STATE ROAD AND TOLLWAY AUTHORITY

Value Pricing on the I-75 HOV/BRT Project

VALUE PRICING ON THE I-75 HOV/BRT PROJECT

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FINAL

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Executive Summary

BACKGROUND

This evaluation of value-pricing on I-75/I-575 is an outgrowth of the Northwest I-75/I-575 HOV/BRT program currently under development by the Georgia Department of Transportation (GDOT) and the Georgia Regional Transportation Authority (GRTA). Beginning in 2001, GDOT studied options for extension of the High Occupancy Vehicle (HOV) system in the I-75 and I-575 corridors. At approximately the same time, GRTA began exploring transit options for the area Northwest of Atlanta which included the I-75 corridor, eventually settling on Bus Rapid Transit (BRT) as a preferred transit technology. Realizing that the projects would mutually benefit from the joint preparation of the environmental documentation for the two endeavors, GRTA and GDOT began working together on the engineering and environmental documentation for the combined HOV/BRT (BRT) Project in 2004.

About Value Pricing

In 2005, the Georgia State Road and Tollway Authority (SRTA) received a grant from the Federal Highway Administration (FHWA) to investigate the application of "value pricing" to the HOV/BRT project. In this study, value pricing is only considered for the lanes to be constructed for HOV/BRT usage; general travel lanes remain free of tolls at all times.

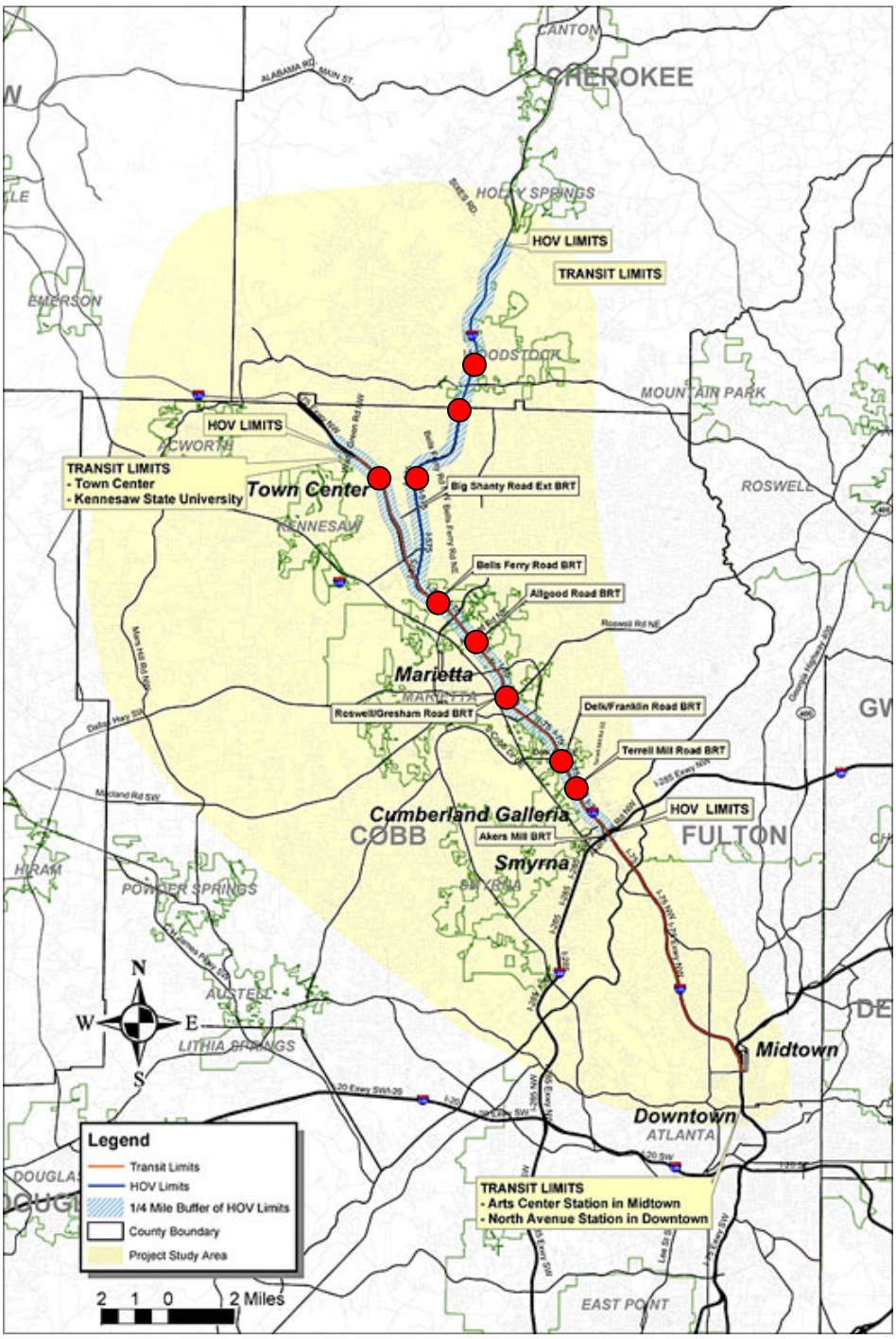
The effort is funded through FHWA's Value Pricing Pilot Program. The Congressionally mandated, experimental program is aimed at learning the potential of different value pricing approaches for improving the efficiency of transportation systems, and in dealing with congestion, pollution, energy and other problems related to automobile use in congested areas. Value pricing, also known as congestion pricing or peak-period pricing, entails fees or tolls for road use which vary by level of vehicle demand on the facility. Just as airlines offer off-peak discounts and hotel rooms cost more during peak tourist seasons to allocate scarce capacity, road-use charges that vary with the level of vehicle demand provide incentives to shift some trips to off-peak times, less-congested routes, or alternative modes, or to cause some lower-valued trips to be combined with other trips, or eliminated. A shift in a relatively small proportion of peak-period trips can lead to substantial reductions in overall congestion. And, while variable charges create incentives for more efficient use of existing capacity, they also provide improved indicators of the potential need for future capacity expansion and generate revenues that can be used to further enhance urban mobility.

Study Area

As shown below, the proposed Northwest Corridor HOV/BRT Project and the Value Pricing Study area extends 14.5 miles along I-75 from Akers Mill Road to Wade Green Road and 11.5 miles along I-575 from the I-75 interchange to Sixes Road. As part of the

HOV/BRT alternative, transit stations are proposed at Akers Mill Road, Terrell Mill Road, Franklin Road, Roswell Road, Allgood Road, Bells Ferry Road, and Big Shanty Road Extension. The project includes nine points of access for private vehicles to managed lanes along the route, as highlighted in red.

Figure ES-1: Study Area



Study Scope

The Value Pricing Study is comprised of six elements as explored in the chapters of the full report. In addition to an introduction, they include:

Chapter 2: Existing traffic conditions and trends in the I-75/575 corridor;
Chapter 3: An exploration of how potential users perceive tolling and value travel time accomplished through a stated preference survey;
Chapter 4: Modeling and estimation of traffic demand based on expected travel behavior;
Chapter 5: Annual forecasts of traffic and toll revenue derived from anticipated traffic in the managed lanes;
Chapter 6: An exploration of toll technology and operation including HOV to Managed Lanes conversion costs and ongoing operating cost; and,
Chapter 7: An assessment of available truck traffic data.

The Study does not address policy and statutory restrictions on tolling, the truck-only/truck-only toll lane alternatives currently being developed as part of the environmental process for the I-75/575 HOV lane project, implications of changes in HOV lane occupancy and/or eligibility policies, or detailed construction and bridge and roadway maintenance costs.

Summary of Findings:

Existing Traffic Conditions and Trends in the I-75/575 Corridor

Congestion is a significant problem in the I-75 and I-575 corridors today, and will become more severe. By 2030, average daily traffic is expected to increase by 20-25 percent along the I-75 corridor and 83 percent along I-575, compared to a 12 percent increase in lanes miles. Region wide, the proportion of afternoon travel in severe congestion is forecast to increase from 25 percent to 34 percent over the planning horizon.

Future roadway Level of Service is expected to decrease along the majority of sections of the corridor. The travel time from Akers Mill Road to I-575 in the PM peak is expected to increase from 25 minutes to 33 minutes, compared to 16 minutes under free flow conditions, even with the improvements currently planned in ARC's Mobility 2030 long-range transportation plan. Very high volumes in the AM and PM peak periods will continue to result in peak spreading as commuters adjust their travel times to avoid the most congested hours of the day. As a result, more of the corridor will experience congestion over more hours of the day.

Traveler Preferences and Value of Time

An understanding of the value that travelers attach to travel time savings is essential to understanding the potential for managed lanes to relieve congestion and generate revenue. The Study accomplishes this objective through the use of a stated preference survey in which recent travelers in the corridor were contacted at random by telephone and presented with a series of hypothetical choices between reduced travel time and increased travel cost expressed as a toll. A total sample of 1500 subjects was contacted

in the summer and fall of 2005. The travel behavior of these respondents was distributed among a range of trip types, classified as Home-Based Work, Non-Home Based, and Home Based-Other to understand differential value of time relative to activity. The sample was statistically scrutinized and confirmed to be valid to a 95% level of confidence.

Average values of time derived from the model ranged from $6.71/hour for off-peak hour Home Based Other (i.e. shopping, recreation) up to $12.84/hour for off-peak Non Home Based (i.e. trips undertaken during the work day on employer's business). Along with survey outputs that expressed the change in demand for access to the managed lanes as a result of changes in time savings and toll prices (demand elasticity), these values of time were converted to formulaic format for input into a regional transportation demand model in the next phase of the Study.

Modeling Review and Strategy

Roadway tolling remains an exotic aspect of Georgia's transportation system. Currently, Georgia 400 between I-285 and Buckhead is the only segment of tolled roadway in the state. Because of the lack of tolling experience here, travel demand models used in the region to predict travel behavior and identify infrastructure needs must be adapted to account for the affect that variable tolling would have on traveler decision making. Variable tolling to manage roadway performance is unknown here, but has been implemented in other regions of the US for several years. To inform the adaptation of local models to incorporate managed lanes, the Study undertook a review of modeling approaches used in nine other jurisdictions, and identified strengths and weaknesses associated with each approach. This understanding was then applied to the Atlanta Regional model, as enhanced for the Northwest I-75/I-575 HOV/BRT program referenced above.

Taking into account Study schedule and scope limitations, the analysis indicated that an approach focused on traveler "willingness to pay" under a range of price and time circumstances as the best available approach to updating the Atlanta Regional Model. Briefly stated, this approach integrates estimates of traveler value of time with expectations for travel speed and time on the managed lane facility under analysis. For example, high values of time paired with inelastic demand for mobility would result in the highest propensity to "buy in" to the managed lane to experience reduced travel time under such an approach. This approach can be effectively integrated into the existing model framework, and produces outputs that are consistent with other measures of accuracy.

Traffic and Toll Revenue Estimates

With a forecast methodology in place and a data set reflecting the stated preference of likely users acquired, the Study next introduced these inputs into the Regional Travel Demand Model, to extract outputs in the following areas: Maximum, Optimum, and Recommended Toll Rates, managed lane traffic volume and traffic share, and Annual Net Toll Revenues (inclusive of debt service and toll system construction and operation, but exclusive of roadway construction and maintenance).

