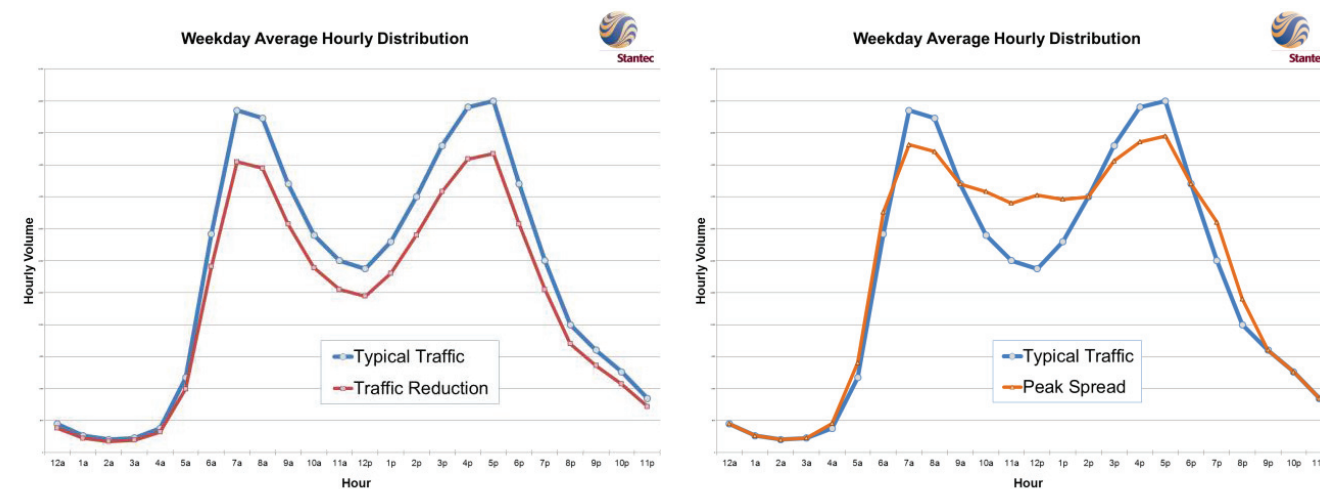


5.0 Travel Demand Management Strategies

Travel Demand Management (TDM) seeks to maximize the efficiency of existing transportation facilities by reducing overall (and peak) traffic demands or by moving peak travel to other times of the day. Exhibit 5-1 illustrates the two potential impacts of TDM strategies on hourly traffic volumes. This reduction of peak travel demand in turn lessens the need to increase capacity and could improve environmental impacts and promote better health. TDM includes consideration of both person-trips and freight-trips.

This chapter reviews several TDM programs that are considered reasonable and viable for the I-526 study corridor and the Charleston area as a whole, including several existing TDM programs. To determine the potential impacts of TDM on the I-526 corridor, a literature review of case studies for TDM efforts around North America was conducted and two analysis packages were utilized.

Exhibit 5-1: Potential TDM Impacts on Hourly Traffic Volumes



5.1 TDM Strategies

For the purposes of this analysis, a review of the potential TDM strategies was conducted and the strategies were separated into four categories that contain similar TDM methods, consisting of Commuter-Based, Employer-Based, Operations, and Long-Term Planning. This review includes TDM strategy suggestions from the Steering Committee, Stakeholder Committee, and from the Public Information Meeting.

The categories and strategies considered for the I-526 Corridor Analysis are summarized herein, including a summary of select existing TDM programs that are currently in operation in the Charleston area.

Commuter-Based

Commuter-based TDM strategies are focused on the travel of employees to/from work.

