Section 10: Peer Cities

Transportation Lessons From Peer Cities

This chapter outlines the transportation lessons to be learned from the following Midwestern metropolitan areas of comparable size and geography to the 5-County region:

- Dallas-Fort Worth-Arlington, Texas
- Denver-Aurora, Colorado
- Minneapolis- St. Paul, Minnesota
- St. Louis, MO-IL

The section begins with a snap-shot comparison of each peer city including data on population, land area, and transportation system characteristics in Figure 10-1. Analysis of this information provides context on where the 5-County region stands compared to the selected peer cities in Table 10-1. The second section includes a matrix of the transportation toolbox strategies implemented in the comparable metros. A follow-up narrative provides additional insights and lessons learned from specific case studies into successful and unsuccessful implementation of the transportation toolbox strategies.

PEER CITY CHARACTERISTICS

The following set of figures provides a snap-shot comparison of the existing population and transportation characteristics from the selected peer cities. The data presented here was primarily drawn from the *2011 Urban Mobility Report* [1] produced by the Texas Transportation Institute. This data is scaled to the metropolitan level, so Kansas City includes both the Kansas and Missouri sides of the state line rather than specifically the 5-County region. The figures presented here can be used to identify broad trends and draw comparative conclusions.

Conclusions drawn from analysis of these figures will be provided in the next section. For example, the population and land area figures combine to give a rough approximation of the relative population densities of each metropolitan area. Population density is a good indicator of land-use patterns, which can be particularly relevant when evaluating opportunities for efficient public transportation. Also, more dense land-use patterns can shorten the distances to common destinations, such as shops and schools making walking and biking more attractive options. Conversely, low density land-use patterns with abundant roads can proliferate automobile use and limit non-motorized options.

Population Density

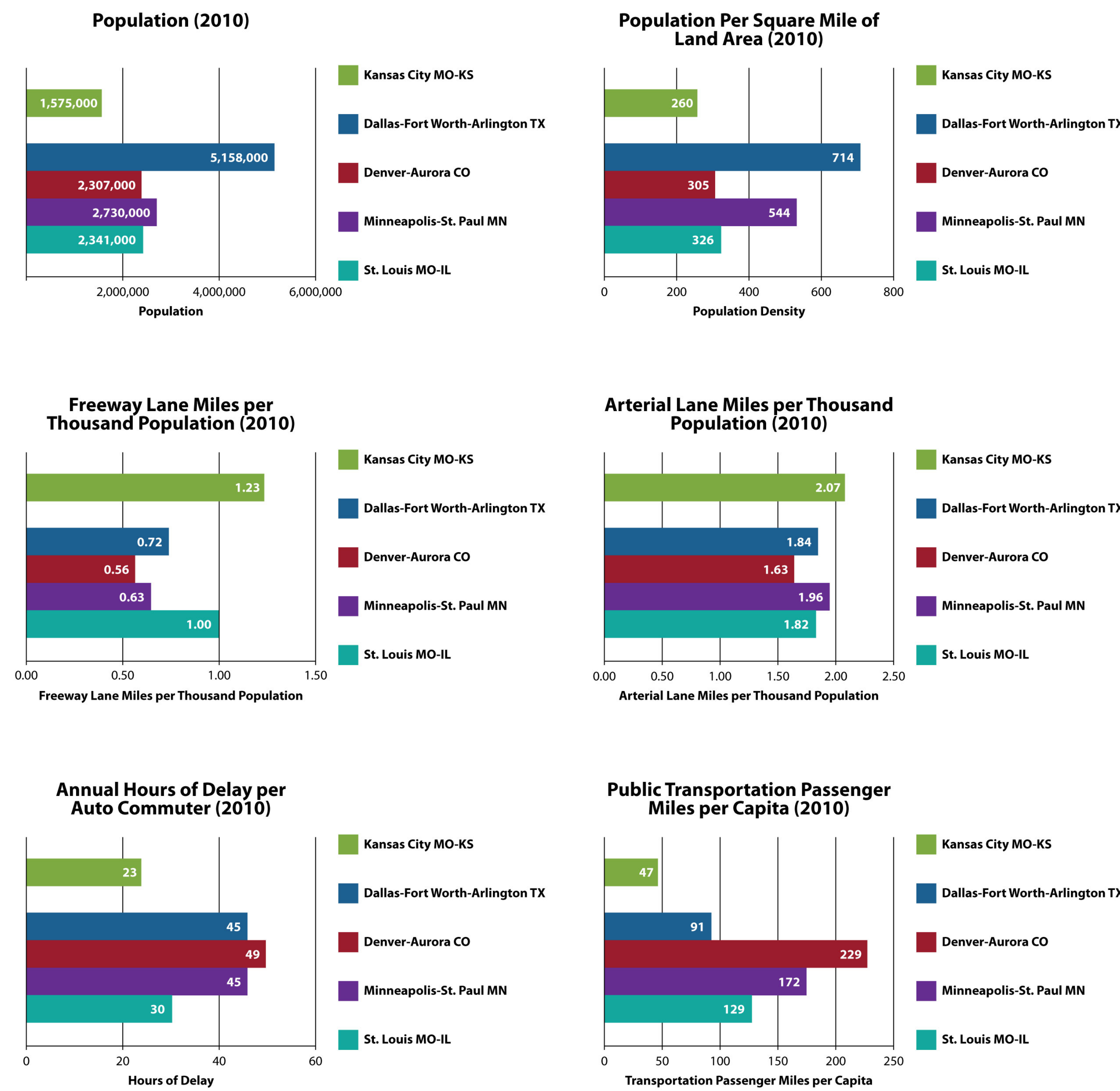
It is evident that the Kansas City metropolitan area is comparatively low-density with only around 260 residents per square (res/sq.) mile versus 544 res/sq. mile in Minneapolis-St. Paul and nearly 714 res/sq. mile in Dallas. As mentioned previously, there is a direct relationship between relative density, land-use patterns and the attractiveness of alternative transportation options.

