoulder, giving a total separation width of up to 16 feet (including the two-foot-wide barrier). Figure 3-3,
which shows a two-lane reversible HOV facility on I-394 in the Twin Cities area of Minnesota, illustrates the potential right-of-way issues that could be associated with adding barrier separation. Additionally, if access through the barrier were provided along the managed lane at various intervals, each starting section of the barrier would need to be treated to provide a buffer to protect vehicles during collisions. Concrete traffic barrier, at a cost of about $45 per linear foot (based on the I.H. 820 Corridor Alternative Analysis), is the most costly in terms of initial capital costs compared to the other options, but maintenance costs are fairly low as compared to other strategies. Concrete barriers also enhance the safety of the facility by physically separating different types of traffic, and provide a mounting location for lights and signs.

Concrete barriers are the most costly in terms of initial capital costs compared to the other options, but maintenance costs are fairly low as compared to other strategies. Concrete barriers also enhance the safety of the facility by physically separating different types of traffic, and provide a mounting location for lights and signs.

In summary, the configuration and location of the new lanes combined with the number and type of freeway-to-freeway connection requirements is most likely the largest cost factor when adding separate toll lanes to a freeway.

3.4.9 Facility can be Designed with Minimal Design Exceptions

In general, FHWA design exceptions are an issue in the region because of restricted right-of-way and limited freeway width on some existing facilities. TxDOT has had to seek exceptions where the facility right-of-way does not support proper lane and shoulder widths that are consistent with FHWA standards. As a rule of thumb, such exceptions should be kept to a minimum. NCTCOG and other agencies that work on developing preliminary designs strive to avoid design exceptions. When evaluating a managed facility, the same design standards apply that would be considered for any highway project. Specifically, a facility with three or fewer lanes would require 10-foot outside shoulders and 4-foot inside shoulders. A facility with four or more lanes and reversible lanes require 10-foot inside and outside shoulders. All lanes are required to be 12 feet wide. Vertical clearance between the roadway and overpass structures should be 16 feet.
For short-term evaluation, this criterion is more critical because of the short time frame for implementation and because most short-term implementation projects would likely be retrofits of existing facilities that were designed using older standards. For long-term planning, it is assumed that design standards would be considered and met during the design process.

### 3.4.10 Facility Supports Ingress/Egress Directly to/from the Managed Lanes

As noted in the discussion of physical lane separation, access to and from the managed facility can be at-grade, grade-separated, or not allowed at all except at the endpoints. Two principle at-grade access strategies have been commonly used to provide access between separated managed lanes and adjacent general purpose lanes. Figure 3-5 shows an at-grade buffer opening on I-405 in Orange County, California. Open weaving is permitted at this location, which is of sufficient length to support acceleration/deceleration and merging maneuvers and allows vehicles to enter and exit the HOV lane. Open weaving minimizes the pavement width required for access, but introduces the potential conflicts that are associated with weaving areas. Figure 3-6, also on I-405 in Orange County, illustrates an alternate access method: directional slip ramps. Each slip ramp can accommodate a single on or off movement, with a channelization preventing conflicting movements. Typically, an auxiliary lane is added to isolate the weaving movement from the main traffic flow, reducing the potential for conflict. Additional pavement width is required for the auxiliary lane, however, and more access points may be required because the movements are directional. Designers of these types of facilities must also consider the differential in speeds between the managed and general use lanes.

When employing either method of at-grade access, sufficient space should be provided between the upstream and downstream entrance and exit ramps and the buffer opening to allow safe, gradual merging between the two points. To accommodate weaving and merging traffic, the location of each opening should be carefully coordinated with highway entrance and exit ramps. The Caltrans publication HOV Guidelines for Planning, Design, and Operations, published in July 1991, recommends a buffer/barrier opening of at least 1,300 feet, and a weaving distance of at least 500 feet per lane between the upstream and downstream ramps and the opening. For facilities in Texas, and specifically for the design of improvements to the LBJ Freeway, weaving distances are typically closer to 1,000 feet per lane. For at-grade access, the locations of slip ramps should be carefully coordinated with highway entrance and exit ramps to accommodate weaving and merging traffic.
weaving distance of at least 1,000 feet per lane between upstream and downstream highway entrance and exit ramps is also suggested by the Caltrans HOV design guidelines.

On the other extreme, the I-15 HOT lanes are accessible only at their endpoints. However, studies are underway to extend the current eight-mile facility by 12 miles north to SR 78 in Escondido to improve overall operation of I-15. This plan calls for a three-lane HOT lane concept with moveable median barriers and access points to and from the freeway at various locations. Similarly, the SR-91 Express Lanes run approximately 10 miles from the SR 91/55 junction in Anaheim to the Orange/Riverside County Line and have no intermediate access points, although adding one is currently under consideration in the OCTA 10-year plan. An additional access point would enable drivers originating from a larger area to enter the lanes, potentially increasing usage. However, the lack of intermediate access points has advantages in that the conflicts and impacts associated with furnishing ingress and egress from the HOT lane are eliminated, making the facility more attractive for long distance trips. As mentioned earlier, the pattern of ingress/egress will also greatly impact the design of the enforcement for the system.

Slip ramp locations should also take into account the operating characteristics of the adjacent freeway lanes and the location of all nearby entrance and exit points upstream and downstream of the buffer/barrier opening. In addition, the buffer and acceleration/deceleration lanes require additional pavement area, increasing cost. Also, because access is limited to certain locations upstream and downstream of interchange ramps, there is the potential for bottleneck formation near access points. In areas of heavy weaving between the priced lanes and interchange ramps, grade-separated access may be desirable.