- **Carpools** involve the sharing of one's own vehicle with one or more employees for a commute. The City of North Charleston, Trident Technical College, and Medical University of South Carolina (MUSC) currently utilizes and encourages carpools.
- **Vanpools** involve employees commuting together in a van, which is typically subsidized by a third-party, possibly the employer. The maintenance costs of the van could also be divided evenly between the riders.
- **Ridesharing Matching** generally consists of a web-based interface tool to help commuters find other commuters that have similar routes to/from work to carpool or vanpool. BCDCOG currently operates the Trident Rideshare program (tridentrideshare.com) for the Charleston area, which includes the capability of developing specific rideshare sites for each individual employers and schools.
- **Guaranteed/Emergency Ride Home** is an occasional subsidized taxi ride home for commuters who use alternative modes of travel including carpools, vanpools, and transit. BCDCOG offers Emergency Ride Home services as part of the Trident Rideshare program.
- **Park & Ride** lots provide convenient and central areas for commuters to meet or gain access to transit. CARTA and TriCounty have numerous Park & Ride locations around the Charleston area, including the Rivers Avenue Park & Ride "Super Stop" at the K-mart Super Center at 8571 Rivers Avenue in North Charleston.
- **Preferred Parking** spaces are an incentive that can be provided by employers for carpool and/or vanpool vehicles. These spaces are typically located near an entrance to the workplace to reduce the walk times to/from the parking lot. The City of North Charleston and MUSC currently provide preferential parking for carpools.
- **Bike/Walk** options promote walkability with sidewalk and bike lane connectivity so that employees can commute to work by bicycle or walking. Other bike/walk strategies include providing shower/changing facilities at the workplace. The South Carolina Safe Routes to Schools has provided for sidewalk connectivity to numerous local schools in the Charleston area.
- **Car Sharing (Zip Cars)** refers to short-term vehicle rentals, which typically charge the users by the hour and/or mileage driven. Due to the fact that car sharing programs are typically implemented by

private companies and the lack of centralized population in the Charleston area, this strategy was not considered in detail for this analysis.

- **Shuttles** use small buses or vans to make short trips along fixed routes that typically connect major destinations. CARTA, TriCounty Link and MUSC currently utilize shuttles in their operations.

Employer-Based

Employer-based TDM strategies are focused on the hours and operations of employees in the workplace.

- **Work Flextime** allows employees flexibility in their daily work schedules, which could be utilized to avoid travel congestion during the peak hours. Roper St. Francis Hospital utilizes work flextime for certain employees.
- **Staggered Shifts** consists of spacing out work shifts to minimize the impact of employees arriving and departing the workplace at one time. Boeing and Roper St. Francis Hospital utilize staggered shifts in their workplace operations.
- **Compressed Work Week** enables employees to accomplish the same work in a fewer number of days, with options of four 10-hour days in one week or nine 9-hour days for two weeks with every other Friday off (9/80). SCDOT and the City of North Charleston offer compressed work weeks for certain employees.
- **Telecommuting** allows employees to work from home utilizing telecommunications as a substitute for physically traveling to a central workplace, and can be used on a full-time or part-time basis. The Federal Highway Administration (FHWA) utilizes telecommuting for their employees.
- **Transit Pass Incentives** consist of employer-subsidized or tax benefits to encourage employees to utilized transit for travel to/from work.
- **Financial Incentives** include other incentives to encourage off-peak travel, potentially including tax benefits. Tanger Outlet Mall has used direct mail gift certificates worth \$25 which can only be redeemed during the midday hours.
- **Parking Management/Parking Cash-Out** involves using incentives or disincentives for commuters who park in areas where parking is an issue. Strategies can include offering employees incentives to not park a vehicle at the workplace or charging a cost for parking a vehicle at the workplace. Due to the availability of adequate parking near the study area, this strategy was not considered in detail for this analysis.

Operations

Operations-based TDM strategies are focused on implementing incentives or disincentives for peak-hour travel along a specific roadway or corridor.

- **Managed Lanes** include High-Occupancy Vehicle (HOV), High-Occupancy Toll (HOT), and Reversible-Lane strategies that restrict travel lanes during peak periods to certain vehicles types, which can give transit and rideshare vehicles priority over other traffic in the general-purpose lanes. This strategy is discussed further in the Traffic Operations chapter of this report.
- **Congestion Pricing** consists of dynamic tolls tied to the levels of existing congestion along a roadway used to discourage peak-period vehicular travel. This strategy is discussed further with Managed Lanes in the Traffic Operations section of this report.
- **Signal Priority Systems** consist of signalized arterial networks that give transit, or possibly rideshare vehicles, priority over other traffic at signalized intersections. Due to the lack of demand in the Charleston area, further consideration of this strategy was not considered in this analysis.
- **Fuel Taxes/Mileage Taxes** consist of increasing fuel taxes or replacing existing registration fees by a variable tax which is based on the distance a vehicle travels in a given year to encourage less travel and reduce traffic congestion. Due to the fact that these new taxes would need to be driven by the South Carolina Legislature, the potential impacts were not studied in detail for this analysis.

Long-Term Planning

Long-Term Planning TDM strategies are generally focused on the management of future growth to incorporate transportation considerations as significant aspect in land use planning.