Existing Roadway Capacity

In order to meet the transportation needs of the Kansas City region's widespread, low-density land-use patterns, an extensive network of roadways has been built. The Kansas City region has more than double the number of freeway miles per capita found in Denver and Minneapolis-St.Paul, almost double the number in Dallas and 25 percent more than in St. Louis. The Kansas City region also exceeds all other peer cities in arterial lane miles per capita. Our roadway capacity is very high and

1 *2011 Annual Urban Mobility Report*. Texas A&M Transportation Institute. Accessed October 1, 2012: http://mobility.tamu.edu/ums/

Figure 10-1: Peer City Comparison of Population and Transportation Characteristics



Source: Lomax, Tim and Schrank, David. (2010) Urban Mobility Report. Texas A&M Transportation Institute, Strategic Solutions Center
Note: Data represented in figure above is from the Kansas Metro area and does not cover the entire 5-County region.

the associated maintenance costs will last in perpetuity. This gives credence to the idea that the region can no longer afford to rely on adding lanes as the sole solution to its transportation issues.

Commuter Delays

With the abundant roadways in the Kansas City region, the figures presented here indicate that driver delay and congestion are relatively minor when compared to our peer cities. The average auto commuter in the region spends about 23 hours each year delayed by congestion or incidents, whereas commuters in Denver, Dallas and Minneapolis will spend upwards of 45 hours delayed each year. To address this issue, our peer cities have implemented many of the transportation demand and system management strategies.

Public Transportation

One strategy where the Kansas City region appears to falling behind is public transit. The Kansas City region was found to have roughly half the annual ridership found in Dallas and one quarter of the annual ridership of Denver. It is apparent that these regions have implemented an aggressive public transportation strategy out of necessity and commuters are drawn to this alternative to avoid widespread congestion. There is an opportunity for growth in transit ridership in the Kansas City region. The next section will present the transportation system management, demand management and capacity strategies that have been implemented in our peer cities.

TRANSPORTATION SYSTEM MANAGEMENT LESSONS FROM PEER CITIES

This set of strategies emphasizes the management and operation of existing transportation facilities. Transportation management strategies are typically low cost when compared with capacity projects. The objective of these strategies is to provide improved traffic and transit operation, which results in moderate improvements in travel mobility and reduced vehicle emissions. The following case examples from peer cities provide an overview of successful and unsuccessful attempts at implementing these strategies with an emphasis on lessons learned.