The managed lane corridor is segmented into three tolled sections: I-75 from Akers Mill Road to I-575, I-75 from I-575 to Wade Green Road, and I-575 from I-75 to Sixes Road.

Based on the assumption that average travel speeds of at least 45 miles per hour should be maintained in the managed lanes, and optimizing toll rates to achieve or exceed this mobility standard, the model delivered recommended tolls (in constant 2005 dollars) for each segment for three time frames: 2011, 2020, and 2030. Only the southern segment, on I-75 from Akers Mill to I-575 will be open in 2011.

In 2011, recommended tolls ranged from $.50 to $1.50 on the sole opened segment. In 2020, with all segments open, recommended tolls range from $.50 for northbound travel during the morning peak to $3.00 for travel from Akers Mill Road south to the I-75 / I-575 split during the morning rush hour. In the northbound direction during the evening rush hour HOV motorists consume all of the available capacity in the managed lanes. With no capacity to sell, SOV motorists are prevented from using the managed lanes. As the managed lanes continue to fill with HOV travelers, pricing alone fails to manage demand resulting in the need to consider modifications to occupancy policies. Without active management through pricing and occupancy changes, the ability to manage demand to optimize operations and guarantee mobility in the lanes deteriorates.

As a percentage of total traffic volume, travel in managed lanes becomes more significant over time. By 2030, segments of the managed lanes are expected to carry over 20% of total traffic volume during certain peak hours of operation (with these travelers maintaining an average speed of over 45 miles per hour!). However, if HOV occupancy rates hold at HOV 2+, HOV traffic will absorb available managed lane capacity during certain peak hours in the out years, excluding toll-paying SOV travelers from the facility in order to maintain travel speed.

Expected net revenue for the system starts off in negative territory, but soon breaks even, and eventually generates a substantial capital pool. Covering only the cost (including debt service) of converting programmed HOV lanes to managed lanes, the facility is forecast to generate an annual net loss of $807,000 in 2011. This value turns positive in 2014, and by 2050, cumulative net revenues are forecast to total $61,089,000.

Managed Lane Operations

The toll collection and system operations technologies of today and the future are sophisticated and rapidly evolving. Even mature systems like New Jersey's are keeping pace through retrofit. The I-75/575 corridor will require state of the art technology due to the magnitude of travel volume and complexity of operations expected there. While considerable innovation is anticipated before a managed lane could be open to service in 2011, a survey of the state-of-the-practice conducted for the Study revealed some key parameters upon which to base operational assumptions. Available technological approaches were evaluated based on the parameters, yielding a recommended approach. The analysis also estimates capital and operating costs, which are reflected in the financial pro-forma described above. Other features and relevant considerations for continued attention in the planning and implementation process were also identified and discussed.

Managed Lanes influence facility performance through the manipulation of pricing (through tolls), eligibility (of different types of vehicles), occupancy (within a class of vehicles), and access (to the managed facility). Permutation of these characteristics yield alternative approaches to facility management.

In the process of developing operational recommendations, the Study evaluated a range of schemes against evaluation parameters to identify the best currently available approach for managing the facility. The evaluation factors included Ease of Toll Collections, Ability to Dynamically Price, Ease of Enforcement, Cost of Implementation, Flexibility and Equity, Accounting Simplicity, Operations and Maintenance, Customer Relations and Public Understanding.

As a result of this evaluation, the Study recommends a system that employs an entry/exit system where managed lane users are tracked by point of entry and point of departure. All SOV and HOV users of the managed lanes would be equipped with a transponder and use the same access ramps (which are separate from general travel ramps). Tolls are collected in motion; there would be no staffed booths. Toll recognition equipment would be located on the ramps, with tolls levied at the exit point. The system would pre-register HOV users or employ onsite visual inspection by mobile enforcement officers to discriminate between vehicles on the basis of occupancy and enforce occupancy requirements, allowing HOV users to travel toll-free.

Collateral opportunities identifies in the review include smart card technology that would shift responsibility for financial transaction from the toll collection entity to a financial institution that issues the smart card. Smart Cards could also be employed in other uses, like transportation combinations that might include tolls, transit and parking, or unrelated convenience transactions.

Understanding Truck-Only Lanes

While this study does not take into account Truck Only Toll (TOT) lanes facilities or their potential affect on HOT lanes in the corridor. This section provides key background information that will foreshadow the more exhaustive evaluation of the feasibility of Truck-Only facilities within the corridor. Available data was thin, primarily consisting of crash data, regional studies, and qualitative information gleaned from other studies. Nevertheless, the available data provided no indication that this option was not appropriate for the corridor, and more exhaustive analysis is now under way.

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CHAPTER 1

INTRODUCTION

The Interstate 75 North corridor is a major radial roadway in the Atlanta region. This facility not only serves as a major commuting route from Cobb and Cherokee Counties to activity centers in Atlanta, but also as a statewide and national transportation artery. As such, traffic levels have steadily increased as metropolitan Atlanta, the Southeast, and the nation has grown. Today, traffic on many sections of the freeway is heavily congested for numerous hours of each day. Given the vitality of the local economy and the history of growth, congested conditions throughout the metropolitan region are expected to increase, even with a $50 billion investment in the transportation system over the next 30 years. This Study evaluates some innovative alternatives to meet this challenge.

Currently, alternatives to add High Occupancy Vehicle (HOV) and Bus Rapid Transit Capacity to this corridor are under consideration by transportation planners. To maximize the efficiency of the proposed HOV lanes, the Georgia Department of Transportation (GDOT) is evaluating the re-configuration of its design to better serve corridor mobility and travel needs as demand increases. One option is to expand the management strategies in the corridor to include pricing elements, thereby converting the planned High Occupancy Vehicle (HOV) lanes to High Occupancy Toll (HOT) Lanes. Packaged with other operational and design techniques such as access eligibility and occupancy polices, these strategies are known collectively as managed lanes. In this case, it is anticipated that lane management would be dynamic and have the ability to be adjusted at any time to better match regional goals.

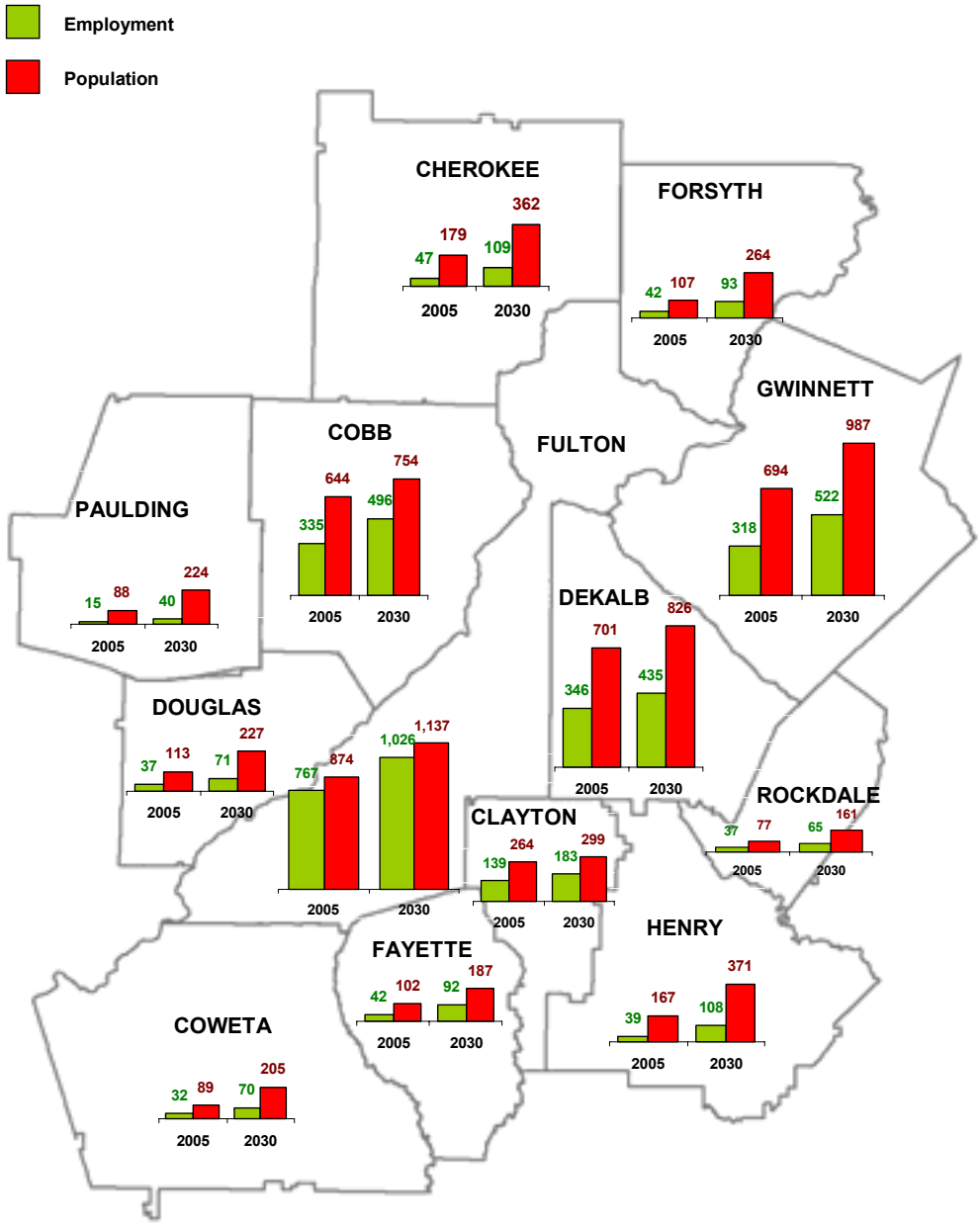
In its application to the I-75/575 corridor, the term “managed lanes” is more appropriate than High Occupancy Toll or HOT lanes in that it communicates that the facility could be much more than a HOV lane with SOV buy-in opportunities. Rather, managed lanes offers a myriad of opportunities from allowing varying occupancy levels (HOT2+, HOT3+, etc.), potential broadened buy-in, and highly variable dynamic pricing. It is assumed that transit vehicles would be allowed to use the lanes for free, and with the potential for multiple BRT services in the corridor, coordinating capacity and associated interoperability, provides further evidence that the corridor will need the ability to manage demand rather than simply sell excess capacity.

1.1 Growth in the Atlanta Region

The Atlanta Regional Commission (ARC), the responsible Metropolitan Planning Organization for this facility, estimates that population will grow in the 13-county Atlanta region from roughly 3.7 million in 2000 to 6.0 million in 2030, a 62% increase. ARC estimates indicate that employment will increase from 2.1 million in 2000 to 3.3 million by 2030, a 60% increase. Recently, ARC developed a $50 billion Regional Transportation

Plan (RTP), Mobility 2030, to guide transportation investment within the Atlanta area. Mobility 2030 has as its goal "to improve accessibility and mobility for all people and goods, maintain and improve system performance and preservation, protect and improve the environment and the quality of life, and increase the safety and security of the transportation system". But, while substantial, planned investment, is not expected to keep up with the modeled 21% increase in congestion levels from 2003 to 2030 under a no-build scenario. Population and employment growth challenge the region's ability to keep congestion at existing levels. Figure 1-1 presents ARC's county growth forecasts.

