

Feasibility Study of Shared High Occupancy Vehicle Lanes on Bruce B Downs Boulevard between Interstate 75 and Bearss Avenue



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- D Case Studies
- E Commuter Assistance Program

1.0 INTRODUCTION

Findings from the *Feasibility Study of Shared High Occupancy Vehicle Lanes on Bruce B Downs Boulevard between Interstate 75 and Bearss Avenue* are presented within this document.

1.1 FRAMEWORK

In order to address congestion and plan for future community transportation needs, focusing specifically on arterial roadways within Hillsborough County, the Hillsborough County Metropolitan Planning Organization (MPO) prepared the *Congestion Management/Crash Mitigation Process: A Feasibility Study on Implementing HOV, Reversible Lanes or Time-of-Day Parking Strategies* in November 2012. The purpose of the study was to identify innovative, successfully implemented congestion management and operational concepts on arterial roadways in order to optimize the use of existing infrastructure; the three arterial operational strategies that were explored included: High Occupancy Vehicle (HOV) lane restrictions, reversible lane applications, and time-of-day parking/off-peak parking restrictions. Based on the findings of the study, Bruce B Downs Boulevard from Interstate 75 (I-75) to Bearss Avenue in northern Hillsborough County surfaced as a strong candidate for HOV lane implementation to reduce peak-hour impacts in addition or in lieu of sole capacity improvements.

A HOV lane is defined as a restricted traffic lane reserved for vehicles with a driver and one or more passengers; it is used as a congestion management tool in order to attract people to carpooling and transit by offering faster, more reliable trips than the general purpose lanes of roadways¹. Reasons highlighted in the study justifying the appropriateness of Bruce B Downs Boulevard for HOV lane implementation included:

- Bruce B Downs Boulevard will remain congested in the future even after the widening;
- Opportunity exists to designate HOV lanes on the facility as it is widened to eight lanes;
- Opportunity exists for use of the HOV lanes to accommodate high peak traffic volumes along the corridor at rush hour;
- Transportation Demand Management (TDM) factors are present in the area (i.e., carpooling/vanpooling programs) that could utilize the HOV lanes on the facility; and
- Opportunity exists for the designated HOV lanes to connect to/be utilized to facilitate other transportation planning initiatives in the area (i.e., Florida Department of Transportation Managed Lanes on I-75, Hillsborough Area Regional Transit Authority MetroRapid Service to University of South Florida, Tampa Bay Area Regional Transportation Authority Rail/Bus Rapid Transit Service on Bruce B Downs Boulevard).

1.2 PURPOSE/SCOPE

In preparation of the widening of Bruce B Downs Boulevard from I-75 to Bearss Avenue to eight lanes (four through lanes in each direction), the Hillsborough County MPO initiated a second study in 2013

¹, Transportation Research Board, "High Occupancy Vehicle or General Purpose Lane?", <http://pubsindex.trb.org/view/2009/C/881258>, 2009.

which specifically focused on the feasibility of dedicating one shared HOV lane in the peak hour and peak direction along the Bruce B Downs Boulevard corridor. Components of the *Feasibility Study of Shared High Occupancy Vehicle Lanes on Bruce B Downs Boulevard between Interstate 75 and Bearss Avenue* included:

- Reviewing related previous and present planning initiatives,
- Performing stakeholder coordination/outreach,
- Assessing current and future TDM support factors and initiatives within the project area,
- Analyzing existing and future traffic conditions (including project simulation results),
- Developing corridor sketch plans and typical sections*, and
- Preparing project cost estimates*.

*Corridor sketch plans/typical sections and project cost estimates were ultimately eliminated from the scope of work as the study findings revealed that the project is not feasible (as discussed later in this document).

The total project length is approximately 4.4 miles. **Figure 1** presents the location of the project.

Figure 1: Project Location



2.0 PREVIOUS AND PRESENT INITIATIVES

Table 1 displays the local, regional, and state transportation plans, studies, and projects that were reviewed in order to understand previous and current planning initiatives pertinent to the corridor and surrounding area that may impact traffic patterns/composition and overall mobility in northern Hillsborough County (primarily regarding potential HOV lane implementation, performance, and enforcement). These resources were acquired from a number of entities including: the Hillsborough County MPO, Hillsborough County, Hillsborough Area Regional Transit (HART) Authority, Florida Department of Transportation (FDOT) District 7, and Tampa Bay Area Regional Transportation Authority (TBARTA). The gathered information provided the basis for exploring the feasibility of implementing HOV lanes on Bruce B Downs Boulevard.

**TABLE 1
SUPPORTING PLANNING INITIATIVES**

Plan/Study/Project	Source	Date
Congestion Management/Crash Mitigation Process: A Feasibility Study on Implementing HOV, Reversible Lanes or Time-of-Day Parking Strategies - Executive Summary for Phase I	Hillsborough County MPO	2012
Congestion Management/Crash Mitigation Process: A Feasibility Study on Implementing HOV, Reversible Lanes or Time-of-Day Parking Strategies - Technical Memorandum for Phase II	Hillsborough County MPO	2012
Congestion Management/Crash Mitigation Process: Crash Severity Reduction Report	Hillsborough County MPO	2013
University Area Transit Circulator Study	Hillsborough County MPO	2013
Bruce B Downs Boulevard Reconstruction Assessment	Hillsborough County and Hillsborough County MPO	2012
CR 581 (Bruce B Downs Boulevard) from South of Bearss Avenue to Palm Springs Boulevard Transit Assessment	Hillsborough County and Hillsborough County MPO	2010
MetroRapid North-South Corridor	HART	2013
Managed Lanes Master Plan Study	FDOT District 7	Ongoing
USF to Wesley Chapel Regional Transit Corridor Study	TBARTA	2010-2012

3.0 STAKEHOLDER COORDINATION/OUTREACH

To augment information gathered from reviewing relevant planning initiatives, stakeholder coordination and outreach was conducted. Members of the New North Transportation Alliance (NNTA) were selected to serve on the stakeholder committee as the NNTA is composed of a range of entities representing the northern Hillsborough County/project area including government agencies (i.e., City of Tampa, Hillsborough County, HART, FDOT District 7, TBARTA, etc.), major area employers (i.e., University of South Florida, Florida Hospital, Moffitt Cancer Center, etc.), and residential and civic associations. Additional employers along the corridor and in the area, as well as neighborhoods, were also identified to complete the stakeholder committee. A list of the stakeholders may be found in **Appendix A**.

In order to solicit feedback on the project from members of the stakeholder committee, a series of meetings and interviews were organized by the Hillsborough County MPO. The purpose of the meetings and interviews was to collect information regarding: mobility needs/transportation demand on the corridor at various times of the day, current TDM strategies being used in the area and by employers, the likelihood of area residents and employees to use HOV lanes, potential improvements to encourage HOV lane use/opportunities for TDM initiatives, potential public support or controversy pertaining to the project, etc. **Table 2** presents a list of the various meetings (including presentations) that were conducted. The list of stakeholders that were interviewed, along with the interview questions that were developed, may be found in **Appendix B**.

**TABLE 2
STAKEHOLDER MEETINGS/PRESENTATIONS**

Stakeholder	Type of Coordination	Date
Hillsborough County	Meeting	04/05/2013
NNTA	Presentation	04/10/2013
City of Tampa	Meeting	07/15/2013
City of Tampa and Hillsborough County	Meeting	09/27/2013
NNTA	Presentation	11/13/2013
Hillsborough County MPO Intelligent Transportation Systems Committee	Presentation	11/14/2013
Hillsborough County MPO Citizens Advisory Committee and Hillsborough County MPO Technical Advisory Committee	Presentation	12/11/2013
Hillsborough County MPO Bicycle & Pedestrian Advisory Committee and Hillsborough County MPO Livable Roadways Committee	Presentation	12/11/2013
TBARTA Citizens Advisory Committee	Presentation	12/18/2013
TBARTA Transit Management Committee	Presentation	12/19/2013
Hillsborough County MPO Board	Presentation	01/07/2014

4.0 TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) is the application of strategies and policies aimed at reducing or shifting the demand for roadway travel (i.e., carpooling, vanpooling, etc.), particularly in terms of single occupancy vehicles (SOVs)². Due to the fact that TDM initiatives support HOV lane utilization, existing TDM support services and future TDM support services, incentives, and training opportunities within the project area were assessed as part of this study.

4.1 RESEARCH

Current area TDM programs through stakeholder interviews, national data/reports pertaining to TDM, and national case studies regarding TDM strategies/trends related to HOV lane implementation were specifically analyzed and are described below in further detail.

4.1.1 Stakeholder Interviews

As discussed in Section 3.0, major area employers were targeted through the stakeholder interviews to determine their level of engagement in TDM programs, understand what TDM initiatives are currently in place, assess what other types of programs/initiatives are likely to be offered that would support the actual use of a HOV lane, identify gaps in TDM employer outreach, and gauge the overall saturation of the project area market in terms of introducing additional TDM opportunities.

Research revealed moderate levels of participation by area employees in TDM programs:

- Carpooling: 860 database registrations (specifically employees of James A. Haley Veterans' Hospital and University of South Florida/ Center for Urban Transportation Research).
- Vanpooling: 185 participants / 27 vans in service (James A. Haley Veterans' Hospital receives a federal subsidy to offset costs; USAA Insurance runs its own internal vanpool program).
- Emergency Ride Home: 214 employee registrants and 22 student registrants.

While the NNTA and TBARTA are active in the northern Hillsborough County/project area and maintain a supportive role in encouraging TDM initiatives, recent funding constraints have limited TDM outreach program development and implementation efforts. However, current funding allocated to the NNTA by Hillsborough County and FDOT District 7 (through a grant) has provided the NNTA with the opportunity to conduct additional TDM outreach activities, primarily targeting 7-8 area businesses to broaden TDM program efforts. NNTA will focus on carpool matching as the interviews revealed that the carpooling market appears to be more prominent along the corridor than the transit market.

Findings from the stakeholder interviews regarding TDM initiatives may be found in **Appendix C**.

4.1.2 Data/Reports

National data/reports were collected and examined from the American Public Transportation Association, United States Census Bureau, and Transportation Research Board (as displayed in **Table 3**)

² <http://ops.fhwa.dot.gov/tdm/index.htm>, Federal Highway Administration Travel Demand Management home page

to further understand the relationship between TDM factors and HOV lanes. The data/reports helped form the assumptions for the future year traffic projections and VISSIM micro-simulation model discussed in Section 5.0.

**TABLE 3
SUPPORTING NATIONAL DATA/REPORTS**

Title	Source	Date
Designing Bus Rapid Transit Running Ways	American Public Transportation Association	2010
2006-2010 Journey to Work/County-to-County Commuting Flows (Hillsborough County)	United States Census Bureau	2010
Hillsborough County Long Range TDM Plan	NNTA/University of South Florida/ Center for Urban Transportation Research	2004
Integrating Pricing Alternatives into the Planning & Project Development Processes	Transportation Research Board	2003
Forecasting Traffic for a HOV Lane from Feasibility Study to Preliminary Design	Transportation Research Board	2003

4.1.3 Case Studies

National case studies on HOV lane implementation and how TDM strategies were applied before, during, and after implementation were reviewed in order to identify 1) the tradeoffs between single occupancy vehicle (SOV) travel and travel via carpool/transit in a HOV lane (including estimated time savings and congestion reduction) and 2) opportunities to enhance TDM initiatives within the project area. Information regarding HOV lane implementation, performance, and enforcement was gathered for five projects outside of the ones studied as part of the Hillsborough County MPO's *Congestion Management/Crash Mitigation Process: A Feasibility Study on Implementing HOV, Reversible Lanes or Time-of-Day Parking Strategies* (November 2012). The five projects included:

- I-880 HOT/HOV Value Pricing Feasibility Study [Florida] (April 2004);
- California Department of Transportation (CalTrans) Regional HOT Lanes Network Feasibility Study: Policy and Operation Considerations for a Regionwide Bay Area HOT Lane Network [California] (December 2006);
- North Carolina Department of Transportation (NCDOT) I-77 HOV Newsletter - includes marketing/public relations/outreach/ public communications about the project [North Carolina] (Spring/Summer 2004);
- South Carolina Department of Transportation (SCDOT) HOV/HOT Lane Feasibility Study Final Report [South Carolina] (February 2010); and
- Virginia Department of Transportation (VDOT) I-95 HOV Feasibility Study [Virginia] (March 2002).