- **Access Management** refers to providing reasonable ingress and egress to parcels while simultaneously preserving the flow and safety of traffic along the surrounding roadway network. This strategy is discussed further in the Traffic Operations section of this report.
- **Integrated Corridor Management** aims to proactively maximize the mobility of multiple adjacent transportation networks within a corridor (freeway, transit, rail, arterials) during peak travel times by connecting the operations of each of the networks and providing real-time traveler information. Parts of Integrated Corridor Management are further discussed in the Active Traffic Management section of the Traffic Operations chapter.
- **Land Use Planning** includes smart growth and locating common destinations close together to increase accessibility and support transportation diversity. Joint Base Charleston is an example of

providing more on-base living options to connect housing and employment. Due to the fact that the study corridor is significantly built out, land use planning options were not studied in detail in this analysis.

- **Transit-Orientated Development** consists of encouraging development around transit stations as a catalyst to create more livable communities. Transit-Oriented development is discussed in more detail in the Modal Strategies chapter.
- **Marketing of TDM** provides TDM information to commuters and can include encouragement programs to help promote TDM. BCDCOG and CARTA have developed marketing campaigns promoting the Trident Rideshare program and area transit respectively.

Finally, a suggestion of “do nothing” was noted during a Stakeholder Meeting, reasoning that travel habits will adjust to congestion based upon human behavior. This strategy was indirectly considered in the no build baseline analysis scenarios.

5.2 Employer Survey

As part of the I-526 Corridor Analysis, a questionnaire was developed to determine, in part, the extent of existing TDM and transit programs that area employers have implemented for their employees. The questionnaire was distributed to project stakeholders and was developed to complement a similar survey developed by CARTA and the Charleston County Economic Development Office.

The surveys were developed to assess how each company’s employees currently get to work, existing TDM initiatives (including carpool and vanpool), the company’s interest in providing incentives for transit use, and any impediments that may discourage TDM and transit use. A total of 14 businesses representing over 16,300 employees provided responses to the questionnaires.

The results of the responses received indicated the following:

- Approximately 97% of employees drive alone to work, with the remaining employees being dropped off, using transit, using carpools, or bike or walk to work.
- Seven employers indicated that employees would be willing to use transit if it was available, and three employers indicated they would consider providing incentives for employees to use transit.
- Two employers currently encourage carpool by providing preferential parking spaces and use of BCD-COG’s Trident Rideshare matching program.

- All employers indicated that they currently have adequate existing parking, with two employers expressing potential parking issues with future growth.

Further discussion of the questionnaire results is provided in the Modal Strategies chapter.

5.3 Case Study Review

To help determine the effectiveness of TDM programs in reducing peak-hour traffic, a review of available case studies was undertaken. A total of 64 case studies were considered from multiple published reports, including:

- *Lloyd District TMA Annual Reports*, Portland, Oregon (2005 through 2009)
- *Mitigating Traffic Congestion The Role of Demand-Side Strategies*
- *Impact of Employer-Based Programs on Transportation System Performance*
- *Vanpool Programs: Implementing Commuter Benefits Under the Commuter Choice Leadership Initiative*
- *Success Stories Examples of TDM Programs that Work*
- *TDM Case Studies and Commuter Testimonials*
- *TDM Review* (Spring 2010 and Summer 2011)
- *Report on Canadian Alternative Transportation Programs*

The majority of the case studies looked at single employer-specific TDM programs, with the employer programs typically offering multiple TDM strategies within their overall programs for their employees. The case studies considered TDM programs from 1980 to 2009, with the bulk of the programs occurring in the 1990s and 2000s. It should be noted that, approximately 66% of the case studies incorporated some level of transit pass incentives, and a number of the case studies considered TDM programs that were implemented in the State of Washington as part of a Commuter Trip Reduction law that was passed in 1991 in part to reduce single-occupancy vehicle travel.

The average length of the before and after comparisons in the TDM programs reviewed in the case studies was seven years, and the program costs ranged from \$4,000 to \$1,600,000. The size of the employers in the case studies ranged from 100 to 10,000 employees, with an overall cost per employee for the TDM programs typically in a range of \$40 to \$60 per employee. Participation rates of the programs ranged between 12% and 40% of the total number of employees, with an average participation rate of approximately 24%.

The results of the TDM programs of the case study review are summarized in Table 5-1, and indicate increases of the non-drive alone mode splits from less than 1% to over 16%, with an overall reduction of drive alone trips of approximately 13%. It should be noted that there was minimal differentiation between Work Flextime and Staggered Work Hours, and transit pass incentives and financial incentives in the case studies.