Figure 1-1: Regional Growth



EMPLOYMENT AND POPULATION GROWTH BY COUNTY-2005 AND 2030
Note: All numbers in thousands

1.2 Project Description

Currently, there is no HOV service on Interstate-75 north of Akers Mill Road. However, traffic studies performed in 2002 along the corridor indicate that approximately 10 percent of the 2025 projected Daily Traffic Volumes and Peak Hour Traffic Volume will be High Occupancy Vehicles.

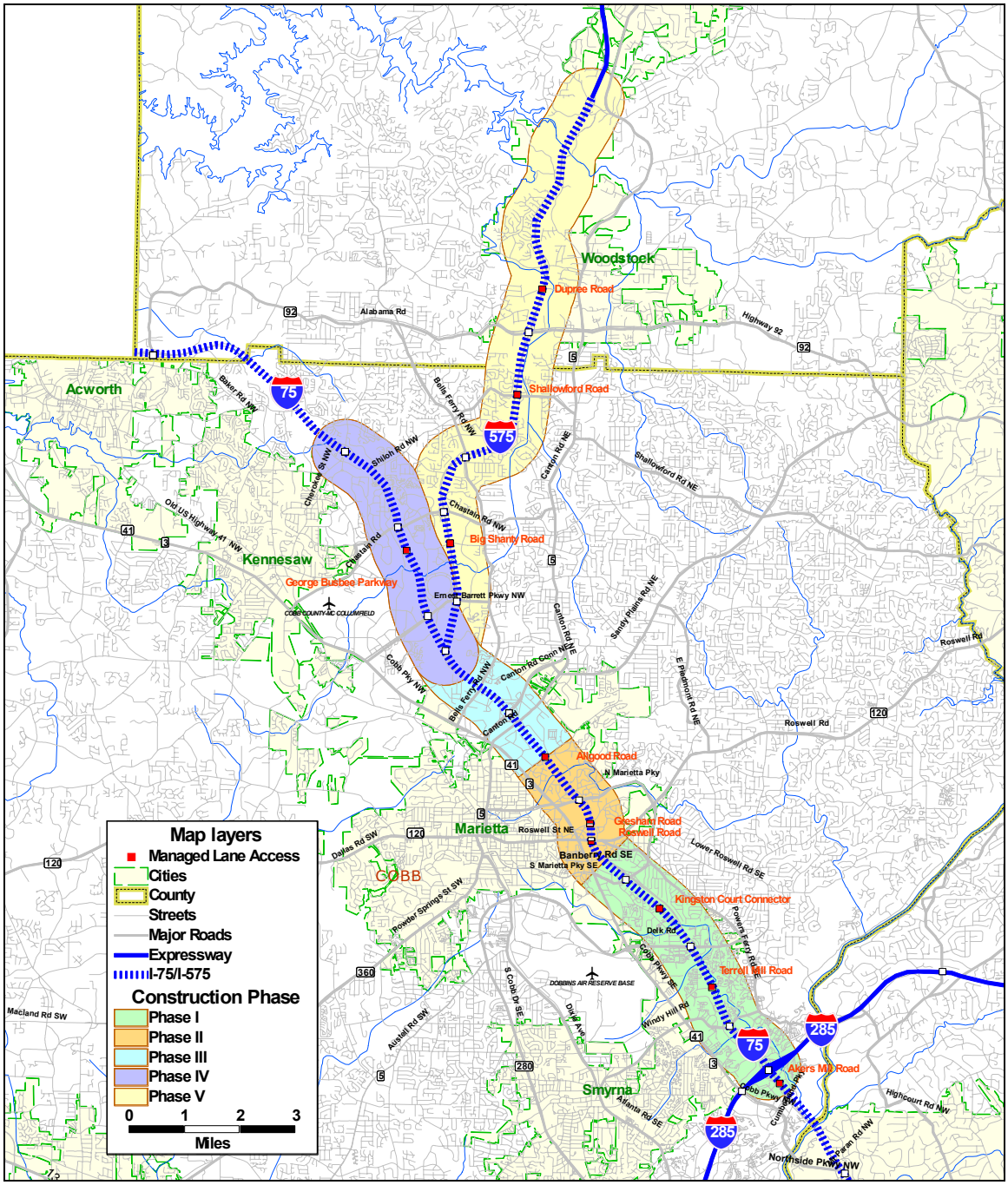
Existing conditions in the corridor are such that simply widening the roadway may not be the best solution and may not even be feasible in all areas. For example, at several existing interchanges, the openings beneath the bridges are inadequate for the current number of lanes in operation if appropriate shoulder widths are to be provided. Therefore, adding lanes may involve replacing the bridges or avoiding them altogether with separate flyover structures.

To address existing and future congestion, GDOT and the Georgia Regional Transportation Authority (GRTA) are currently evaluating high occupancy vehicle lane options and transit options for the I-75 corridor from Akers Mill Road to Wade Green Road, in the northwest quadrant of the Atlanta area. They are conducting a joint Environment Impact Statement (EIS) process, with the Federal Highway Administration as the lead federal agency. This study investigates pricing opportunities for each of the build alternatives under consideration in the EIS process.

Figure 1-2 illustrates the I-75/575 facility as it is currently conceived at build-out. As shown in the figure, the construction will be phased into five sections:

- **Phase 1**
  I-75 from Akers Mill Road to Banberry Road
  Letting / Begin Construction 2009
  Complete: 2011
- **Phase 2**
  I-75 from Banberry Road to Allgood Road
  Letting / Begin Construction 2012
  Complete: 2013
- **Phase 3**
  I-75 from Allgood Road to (and including) I-575 Interchange
  Letting / Begin Construction 2014
  Complete: 2015
- **Phase 4**
  I-75 from I-575 Interchange to Wade Green Road
  Letting / Begin Construction 2016
  Complete: 2017
- **Phase 5**
  I-575 from I-75 Interchange to Sixes Road
  Letting / Begin Construction 2018
  Complete: 2019

Figure 1-2: Project Location Map



1.3 Managed Lanes Access

The managed lanes concept under evaluation proposes to use a barrier to separate managed lanes from general purpose lanes on both I-75 and I-575. To avoid conflicts between general purpose traffic and managed lane traffic, access points are proposed to

be separated from general purpose traffic by modifying existing and creating new dedicated interchanges at various points. They are described as follows:

I-75 Access Points

1. The access point at Akers Mill Road at I-75 is proposed to be modified to add the north-facing HOV ramps to complement the existing south-facing HOV ramps.
2. Terrell Mill Road (existing grade separation with I-75 over Terrell Mill Road)
3. A new access point to Franklin Road between Delk Road and South Marietta Parkway. The access point is proposed to be located north of Delk Road and would tie to existing Kingston Court which is a loop road that connects to Franklin Road on both ends.
4. Roswell Road/Gresham Road split diamond HOV interchange. Roswell Road is currently grade separated with I-75 over Roswell Road. Gresham Road is grade separated with Gresham over I-75.
5. Allgood Road (existing grade separation with Allgood Road over I-75).
6. A new access south of Chastain Road to serve the proposed BRT station at the George Busbee Parkway location and the new Cobb County Transit Park and Ride facility currently in operation behind Town Center Mall on the southwest corner of George Busbee Parkway and South Busbee Drive.

I-575 Access Points

1. Big Shanty Road (existing grade separation with I-575 over Big Shanty Road).
2. Shallowford Road (existing grade separation with Shallowford Road over I-575).
3. Dupree Road (existing grade separation with Dupree Road over I-575).

Previous traffic analysis prepared for the corridor indicates that two managed lanes in each direction are required on I-75 between the I-75/I-285 Interchange and the I-75/I-575 Interchange and one lane in each direction is proposed to the north on both I-75 and I-575. There is a lane dropped from the southbound managed lane system at I-285. This lane would allow access to the future managed lane/HOV system on I-285 eastbound and westbound. Similarly, a lane would be added to the I-75 managed lane system northbound on I-75 to receive the eastbound and westbound traffic from the future managed lane/HOV system on I-285.

Dedicated managed lanes access locations are illustrated on Figure 1-2.

1.4 Study Objectives

While the potential for the managed lanes concept is high, the achievement of benefits must be demonstrated through study and analysis of the lane's operational characteristics and revenue generating potential. This study represents an initial assessment of the revenue potential for the proposed managed lanes. The primary objective of the study is to determine if converting the planned HOV lanes to a managed lanes facility, including pricing, could be an effective mechanism to provide a non-congested alternative for HOVs, transit, and SOVs willing to pay a toll.

This preliminary traffic and toll revenue feasibility study is primarily targeted at identifying the potential range of revenue streams beginning in the projected opening year, 2011, and its financial capacity to fund project costs through the sale of bonds. This analysis is complementary to, yet distinct from the traffic modeling and analysis of the EIS effort, which is addressing conditions under a toll-free condition.

Furthermore, this toll study focuses on an in-depth assessment of the feasibility of tolls for two "book-end" pricing or tolling objectives. These book-ends frame the range of traffic and toll revenue impacts that can be expected in the I-75/575 corridor. These objectives are:

- **Maximum Funding Scenario** – This revenue maximization scenario strives to capture as much revenue possible through a higher, more variable toll structure in order to maximize the financial capacity of the project.
- **Traffic Management** – The traffic management scenario is an exercise in transportation efficiency. The objective of this concept is to maximize the travel efficiency on the managed lanes system without unnecessarily diverting traffic to alternative roadways. This concept in essence maximizes the efficiency of the transportation network.

1.5 Study Contents

In addition to the preceding Executive Summary and this Introduction, this report is organized around the follow topics by chapter:

- **Chapter 2**: Existing traffic conditions and trends in the I-75/575 corridor;
- **Chapter 3**: The results of the stated preference survey including an understanding how users value their time;
- **Chapter 4**: Travel demand modeling methodology and estimation of traffic demand;
- **Chapter 5**: Projected toll rates by time of day and annual forecasts of traffic and toll revenue;
- **Chapter 6**: Toll technology and operational assessment including HOV to Managed Lanes conversion costs and operational costs; and,
- **Chapter 7**: An assessment of truck only lanes.

Several Appendices are also included to provide additional details on the analysis.

The products of this study, including projected toll rates, traffic volumes and revenue should be considered "planning-grade" or feasibility estimates. While these estimates represent a rigorous analysis they are not "investment-grade" and additional analysis would be required to obtain an investment credit rating and/or issue toll revenue bonds.

1.6 Study Framework

The following framework set the stage for the assumptions of the technical analysis. Topics beyond this framework may warrant future analysis.

- This study investigated traffic impacts and toll revenue streams if the planned HOV lanes are converted to High Occupancy Toll (HOT) lanes with vehicles having two or more travelers being free (HOT2+).
- Additional pricing alternative such as HOT3+, HOT4+, and express toll lanes (ETL) will be examined by a complementary GDOT study.
- The additional truck-only/truck-only toll lane alternatives currently being developed as part of the environmental process for the I-75/575 HOV lane project was not sufficiently defined at the time of writing to be included in this study.
- Impacts to traffic and toll revenue streams resulting from changes in occupancy and/or eligibility policies.
- Detailed construction costs and alternative-specific phasing have not been addressed.
- Bridge and roadway maintenance costs were not considered in this analysis and therefore not included in the calculation of net revenue.