It is important to note that while the majority of projects examined involved the use or implementation of tolling [High Occupancy Toll (HOT) lanes] on interstates, many of the findings from each case can be applied to the implementation of a HOV lane where none formerly existed just as readily as they were in adding tolls to existing HOV lanes. The major concepts/lessons learned from the case studies that are relevant to potential HOV lane implementation on Bruce B Downs Boulevard are presented below:

- Changes in HOV lane policy should be considered as a package rather than as individual elements; changes in possible HOV lane eligibility and hours of operation can significantly impact the potential for lane use. Extending the operating hours could also increase overall HOV lane benefits.
- Changes in HOV lane policy should consider as much of a region's HOV lane system as possible. The benefits of implementation are likely to be greater if other parts of the regional HOV lane system are similar and/or involved.
- HOV lane design with continuous access and egress greatly increases the complexity of management and enforcement where there was no HOV restriction in the past.
- Consider how to keep HOV lanes effective as HOV lane volumes increase. As a HOV lane exceeds level of service C (approaching breakdown conditions), it may be important to consider increasing the vehicle occupancy requirement (from 2+ to 3+), adding a second HOV lane, or taking some other approach to maintain the effectiveness of the HOV lane. A public policy of increasing the HOV requirement when a lane fills to capacity with HOVs is essential to the ability of the region to make the lanes successful.
- To understand potential acceptance of HOV lanes in the area surrounding the Bruce B Downs Boulevard corridor, collective experience/national public opinion regarding HOV lanes and demographic characteristics of areas with HOV lanes should be investigated and compared to the northern Hillsborough County/project area. The two major challenges in public acceptance of HOV lanes have been "empty lane syndrome" and enforcement. Empty lane syndrome refers to the visual perception of non-HOV lane users that a HOV lane is not well used, particularly if the general purpose lanes are very congested. To avoid this syndrome, national HOV lane experience indicates that mature HOV lanes should carry a minimum of 400 to 800 vehicles per hour during peak periods. Enforcement also needs to be prominent and effective to avoid the perception of HOV lane misuse, real or exaggerated. National experience also indicates that a tolled road or lane is generally accepted and successful if it provides a reliable trip with significant time or distance savings.
- Strategies to address public acceptance need to be implemented early in the planning phases of the project - strategic public relations may offer opportunities to enhance public acceptance when market research suggests negative or polarized public attitudes exist toward a proposed HOV lane project. By identifying the key issues of concern, the appropriate messages and strategies may be selected, including one or more of the following options:
 - Travelers "have the option" - marketing HOV lanes as a benefit available to all users rather than a concept that creates two classes of users can help to address equity issues.
 - HOV lanes result in enhanced reliability and speed benefits to all motorists on the corridor, including the benefits of reduced peak period travel and improved air quality.
 - HOV lanes need a political "champion" behind them - having a political champion, coupled with local and state agencies willing to collaboratively move forward, is an important factor in being able to demonstrate and implement these traffic management tools and overcome any expressed skepticism. The implementation of HOV lanes can be controversial to the general public and media despite the improved mobility to a large number of users. Having a political champion can help to ease some of the controversy and opposition by those who will be affected.

- Keeping stakeholders, citizens and other parties informed throughout the process is very important. A stakeholder database can be used to invite citizens to public information meetings. The first meeting should be held in the early stages of the project; the general public and targeted stakeholders should be invited to attend the meetings. In addition to mailed invitations, meeting notices should be announced on the sponsoring agency’s website as well as via the local newspaper through public notices/ads and press advisories. Citizens should be provided with ample opportunities to ask questions, provide comments, complete comment sheets, and view project informational materials. Other communication methods could include a simple, project-specific website and a newsletter that can be widely distributed. Designing a newsletter specific to the rules of the corridor where the HOV lane is being implemented can be very informative and beneficial to the public, members of the media, and other stakeholders. This collateral not only promotes the use of HOV lanes to those who can potentially utilize them but also informs non-users of the benefits to all who travel on the corridor (using an “everyone wins” approach). A newsletter (or similar collateral such as brochures, flyers and/or posters) should be finalized well in advance of the opening of the HOV lane(s) and presented to the media and public whether in the public information meeting format described above or through more informal channels.

Specific findings of each of the five case studies are presented in **Appendix D**.

4.2 COMMUTER ASSISTANCE PROGRAM

Research was compiled from other commuter assistance programs around the nation to determine:

- Program outcomes or “year one” metrics v. “over time” metrics (i.e., whether or not there is an increase in carpoolers/vanpoolers if TDM outreach is funded for a year and if there is a different outcome/further increase in carpoolers/vanpoolers with more funding/longer TDM outreach effort) and
- Resources involved to initiate a commuter assistance program (i.e., staff hours, costs, time frame to initiate program, steps to initiate program, number of companies anticipated to participate in program through outreach, work site outreach v. general outreach, etc.).

Appendix E documents the progressive outcomes that can be achieved over time as a commuter assistance program becomes successfully established within a community. The top benefits of a mature commuter assistance program over time include:

- Growth in the number of commuters served,
- The more SOV trips eliminated from the targeted roadway, and
- The higher the cost savings to commuters (in both time and distance).

In addition, as the use of shared-mode options increases with an established commuter assistance program, the overall likelihood of individuals to use a HOV lane is greater. Appendix E also describes the structure of a commuter assistance program and its applicability to the study area.

5.0 EXISTING AND FUTURE TRAFFIC CONDITIONS

To better analyze traffic conditions as part of this study, the entire length of the Bruce B Down Boulevard corridor extending from Fletcher Avenue (southern limit) to I-75 (northern limit) was assessed. Therefore, this section presents the existing and future traffic characteristics and conditions for the overall corridor.

5.1 EXISTING TRAFFIC CONDITIONS

The geometry and existing traffic volumes of the Bruce B Downs Boulevard corridor are described below in further detail.

5.1.1 Existing Roadway Geometry

Bruce B Downs Boulevard is a major urban arterial in northern Hillsborough County. In the study area, the posted speed limit on Bruce B Downs Boulevard is generally 45 miles per hour (MPH). Field reviews were conducted along the corridor in order to identify the existing lane geometrics layout. **Figure 2** illustrates a line diagram with lane schematics for the existing conditions.

Bruce B. Downs Boulevard is an existing six-lane divided roadway (three lanes in each direction) from Fletcher Avenue to Bearss Avenue transitioning to a four-lane divided facility (two lanes in each direction) from Bearss Avenue to Palm Springs Boulevard and continuing as an eight-lane divided roadway (four lanes in each direction) from Palm Springs Boulevard to north of Commerce Palms Drive in the vicinity of I-75.

5.1.2 Existing Traffic Volumes

A comprehensive traffic count program was performed (entailing field reviews that were conducted from March 25, 2013 to March 29, 2013) in order to assess existing traffic operations along Bruce B Downs Boulevard.

Figure 3 shows existing Annual Average Daily Traffic (AADT) volumes for the corridor and intersecting side streets. **Figure 4** displays existing AM and PM peak hour directional design hour volumes for each intersection along the corridor.