Table 5-1: Summary of the TDM Case Study Review

TDM STRATEGY	INCREASE IN MODE SPLIT	NUMBER OF STUDIES
Carpool	5.5%	16
Vanpool	1.0%	1
Transit	16.2%	25
Telecommuting	2.1%	6
Compressed Work Week	0.5%	6
Work Flex Time/Staggered Work Hours	5.0%	1
Bike	8.6%	15
Walk	4.9%	10

Based upon the strategies that were considered in the majority of the TDM programs reviewed in the case study data, it was determined that there are 10 potential TDM strategies that would be appropriate for the I-526 study area. The TDM strategies considered in this analysis are summarized in Table 5-2.

Table 5-2: TDM Strategies

STRATEGY NUMBER	TDM STRATEGY
TDM1	CARPOOL/RIDESHARE MATCHING
TDM2	VANPOOL
TDM3	TRANSIT PASS INCENTIVES
TDM4	FINANCIAL INCENTIVES
TDM5	TELECOMMUTING
TDM6	COMPRESSED WORK WEEK
TDM7	WORK FLEXTIME
TDM8	STAGGERED WORK HOURS
TDM9	BIKE/WALK ENHANCEMENTS
TDM10	MARKETING OF TDM

For the purposes of this analysis, the carpool and vanpool strategies were assumed to include supporting TDM strategies such as rideshare matching, preferential parking, park & ride, and guaranteed ride home programs. As previously noted, parking management/parking cash-out programs were not considered to be an appropriate strategy at this time for the I-526 study corridor, as there is more than adequate parking near and around the study area. These strategies would be more appropriate in urban areas where parking may be at a premium.

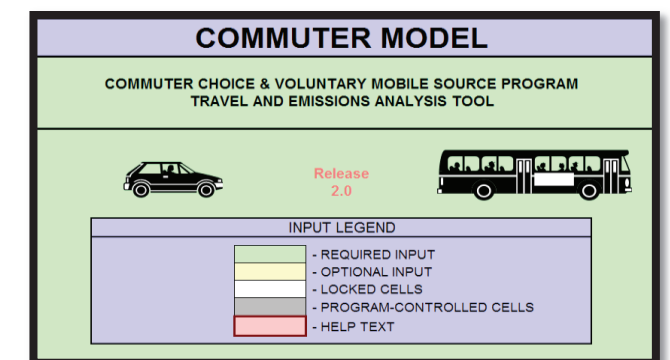
5.4 Analysis Models

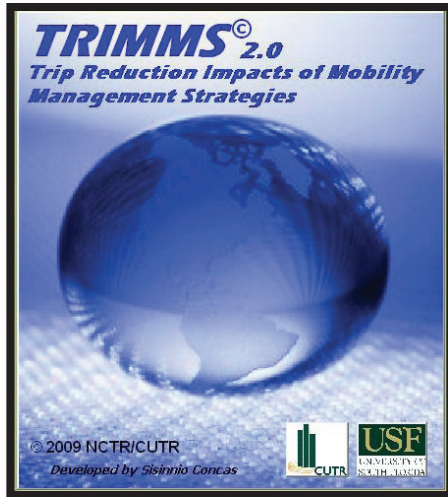
In addition to the case study review, two analysis models were run to determine the potential effectiveness of TDM programs in the I-526 study area. The two analysis models consisted of the *COMMUTER Model v2.0* developed by the United States Environmental Protection Agency (EPA) and the *TRIMMS® Model 2.0* developed by the Center for Transportation Research (CUTR) for the Florida Department of Transportation (FDOT). The results of the model runs are documented herein.

5.4.1 COMMUTER

The *COMMUTER* model was developed by the U.S. EPA in 2005 to help quantify the travel and air quality/emission effects resulting from TDM strategies. The model consolidates a wide range of EPA tools and guidelines that were developed in part due to the 1990 Clean Air Act, and can be utilized to evaluate the impacts of regional TDM programs or employer-specific programs.

The *COMMUTER* model program was able to be customized with the travel characteristics and census data for the Charleston County area, and the results of the program are given in ranges which vary based upon the amount of investment for each strategy.