1.7 Build Alternatives under Considered in the EIS Study

Considering the need to retain maximum flexibility in the corridor with respect to increasing demand, coordination with future corridor and adjacent roadway improvements, and retaining/reusing existing infrastructure, the EIS study team compiled an exhaustive list of potential project alternatives. These alternatives are centered on the location of the managed lanes: located in the median, located on either the east or west-side of the existing travel lanes, and either at-grade or aerial. Alternatives considered at the start of this study may not reflect the full spectrum of alternatives addressed as part of the final EIS as concepts evolved over time.

Detailed descriptions and typical sections for each of the four proposed alternatives developed and documented as part of the EIS are presented in Appendix A. The alternatives are generally described as follows:

- **HOV Option U1:** All four HOV lanes, two HOV lanes in each direction, would be located in the median. The existing median would be expanded to accommodate the HOV system by relocating the existing general purpose lanes to the outside.
- **HOV Option U2:** Two HOV lanes in each direction located on each side of the corridor outside of and separate from the existing general purpose lanes.
- **HOV Option U3:** All four HOV lanes located on the west side of the corridor outside of and separate from the existing general purpose lanes.

- **HOV Option U4:** All four HOV lanes located on the east side of the corridor outside of and separate from the existing general purpose lanes.

From a traffic and revenue perspective, each option offers the same opportunities for reduced travel time, system improvements, and revenue generation. Therefore, the traffic and revenue analysis performed was conducted on the HOV Option U1 but is directly applicable to the other three options under consideration.

1.8 Potential Benefits Achievable with the Proposed Managed Lanes

Managed lanes offer a range of achievable benefits resulting from implementation. Some key benefits are:

Regional Mobility
Managed lanes offer the opportunity to effectively blend operational needs of all roadway users, SOVs, HOVs, transit and trucks, into a comprehensive management system that continuously measures and adjusts conditions in the corridor to improve mobility and keeps traffic flowing. These management elements and resulting performance characteristics offer measurable benefits to individual corridors and in concert provide true regional benefits.

At a regional level, a network of managed lanes would provide a network of continuously flowing corridors to increase access to important business centers, free-up capacity for transit vehicles, and ultimately improve the operational conditions on interstate roadways.

Multi-modal System Integration
Recent technological advances permit the utilization of a convenient form of Electronic Toll Collection (ETC) that makes real time variable tolling possible. These emerging technologies are moving away from vehicle-based systems such as transponders and migrating to person-based smart card systems. Smart cards are payments devices that look like credit cards and enable their users to pay for goods and services by directly deducting funds from established accounts. One of the primary benefits of the smart card is its ability to store and recall information on usage. This would enable interoperability and transferability between transportation services. Having the ability to keep track of system usage enables system operators to offer cross system discounts as a means of encouraging the use of various elements of the transportation system. For example, a user could travel in the managed lanes to a BRT station and transfer modes for the remained of their trip, the user would pay full price for use of the managed lane and then received discounted transit fare. Furthermore, smart cards would be directly tied to a financial institution eliminating the need for the operating agency to collect funds.

Revenue Potential
Since the managed lanes are to be tolled for certain travelers, they have the ability to supplement traditional federal and non-federal sources of public funding. These new revenue streams would be a welcome influx of funding that can be reinvested in the

corridor through additional improvements, operational and maintenance, or other supporting services.

Transportation System Performance Improvements

Improvements to the operational characteristics of the transportation system through the introduction of managed lanes will only be realized through strong inter-agency cooperation and public/private support. This is due not only to the need for a parallel evolution of system operators but also the need for coordinated and compatible technology platforms. While the Atlanta region currently seems a long way from a truly integrated smart card system, individual operator are making progress in developing a technology architecture that is open enough to adapt to the ever changing environment. To reach the full potential for achievable benefits, broader involvement of the general public and private sectors as well as the traveling public would be required. If true integration and interoperability is achieved, tremendous benefits could be realized including:

- Improved Mobility;
- Economic Competitiveness;
- Quality of life;
- Air quality; and,
- Safety.

CHAPTER 2

EXISTING TRAFFIC CONDITIONS

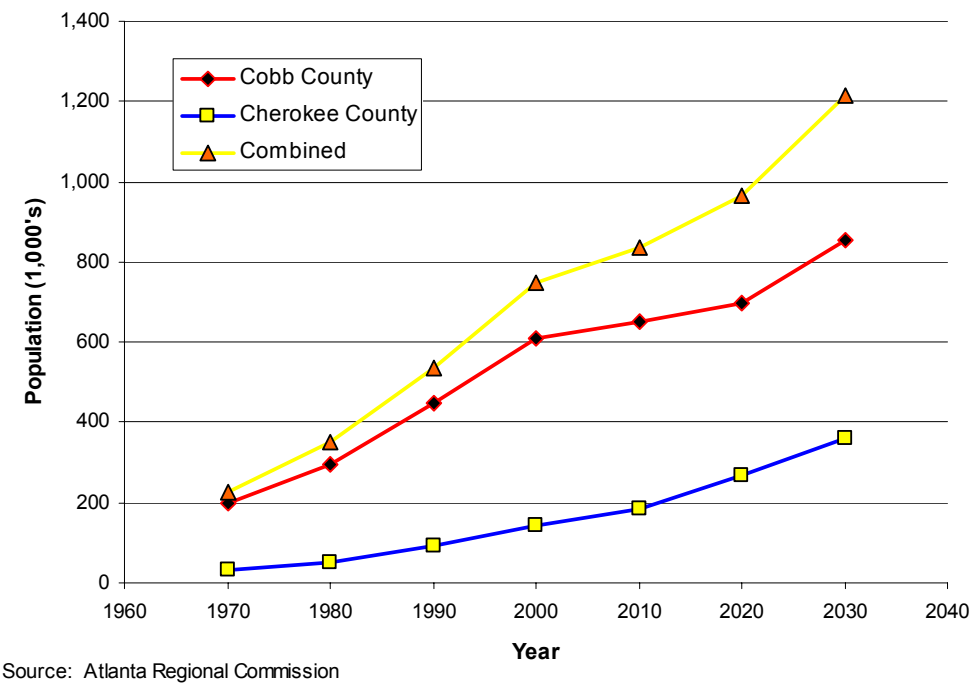
2.1 Regional Growth and Congestion

2.1.1 Growth in the Atlanta Region

During the last several decades, the Atlanta Region has experienced enormous growth. Between 1980 and 2000, the population of the Untied States increased by 20 percent, while during the same period, the population of Georgia grew by 50 percent, and the population of the 13-county Atlanta region increased by a dramatic 81 percent. In particular, Cobb County experienced a huge influx of growth in the 1980s and early 1990s. More recently, these high rates of growth have started to spill over into neighboring Cherokee and Bartow Counties.

Economic forecasts for the region project the boom to continue for at least the next two decades. The population of the Atlanta Region is expected surpass six million by 2030. As shown in Figure 2-1, projections indicate that by 2030 the combined population of the two counties in which the I-75/575 project is located will exceed 1.2 million people.

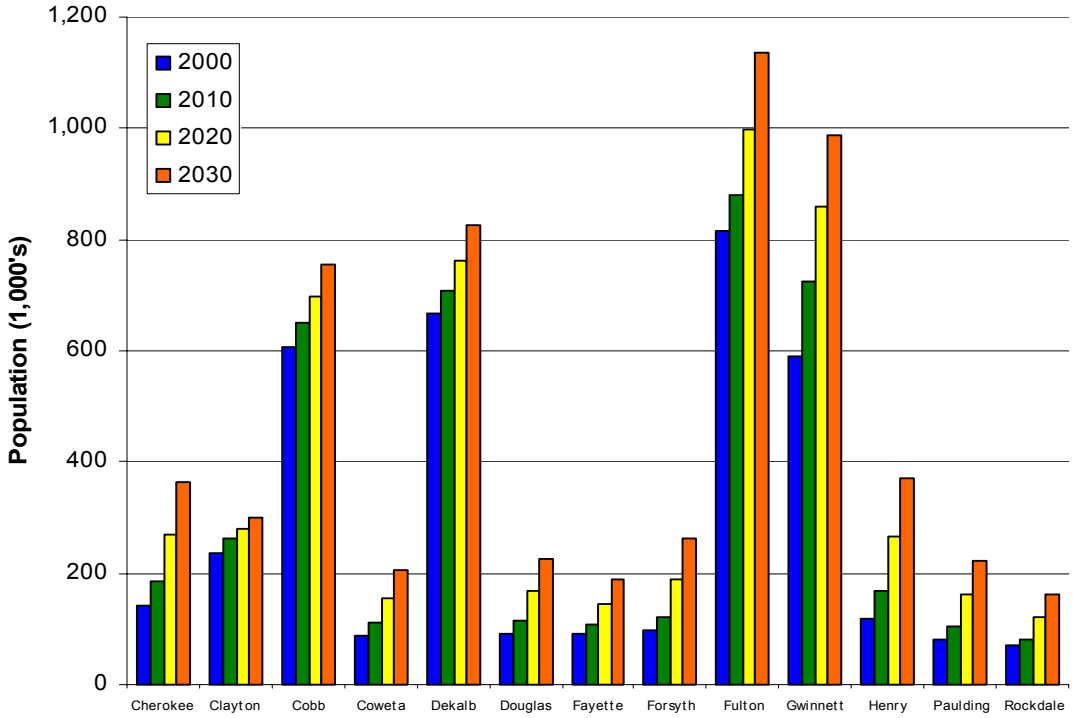
Figure 2-1: Historic and Forecast Study Area Population



Source: Atlanta Regional Commission

Figure 2-2 presents forecast growth for the 13 counties comprising the Atlanta region.

Figure 2-2: Forecast Atlanta Region Population



These growth projections assume maintenance of current levels of mobility. Clearly the capacity and performance of the transportation system in moving people and goods within the region will influence whether anticipated growth is realized. As experienced in the past, population growth can bring tremendous benefits, and from this perspective is desirable. It must be recognized that, however, that the accompanying transportation needs must be managed to support these benefits.

2.1.2 Congestion in the Atlanta Region

Accompanying the recent population and employment growth of the 90's and 2000's was an increase in traffic volumes and travel demand. One clear manifestation of those increases was congestion levels that have worsened year by year, particularly on major roadways, in the peak commute periods.

Clearly, the rapid growth in travel demand has outpaced improvements to the region's transportation facilities. Despite large investments in our highway system, congestion is on the rise. Commuters, and sometimes those traveling in the off-peak periods, face delays that were not foreseen at the beginning of the plan development process.

These conditions are expected to worsen in the next 25 years. **The region's total population is expected to increase by more than 60 percent by 2030, surpassing the 6 million mark. However, roadway capacity is planned to increase by less than 24 percent with much of the capacity being realized in the managed lanes system.**

Essentially, the pace of growth in demand for travel will greatly exceed the abilities of the respective cities, counties and the State to provide the necessary roadway capacity.