Table 10-1: Implementation of Transportation Strategies Among Peer Cities

Transportation System Management (TSM) Strategies

Strategy	Kansas City	Dallas	Denver	Minneapolis	St. Louis
Signal Timing/Optimization	★	★	✓	✓	✓
Freeway and Arterial Bottleneck Removal		★	✓	✓	
Ramp Metering	✓	★	✓	★	✓
Access Management	✓	✓	✓	✓	✓
Variable Speed Limits				★	★
ITS Technology	✓	✓	✓	✓	✓
Traffic Incident Management	✓	✓	✓	✓	✓
Travel Information	✓	✓	✓	✓	★
Transportation Demand Management (TDM) Strategies					
Ridesharing	✓	★	✓	✓	✓
Public Transportation	★	✓	★	✓	✓
Bicycle and Pedestrian Travel	✓	✓	✓	✓	★
Alternate Work Hours	✓	✓	✓	✓	✓
Telework	✓	✓	✓	✓	✓
Land Use Management	✓	✓	✓	✓	✓
Capacity Strategies					
Add Travel Lanes	✓	✓	✓	✓	✓
Modify or Add Interchanges	✓	✓	★	✓	✓
Construct New Highways or Arterials	✓	✓	✓	✓	✓
Intersection Capacity Improvements	★	✓	✓	✓	✓
Transit Capacity	✓	✓	★	✓	✓
HOV and Managed Lanes		✓	★	★	
Bicycle and Pedestrian Facilities	✓	✓	✓	✓	✓
Freight Rail Track Improvements	✓	✓	✓	✓	✓
Congestion Pricing - High Occupancy Toll Lanes		✓	✓	★	

✓ - Strategies currently implemented ; ★ - Lesson learned case study example described in following section

Traffic signal timing and optimization is a technique for upgrading traffic signal equipment and signal timing to coordinate traffic lights along arterial streets, in order to expedite smoother traffic flows. A good example comes from the Dallas area, where six local governments were operating 224 uncoordinated traffic signals along a single transportation corridor. After major negotiations, the jurisdictions agreed to treat the whole corridor as a unified system and to operate all the signals under one control plan. An evaluator of the project described the results along this corridor:

> *"Travel time in the corridor has been reduced by six percent, vehicle delay time has been reduced by 34 percent, and stops have been reduced by 43 percent. The estimated reduction in fuel consumption and emissions is approximately five percent, and the estimated annual benefits are $26 million at a cost of $4 million. I think one of the real benefits of the project is that it showed that Dallas County could undertake a multi-jurisdictional effort and that the County and the six cities with differing goals and priorities could work cooperatively."* [2]

The Dallas County example is similar to efforts already under way in the Kansas City metropolitan area with the Mid-America Regional Council's Operation Green Light initiative. The goal of Operation Green Light is to cooperate across jurisdictions to improve the coordination of traffic signals and incident response on major routes throughout the Kansas City area on both sides of the state line. A lesson to be drawn from both examples is that coordination is paramount when planning or making system changes along corridors passing through multiple jurisdictions.

Freeway bottleneck removal is any minor, relatively low-cost roadway geometric or traffic control improvement that can reduce localized congestion, and increase safety through fewer collisions. Common locations of bottlenecks include places where the number of lanes decrease, at ramps and interchanges, or where there are roadway alignment changes.[3]

2 Downs, Anthony. "Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion". Washington D.C.: Brookings Institution Press, 2004. Print.
3 Bottleneck Removal: Executive Summary. Texas A&M Transportation Institute. Accessed October 7, 2012: http://mobility.tamu.edu/mip/strategies.php

A successful case study comes from the Dallas metro. A significant bottleneck was occurring along a stretch of State Highway 360 (SH 360), a six-lane freeway. Traffic queued badly at the point of an interchange along SH 360, but rather than undertaking a massive project to add travel lanes, the Texas DOT (TxDOT) decided to extend an auxiliary lane on the outside shoulder between two particularly troubling on/off-ramps. Despite some safety concerns, TxDOT implemented a 700-foot auxiliary lane on a trial basis at a cost of only $150,000. This improvement was completed in two months, and later performance measurement found that speeds through the bottleneck improved significantly and volumes increased as well. The overall delay benefits, i.e. decreased cost associated with all commuter delay, were calculated as $200,000 per year and an injury crash reduction of 76 percent was found in this section after the auxiliary lane was added.[4] This case shows that a relatively inexpensive, localized fix can have marked improvements of overall freeway traffic operations.

Ramp-metering is the use of traffic signals on a ramp to control the rate at which vehicles enter a freeway facility. By controlling the rate at which vehicles are allowed to enter a freeway, the flow of traffic onto the freeway facility becomes more consistent, smoothing the flow of traffic on the mainline and allowing more efficient use of existing freeway capacity.