5.4.2 TRIMMS

The *TRIMMS* (*Trip Reduction Impacts of Mobility Management Strategies*) model was developed by CUTR in association with FDOT in 2009 to estimate the travel, emissions, and crash impacts of a broad range of TDM strategies. The model was developed based upon commute trip reduction data of Washington State over a three-year time period, and has the capability to provide for sensitivity analyses and benefit/cost calculations.

The *TRIMMS* model program contains default parameters for the 85 Metropolitan Statistical Areas (MSA) across the United States; the parameters of the Charleston/North Charleston MSA were considered for this analysis.

5.4.3 Analysis Model Results

The results of the *COMMUTER* and *TRIMMS* model analyses are summarized in Table 5-3, which generally indicate a potential reduction in the number of regional trips from less than 1% to approximately 3% with implementation of various TDM strategies.

Table 5-3: Overall Network Model Trip Reduction

TDM STRATEGY	MODEL	
	<i>COMMUTER</i>	<i>TRIMMS</i>
Carpools/Rideshare Matching	-0.2% to -1.8%	-1.72%
Vanpools	-0.3% to -3.0%	-1.74%
Transit Pass Incentives	-0.2% to -2.1%	-1.72%
Telecommuting	-1.0%	-1.72%
Compressed Work Week	-0.4% to -1.4%	-1.72%
Work Flex Time	-3.2%	-1.71%
Staggered Work Hours	-3.2%	--
Bike/Walk	-0.2% to -1.7%	-1.71%

5.5 Bike/Walk Options

As part of the analysis of the potential TDM strategies for the I-526 Corridor Analysis, a review of the sidewalk and bike lane connectivity along the study arterials that cross the I-526 and I-26 study segments was conducted. This review is summarized herein.

- **Aviation Avenue (at I-26)** – Five-foot concrete sidewalks extend on both sides of Aviation Avenue from east of South Aviation Avenue through I-526 and to Rivers Avenue.
- **Remount Road (at I-26)** – Five-foot concrete sidewalks extend on both sides of Remount Road from east South Aviation Avenue through I-526 and past Rivers Avenue.
- **Rivers Avenue (at I-526)** – Five-foot concrete sidewalks exist on both sides of Rivers Avenue that extend from West Aviation Avenue through I-526 and past Montague Avenue.
- **International Boulevard (at I-526)** – Five-foot concrete sidewalks extend on both sides of International Boulevard from the I-526 Eastbound ramps east to Montague Avenue intersection, except for one section on the north side of International Boulevard adjacent to FedEx Shipment Center. No sidewalks currently exist west of the I-526 Eastbound ramps through I-526.
- **West Montague Avenue (at I-526 and I-26)** – Five-foot concrete sidewalks extend on both sides of West Montague Avenue from Dorchester Road through I-526 and I-26 and past Mall Drive.
- **Dorchester Road (at I-526)** – Five-foot concrete sidewalks extend on both sides of Dorchester Road from west of Montague Avenue through I-526 and past Montague Avenue.
- **Paramount Drive (at I-526)** – Five-foot concrete sidewalks extend on both sides of Paramount Drive from Faber Place Drive through I-526 and to Dorchester Road.
- **Leeds Avenue (at I-526)** – Sidewalks do not exist on either side of Leeds Avenue around the I-526 interchange.
- **Ashley River Road (at I-526)** – A multi-use bike and pedestrian pathway is currently being designed by Charleston County as part of the Transportation Sales Tax program for one side of Ashley River Road in the area of I-526, which will terminate at Tobias Gadson Boulevard. The project is funded for construction, which is anticipated to begin in 2014.
- **Paul Cantrell Boulevard (at I-526)** – Sidewalks do not exist on either side of Paul Cantrell Boulevard around the I-526 interchange.
- **Savage Road (at I-526)** – Sidewalks do not exist on either side of Savage Road around the I-526 interchange. A five-foot concrete sidewalk is planned by the Charleston County Transportation

Committee on one side of Savage Road from Orleans Road to US 17/Savannah Highway; no funding is currently allocated for the project.

- **Sam Rittenberg Boulevard (at I-526)** – A five-foot sidewalk extends on the south side of Sam Rittenberg Boulevard from Skylark Drive through I-526 to US 17/Savannah Highway.
- **US 17/Savannah Highway (at I-526)** – Five-foot sidewalks extend on both sides of US 17/Savannah Highway west of Ashley Town Center Drive through I-526 and past Orleans Road.

It should be noted that no bike lanes currently exist along the study arterials across I-526 or I-26, other than the planned multi-use pathway facility planned for one side of Ashley River Road.