As a result, congestion is forecast to continue to increase. Specific factors contributing to the growing congestion problem include:

- Nationally, and within Georgia, people are driving more and traveling longer distances. Historically, vehicle miles of travel (VMT) are increasing at a greater rate than the population. But with congestion imposing an increasing cost of travel in the Atlanta region, this trend has leveled off and growth in VMT mirrors growth in population. (See Figure 2-3)

- The vast majority of commuters (74 percent) drive alone to work. This is understandable given the limited opportunities and incentives to use alternative modes of travel. (See Figure 2-4)

- The region has attempted to keep pace with the increase in demand for travel through heavy investment in new and upgraded highways and transit systems. For many reasons, including financial constraints, traffic conditions continue to deteriorate. Even ARC's aspiration plan, a theoretical plan that removes financial constraints, experiences an increase in congested travel. While congested conditions are expected to increase, it should be noted that without any transportation investments the percent of travel time in severe congestion is expected to increase by 116% verses 36% and 16% for ARC's Mobility 2030 and Aspirations Plan respectively. (See Figure 2-5)

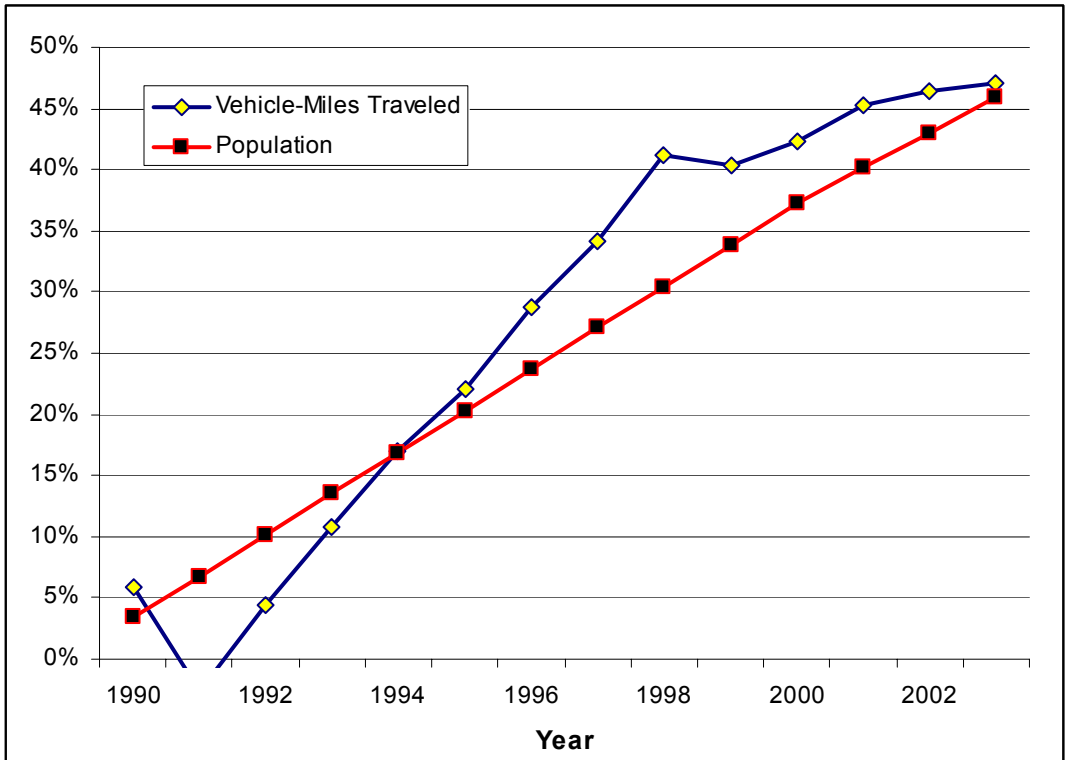
- While the region has historically invested heavily in highways, there has not been a similar investment in travel alternatives to the private automobile. Only recently has the region begun to understand the need for a high quality transit system and initiatives such as travel demand management. (See Figure 2-6)

- The single, largest contributor to congestion in the Atlanta region, aside from the high growth rate, is the low-density land development pattern. Often characterized as sprawl, this type of growth results in more and longer automobile trips, with limited opportunity for transit use.

2.1.3 The Impact of Congestion on the I-75 / 575 Corridors

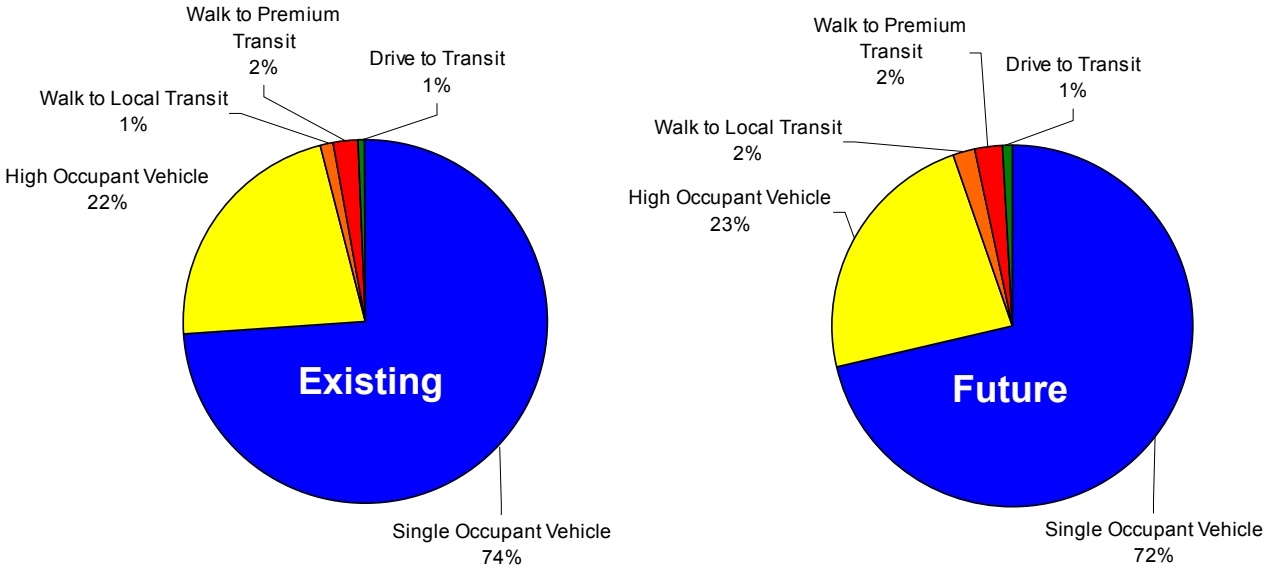
Interstate 75, particularly in the northern suburbs of Atlanta, in particular, experiences severe congestion during certain times of the day. I-75 is an economic center for the Atlanta region housing major activity centers at Cumberland-Galleria and Town Center, as well as Dobbins Air Force Base. Businesses and institutions in this corridor consider the implications of congestion as they evaluate relocation or expansion decisions. In an era of tight labor markets, business locations decisions are sensitive to quality of life issues that concern existing and potential employees. If the I-75 corridor is to continue as an economic engine for the region, it is imperative that transportation choices are expanded and the work force is provided alternatives, whether modal or managed, to severely congested roadways.

Figure 2-3: Region Cumulative Growth in Population and VMT – 1990-2003



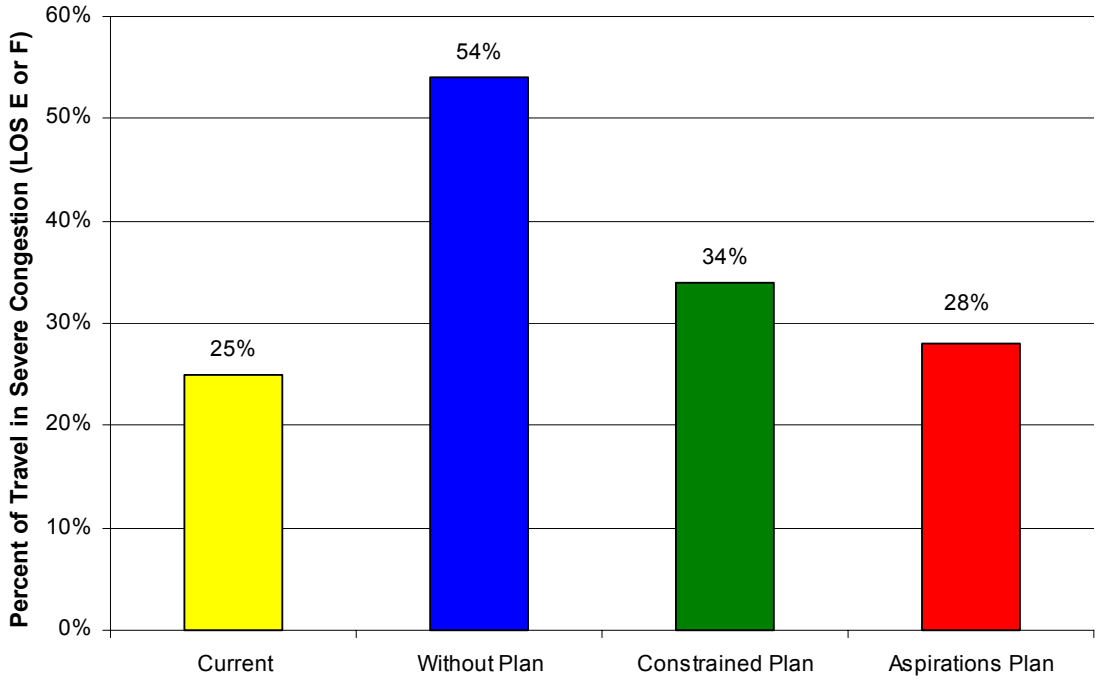
Source: Georgia Depatment of Transportation, Office of Information Services

Figure 2-4: Existing (2005) and Forecast (2030) Mode Split in the Atlanta Region



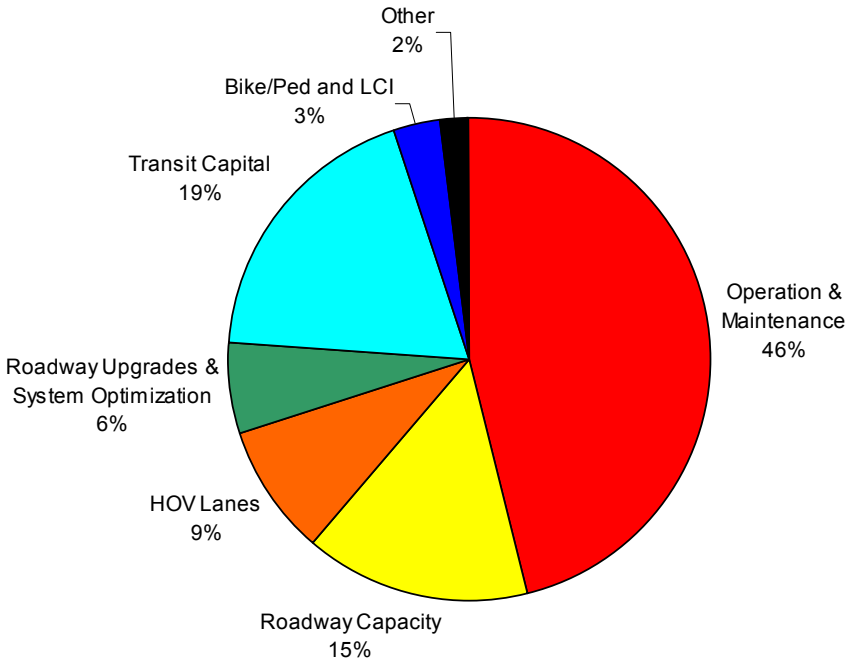
Source: Atlanta Regional Commission

Figure 2-5: Forecast 2030 Percent of Afternoon Travel in Severe Congestion



Source: Atlanta Regional Commission

Figure 2-6: Mobility 2030 System Funding by Expenditure Type



Source: Atlanta Regional Commission

2.2 Existing and Future Travel Demand

The Atlanta Regional Commission Travel Demand Model was used to quantify, evaluate and compare projected future demand for the No-Project (Baseline) and priced High Occupancy Toll (HOT) lanes configurations. This travel demand model is the official regional planning model for the Atlanta region, and was enhanced in the I-75 corridor for use in the EIS. The model provides valuable input for the evaluation of the need for improvements in the corridor. The focus of this study is an assessment of the willingness of SOV vehicles to buy-in to the managed lanes system and the associated impacts to the performance of the managed lanes and general purpose lanes.