In the Minneapolis area, over 400 ramp meters are currently installed on 15 different freeway facilities. At the urging of the Minnesota State Legislature and local opponents to the technology, the Minnesota Department of Transportation (MnDOT) shut down this extensive system of ramp metering on Twin Cities freeways for a month and a half in 2010. A study was carried out to compare the traffic conditions with and without ramp metering along four major freeway corridors. Turning off the region's ramp meters resulted in the following:

- Freeway volume fell by 9 percent, and peak period throughput (VMT) fell 14 percent.

4 Cooner, Scott, et al. Freeway Bottleneck Removals: Workshop Enhancement and Technology Transfer. University Transportation Center for Mobility, Texas Transportation Institute. Accessed October 15, 2012: http://utcm.tamu.edu/publications/final_reports/Walters-Cooner_08-37-16.pdf

- Freeway travel times became 22 percent longer. This time loss more than offset the elimination of delays at the ramp meters when they were operating.
- Freeway speeds declined by 14 percent.
- There was a sizable net annual increase in auto emissions.
- System-wide crashes increased 26 percent.

As a result of this study, MnDOT concluded that ramp metering was effective for controlling system demand and therefore restored the use of ramp meters throughout the Twin Cities freeway system.

On the other hand, Dallas, Austin and San Antonio removed ramp meters from freeways after unsuccessful initial introduction of the technology. In Dallas, there was strong citizen pushback as ramp meters began to back-up traffic onto feeder arterials, thereby transferring traffic congestion from the freeways onto the local network. In retrospect, the traffic back-up issue in Dallas may have had more to do with roadway design than the effectiveness of ramp metering technology:

> *"If the roadway's entry ramps are very long (as in Minneapolis and St. Paul freeways), the queues resulting from such congestion can often be confined to the ramps themselves. But if those ramps are short (as in Dallas and Houston freeways), such queues may spill congestion out onto local streets or arterials near the main roadway."*[5]

The lesson to be learned is that ramp-metering can be successful if implementation takes into account roadway design and other factors, such as public education, that were overlooked in Dallas.

Variable speed limits are a system management approach used to moderate freeway traffic flow in response to traffic congestion, weather or construction. The speed limit is varied based on downstream conditions that drivers are heading towards, not necessarily conditions at the site where speed limits are changed.

5 Downs, Anthony. "Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion". Washington D.C.: Brookings Institution Press, 2004. Print.

In 2008, the Missouri Department of Transportation implemented this strategy in St. Louis along I-270 and I-255. After a study of the system in 2010, it was determined that enforcement of the variable speed limits had been minimal and many people were angry or confused about the potential for enforcement.[6] There was some observed reduction in congestion and crashes, but in 2011 the decision was made to change the 'variable speed limits' to 'advisory speed limits'. The advisory speed is intended to advise motorists of the potential for slow down from upcoming congestion, work zone lane closures, weather conditions or stopped traffic. The change to 'advisory speeds' has removed the threat of enforcement although the underlying purpose and mechanics of the technology remain the same.

In Minnesota, variable speed limits were initially used to facilitate signing and enforcement of work zone speed limits on high volume urban freeways. In practice, the variable speed signs display a 65 mph speed limit without construction workers and a 45 mph speed limit with construction workers. The variable speed limits are enforceable, a key component of their effectiveness. More recently, Minnesota Department of Transportation has begun to experiment with variable speed limits in combination with high occupancy toll (HOT) and high occupancy vehicle (HOV) lane implementation to reduce traffic congestion. The key lesson to be learned here is that the coordination between variable speed limits and enforcement is vital to altering driver behavior.

Travel information is a strategy that involves providing information to users of the transportation system about congestion or other problems on their typical route which enables them to modify their trip enroute. A good example of travel information implementation comes from the St. Louis metro area where the Illinois and Missouri Departments of Transportation and the East-West Gateway Council of Governments worked together to develop a web application tool (stl-traffic.org) that provide real-

6 Missouri Department of Transportation. Variable Advisory Speeds on I-270 St. Louis. Accessed October 15, 2012: http://www.modot.org/stlouis/links/VariableSpeedLimits.htm

time information on roadway speeds, incidents, and road work lane closures. In the Kansas City metro a similar live traffic technology (KC Scout) has been successfully implemented on a portion of the freeway network. The KC Scout technology also relied on a partnership between the DOT's on both sides of the state line.

TRANSPORTATION DEMAND MANAGEMENT LESSONS FROM PEER CITIES

This set of strategies addresses transportation needs by reducing the number of trips taken during peak travel periods. The strategies address the "desired outcome" to provide travel options, particularly for persons without access to private vehicles. Many of these strategies, such as ridesharing, public transportation, bicycling and walking, are closely tied to and somewhat dependent on an area's population density. The following case examples from peer cities provide an overview of successful and unsuccessful attempts at implementing these strategies with an emphasis on lessons learned.