Figure 2: Existing (2013) Lane Geometry and Configurations

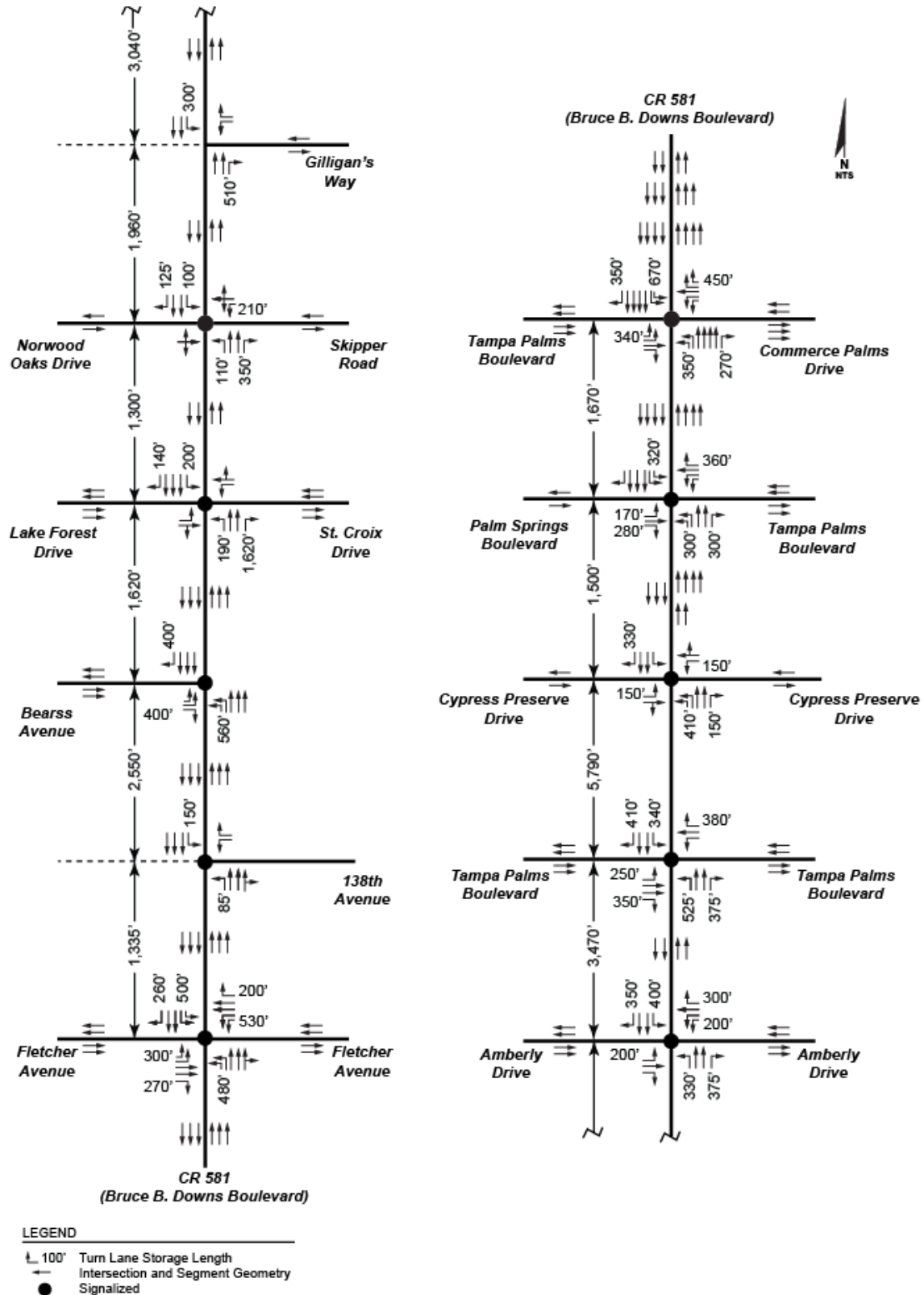


Figure 3: Existing (2013) Annual Average Daily Traffic Volumes

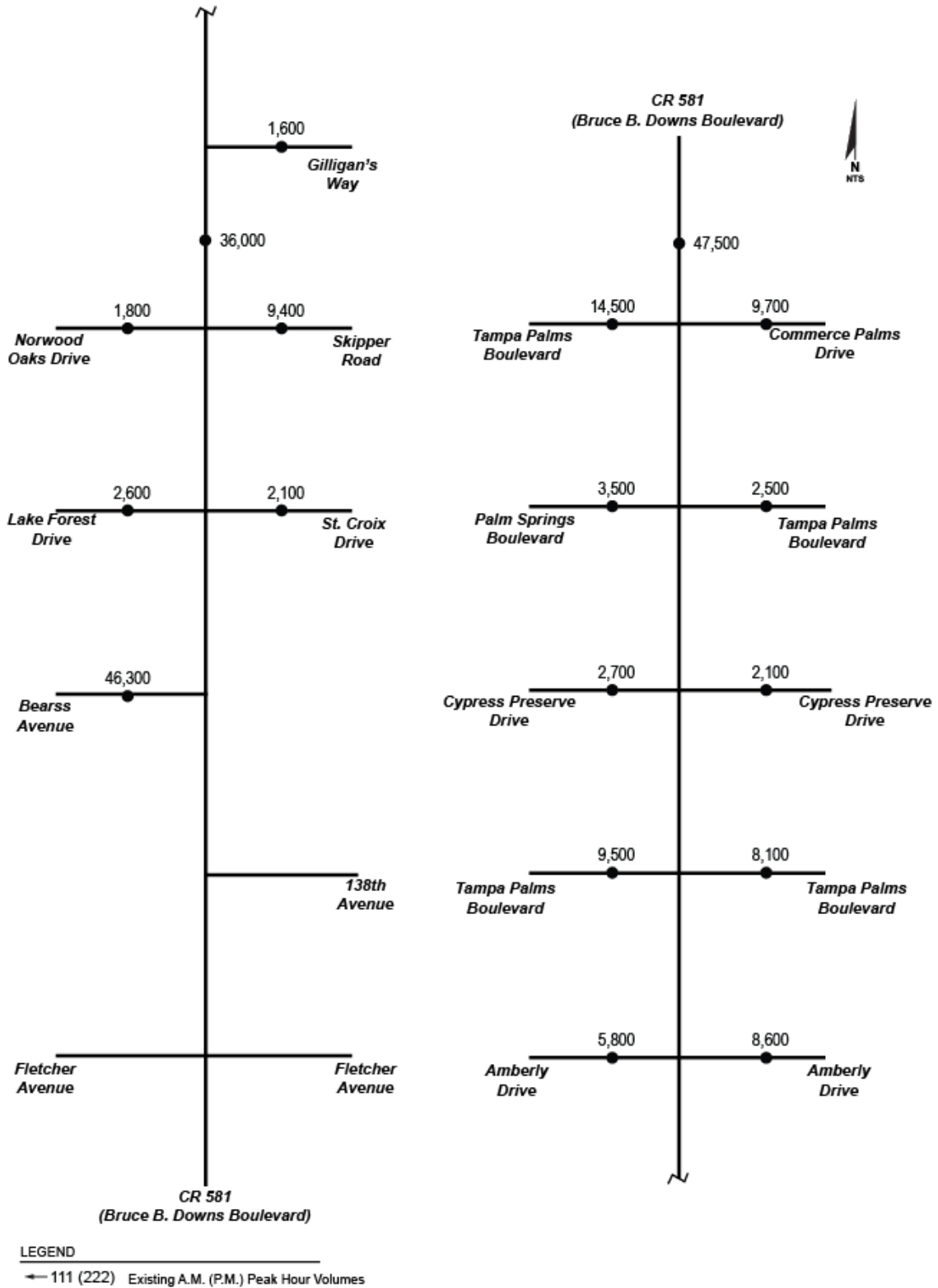
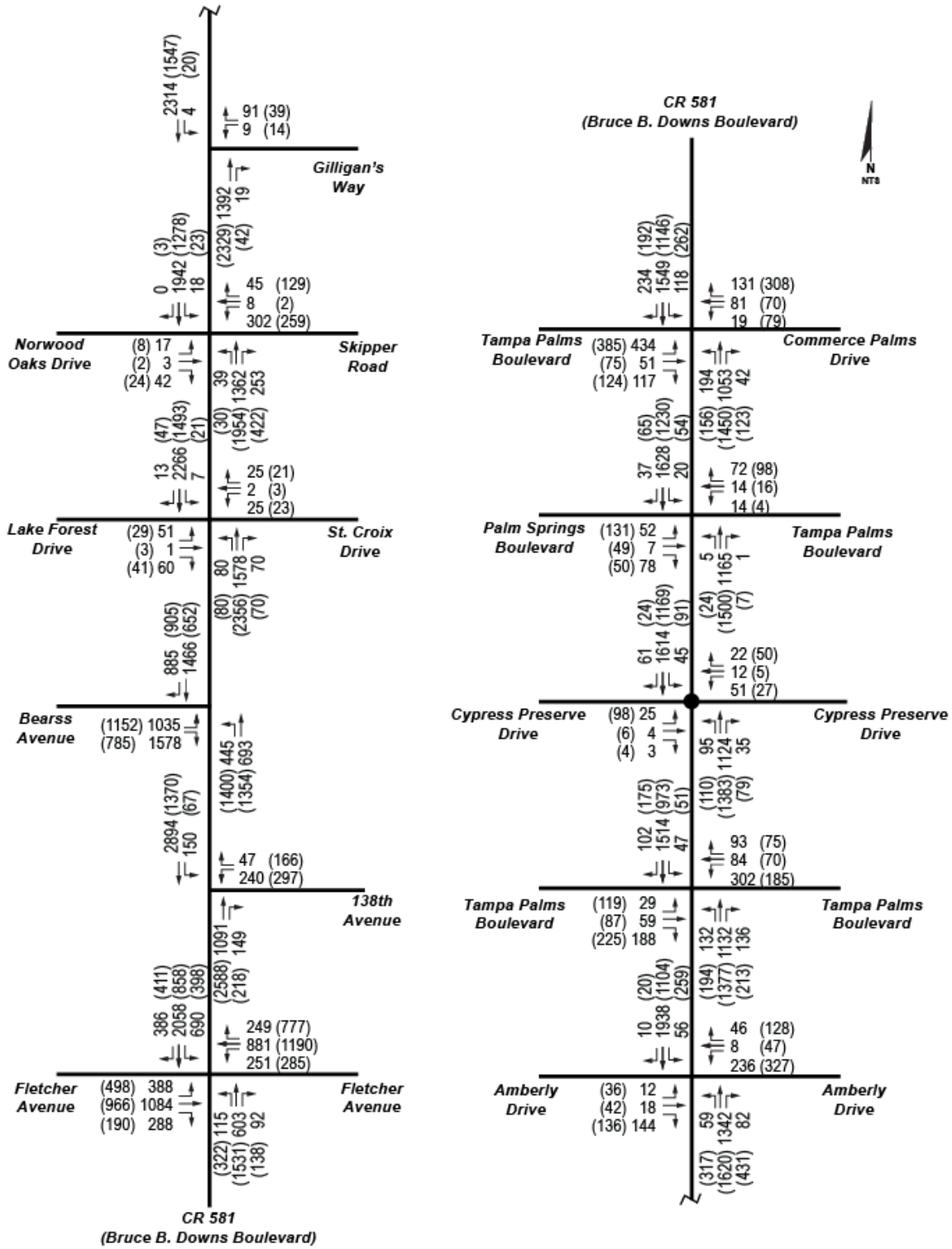


Figure 4: Existing (2013) Peak Hour Directional Design Hour Volumes



LEGEND
 ← 111 (222) Existing A.M. (P.M.) Peak Hour Volumes

Existing High Occupancy Vehicle Survey

It was determined that direct observation of vehicles would be the most cost efficient method to collect HOV data. As such, vehicles in the traffic stream were observed south of Gilligan’s Way and south of Cypress Preserve Drive in both the northbound and southbound directions. Vehicle occupancies were recorded for 5-minute intervals on March 27, 2013 from 7:15 AM to 8:45 AM (for the AM peak period) and from 4:00 PM to 5:30 PM (for PM peak period). **Table 5** summarizes the collected vehicle occupancy survey data.

**TABLE 5
EXISTING PEAK HOUR VEHICLE OCCUPANCY SURVEY SUMMARY**

Location	AM Peak						PM Peak					
	Total Vehicles Sampled	Vehicle Occupancy				Vehicle Occupancy Rate	Total Vehicles Sampled	Vehicle Occupancy				Vehicle Occupancy Rate
		1	2	3	4			1	2	3	4	
Gilligan’s Way	808	695	89	13	11	1.19	810	687	95	19	9	1.21
		86%	11%	2%	1%			85%	12%	2%	1%	
Cypress Preserve Drive	1,271	1,158	108	4	1	1.10	1,080	889	170	19	2	1.20
		91%	8%	<0%	<0%			82%	16%	2%	<0%	

As shown in Table 5, vehicle occupancy is slightly higher for the PM peak period (with 2 or more passengers at both surveyed locations). The survey also indicated that the average vehicle occupancy rate during the AM peak period was approximately 1.15% and 1.21% during the PM peak period along the corridor. It is important to note that the vehicle occupancy survey data was compared to the United States Census Bureau 2006-2010 Journey to Work/County-to-County Commuting Flows data obtained for Hillsborough County; both datasets revealed that HOVs compose approximately 15% of commuter traffic in Hillsborough County.

5.2 FUTURE TRAFFIC CONDITIONS

This section focuses on a comparison between the No-Build and Build alternatives (presented below in further detail). The future geometry and projected traffic volumes of the Bruce B Downs Boulevard corridor are additionally described.

5.2.1 Future Year Roadway Geometry

Viable alternatives considered as part of this study included the No-Build alternative and a Build alternative with one HOV lane next to the median. The No-Build alternative proposes to add one additional through lane along the length of the corridor as part of the widening of the corridor to eight lanes (four lanes in each direction); no HOV lane is designated for the No-Build alternative. The Build alternative assumes the widening of Bruce B Downs Boulevard to eight lanes (four lanes in each direction) and proposes to designate one HOV lane next to the median. As recommended in the Road

Safety Audit Study for the Livingston Avenue and Bearss Avenue Intersection, a free-flow eastbound-to-southbound right turn lane is also assumed at the intersection of Bearss Avenue and Bruce B Downs Boulevard for both the No-Build and Build alternatives.

5.2.2 Future Year Traffic Projections

The future year traffic projections for Bruce B Downs Boulevard were generated using the Tampa Bay Regional Planning Model–Managed Lanes (TBRPM-ML) 2035 Cost Affordable Plan network. The existing and model peak hour volumes along with the intersection turning movement volumes were used to develop the directional design hour volumes (DDHV). Some minor adjustments along the corridor were applied in order to account for side streets traffic. **Figures 5 and 6** illustrate the opening year (2015) and design year (2035) AM and PM peak hour intersection volumes.

5.2.3 Analysis of Design Year Conditions

The VISSIM micro-simulation model was used to produce speed profiles along the Bruce B Downs Boulevard corridor. A total of 14 segments were coded along the facility in both the northbound and southbound directions. Segmentation for the Build alternative is the same as that for the No-Build alternative. **Tables 6 and 7** list the segment numbers and limits along the corridor.

**TABLE 6
BRUCE B DOWNS BOULEVARD SEGMENTS - NORTHBOUND**

Segment Number	From	To
1	South of Fletcher Avenue	Fletcher Avenue
2	Fletcher Avenue	138 th Avenue
3	138 th Avenue	Bearss Avenue
4	Bearss Avenue	Lake Forest Drive
5	Lake Forest Drive	Skipper Road
6	Skipper Road	42 nd Street
7	42 nd Street	Gilligan’s Way
8	Gilligan’s Way	Amberly Drive
9	Amberly Drive	Tampa Palms Boulevard (South)
10	Tampa Palms Boulevard (South)	Methodist Place
11	Methodist Place	Cypress Preserve Drive
12	Cypress Preserve Drive	Tampa Palms Boulevard (North)
13	Tampa Palms Boulevard (North)	Commerce Palms Drive
14	Commerce Palms Drive	North of Commerce Palms Drive

Figure 5: Opening (2015) Peak Hour Directional Design Hour Volumes

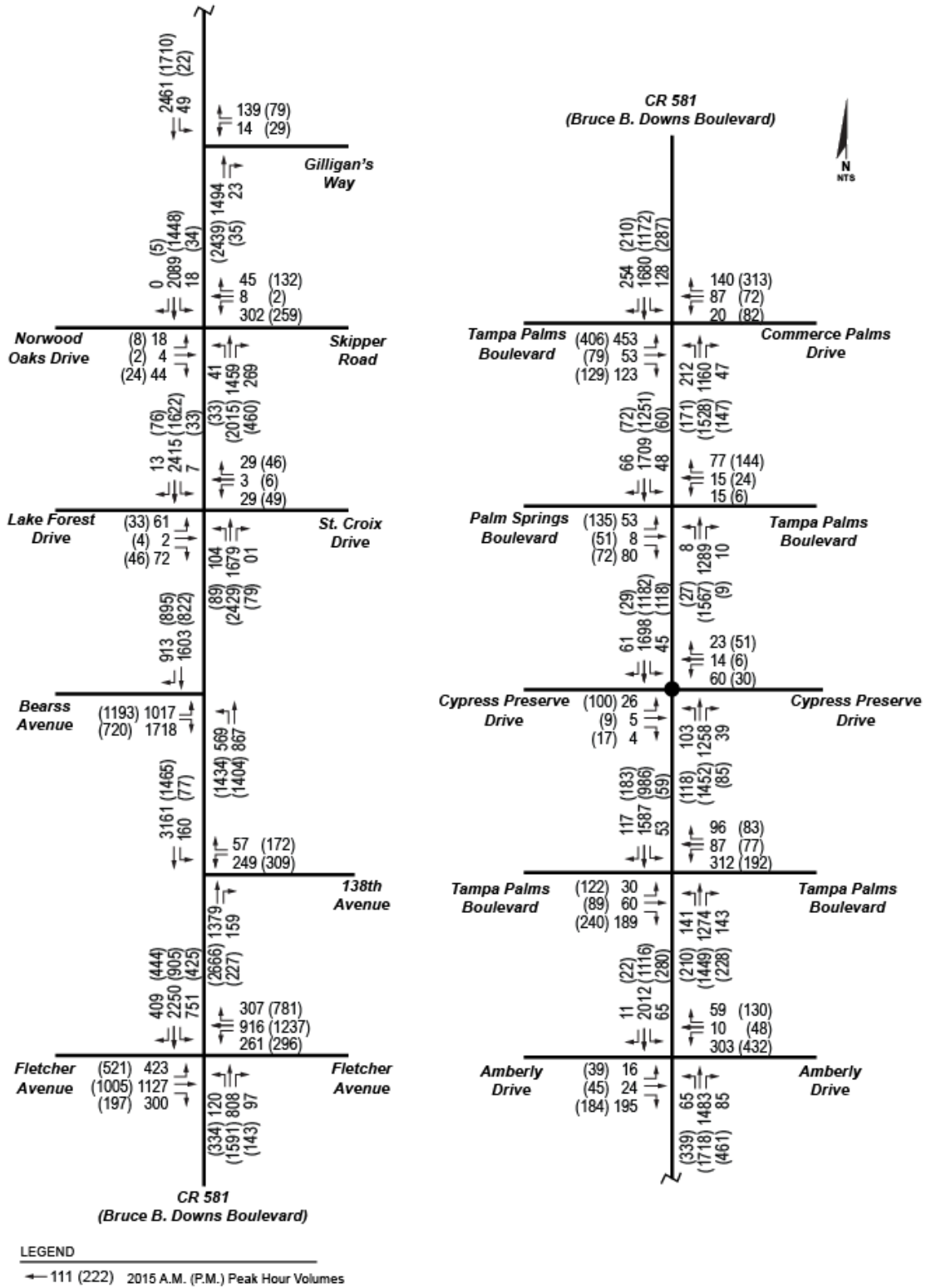
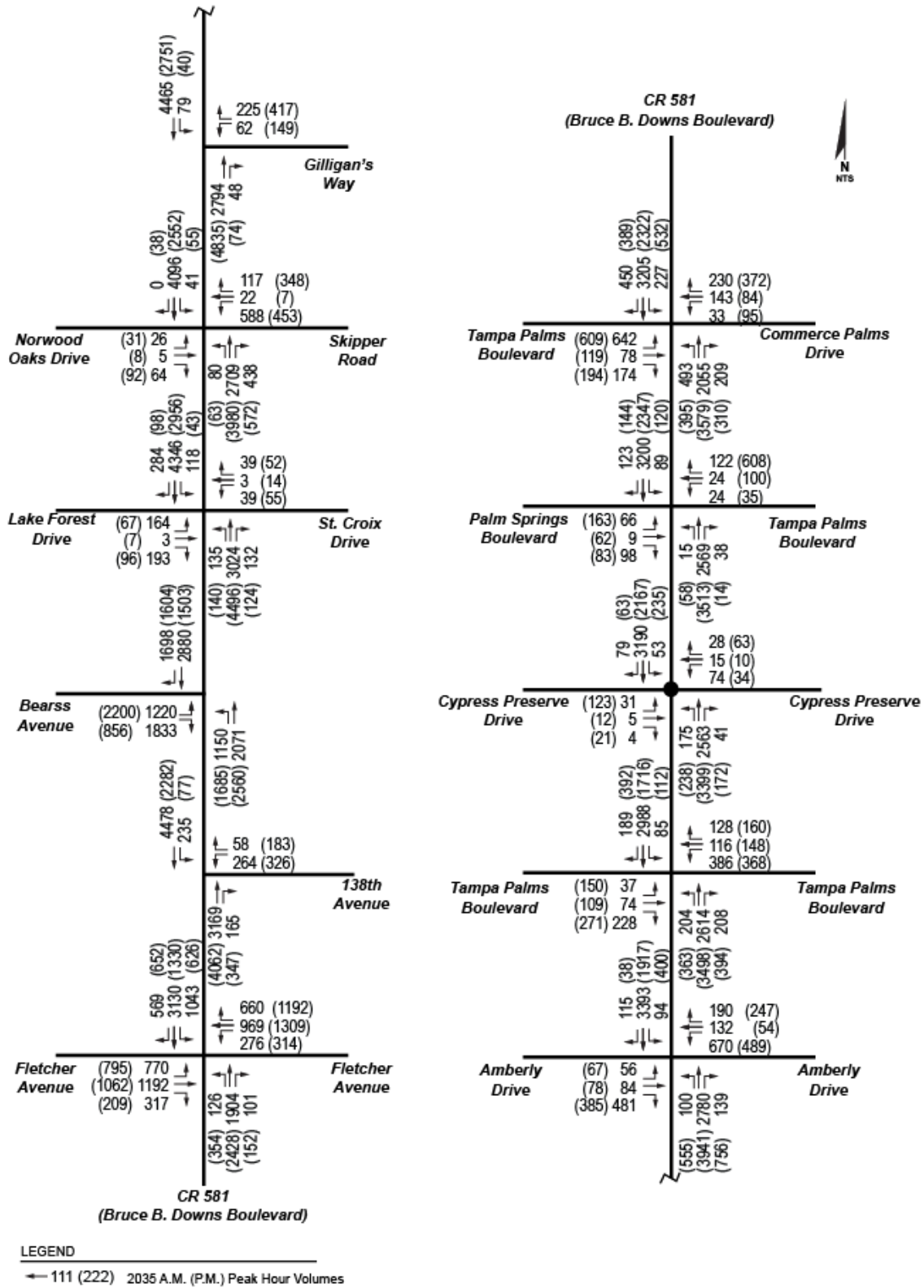