This section of the report identifies the current, base year (2005), and future year (2030) no-project conditions. No-project is defined as the future transportation network without pricing in the managed lanes. Managed lanes with pricing alternatives are explored in detail in Chapter 5.

2.2.2 Regional Trip Growth

Over the period 2005-2030, regional population and employment are expected to increase 62 percent and 60 percent respectively. As shown in Table 2-1, travel demand model analysis projects a 59 percent increase in total vehicle trips with a 59 percent increase in drive alone travel and 65 percent increase in carpool travel. This closely correlates with projected increases in population and employment. Single occupant vehicle travel constitutes over 71 percent of all travel and over 82 percent of automobile travel. Auto occupancy is not forecast to noticeably change during the analysis period.

Table 2-1: Regional Growth in Daily Vehicle Trips

Analysis Year (1)	Vehicle Trips (2)				Car Pool Share
	Total	Drive Alone	Trucks	Carpool	
2005	11,623,343	8,308,340	1,525,061	1,789,942	21.54%
2010	13,266,880	9,530,432	1,690,799	2,045,649	21.46%
2020	15,770,036	11,274,281	2,021,772	2,473,983	21.94%
2030	18,479,910	13,175,501	2,356,865	2,947,544	22.37%
Difference (2005-2030)	6,856,567	4,867,161	831,804	1,157,602	
Growth (2005-2030)	59%	59%	55%	65%	

(1) The Project Specific Travel Demand Model develop by PBQD was utilized for 2010, 2020 and 2030 analyses; whereas the standard ARC model was used for 2005

(2) Vehicle Trip include both internal and external trip to the Atlanta region.

The model also allows for an examination of the impact of transit trips under existing and future conditions. As shown in Table 2-2, the total person trips increase by 62 percent between 2005 and 2030, slightly higher than the growth in vehicle trips. The primary reason for this difference is that the transit share of total trips is forecast to increase significantly from 3.21 percent in 2005 to 4.19 percent in 2030. This growth reflects an increase of 336,632 transit trips between 2005 and 2030. The increase can be attributed to aggressive transit investments over the next 20 years.

Table 2-2: Growth in Regional Daily Person Trips and Transit Use

Analysis Year (1)	Person Trips (2)			Transit Share
	Total	Drive	Transit	
2005	9,381,674	9,080,132	301,542	3.21%
2010	10,866,781	10,448,797	417,984	3.85%
2020	12,971,969	12,409,000	562,969	4.34%
2030	15,213,567	14,575,393	638,174	4.19%
Difference (2005-2030)	5,831,893	5,495,261	336,632	
Growth (2005-2030)	62%	61%	112%	

(1) The Project Specific Travel Demand Model develop by PBQD was utilized for 2010, 2020 and 2030 analyses; whereas the standard ARC model was used for 2005

(2) Person trip only include trip internal to the Atlanta region.

2.2.3 I-75 / 575 Corridor Trip Growth

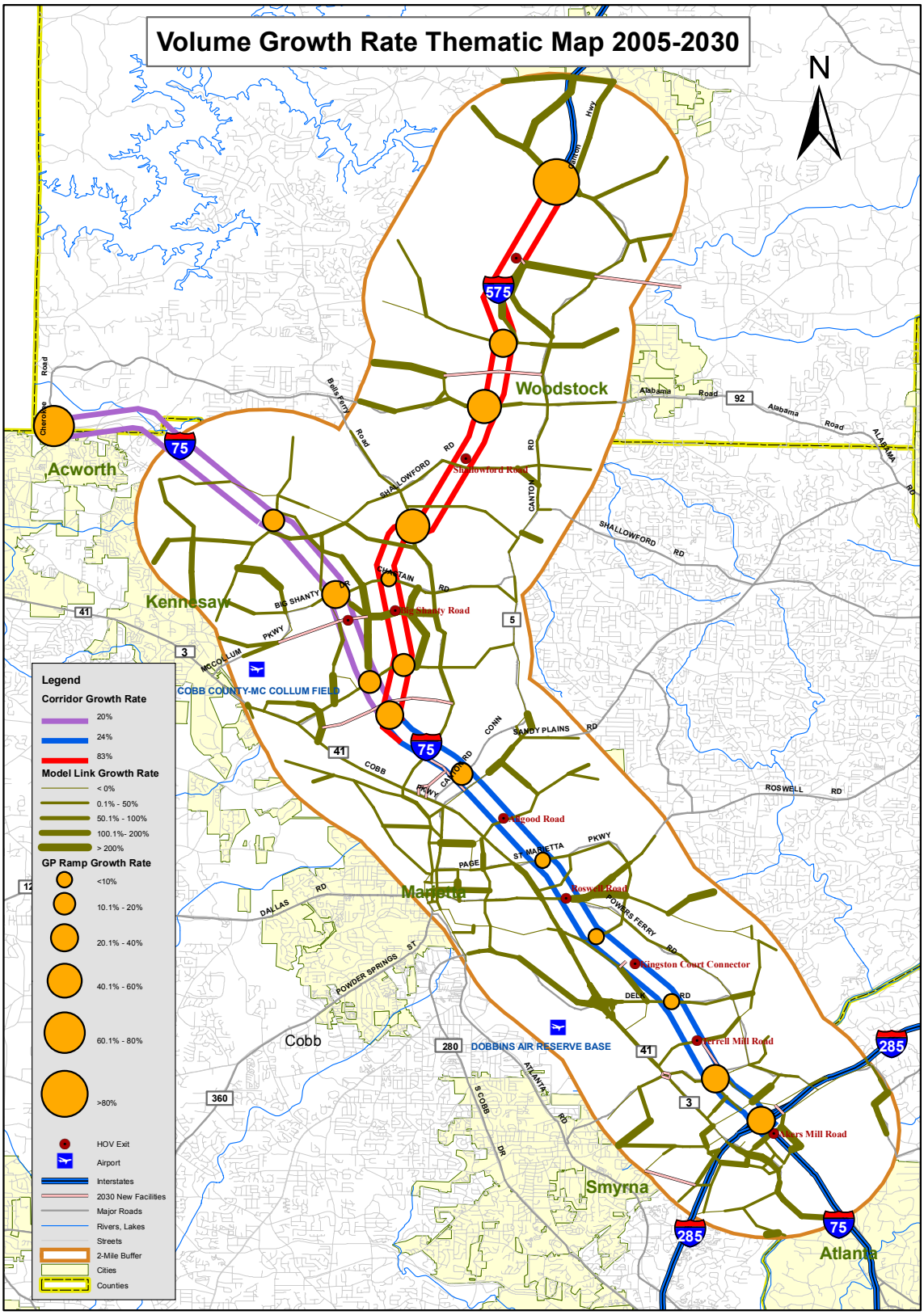
Of particular interest to this study are the growth rates on the analysis links in the I-75 and I-575 corridors. The analysis links include I-75, I-575, interstate interchange ramps, intersecting roadways (i.e. cross-streets), and adjacent roadways.

Growth rates for daily vehicle trips on the analysis links are illustrated on Figure 2-7 and summarized by link analysis type in Table 2-3. Overall, growth in the corridor is fairly uniform with growth rates ranging from 20 to 30 percent. The outlier to this trend is the I-575 corridor which is anticipated to experience 83 percent growth. The greater than average growth in the I-575 corridor, when compared with regional growth trends presented in Table 2-1, is indicative of the anticipated 155 percent population growth in Cherokee County. In contrast, Cobb County's population growth is 24 percent, which is reflected in the trip growth in the corridor.

Table 2-3: Growth Rates for Daily Vehicle Trips in the I-75 /575 Corridor by Type 2005 to 2030

Analysis Link Type	Weighted Average Segment Volume		
	2005	2030 No Project	Growth Rate
I-75 Mainline (Akers Mill to I-575)	228,484	282,876	24%
I-75 Mainline (I-575 to Wade Green Road)	121,560	145,966	20%
I-575 Mainline	80,180	146,708	83%
Supporting Network (within a 2 mile buffer)			
Ramps	1,278,920	1,541,540	21%
Cross Street Network	8,134,800	10,023,620	23%
Adjacent Street Network	12,592,800	16,415,640	30%

Figure 2-7: Growth in Daily Vehicle Trips 2005 to 2030



2.2.4 I-75 /575 2030 No-Pricing Volumes

The growth rates illustrated in Section 2.2.2 forecast average growth in the I-75 corridor and explosive growth in the I-575 corridor through 2030. From this section of the report forwards, HOV demand is presented separately from SOV demand. Illustrating demand by occupancy facilitates an understanding of potential use of the managed lanes system and benchmarks operational levels from which additional management strategies can be applied. Figures 2-8 to 2-13 illustrate 2030 no-project volumes by vehicle type and direction for I-75 and I-575. The figures show that carpool volumes range between 19,800 and 30,000 in the managed lanes with an additional 2,000-8,000 carpoolers utilizing the general purpose lanes. This demand equates to car pool shares ranging from 20 to 30 percent in the I-75 corridor. These shares drop slightly to 15 to 20 percent in the I-575 corridor.

Even though the daily traffic volumes are forecast to increase over the planning horizon, the impact during the peak hours is less pronounced due to “peak spreading”. Instead of congestion conditions lasting for two-hours in the AM period, as is typical under existing conditions, the travel demand model predicts that this period of severe congestion will expand to closer to 4-hours in the future. Peak period spreading occurs when the absolute capacity of the peak hour is exceeded, forcing traffic to begin their trip earlier or later than they normally desire.