Typically, the greatest efficiency, safety, and capacity are achieved when conflicting movements are grade separated. Grade separation is usually an effective way of achieving these goals, but it comes at the expense of increased complexity in design and construction, and therefore greater construction, operation, and maintenance costs.

Grade separation provides access to the managed lane while eliminating the weaving and merging movements that conflict with the operations of the freeway lanes. In addition, the ramps themselves provide acceleration and deceleration areas, which allow high-speed merges and also provide some storage distance when the freeway lanes are congested. Grade-separated options include median drop ramps from overpasses or direct freeway-to-freeway connections, such as flyover ramps as shown in Figures 3-7 and 3-8.
3.5 OTHER CONSIDERATIONS FOR IMPLEMENTING VALUE PRICING

In addition to the ten evaluation criteria established for this study, the following activities associated with value pricing are important considerations for both short and long-term projects. In most cases, these factors are better understood after a more comprehensive analysis is performed as part of project planning.

3.5.1 Public Outreach and Marketing

Public understanding is one of the key elements that will influence the success of a value pricing program. If even a single demonstration a value pricing project were to be unsuccessful because of public misconceptions and lack of proper education, it might become more difficult to implement other projects. In addition to public workshops and other outreach tools, a marketing campaign could be developed that would advertise and market the value as well as the logistics of pricing, such as features of the program (hours, costs, and restrictions) and future plans for the program.

The public outreach and marketing program could begin as soon as a project is approved for implementation and should continue throughout the program. A marketing effort is seen as an important step to ensure the success of the project and ultimate long-term implementation of value pricing. Many of the value pricing projects in the United States have incorporated the services of an experienced marketing firm to develop and implement a successful marketing campaign. Overall, the campaign should strive to accomplish the following objectives:

- Identify and target the appropriate markets
- Explain the concept of managed lanes
- Reassure current HOV/tollway users that they will be given top priority once SOV’s are permitted to use the lane
- Provide clear and detailed publications including complete, honest, and straightforward information explaining details, rules, and benefits and emphasizing simplicity, efficiency, and reliability
- Improve user/agency communication by establishing a toll-free hotline, customer service center/storefront office and media kits, editorials, and testimonials
- Make participation in user surveys a condition of the program
- Provide daily traffic reports to local media

Many operational projects, such as I-15, SR-91, and LeeWay were successful because in part they focused on public involvement from the outset. Likewise, the lack of success of some of the studies that did not become operational projects could be attributed in part to not involving the public early on, but focusing only on the technical issues. Based on research of the marketing efforts of these operational projects, there are three key steps to making a variable pricing project successful:

- Define the public opinion through research, public preference surveys, focus groups, and finding out what the decision makers are concerned about. Laying this groundwork is vital.
- Build local support by extending the outreach effort beyond the DOT and other agencies. Local support should include elected officials, community and opinion leaders, and the media. It is important to frame the project’s message before the opponents do and for the project to be aligned with the public’s needs.
- Find a champion or group of champions to publicly support the project. It is important for all levels to “buy into” the project because it is difficult for elected leaders to make themselves vulnerable unless others are on board. Nearly all successful pricing projects have a project champion.

With SR-91, for example, the marketing team used many one-on-one communication strategies, as well as some for small groups, all aimed at relationship building by focusing on the benefits and costs to the community. Understanding the public’s motivations is the key to developing the “brand,” position, and message. The message that was marketed for SR-91 was a “Fast, Safe, Reliable Commute” because that was what the public indicated it was looking for. Recent surveys
of SR-91 users still back this up: most of them still respond that their commute is faster, safer, and more reliable.

### 3.5.2 Collateral Actions

Collateral actions are those programs or projects established to support the pricing program by using revenues generated by the managed lanes or tollways. There are two categories of collateral actions: 1) operations and maintenance and 2) associated new and supporting projects. The ability for revenues collected from the value pricing project to cover operations and maintenance is one way to measure a facility’s financial viability, as well as its public acceptance. Operation and maintenance costs generally include facilities and staff needed to operate and maintain the system, including electronic toll collection and enforcement programs.

Associated new projects could include services that enhance the effectiveness of the managed lanes, such as alternative work hour programs, transit system improvements, or other transportation demand management (TDM) measures. For example, part of the revenues generated by I-15 FasTrak project fund a new bus route which provides an alternate transportation method in the I-15 corridor. These services can further decrease the demand on the facility, and can also increase mobility by providing additional choices to travelers in the corridor. Value pricing strategies, along with TDM measures created through resulting revenues, should be evaluated as part of a corridor-wide transportation improvement strategy.

A concept called “FAIR” (Fast and Intertwined Regular) lanes attempts to overcome public resistance and address the equity issues has been the subject of debate throughout the United States. Under this concept, congested freeways are separated into fast lanes and regular lanes. The fast lanes are electronically tolled, with tolls set dynamically in real time to ensure that traffic moves at the maximum allowable free-flow speed. Users of the regular lanes still face congested conditions but are eligible to receive credits if their vehicles have electronic toll tags. Accumulated credits can be used as toll payments on days they choose to use the fast lanes, or as payment for transit.

### 3.5.3 Monitoring Program

Most value pricing programs include some form of monitoring program to evaluate its success in reducing congestion and travel times. Some methods of collecting user data include conducting public acceptance surveys, determining levels of usage and average time savings, and evaluation of the violation rate and enforcement issues. This monitoring is especially important for a region’s first or first few demonstration projects. Data can be used to measure and market as well as quell fears of equity and fairness concerns.