5.6 Environmental Review

TDM strategies have the least disruptive effect on the human and natural environment of the four improvement categories of strategies discussed in this study. The TDM strategies focus primarily on decreasing the demand for travel on the existing roadway network, including I-526, thereby creating more efficient movement of traffic within the study area. Strategies such as carpooling, ridesharing, vanpools and transit pass incentives are all directed at moving the same numbers of people, but doing it in a more efficient manner with greater occupancy of the shared vehicles. Strategies for telecommuting, compressed work, work flex time and staggered work hours will decrease the demand to travel, particularly in the peak hours. All of these strategies require very little if any construction activity and would likely have minimal environmental impacts.

The strategy of reducing travel demand by improving the network connections for bicycles and pedestrians will likely require some construction activity and may have environmental impacts. However, these construction activities are expected to be relatively minor with only minimal local impacts. Implementation of TDM strategies requiring construction could be environmentally accomplished by way of Categorical Exclusions to qualify for federal funding. Final determinations as to the level of environmental documentation will be made by the Federal Highway Administration where federal highway funds are involved.

While all of these strategies offer the possibility of improving travel conditions, none would pose environmental issues that rise to the level of further discussion in the document. Improved travel conditions brought about by the TDM strategies would benefit the area air quality and assist, with other measures discussed in this document, to reduce traffic congestion.

5.7 Measures of Effectiveness – TDM Strategies

The measure of effectiveness for the proposed TDM strategies was the potential reduction in traffic along the I-526 study corridor, and Charleston area in general. Based upon the potential reduction of traffic due to TDM strategies determined in the case study review and the analysis model results, and the characteristics of the I-526 and Charleston study area, Table 5-4 details the expected traffic reduction results for the 10 TDM strategies considered for this analysis. Table 5-4 also further details approximate implementation costs, potential coordinating agencies, and an expected implementation schedule.

A total reduction of 5.2% of total overall traffic can be expected with the implementation of all of the TDM programs, most of which can be implemented in the short term with adequate funding. The impacts of this traffic reduction due to TDM programs are discussed further in this study.

Table 5-4: TDM Strategy Summary

LABEL	STRATEGY	DESCRIPTION	TIMING	COSTS	POTENTIAL COORDINATING AGENCIES	ASSOCIATED STRATEGIES	TRAFFIC REDUCTION POTENTIAL
TDM 1	Carpools/Rideshare Matching	Programs to encourage and match multiple workers with similar commutes to share trips to/from the workplace (funds for Marketing and Promotion).	2015	\$ 100,000	BCDCOG	TDM 2	2.0%
TDM 2	Vanpools	Programs that provide multiple workers with similar commutes (usually 6 and greater) a van to share trips to/from the workplace (funds for Marketing and Promotion).	2015	\$ 25,000	BCDCOG	TDM 1	
TDM 3	Transit Pass Incentives	Employer-provided passes that cover a portion (or all) the cost for travel to/from the workplace via transit (funds for developing programs).	2015	\$ 250,000	BCDCOG, Counties, Cities	M 1	1.5%
TDM 4	Financial Incentives	Employer-based payments to travel to work via a different mode than a single-occupant vehicle (funds for Marketing and Promotion).	2015	\$ 50,000	BCDCOG, Counties, Cities	M 1	
TDM 5	Telecommuting	Use of mobile telecommunications instead of physically commuting to a place of work.	2015	\$ 75,000	BCDCOG, Counties, Cities		0.1%
TDM 6	Compressed Work Week	Work schedules allowing employees to work longer hours for fewer weekdays.	2015	\$ 25,000	BCDCOG, Counties, Cities		
TDM 7	Work Flex Time	Work schedules allowing employees to arrive and/or depart work away from the peak hours.	2015	\$ 25,000	BCDCOG, Counties, Cities		0.5%
TDM 8	Staggered Work Hours	Work schedules to minimize the number of employees arriving or departing work at the same time.	2015	\$ 25,000	BCDCOG, Counties, Cities		
TDM 9	Bike/Walk Enhancements	Improving the bike lane and sidewalk connections along the arterials crossing I-526.	2018	\$ 150,000	SCDOT, BCDCOG, Counties, Cities		0.1%
TDM 10	Education, Promotion, Marketing	Public outreach programs designed to inform commuters of the available options other than single-occupant vehicles.	Ongoing	\$ 50,000	BCDCOG, Counties, Cities	M 1	1.0%
Total TDM Reduction Potential:							5.2%