2.2.5 I-75 / 575 No-Project Volume to Capacity Ratios

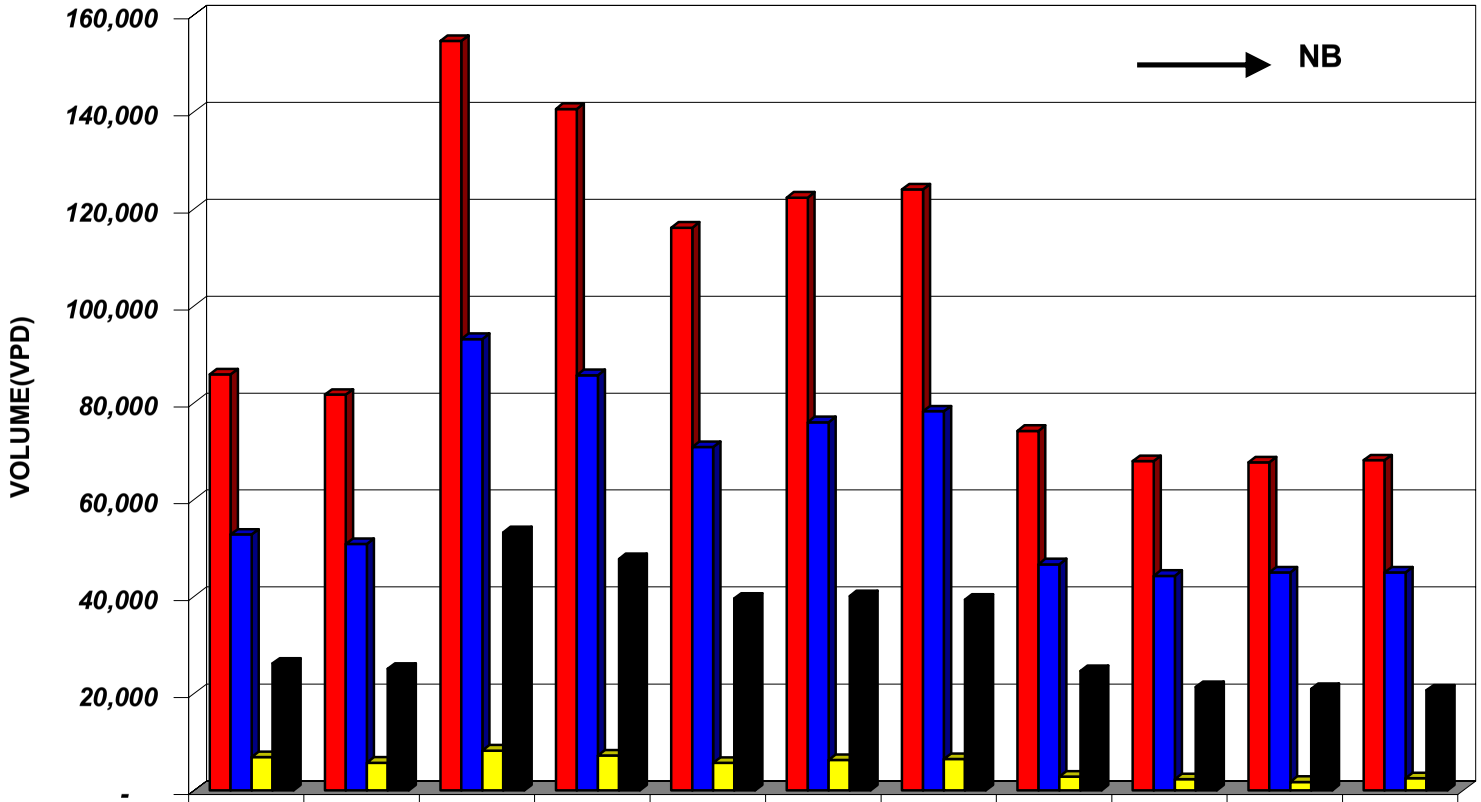
Using the 2005 and 2030 traffic volumes in the corridor, a volume-to-capacity (V/C) ratio was developed to indicate locations with higher demand volume than available capacity. As shown in Figures 2-14 through 2-17, the VC ratio approaches or exceeds 1.0 in the peak direction of the peak hour. Figure 2-16 and 2-17 show that the addition of two managed lanes in each direction absorbs significant traffic volume such that congested conditions do not increase at the same rate as trip growth in the corridor.

2.2.6 I-75 / 575 Travel Times

The travel demand model was used to estimate speed along I-75/575 in the current, opening and future no-project scenarios. The estimated travel times extracted from the model are shown in Tables 2-4 and 2-5. In the PM peak period travel time from Akers Mill Road northbound to the I-575 split is estimated to take 25 minutes. Even with the addition of the HOV lanes, travel time is expected to escalate to 33 minutes in the general purpose lanes. The HOV lanes would save 17 minutes over the general purpose lanes for the same trip according to the model.

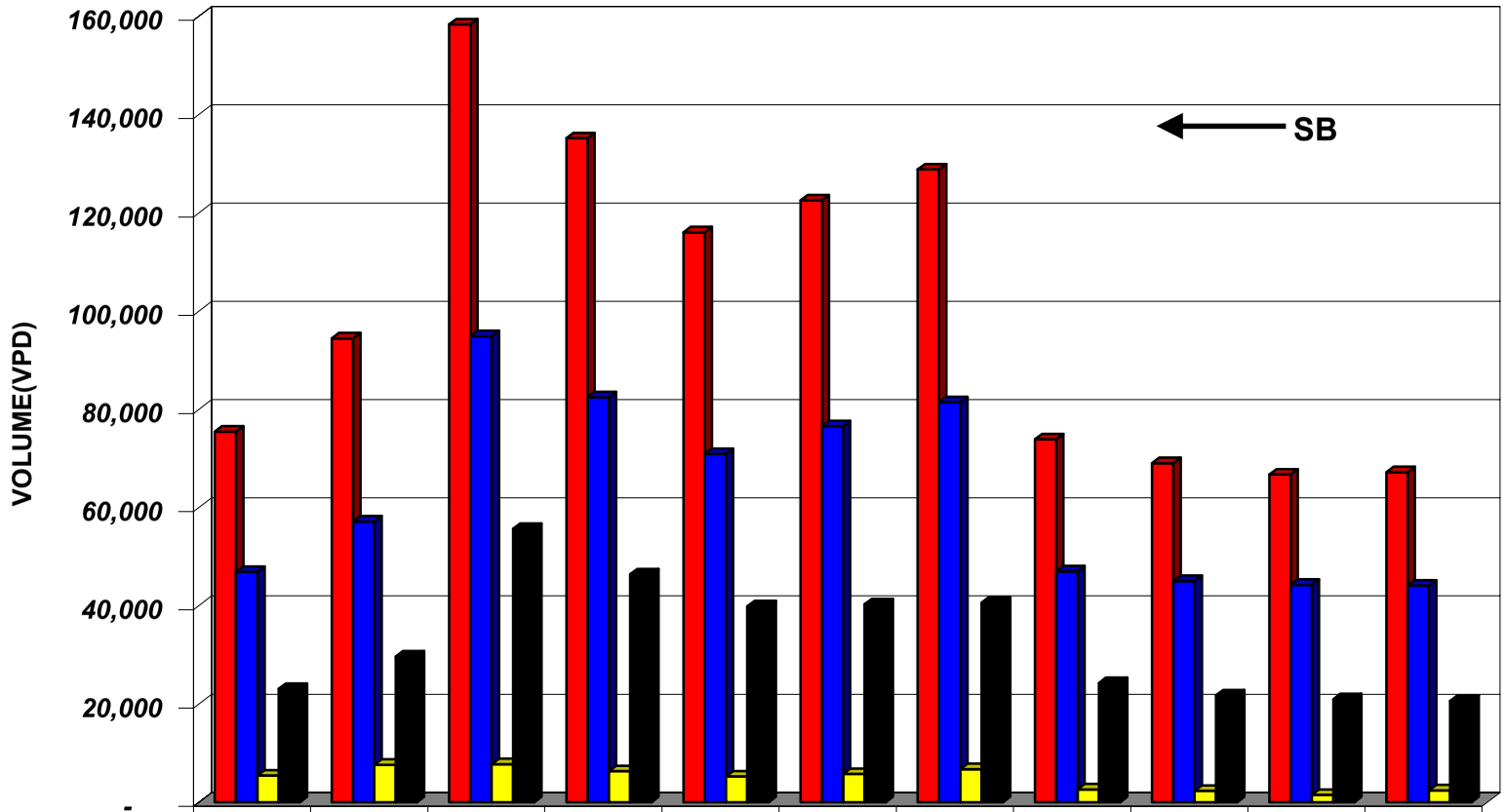
Overall trip times in the general purpose lanes are expected to increase by 32 percent. The midday period is expected to deteriorate the most rapidly. This can be attributed to peak spreading due to the inability of the transportation system to accommodate the demand in the peaks. Furthermore, non-peak direction travel times are increasing faster than the peak travel direction. This correlates with the expectation that population and employment will become more dispersed over time. The HOV lanes remain predominately free-flowing with sparse pockets of congestion.

Figure 2-8: I-75 Northbound 2030 Daily Volume in the General Purpose Lanes



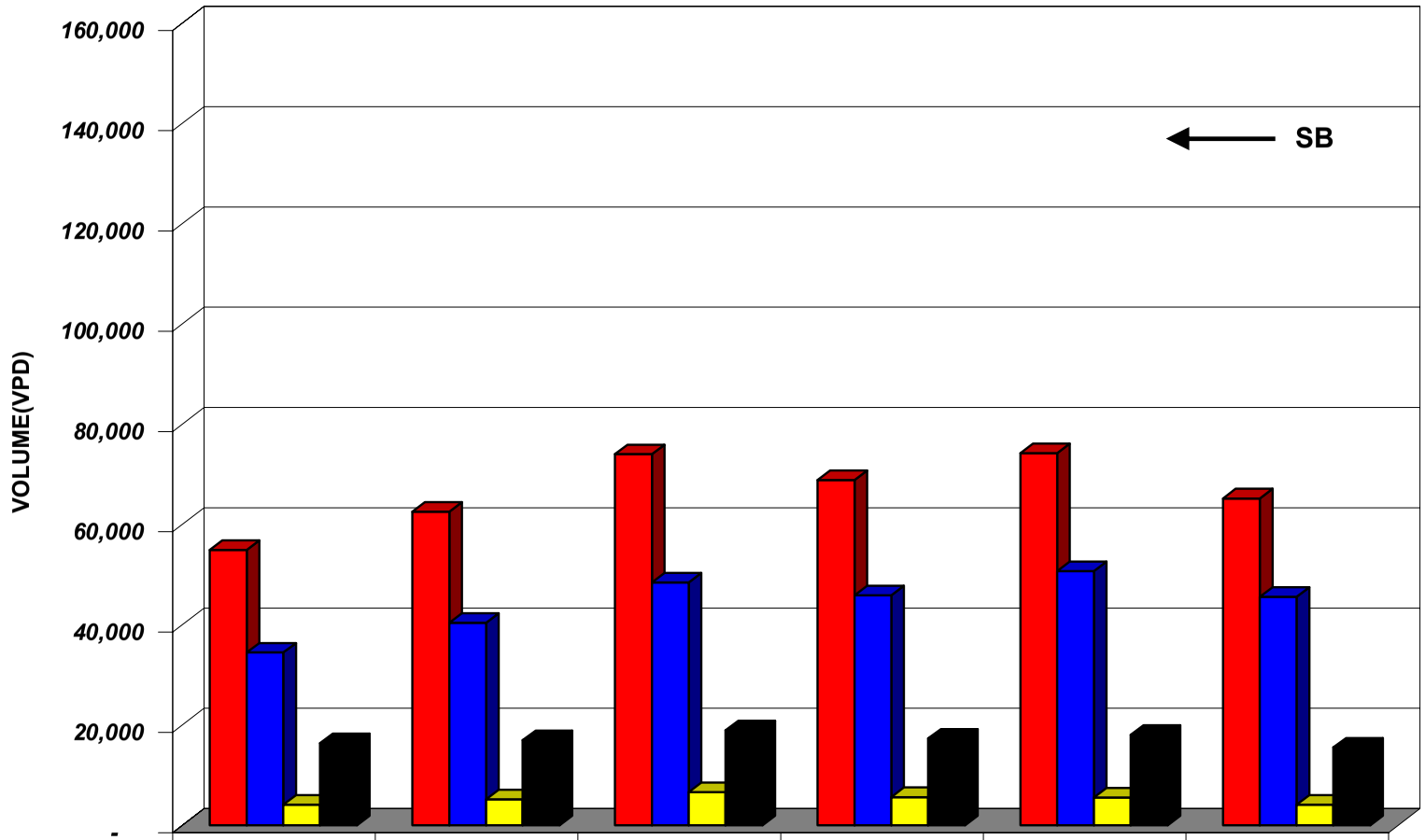
	Akers Mill Road	I-285	Windy Hill Road	SR 280	S. Marrietta Pkwy	N. Marrietta Pkwy	Canton Road Conn.	I-575	Ernest Barrett Pkwy	Chastain Road	Wade Green Road
Total	85,870	81,660	154,660	140,640	116,110	122,330	124,040	74,180	67,930	67,690	68,110
SOV	52,800	50,850	93,130	85,700	70,830	76,000	78,230	46,680	44,280	44,980	44,950
HOV	6,880	5,710	8,250	7,210	5,690	6,260	6,450	2,850	2,310	1,760	2,530
Truck	26,190	25,100	53,280	47,730	39,590	40,070	39,360	24,650	21,340	20,950	20,630