Figure 6: Design Year (2035) Peak Hour Directional Design Hour Volumes



**TABLE 7
BRUCE B DOWNS BOULEVARD SEGMENTS - SOUTHBOUND**

Segment Number	From	To
15	North of Commerce Palms Drive	Commerce Palms Drive
16	Commerce Palms Drive	Tampa Palms Boulevard (North)
17	Tampa Palms Boulevard (North)	Cypress Preserve Drive
18	Cypress Preserve Drive	Methodist Place
19	Methodist Place	Tampa Palms Boulevard (South)
20	Tampa Palms Boulevard (South)	Amberly Drive
21	Amberly Drive	Gilligan's Way
22	Gilligan's Way	42 nd Street
23	42 nd Street	Skipper Road
24	Skipper Road	Lake Forest Drive
25	Lake Forest Drive	Bearss Avenue
26	Bearss Avenue	138 th Avenue
27	138 th Avenue	Fletcher Avenue
28	Fletcher Avenue	South of Fletcher Avenue

Figures 7 and 8 show a comparison of the average speeds between the No-Build and Build alternatives in the peak direction during peak hours. Under the No-Build alternative, the depicted speeds (displayed in red) indicate the average speeds across all lanes. Under the Build alternative, the depicted speeds are the average speeds of the HOV lane (displayed in blue) and the three general use lanes (displayed in green). The figures generally show that the average speed of the HOV lane under the Build alternative within most of the corridor segments is higher than the average speed under the No-Build alternative. Specifically, the average speed of the HOV lane under the Build alternative in the southbound direction during the AM peak hour is 35.4 mph compared to 31.4 mph for the general use lanes of the Build alternative and 32.1 mph for all lanes of the No-Build alternative (as depicted in Figure 7). Accordingly, the average speed of the HOV lane under the Build alternative in the northbound direction during the PM peak hour is 36.2 mph compared to 34.0 mph for the general use lanes of the Build alternative and 34.5 mph for all lanes of the No-Build alternative (as depicted in Figure 8).

Figure 7:
Comparison of Roadway Speeds - Design Year (2035)
Bruce B Downs Boulevard Southbound AM Peak Hour

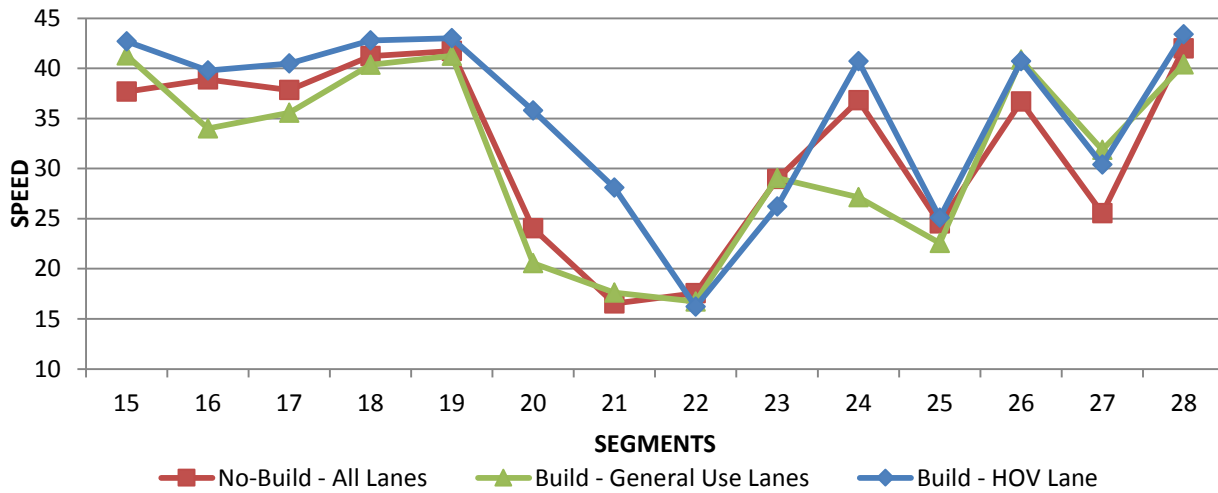
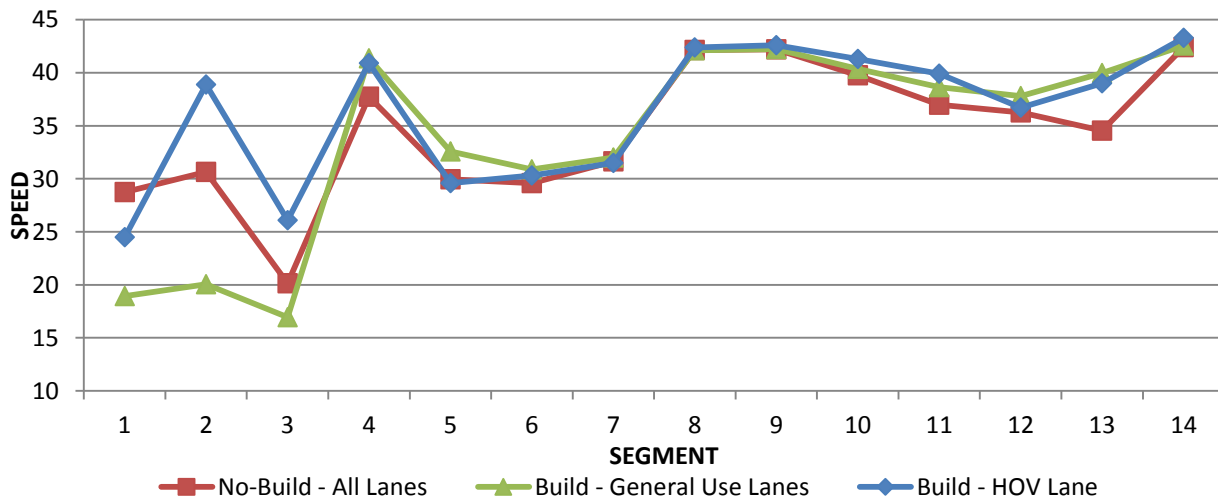


Figure 8:
Comparison of Roadway Speeds - Design Year (2035)
Bruce B Downs Boulevard Northbound PM Peak Hour



Figures 9 and 10 provide a comparison of the average speeds between the No-Build and Build alternatives by vehicle type in the peak direction during peak hours. Under the No-Build alternative, the depicted speeds (displayed in red) account for all vehicle types [High Occupancy Vehicles (HOVs) and Single Occupancy Vehicles (SOVs)]. Under the Build alternative, the depicted speeds for HOVs (displayed in blue) are shown separately from the depicted speeds for SOVs (displayed in green). Figure 9 shows that the average speed of HOVs under the Build alternative in the southbound direction during the AM peak hour is 30.1 mph compared to 31.1 mph for all vehicle types under the No-Build alternative (a difference of 1 mph) and 22.0 mph for SOVs under the Build alternative. In the northbound direction during the PM peak hour (as depicted in Figure 10), the average speed of HOVs under the Build

alternative is 36.9 mph compared to 35.5 mph for all vehicle types under the No-Build alternative and 28.8 mph for SOVs under the Build alternative.

Figure 9:
Comparison of Roadway Speeds by Vehicle Type - Design Year (2035)
Bruce B Downs Boulevard Southbound AM Peak Hour

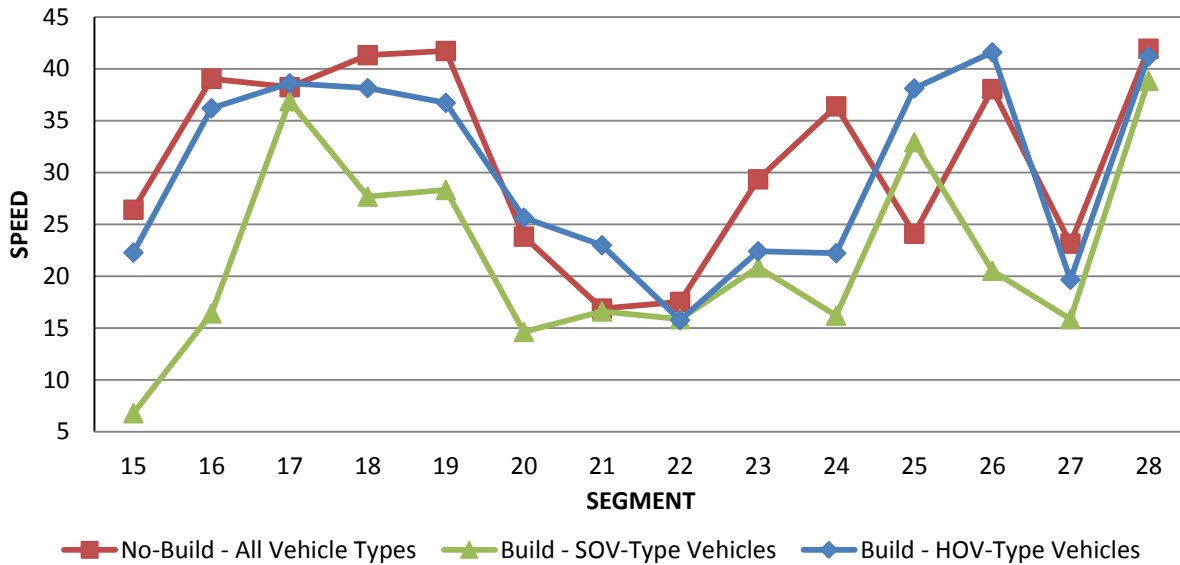
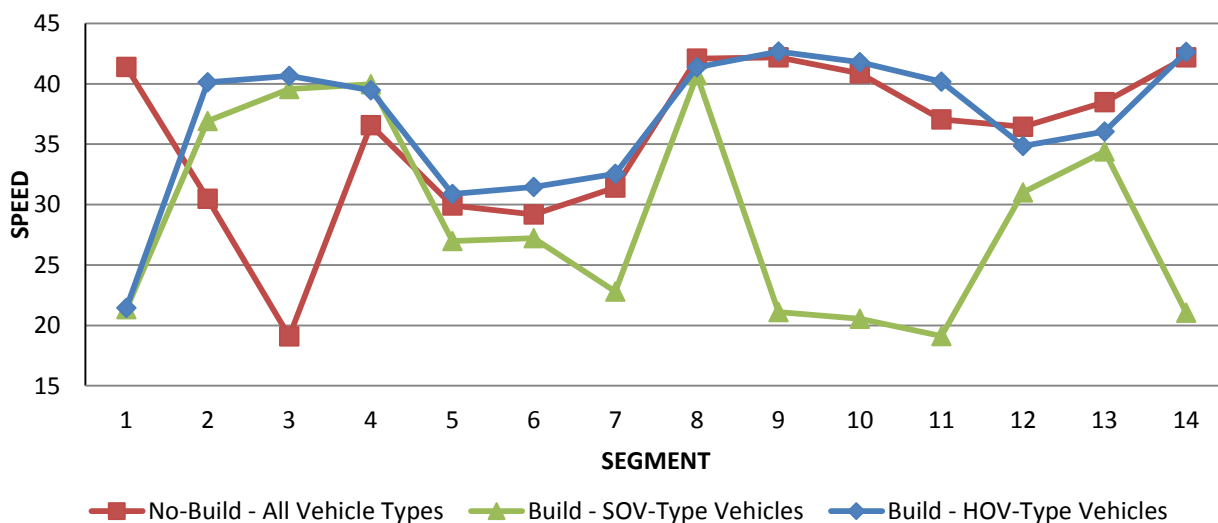


Figure 10:
Comparison of Roadway Speeds by Vehicle Type - Design Year (2035)
Bruce B Downs Boulevard Northbound PM Peak Hour



Overall, the average speed within the HOV lane under the Build alternative is higher than the average speed under the No-Build alternative.