Ridesharing consists of an organized system or approach for providing commuters with opportunities to carpool or vanpool. This is one way for commuters to help improve traffic congestion by reducing the number of vehicles that travel on roadways from driving alone to work. The Mid-America Regional Council RideShare Program is a good example of how this type of program has been implemented in the 5-County region. Also, it is becoming increasingly common for private companies and other organizations in the Kansas City metro to encourage employees to carpool to work.

Another example of a regionally implemented rideshare program comes from the Dallas metropolitan area. *Try Parking It* is a two-part program for reducing the number of vehicles on the road and tracking the savings that result from fewer vehicles. This tool can be used to locate carpool or vanpool matches within the region. It also tracks contributions to clean air and congestion reduction and provides estimates of miles saved and trips reduced each time the user submits their commute information. This extra step of encouragement is a unique feature of the Dallas regional ridesharing program.

Fixed route ***Public transportation*** as a demand management strategy depends on end-to-end accessibility to destinations and transit supportive land-use patterns at transit stop locations. Fixed guide-way systems can be constructed to provide exclusive transit right-of-way. It may include track improvements for commuter rail or exclusive transit lanes to operate BRT service. In urban environments with high transit ridership, light rail transit, commuter rail or streetcar lines have been constructed.

In Denver, the Regional Transportation District (RTD) was organized in 1969 as a regional authority for operating public transit services in eight of the twelve counties of the metropolitan area. Currently, the RTD operates local, limited, express and regional bus routes, along with 5 light rail lines with 36 stations and 40 miles of track.[7] This regional approach to transit can be seen as a success. However, it has taken many years of political will and public investment for this system to come to fruition.

In the Twin Cities metropolitan area, an extensive network of **park-and-ride facilities** has made transit a more convenient transportation option for suburban commuters. As of October 2010 the regional system consisted of 150 active facilities throughout the metropolitan area: 111 park-and-ride and 39 park-and-pool facilities[8]. These facilities are serviced by light rail and bus routes from various transportation agencies. A recent study of system performance showed nearly 18,000 system-wide users in 2010.

In Kansas City, a more small-scale **'bus on shoulder'** strategy has been implemented along an eight mile stretch of I-35, from 95th street to Lamar Avenue in Johnson County. This strategy is oriented toward serving longer distance commuting trips where buses can bypass freeway congestion by traveling along the freeway shoulder. Implementation of this strategy required some infrastructure investment and minor highway improvements including guardrails and pavement markings to make the freeway shoulder suitable and safe for bus service. This strategy can be seen as a localized approach compared to the regional approach taken in Denver.

Bicycle and Pedestrian travel as a demand management strategy depends on the availability of safe and efficient facilities and relatively dense land-use patterns to support bicycling and walking as a viable transportation option. Bicycle and pedestrian planning at the local and regional levels is often a key first step toward making the modes viable.

A good example of bicycle planning comes from St. Louis, where a consortium of governments and organizations came together to complete the *Gateway Bike Plan* which calls for a regional system of on-street bikeways in the greater St. Louis region. This regional system of facilities is intended to connect key destinations such as parks, trails and greenways, colleges and universities, transit and transfer centers, employment centers, and town centers. A regional authority was formed to help local agencies implement the plan by providing technical assistance and partnerships for funding projects. It has been important for the jurisdictions of the St. Louis region to cooperate with one another to provide a connected system of bikeways, as a disjointed network offers little value as a viable transportation option.

CAPACITY LESSONS FROM PEER CITIES

This set of strategies refers to traditional transportation supply approaches such as adding travel lanes, modifying interchanges to accommodate higher traffic volumes, constructing new highways or urban arterials, or major capacity increases for public transportation. While capacity projects typically address traffic congestion in the short term, adding capacity can support a long-term cycle of inducing new demand, which causes congestion to return. The following case examples from peer cities provide lessons learned from the implementation of capacity strategies that go beyond simply building additional lane miles.

Modifying or adding interchanges includes adding capacity to existing interchanges by modifying the ramp configuration, widening ramps, or adding collector/distributer roads. Major system interchange reconstruction projects can often be costly, upwards of $400 million or more.