6.0 CONCLUSIONS/RECOMMENDATIONS

The overall findings from the *Feasibility Study of Shared High Occupancy Vehicle Lanes on Bruce B Downs Boulevard between Interstate 75 and Bearss Avenue* reveal that the project is not feasible at this time as it is only likely to provide moderate time savings for HOV trips. Higher time savings are not possible due to the multiple access points and intersections along the Bruce B Downs Boulevard corridor. The findings also indicate that a HOV lane is not feasible as an outside lane due to the multiple corridor access points. In addition, TDM outreach activities promoting strategies which encourage the utilization of HOV lanes (i.e., carpooling, vanpooling, etc.) have been limited in the project area to date.

While the benefits of this arterial operational strategy seen to be overshadowed by the lack of time savings, opportunity may surface in the future allowing for the feasibility of dedicating HOV lanes on Bruce B Downs Boulevard to be revisited.

APPENDIX A: STAKEHOLDER COMMITTEE

Agency members of the Stakeholder Committee for this study included:

- Bavarian Village Condominium Association
- Busch Gardens
- Center for Urban Transportation Research
- City of Tampa
- City of Temple Terrace
- ConnectTB
- Enterprise CarShare
- Florida Hospital Tampa
- Hillsborough Area Regional Transit Authority
- Hillsborough County
- James A. Haley Veterans' Hospital
- Florida Department of Transportation District 7
- Moffitt Cancer Center
- Museum of Science and Industry
- New Tampa Neighborhood
- Pasco County
- Pepsi Beverages Company
- School District of Hillsborough County
- Shriners Hospital for Children
- Tampa Bay Area Regional Transportation Authority
- Tampa Palms Neighborhood
- University Area Community Development Corporation
- University Mall
- University Square Civic Association, THAN
- University of South Florida - Facilities Planning & Construction
- University of South Florida/Tampa Innovation Alliance
- USAA Insurance
- West Meadows Neighborhood

APPENDIX B: STAKEHOLDER INTERVIEW QUESTIONS

B.1 APPROACH

We will be calling stakeholders of the area (primarily major employers), including members of the New North Transportation Alliance (NNTA) Board of Directors and those identified by the Hillsborough County Metropolitan Planning Organization (MPO), to gauge their opinions on the potential implementation of alternative lane operation strategies (such as HOV lanes and other treatments) in lieu of sole capacity improvements. The telephone interviews will be conducted by URS during the last week of May 2013 and first week of June 2013.

The telephone interview questions may be programmed into Survey Monkey to streamline data input for the interviewer and the compilation/assessment of results. These interviews have been timed to take approximately 10 minutes. The script and list of questions, including skip patterns, along with the list of targeted stakeholders (major area employers) follows.

B.2 SCRIPT/LIST OF STAKEHOLDER QUESTIONS FOR TELEPHONE INTERVIEWS

(Items in parentheses are not to be read; they are strictly informational in case of needing different/proper wording for questions to certain stakeholders or needing to provide further clarification.)

Hello, this is name calling on behalf of the Hillsborough Metropolitan Planning Organization (MPO). We are evaluating a segment of Bruce B Downs Boulevard between I-75 and Bearss Avenue to determine the feasibility of implementing a high occupancy vehicle lane. The study is exploring the use of one lane for high occupancy vehicles southbound during the morning rush hours and northbound for the afternoon rush hours. This segment of Bruce B Downs Boulevard is being widened to eight lanes (four through lanes in each direction), and this HOV study does not alter that schedule.

Your contact information was provided to us by the New North Transportation Alliance as a person who is important to our study moving forward. We are calling to get your feedback on the feasibility of a HOV lane. The interview only takes about 10 minutes to complete, on average. Do you have time now to participate?

Yes: Proceed

No: Ask if there is another time that we can call back or – especially if they seem very reluctant to do a telephone interview – ask if you can send them a link to do the survey online

We are exploring different solutions to ease traffic congestion along Bruce B Downs Boulevard. In particular, we are exploring innovative ways of using existing lanes to relieve congestion during rush hours instead of further widening. Are you familiar with HOV lanes?

Yes: Skip to questions

No: Proceed with next paragraph

A HOV lane is a traffic lane reserved during the morning and afternoon rush hours for vehicles with two or more passengers (such as carpools, vanpools, and transit buses). Many places allow other vehicles to use HOV lanes (such as motorcycles, emergency and law enforcement vehicles, or low emission vehicles). HOV lanes are normally created to increase the number of people in each car with the goal of reducing traffic congestion.

1. Does your organization/agency/company currently participate in any of the following programs? (please choose yes, no, or unsure)
 - a. Carpool or vanpool matching for employees (yes/no/unsure)
 - i. (vanpool is a group of between 5-12 commuters traveling together)
 - b. Free or reduced-cost transit pass or vanpool fares (yes/no/unsure)
 - c. Transit pass or vanpool pre-tax deductions (yes/no/unsure)
 - d. Pre-tax deductions for parking (yes/no/unsure)
 - e. Other transportation-related incentives (yes/no/unsure)
 - i. *If yes, record verbatim:*
2. Can you please estimate what percentage of your workforce (and/or patients, customers, constituency, etc., depending on stakeholder) travels along Bruce B Downs Boulevard between I-75 and Bearss Avenue, for either their morning or afternoon commute?
 - a. Less than 5%
 - b. 5-10%
 - c. 10-25%
 - d. 25-50%
 - e. 50-75%
 - f. More than 75%
 - g. Unsure/refuse
 - h. *(record verbatim)*
3. How likely do you think your employees (and/or patients, customers, constituency, etc., depending on stakeholder) would be to use a high occupancy vehicle lane on Bruce B Downs Boulevard during their morning and afternoon commutes?
 - a. Very Likely
 - b. Likely
 - c. Unlikely
 - d. Very unlikely
 - e. Unsure/refuse
4. Specifically thinking of the different vehicles allowed in a HOV lane, how likely do you think your employees (and/or patients, customers, constituency, etc., depending on stakeholder) would be to use the following options, rather than drive alone if a HOV lane was available?
 - a. Carpool
 - i. Very Likely

- ii. Likely
 - iii. Unlikely
 - iv. Very unlikely
 - v. Unsure/refuse
- b. Vanpool (a group of between 5-12 commuters traveling together)
- i. Very Likely
 - ii. Likely
 - iii. Unlikely
 - iv. Very unlikely
 - v. Unsure/refuse
- c. Transit bus
- i. Very Likely
 - ii. Likely
 - iii. Unlikely
 - iv. Very unlikely
 - v. Unsure/refuse
5. (IF THEY ANSWERED NO TO THE OPTIONS LISTED IN QUESTION 1, ASK WITHOUT THE UNDERLINED WORD; IF THEY ANSWERED YES TO ANY/ALL OF THE OPTIONS, USE THE UNDERLINED WORD) Do you think your company/agency would be willing to give your employees (and/or patients, customers, constituency, etc., depending on stakeholder) any ADDITIONAL incentives to switch from driving alone to carpooling, vanpooling or riding the bus, if HOV lanes were implemented along Bruce B Downs Boulevard?
- a. Yes – Proceed to Question# 6
 - b. No – Skip to Question #7
6. Which of the following incentives do you think your company would consider?
- a. Preferred (front row/close) carpool or vanpool parking (yes/no/unsure)
 - b. Free or reduced-cost transit pass or vanpool fares (yes/no/unsure)
 - c. Transit pass or vanpool pre-tax deductions (yes/no/unsure)
 - d. Gift cards, prizes or other special recognition (for example, employees who carpool/vanpool or ride the bus can enter a raffle for each day they don't drive alone; random winners would receive a free gift or prize each month) (yes/no/unsure)
 - e. Other transportation-related incentives (yes/no/unsure)
 - i. *If yes, record verbatim:*
7. We understand that along with rush hour traffic during the work week, weekends can also be very congested along this part of Bruce B Downs Boulevard. Do you think that high occupancy vehicle lanes should be available during the weekend?
- a. Yes – Proceed to Question #8
 - b. No – Skip to Question #10

8. Do you think HOV lanes should be enforced on Saturdays? (yes/no)
9. Do you think HOV lanes should be enforced on Sundays? (yes/no)
 - a. If yes, during what times? (*record verbatim*)
10. Which of the following strategies do you think might have the most success in encouraging appropriate HOV lane use on this section of Bruce B Downs Boulevard?
 - a. Signs that educate commuters on how to use the lanes (e.g., entering/exiting lanes; requirements for two or more people per car)
 - i. Temporary signs (similar to construction signs that are moveable/can be replaced by permanent signs)
 - ii. Variable (electronic) message boards
 - b. Enforcement of proper use
 - i. Law enforcement along the corridor, such as police monitoring lane use from car(s)
 - ii. Fines for misuse/abuse of HOV lane
 1. Temporary signs (similar to construction signs that are moveable/can be replaced by permanent signage) indicating penalties for misuse
 2. Variable message signs indicating penalties for misuse
11. Do you think the police should give tickets to lane violators? (yes/no)
12. What if the fines were based on a sliding scale where repeat offenders received a higher fine? Would it be OK to ticket lane violators? (yes/no)
13. Do you think the addition of a HOV lane along this segment of Bruce B Downs Boulevard would have an influence on the available parking at your facility (due to fewer cars coming into your garage/parking lot)? (yes/no)
14. Do you think your employees would be more willing to carpool or vanpool if they were given preferential parking in spaces closer to the entrance of the building for carpooling/vanpooling? (yes/no)
15. Is there anything else that we may not have asked that you think is important to this project? (*record verbatim*)

Thank you for taking the time to answer these questions. I would like to send you my contact information in case you have any questions or think of any additional information you can provide that we didn't cover in the interview. Is your email address: (*read from list*)? Your participation and answers will be very helpful to the Hillsborough County MPO as we move forward with this project. Have a great day!

B.3 STAKEHOLDER LIST FOR TELEPHONE INTERVIEWS

- Busch Gardens
- City of Temple Terrace
- Florida Hospital Tampa
- James A. Haley Veterans' Hospital
- Moffitt Cancer Center
- University of South Florida/Center for Urban Transportation Research
- USAA Insurance

APPENDIX C: STAKEHOLDER INTERVIEW FINDINGS

Employer / NNTA	Contact Context/ Other Background	GRH/ERH	Carpool Matching	Preferential Parking	Vanpool Services	Transit	Employer provided Shuttles	Bike programs	CWW /	Telework	BWC	Car-Sharing	Other Programs of Interest
Busch Gardens	Not much there; the former Board member who had attended for a while is gone and apparently was asked not to attend as regularly.												
USAA Insurance					Runs its own internal vanpool program								
Florida Hospital	New management is more "healthy lifestyle" oriented												They are in the process of master planning at the hospital
VA Hospital				They build a 5,000 space parking garage that opened recently and previously had been using excess parking at University Mall at cost	Has a huge number of vanpools in the service area (28-30 or so) and they get the federal subsidy.								
City of Temple Terrace	HR is becoming more willing to get on board; Brad Parrish							Bike Smart class starting next week; Bike Racks in place; working on a bicycle/pedestrian committee	Not likely				
Moffitt Cancer Center	They have outgrown their campus and are 'within' but 'separate from' USF.						They use a parking lot off McKinley Avenue for an employee park & ride and employer shuttle and serves all the shifts.						
USF / Center for Urban Transportation Research	Primary contacts are hugely involved. In 2008, they signed a campus climate commitment to reduce its carbon footprint to zero. The campus master plan now incorporates TDM and improved sidewalk connectivity, etc.	ERH is valid at the University but they have to be registered through TBARTA to get the passes; it's still voucher based.	University is using ZIM Ride and also some RidePro activity through TBARTA. The ZIMRIDE capabilities are geared more toward students; probably about 3,000 signed up	Do have preferential parking for carpools, but it needs to be revamped. It has fairly low utilization -- they pay a discounted rate and get a priority space.	None known.	University Pass payments to HART and students ride free	Real-time Bull Runner Shuttle data downloadable by an app	Student Green Fund funded a big \$300,000 investment in the bike sharing programs. Vendor is not decided and University is still starting up.	University has had the compressed work week and it's department by department	By department; also specific at CUTR and USF by approval	University is the designee as BWC.	Active Car-sharing program through WE Car; three are in place, and there's a fourth car coming; students mostly use it but staff and faculty can use the program. Also, CUTR is working on launching a multifaceted mobile app to showcase all available options. Hope is to roll something out in Fall	Also a Parking Guidance System is underway that provides information for all the garages and lots with variable message boards. Also funded by the Student Green Fund. These ideas spun out of an April brainstorming system with the student fund leadership. The program schedule is to launch something by Spring.
City of Tampa								Social Bike is the program/ vendor chosen by Tampa.					

APPENDIX D: CASE STUDIES

D.1 OVERVIEW

Five projects regarding HOV lane implementation and how TDM strategies were used before, during and after the implementation of HOV lanes were reviewed in order to:

- Identify the tradeoffs between single occupancy vehicle travel and travel via carpool/transit in a HOV lane (including estimated time savings and congestion reduction)
- Explore opportunities to enhance TDM initiatives:
 - Carpool matching (including mobile and social applications)
 - Road pricing tolls during peak hours
 - Intelligent transportation system improvements
 - Way-finding tools and other methods for promoting non-single occupancy vehicle modes
 - Employer/marketing incentives
 - Promotion of HOV lane usage by existing transportation/TDM providers

According to the Federal Highway Administration, “While lane performance is a central factor in the decision for HOV policy change and the key to understanding the system impacts of one policy over another, there are many other factors that influence the successful implementation of a policy change. Changes such as hours of operation, vehicle eligibility, and occupancy may in some circumstances be policy changes within the authority of the facility operator, or they may require legislative action, depending on the institutional arrangements and laws in a particular location. Authorized policy changes are of course a quicker path to implementation, as they do not require the formal actions of elected legislators. Some agencies acknowledged preferences for not opening up legislative issues, but rather to work with factors within their control. Opening up legislation can lead to unexpected outcomes and slow response to the operating issues faced. Some HOV operators have appointed boards designated to make policy decisions regarding HOV systems. This institutional arrangement can facilitate the HOV policy decision-making process, particularly when multiple partnering agencies are involved. Along these same lines, many operators comment that specific Federal rules related to HOV policy changes and lane performance actually facilitate implementation at the local level.” (http://ops.fhwa.dot.gov/publications/fhwahop09029/sec3_results.htm)

While many of the sample projects available for us to examine as case studies involved the use or implementation of tolling, we understand that it is not the intention of the Hillsborough County MPO to use tolling on this project at this time or in the foreseeable future. However, many of the “major findings” and “lessons learned” that follow each case can be applied to the implementation of an HOV lane, where none formerly existed, just as readily as they were to tolling within an existing HOV lane.

The following pages contain overviews of the case studies listed below, and include:

- A synopsis of each case study
- Major findings as they relate to TDM measures (if/where applicable)
- Lesson(s) learned that can be applied to this project

It is our intention to examine “what went right” and what could have been improved during the process of implementing the HOV lanes/policies, in order to help the MPO take advantage of proven best practices while avoiding any pitfalls that other agencies have encountered across the country.

D.2 FINDINGS BY CASE

For this Task, relevant data (primarily regarding HOV lane implementation, performance, and enforcement) including the TRB report on HOV lanes (dated April 2003) was researched, compiled and reviewed. Specific similar projects/studies in Florida and nationwide were also researched and reviewed, including:

- I-880 HOT/HOV Value Pricing Feasibility Study [Florida] (April 2004);
- California Department of Transportation (CalTrans) Regional HOT Lanes Network Feasibility Study: Policy and Operation Considerations for a Regionwide Bay Area HOT Lane Network [California] (December 2006);
- North Carolina Department of Transportation (NCDOT) I-77 HOV Newsletter - includes marketing/public relations/outreach/ public communications about the project [North Carolina] (Spring/Summer 2004);
- South Carolina Department of Transportation (SCDOT) HOV/HOT Lane Feasibility Study Final Report [South Carolina] (February 2010); and
- Virginia Department of Transportation (VDOT) I-95 HOV Feasibility Study [Virginia] (March 2002).

D.2.1 I-880 HOT/HOV Value Pricing Feasibility Study [Florida] (April 2004)

Synopsis

The objectives of this study were to:

- Determine whether there was potential demand for light-duty (2-axle) commercial vehicles to pay a toll or fee to buy into service on the existing high-occupancy vehicle (HOV) lanes on Interstate 880. These are also known as high-occupancy toll ("HOT") lanes.
- Determine the available HOV capacity over a time horizon of approximately 20 years.
- Determine the special operational and/or enforcement issues associated with commercial vehicle buy-in to the HOV lanes.
- Determine the revenues, costs, and overall financial feasibility of such a program.
- Recommend one or more options for possible implementation as a pilot program

Major Findings as Related to TDM Measures

The principal purposes potentially served by permitting SOV vehicles to buy into HOV lanes:

- System capacity management: Pricing offers another means of managing dedicated priority lanes. Management of dedicated lanes can take the form of user restrictions, pricing and access

controls. To date, user restrictions favoring HOVs provide the sole means of managing these lanes. Pricing would offer another way of enhancing management of the lanes while preserving current travel benefits enjoyed by HOVs.

- Increasing flexibility and choices: A value pricing program provides an opportunity to improve efficiency by providing a choice that is otherwise not available; SOV drivers would be offered the opportunity to save time, increase reliability, and reduce costs. They could choose to avail themselves of the service only when it is beneficial to do so, e.g. when the freeway is highly congested or when lateness to a destination would be especially problematic. Provided that the HOV lanes do not become overloaded by an excess of buy-in vehicles, there are only "winners" from a value pricing program.

Considerations:

- Opening the HOV lanes to SOV buy-in, however, is likely to be much more complicated. There are potentially many thousands, perhaps tens of thousands, of commuters and residents who would be eligible and interested in applying for a permit. Finding a way to select a small/limited number of users from among such a large pool could be administratively difficult and politically problematic.
- There are also enforcement issues under the SOV buy-in scenario, because any vehicle could be a potential eligible user or a potential violator. This means that law enforcement officers would have to scrutinize every vehicle in the HOV lane for either the requisite number of passengers and/or a valid permit decal.
- Thus, if an SOV buy-in were part of the program, electronic toll collection would be far more desirable than the permit decal. However, because physical barriers are unlikely to be acceptable as lane separation treatments, electronic toll readers would likely have to be installed at very frequent intervals. The requirement for frequent toll readers substantially increases the capital cost for the project, as compared to current projects in other parts of the country, where there is only one entrance and one exit.

Applicable Lessons Learned

- Considerations for changes in HOV lane policy should be considered as a package rather than as individual elements. It became apparent during the study that changes in possible changes in HOV lane eligibility and hours of operation could significantly impact the potential for HOT lane use.
- Because significant congestion was observed near both the beginning (PM only) and the end of the peak period operating hours for HOV (AM and PM), extending the operating hours could increase overall HOV lane benefits, whether or not a HOT lane concept is implemented.
- Generally, the introduction of additional eligible vehicles into HOV lanes should be considered soon after new construction has eliminated any existing bottlenecks. Currently, the southbound direction of I-880 has a bottleneck at the end of the HOV lanes, which will be addressed with a widening project that will be completed within three years.
- Considerations for changes in HOV lane policy should consider as much of a region's HOV lane system as possible. The study considered only a "buy in" for commercial vehicles in the existing I-880 corridor in Alameda County. The benefits for the program are likely to be greater if other parts of the regional HOV lane system could be involved.

- The HOV lane design with continuous access and egress greatly increases the complexity of managing and enforcing HOT lane programs. A system that would charge for each HOT lane use would require a large number of transponder receiving stations. Otherwise, a permit system is the only feasible operating strategy, which can result in significantly different average costs per use. But, because a permit system does not charge per use, the ability to manage the system by controlling demand is considerably diminished. This same general principle can be applied to HOV implementation where there was no HOV restriction in the past.
- The need for a political "champion" of the project is underscored, as has been demonstrated in other projects around the country. In this case, while there was little overt opposition to the idea, neither the business community leadership nor elected officials demonstrated much enthusiasm or a sense of urgency about the proposal, even to pursue it as an easily-revoked, limited experiment. This meant that there was no driving force available to overcome skepticism, when it was expressed by public agencies involved in implementing it.

D.2.2 California Department of Transportation (CalTrans) Regional HOT Lanes Network Feasibility Study: Policy and Operation Considerations for a Regionwide Bay Area HOT Lane Network [California] (December 2006)

Synopsis

The Metropolitan Transportation Commission (MTC) in the San Francisco Bay area examined the potential of expanding the existing and planned high-occupancy vehicle (HOV) system by creating a regional network of high-occupancy toll (HOT) lanes. This could be done by converting existing HOV lanes to HOT lanes and expanding the HOV and HOT systems where possible. Potential benefits included more efficient use of freeway capacity and a more reliable and faster travel option for carpoolers, vanpoolers, express bus riders, and toll payers.

This report reviewed the following key topics and described how each was addressed in this study:

- HOT Lane Design Principles and Physical Access
- Interface With HOV Lanes
- Pricing Policy, Tolling Infrastructure, and Technology
- Linkages to Regional ITS Architecture
- Maintenance
- Enforcement
- Public Acceptance
- Equity
- HOV Facilities and Planning Efforts in Neighboring Regions
- Governance

Some topics, while important to tolling, have less influence on how travelers will respond to the availability and pricing of a HOT lane. Governance is such an issue. While critical to determining

stakeholder acceptance and how tolling will be implemented, it does not have an immediate bearing on the numbers of people who would use HOT lanes and what revenue could be generated.

Major Findings as Related to TDM Measures

Occupancy Requirements for Free Vehicles: Two Persons vs. Three Persons – a major consideration underlying the implementation of HOV (and HOT) lanes relates to the number of qualifying carpool vehicles eligible to use HOV lanes and that would be eligible to use the lanes free of charge. Vehicle occupancy requirements significantly impact the effectiveness of these lanes. If the number of qualifying carpools is large enough, the lane will slow down and fail to offer fast and reliable trips; this, in turn, reduces incentives to carpool or take the bus. Further, the premise of HOV lanes is to manage the number of vehicles in the lane and keep it free flowing, and this mechanism clearly does not work if the number of vehicles exceeds the target lane volume. Most HOV lanes are said to operate under a 2+ HOV occupancy requirement. In a small number of corridors across the country, 3 or more persons must be in a vehicle to qualify as a carpool and use the HOV lane during commute periods; these HOV lanes are said to operate under a 3+ HOV occupancy requirement.

In terms of enforcement, successful operation of an HOV/HOT lane system depends on a high level of compliance of the traveling public with the regulations that govern the use of the lanes. Effective enforcement is critical for several reasons:

- HOV/HOT lanes can be managed only if the number of users is regulated at below the operational threshold of the lane. With inefficient or non-existent enforcement, ineligible drivers unwilling to pay will cheat and use the lanes despite the restrictions.
- If cheaters go unpunished, it may embolden travelers who were otherwise willing to obey the rules to cheat, too.
- High violation rates erode public support for dedicated lanes.

The three most common offenses associated with HOV/HOT lanes include:

- Occupancy violations - not having the requisite number of persons in a vehicle.
- Access violations - crossing a buffer where access is restricted.
- Toll evasion (in HOT lanes) - avoiding paying tolls at the prescribed price in effect.

The importance of each violation is influenced by the facility design and intended operation rules. For example, an HOV lane with a physical barrier will not have any access violations. Technology and institutional issues play a key role in what is considered accepted practice in apprehending and citing occupancy violators.

Other concerns include:

- Adequacy of signage and fines - it is crucial to assess fine structure and place fine rates sufficiently high enough to discourage violations, but not so high as to have a large number of citations contested in court. Make sure signing adequacy meets police and traffic court acceptance.

- Lack of dedicated enforcement presence - fund overtime or dedicated enforcement personnel and post fines to discourage violators.
- Safety for on-site activities - dedicated enforcement monitoring and apprehension areas must be set up, either through full width median shoulders or strategically placed enforcement areas.

Challenges and Opportunities:

- Adequate funding for highway patrol presence is a key. Effective HOV lane enforcement requires distinguishing between eligible and ineligible users.
- Soft or hard barriers will offer greater potential to limit access but may make it difficult for law enforcement to distinguish quickly and from any vantage point which vehicles have more than one occupant and which do not.
- Considerable experience from other locations will provide options for addressing enforcement issues. Cost and effectiveness are appropriate factors to determine whether more frequent reader/camera monitor installations, more patrol officers, mobile police monitoring equipment, physical separation, or some other methods are a better investment. The recent history of technology adoption suggests that, over time, it is likely that the technology costs will decline.
- Policy-makers will be faced with many tradeoff decisions regarding enforcement. These will include choices among different types of technology with widely varying costs, how much it is worth to pay for reduced violation rates, how rigorous enforcement might impair convenience for travelers, and privacy and political acceptability considerations.

Applicable Lessons Learned

Options for governance of the HOV lanes will need to be considered as work moves forward and decisions will need to be made on compatibility and consistency, operations practices, management, and a wide range of topics related to governance.