A good example comes from Denver's Transportation Expansion project (T-REX), which was a **combination interchange modification and *transit capacity*** project that provides an innovative example of capacity strategy to alleviate the traffic congestion issues between two primary regional employment centers. T-REX was a $1.67 billion, combined freeway reconstruction and light-rail extension design-build project within shared right-of-way that involved the coordination of four transportation agencies – the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Colorado Department of Transportation (CDOT), and Denver's Regional Transportation District (RTD).[9] In the United States, T-REX is widely considered to be the largest and most innovative project of its kind[10]. The lesson to be learned here is that when a specific project or system bottleneck is of utmost importance to the economic viability of a region, then large scale infrastructure projects can be warranted. T-Rex proves that a capacity project can be constructed in a multimodal way in order to both reduce congestion and add to transportation choice.

Interchange capacity improvement is a strategy that involves adding turn lanes or constructing roundabout intersections in order to improve travel times by reducing vehicle delay at an intersection. A good example project is found on K-7 at Johnson Drive in Shawnee (pictured in Figure 10-2), where a signalized intersection was replaced by a modified diamond interchange with a large, multi-lane roundabout where the ramps intersect Johnson Drive. The project aimed to raise the profile of the intersection as a retail center and to improve K-7 to freeway standards by providing a four-lane divided freeway.

7 Facts and Figures. Regional Transportation District- Denver Reports. Accessed on October 13, 2012: http://www.rtd-denver.com/Reports.shtml

8 2010 Annual Regional Park-and-Ride System Survey Report. Metro Transit Facilities Planning. January 21, 2011 Accessed January 31, 2013.

9 Moler, Steve. (2001). Colossal Partnership: Denver's $1.67 Billion T-REX project. FHWA Public Roads magazine. Sept/Oct 2001, Vol. 65, No. 2. http://www.fhwa.dot.gov/publications/publicroads/01septoct/trex.cfm
10 Moler, Steve. (Sept/Oct 2001). Colossal Partnership: Denver's $1.67 Billion T-Rex Project. FHWA Public Roads Magazine. Volume 65, no. 2.

Figure 10-2: K-7 & Johnson Drive, Shawnee, KS (source: City of Shawnee)

High-occupancy vehicle (HOV) lanes are exclusive roadways or lanes designated for high-occupancy vehicles such as buses, vanpools, and carpools. The facilities may operate as HOV lanes full time or only during peak periods. Traditional high-occupancy vehicle (HOV) lanes require passenger vehicles to have a minimum number of passengers, while ***high-occupancy toll (HOT) lanes*** are HOV lanes that allow vehicles that do not meet occupancy requirements to pay a toll to use the lane. HOT lanes (pictured in Figure 10-3) are considered to encourage carpooling and other transit alternatives while offering vehicles that do not meet occupancy requirements another option. Revenues generated through fees paid by single-occupant vehicles on HOT lanes can be used for transit and ridesharing services to add further capacity along the corridor.

Figure 10-3: I-394 MnPass HOT lanes (source: FHWA)

A good example of HOV and lane-pricing implementation comes from the Twin Cities metro, where the MnPASS tolling technology has been implemented on a total of 25-miles along two primary freeway corridors. On I-394, MnPASS tolling lanes saw a 33 percent increase in the number of vehicles since opening in 2005 without degrading the lane's use by HOV and transit. Furthermore, travel speeds were found to average from 50 to 55 mph for 95 percent of the time that tolling is activated in the lanes.[11] One unique feature of the MnPASS HOT system is the Price Dynamic Shoulder Lane (PDSL) capability, which equips the freeway shoulder to operate as a MnPASS lane during peak periods to maximize capacity. In practice, electronic signs alert drivers if the PDSL is open or closed and provide pricing details.

A key consideration in implementing HOT lanes is evaluating public perception and response to system changes. In Denver, the operating HOT lanes have been found to have support from both users and non-users. While most commuters do not use the HOT lane every day, research has shown that travelers like having the HOT lane as a travel option. On I-25 in Denver (pictured in Figure 10-4), 62 percent of survey respondents say they choose the Express Lane (HOT/HOV) option because it saves time. There are some equity concerns with HOT lanes. Some argue that road-pricing can put an undue burden on lower-income drivers, or be advantageous to only those drivers who can afford to pay the toll. It is important to evaluate the potential social consequences of implementing this strategy.

11 HOT Lanes, Cool Facts. Federal Highway Administration Fact Sheet. FHWA-HOP-12-027. Accessed Oct. 2012: http://www.ops.fhwa.dot.gov/publications/fhwahop12031/fhwahop12027/fhwahop12027.pdf

Figure 10-4: I-25 HOT and HOV express lanes, Denver (source: FHWA)