Critical governance issues include, in addition to which organization(s) play leadership roles, two key policy choices needing continued attention. These are:

- HOV effectiveness - the MPO will need to consider how to keep HOV lanes effective as HOV volumes increase. As an HOV lane approaches service worse than level of service C (approaching breakdown conditions), it will be important to consider increasing the vehicle occupancy requirement (from 2+ to 3+), adding a second HOV lane, or taking some other approach to maintaining the effectiveness of the HOV lane. A public policy of increasing the HOV requirement when a lane fills to capacity with HOVs is essential to the ability of the region to make the lanes successful.
- Public Acceptance of the HOV lane - the addition of HOV lanes is inevitably controversial despite the improved mobility to a large number of users.
- Strategies to Address Public Acceptance need to be implemented very early in the planning phases of the project - strategic public relations may offer opportunities to enhance public acceptance when market research suggests negative or polarized public attitudes exist toward a proposed HOV lane project. By identifying the key issues of concern, the appropriate method(s) may be selected from the following potential menu of options:

- Marketing Message: Travelers "have the option" - marketing HOV lanes as a benefit available to all users rather than a concept that creates two classes of users, can help to address equity issues.
- Marketing Message: Enhanced reliability and speed benefits all users - prior to the implementation of HOV/HOT lanes on the Katy Freeway (I-10) in Houston, Texas, this message was delivered via focus groups, new releases, interviews with agency staff, and media coverage. HOT lanes on the Tappan Zee Bridge in New York (for commercial vehicles) were similarly touted for the benefits of reduced peak period travel, as well as improved air quality.
- Marketing Messenger: The Political Champion - all of these strategies require the dedication of one or more political champions. More importantly, the lack of a champion (or presence of one or more opponents) is why some HOV/HOT projects have not moved forward, even though most were found to be technically feasible. More than 25 HOT lane studies were completed in the period from 1995 to 2005, yet during this period only four HOT lane projects in California, Minnesota and Houston were implemented. Having a political champion, coupled with local and state agencies willing to collaboratively move forward, is an important factor in being able to demonstrate and implement these traffic management tools.

D.2.3 North Carolina Department of Transportation (NCDOT) I-77 HOV Newsletter - includes marketing/public relations/outreach/public communications about the project [North Carolina] (Spring/Summer 2004)

Synopsis

The North Carolina Department of Transportation developed a newsletter as a public outreach/marketing tool to announce the opening of the state's first HOV (High Occupancy Vehicle) lane along a stretch of I-77 north of downtown Charlotte. The new HOV lanes on I-77 would be open 24-hours a day, 7 days a week and restricted to vehicles carrying at least two people. The HOV lanes were designed to alleviate future traffic congestion by encouraging more people to carpool, vanpool and ride the bus. Two public bus routes (CATS routes 83X and 77X) were set to utilize the HOV lanes, with the caveat that additional service would be added to those routes after the HOV lanes opened.

Major topics and features covered in this 3-page newsletter included:

- A letter from the state's Secretary of Transportation
- An overview of the benefits to commuters including:
 - Faster Trips
 - Reliable Travel Times
 - Saving Money
 - Less Pollution
 - Less Stress
 - Reduced Wear and Tear on Your Vehicle

- A map of the corridor where the HOV lane is located
- Rules of the Road
 - How to use the lanes, who can use them, etc.
 - Frequently Asked Questions about HOV lanes
- Graphics including:
 - Signage on the HOV corridor
 - A comparison of the number of vehicles needed to carry 45 people showing SOV drivers, carpools, vanpools and a bus
- TDM information including:
 - Transit information and diagrams of the Bus Routes on the corridor
 - Vanpool information
 - Guaranteed Ride Home information
 - Potential savings by using a TDM option (depicted by mode)

Major Findings as Related to TDM Measures

Designing this type of newsletter specific to the rules of the corridor where the HOV lane is being implemented can be very informative and beneficial to the public, members of the media and other stakeholders. This collateral not only promotes the use of HOV lanes to those who can potentially utilize them but also informs non-users of the benefits to everyone who travels the corridor.

Applicable Lessons Learned

See attached newsletter as a sample marketing piece. A similar piece should be considered by the MPO for development several months before the HOV lane is going to be implemented. The newsletter (or similar collateral such as brochures, flyers and/or posters) should be finalized well in advance of the opening of the HOV lane(s) and presented to the media and public.

D.2.4 South Carolina Department of Transportation (SCDOT) HOV/HOT Lane Feasibility Study Final Report [South Carolina] (February 2010)

Synopsis

SCDOT examined five corridors in South Carolina to determine the feasibility of instituting High Occupancy Vehicle (HOV) lanes or High Occupancy Toll (HOT) lanes. The regulations in a HOV lane implementation would confine use to passenger vehicles with two or more passengers, while the HOT lanes would also allow single occupant vehicles that are willing to pay a toll to use the lanes. These initial studies examined whether there was sufficient congestion to warrant a HOV and/or HOT application on each corridor.

The process used to determine the feasibility of HOV (or HOT) lanes for major corridors in South Carolina involved testing three basic criteria:

- The presence of congestion both today and in the future - if congestion is currently persistent or is expected to be in the future, then mobility benefits can potentially be derived by adding HOV (or HOT) lanes.
- Physical feasibility - this criterion measures the corridor's available space for roadway expansion within the existing roadway envelope via a physical examination of the corridor and comparison to design guidance.
- Considering available congestion and cost information, evaluate the user benefits and costs - if benefits and costs are aligned in a positive manner, a corridor would be deemed feasible. If the benefits are insufficient and the costs are too high, the corridor would be classified as infeasible.

Based upon direction of the SCDOT, an occupancy requirement of HOV-2+ was assumed for both the HOV and HOT lane scenarios. All vehicles with two or more occupants, including transit vehicles, could use the HOV lane for free. The managed lanes in both lane scenarios were assumed to be operational 24 hours a day and enforced primarily during the peak periods and during any other high volume period. In the HOT lane scenario, toll-paying vehicles would be required to have a sticker-type transponder on their vehicle to allow for both toll payment and for assisting in enforcement (the costs of the transponders are assumed to be paid by the user).

For the HOV scenario, 50% of the HOV vehicles in the corridor were assumed to use the HOV lane, primarily because of access limitations. An additional 25% growth in HOV vehicles was assumed as HOV usage is likely to increase as capacity is targeted to them (total person trips in the corridor were assumed constant). Cost estimates did not assume any major roadway or equipment upgrades in the 2010 to 2040 study period, but variable expenses include the cost of un-recovered fines due to violation enforcement, and the fees to process these transactions.

Applicable Lessons Learned

Acceptance Factors: To understand the potential acceptance of HOV lanes (and HOT lanes) in the Charleston area, both the collective experience nationwide of the public's opinion of HOV lanes and the demographic characteristics of areas with HOV lanes as compared to the Charleston area were investigated. The two major hurdles faced by other HOV lanes, in terms of public acceptance, have been "empty lane syndrome" and enforcement. Empty-lane syndrome refers to the visual impression that non-HOV users perceive if the HOV lane is not well used, particularly if the general purpose lanes are very congested. To avoid this syndrome, national HOV experience indicates that mature HOV lanes should carry a minimum of 400 to 800 vph during the peak. Enforcement also needs to be prominent and effective to avoid the perception of HOV lane misuse, real or exaggerated. National experience also indicates that a tolled road or lane is generally accepted and successful if it provides a reliable trip with a significant time or distance savings.

D.2.5 Virginia Department of Transportation (VDOT) I-95 HOV Feasibility Study [Virginia] (March 2002)

Synopsis

The objective of this study, which was initiated by the Virginia Department of Transportation (VDOT) in April 2000, was to determine if an extension of the existing Interstate 95 (I-95) High Occupancy Vehicle

(HOV 3+) lanes would be an effective strategy to accommodate future peak commuter demands in the I-95 corridor. The results of this study are intended to provide valuable input to determining the nature of improvements required to maintain an acceptable level of service along the mainline of I-95 and the extent of the improvement that should ultimately be implemented.

Substantial population and employment growth is projected for the Fredericksburg Area Metropolitan Planning Organization (FAMPO) area by 2025, which will result in significant growth in traffic demand on I-95. Close coordination with the FAMPO Technical Committee, which was the advisory committee for this study, was maintained throughout this study, which also included a public workshop at which citizens were able to review the scope of the study and provide comment. The results of this study were intended to provide input to determining the nature of improvements in the I-95 corridor that will best accommodate future person travel demand.

Major Findings as Related to TDM Measures

General comments and questions at public meetings held by VDOT regarding the HOV Feasibility Study focused on the status of the study, need for HOV lanes, criteria being used to evaluate HOV lanes, and availability of funds for an extension of the HOV lanes. Public comment was divided on the issue of whether the HOV lanes should be extended into the FAMPO region. Specific comments and questions related to HOV lane occupancy requirements (HOV 2+ or HOV 3+), time of operation, and lack of detailed construction cost estimates.

The study team provided responses to comments and questions to the extent that information was available to do so. It was noted that this was a feasibility study and that a formal decision on whether to extend the HOV lanes would ultimately be based on more detailed engineering studies, as well as an examination of their role in the context of other potential regional roadway and transit system improvements.

Applicable Lessons Learned

This study featured significant Public Involvement Activities: developing a credible list of stakeholders was one of the first activities with which the public involvement team was involved. The team researched and identified potential stakeholders who worked in, resided, or commuted through the study corridor. Stakeholders who represented interested/affected constituencies who travel through this corridor were also included. The names and addresses of these key stakeholders were compiled into a mailing database of approximately 500 persons/agencies. It was anticipated that many of the stakeholders would represent their organizations and act as conduits by advising the study team of issues that should be considered within the studies' scope and by communicating findings back to their respective organizations. Key stakeholders included representatives from the following groups:

- Elected and appointed officials;
- Federal, state, and local agency representatives within the study area;
- Business, environmental, community, civic, and homeowner organizations;
- Transit providers and patrons (private bus operators, rideshare coordinators);

- Current/potential/non-HOV users;
- MPO members;
- Local media (newspaper, television, and radio); and
- Major employment centers.

The stakeholder database was used to invite citizens to public information meetings. The first meeting was held in the early stages of the studies and the second was conducted towards the studies' conclusions. The general public, as well as the invited stakeholders, were welcome to attend the meetings. In addition to the personal invitations mailed to all stakeholders on the mailing database, the team prepared meeting notices for the project website (www.virginiadot.org), newspaper ads, and press advisories.

At the public meetings, the study team distributed informational materials, which included the agenda, an overview of the presentation, fact sheets, and comment forms. Citizens had ample opportunities to ask questions, provide comments, complete comment sheets, and view study-related exhibits and maps. Other communication methods used for these studies included the project website, which presented a description and location of the studies, contact information for the VDOT project manager, a calendar, and a status of the study. A toll-free hotline (1-800-862-1386), maintained by VDOT staff, was also employed during the course of the studies.

APPENDIX E: COMMUTER ASSISTANCE PROGRAM

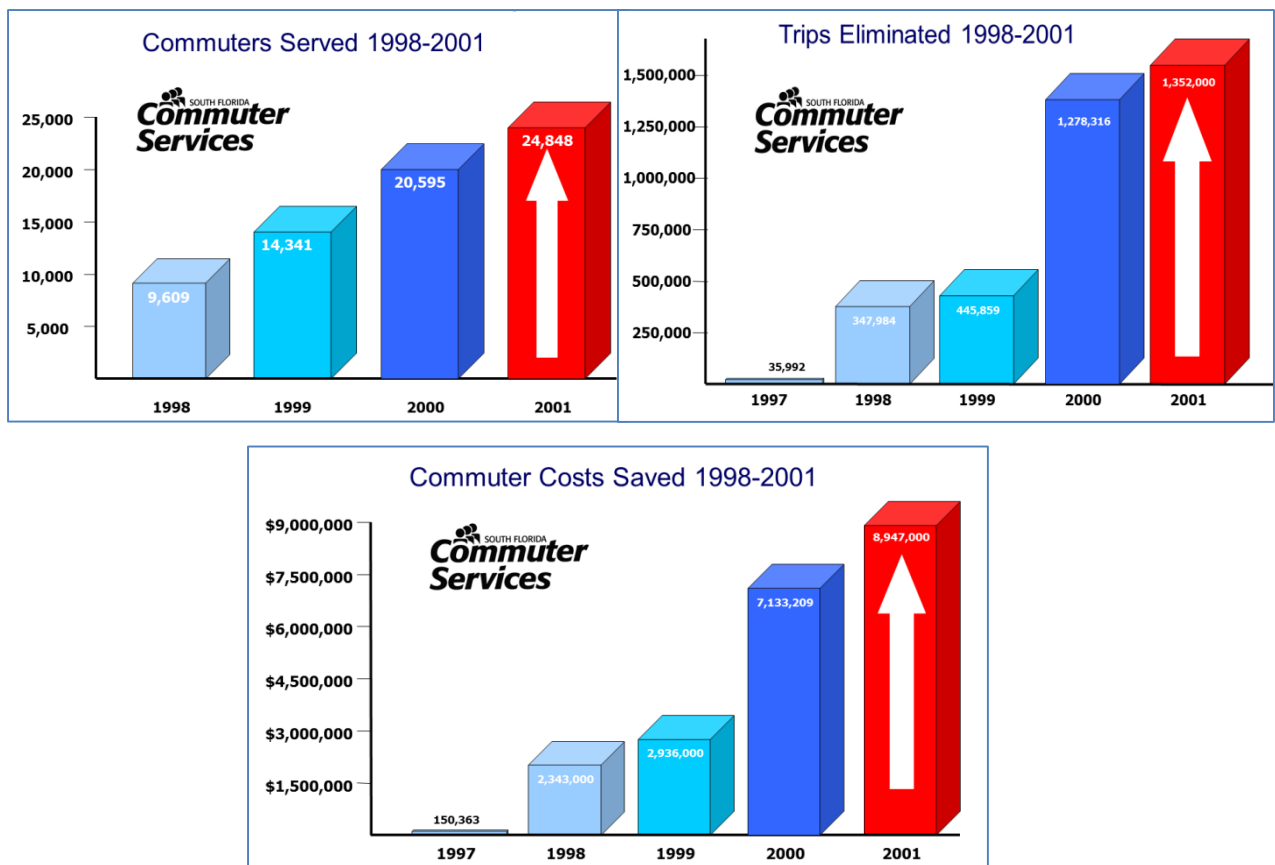
Research regarding outcomes of commuter assistance programs and resources to establish this type of program has been compiled from other programs around the nation. Findings from this research are presented below.

E.1 PROGRAM BENEFITS

Benefits of commuter assistance programs are demonstrated through the three provided examples.

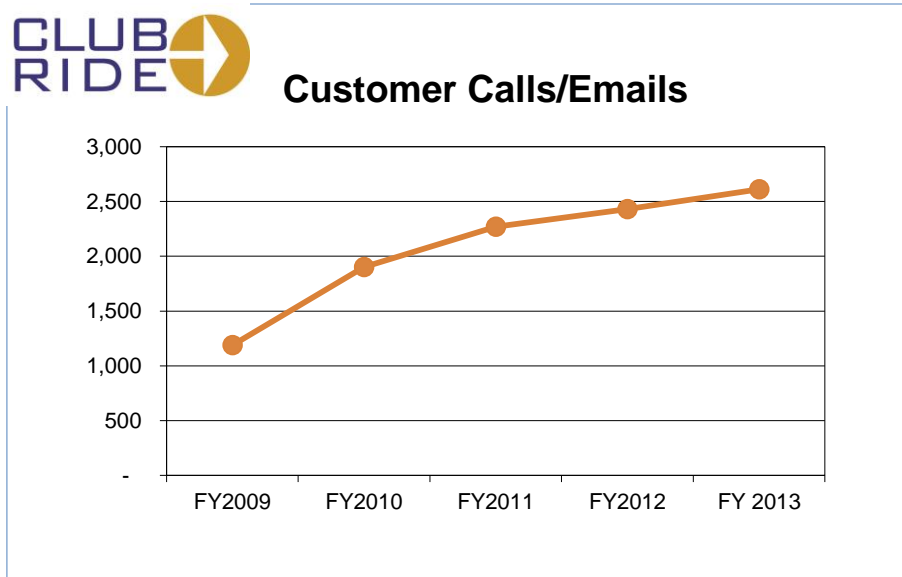
Example 1: Florida Department of Transportation Districts 4 & 6 South Florida Commuter Services Program

The graphs show substantial upward growth over a four-year period (1998-2001) in the number of commuters served, the number of trips eliminated, and the cost-savings accruing to commuters.

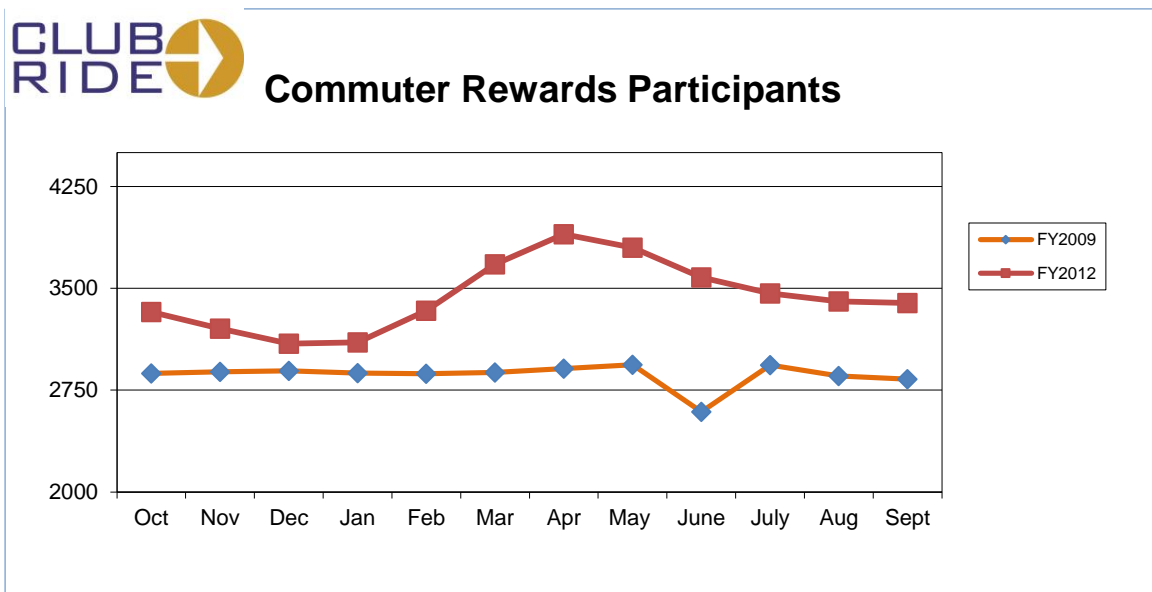


Example 2: Las Vegas Club Ride Commuter Services Program

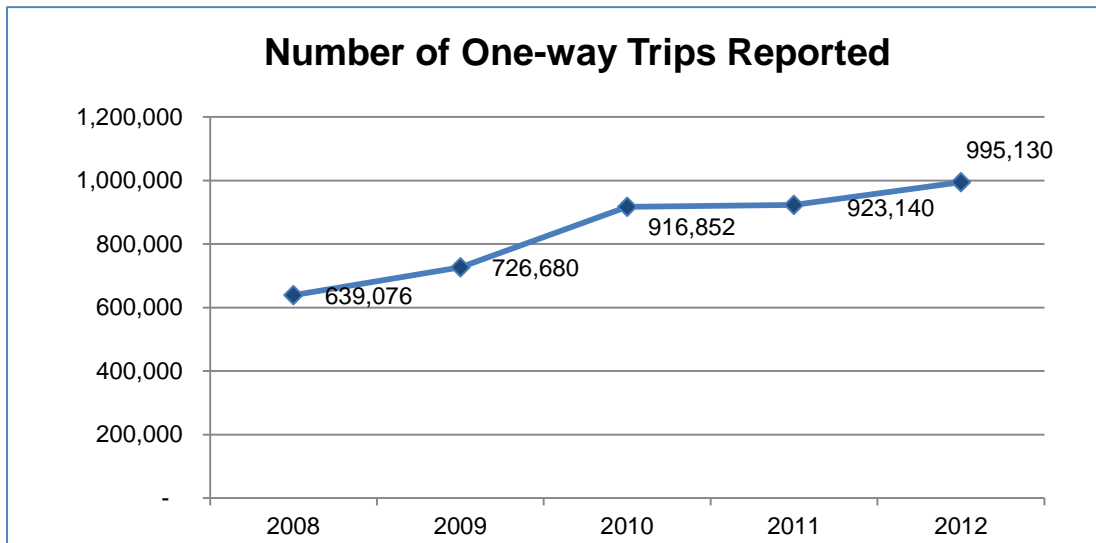
The following graph shows a consistent increase in the number of calls and customer email inquiries being received by the Club Ride Commuter Services Program staff in Las Vegas. In 2009, commuter inquiries averaged less than 100 a month; by July 2013, more than 300 individuals were calling Club Ride Commuter Services with commute-related inquiries.



The next graph shows the number of commuters each month who voluntarily report their commute mode in Las Vegas. While fluctuations occur monthly and periodic "commuter challenge" events may spike reporting, the overall reporting population continues to increase with time.



The last graph portrays growth in participation levels by the number of individuals choosing to report their commute. Over the last several years, the program has captured more daily trips being reported by commuters registered with the program. It has been our experience here that the longer an individual remains in the program, the more frequently they report (and presumably use) alternative commute modes.



Example 3: Atlanta Cash for Commuters Program

The Atlanta-based Clean Air Campaign employer-outreach program launched the incentive-driven “Cash for Commuters” (CFC) Program to convert drive-alone commuters to an alternative travel mode. In the first pilot period, from October 2002 – February 2003, participants were driving alone for 84% of their weekly commute trips. Drive alone trips were cut nearly in half to just 47% of total weekly trips nine – twelve months after completing the program (i.e., when participants were no longer receiving a financial incentive to use an alternative). Additionally, 64% of CFC participants continued to use commute alternatives nine – twelve months after completing the program. In the second pilot period, from May 2003 – December 2003, enrolled participants were driving alone for 78% of their weekly commute trips. Drive alone trips were cut by more than half to just 38% of total weekly trips three – six months after completing the program. Additionally, 74% of these CFC participants continued to use commute alternatives three – six months after completing the program. Finally, based on an evaluation by the Center for Transportation and the Environment (CTE), daily emission reductions were found that may be directly attributed to the program.

E.2 PROGRAM STRUCTURE

The success of a Commuter Assistance Program/TDM Program is based primarily on outreach. As such, the program should be structured with outreach as the focus. Accordingly, the outreach initiative should be organized to provide sufficient coverage within the business district or region to enable each outreach coordinator to accomplish the following critical objectives:

- Reach out to new businesses through sales calls and visits

- Assess a company’s needs and work to develop TDM-supportive policies and programs at the worksite
- Establish and build a relationship with that business including reaching out to multiple contacts within a given company (e.g., human resources, parking/transportation, facilities, finance, etc.)
- Work with a company’s employees to educate and engage them in TDM program offerings (e.g., ridesharing, transit, vanpooling, alternative work-hour programs)
- Deepen program offerings to expand participation on-site, over time
- Hold quarterly events to recruit commuters no less than quarterly
- Hold meetings with company representatives as needed (but not less than quarterly)

Typically, one full-time outreach coordinator can adequately serve between forty – fifty company “partners” in a comprehensive manner. This workload allows each coordinator to maintain a forward momentum with each business, noting that not all companies and not all commuters will be at the same stage of TDM Program adoption at the same time. Our experience suggests that TDM Program adoption follows a traditional “sales model” and as such, must take users through a similar ‘sales’ process before they are willing to change and sustain changes to their travel behavior.

A TDM outreach coordinator generally progresses through the following phases with an employer regarding TDM Program establishment:

- **CONSIDER:** A coordinator must introduce the program to employers to secure their interest and buy-in. This may be done through calls and meetings or through the development of marketing collateral (e.g., an “employer folder” of key services offered by the regional TDM program, letters of endorsement, invitations to TDM-specific training, etc.).
- **REPEAT EXPOSURE:** TDM Program outreach is “sales” at its core and sales people (or outreach coordinators) must expect a high degree of rejection in their attempts to recruit employers into a TDM Program. Cold-calls, visits, marketing, and other efforts to engage prospective business partners must be ongoing.
- **TRY:** At this stage, a business may agree to get involved in TDM initiatives on a trial basis. This may include accepting an offer of technical assistance, agreeing to host a worksite event for employees, or taking part in an area networking event or training workshop on TDM. A positive first experience may lead an employer to the “Trial Use” stage.
- **TRIAL USE:** This may include the early adoption of more “fundamental” TDM Programs or Services, such as adoption of a Guaranteed Ride Home Program, or on-site ridematching for employees. Perhaps an employer will agree at this stage to install a few “carpool parking only” signs to see how many employees utilize them.
- **USE:** Only if the employer and employees have a positive experience with these early stages of TDM outreach and service-delivery is a company likely to take further strides toward adopting more aggressive policies or programs that support long-term mode shift away from drive-alone travel. At this stage in the process, an employer is usually “bought-in” and willing to adopt more TDM services and embrace the concepts more fully.

These steps are displayed in the graphic below.



The following graphic illustrates the cyclical nature of behavioral change of a commuter and the need for TDM outreach to be ongoing before a commuter will give up driving alone for regular use of an alternative. A TDM outreach coordinator may reach employees at any stage of this cycle – as they are considering an alternative, once they’ve tried it, when they’ve had a positive or negative experience with it, or when they are already a periodic alternative-commuter. Public education and marketing campaigns to reach individuals must be tailored to address commuters’ needs and concerns at every stage of this decision-making process if long-term behavior change is to be achieved.



Approximate cost calculations/projected outcomes for a TDM Outreach Program are presented in **Table E-1**.

**TABLE E-1
TDM OUTREACH PROGRAM ESTIMATED COSTS/PROJECTED OUTCOMES**

	Annual Costs (Salary)	Low End			High End		
		Potential Employee Reach*	Worksite Participants	Estimated Commuter Mode Shift	Potential Employee Reach**	Worksite Participants	Estimated Commuter Mode Shift
Coordinator 1	\$80,500	5,000	500 (10%)	130 (26%)	50,000	5,000 (10%)	1,300 (26%)
Coordinator 2	\$80,500	5,000	500 (10%)	130 (26%)	50,000	5,000 (10%)	1,300 (26%)
Coordinator 3	\$80,500	5,000	500 (10%)	130 (26%)	50,000	5,000 (10%)	1,300 (26%)
Coordinator 4	\$80,500	5,000	500 (10%)	130 (26%)	50,000	5,000 (10%)	1,300 (26%)
Cost/Outcomes	\$322,000	20,000	2,000	520	200,000	20,000	5,200
Cost Per Trip Reduced				\$619.00			\$61.90

*Calculations based on 50 employer contacts; each with a workforce of 100 employees.

**Calculations based on 50 employer contacts; each with a workforce of 1,000 employees.