Figure 2-9: I-75 Southbound 2030 Daily Volume in the General Purpose Lanes



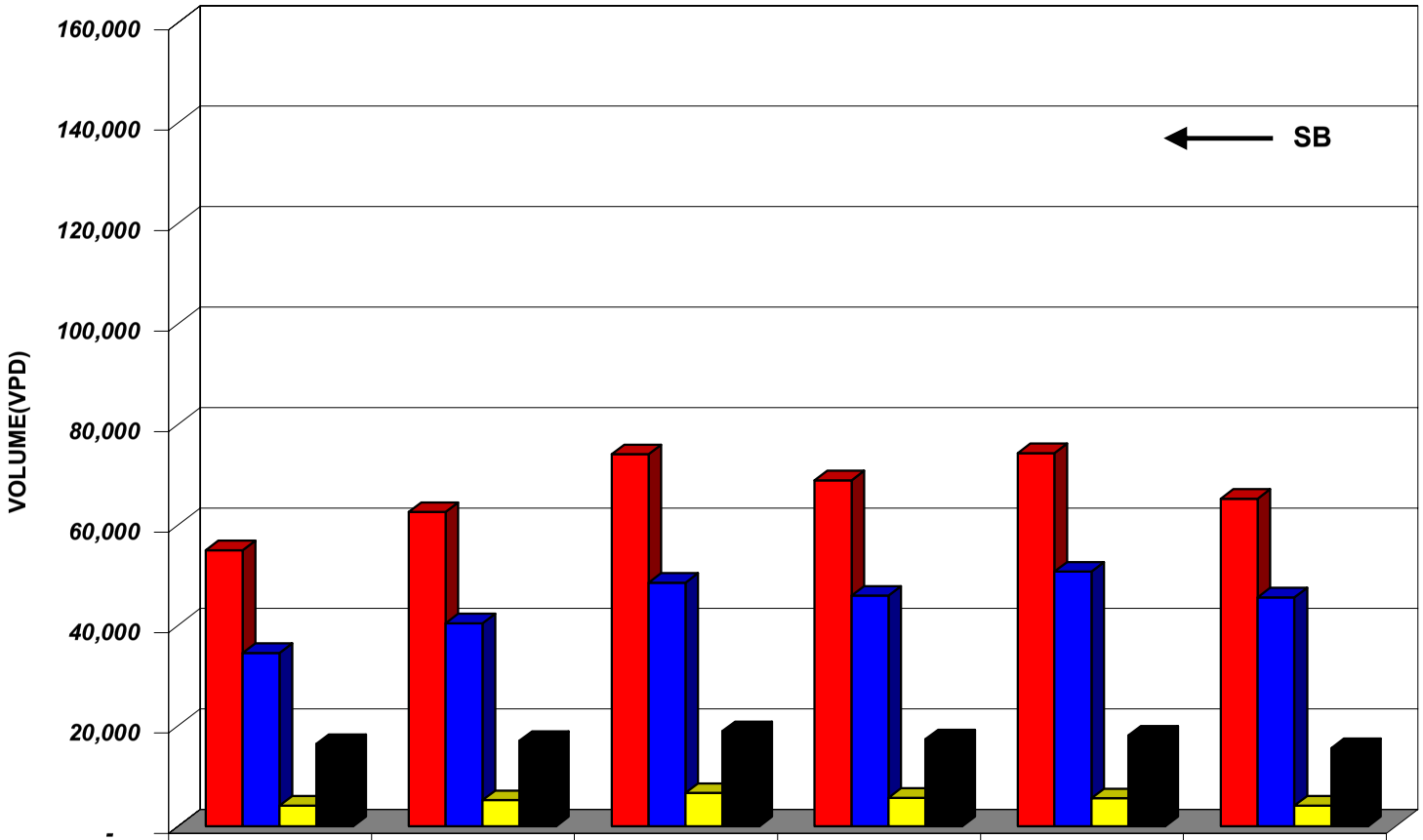
	Akers Mill Road	I-285	Windy Hill Road	SR 280	S. Marrietta Pkwy	N. Marrietta Pkwy	Canton Road Conn.	I-575	Ernest Barrett Pkwy	Chastain Road	Wade Green Road
Total	75,420	94,440	158,310	135,160	116,020	122,560	128,830	73,890	69,040	66,680	67,190
SOV	46,900	57,150	94,890	82,430	70,930	76,520	81,470	47,010	45,020	44,250	44,140
HOV	5,410	7,630	7,770	6,350	5,220	5,750	6,710	2,620	2,310	1,470	2,410
TRUCK	23,110	29,660	55,650	46,380	39,870	40,290	40,650	24,260	21,710	20,960	20,640

Figure 2-10: I-575 Northbound 2030 Daily Volume in the General Purpose Lanes



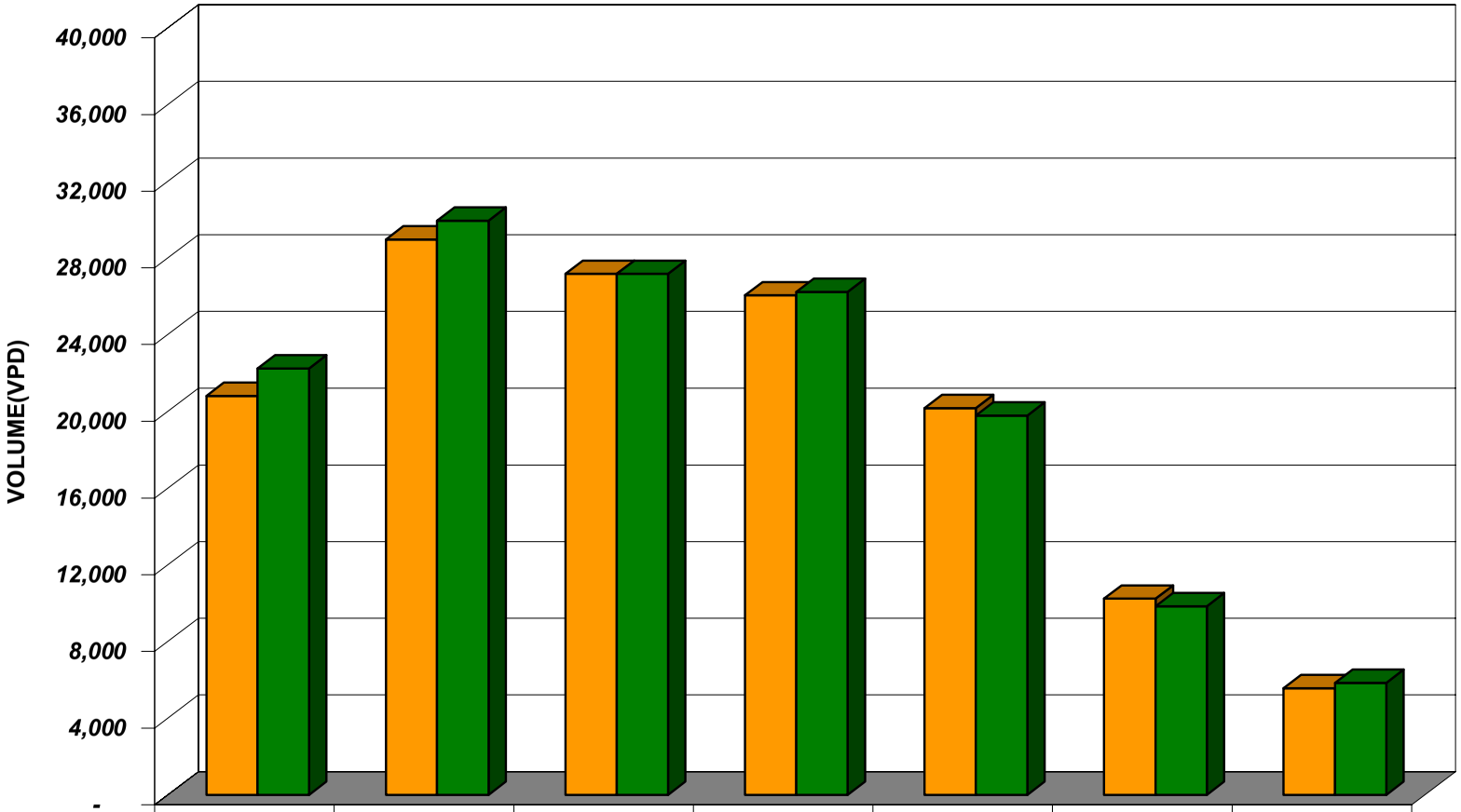
	I-75	Barrett Pkwy	Chastain Road	Bells Ferry Road	SR 92	Town Lake Pkwy
Total	54,950	62,540	74,020	68,880	74,280	65,210
SOV	34,470	40,390	48,460	45,890	50,710	45,570
HOV	4,100	5,180	6,640	5,650	5,550	4,110
TRUCK	16,380	16,970	18,920	17,340	18,020	15,530

Figure 2-11: I-575 Southbound 2030 Daily Volume in the General Purpose Lanes



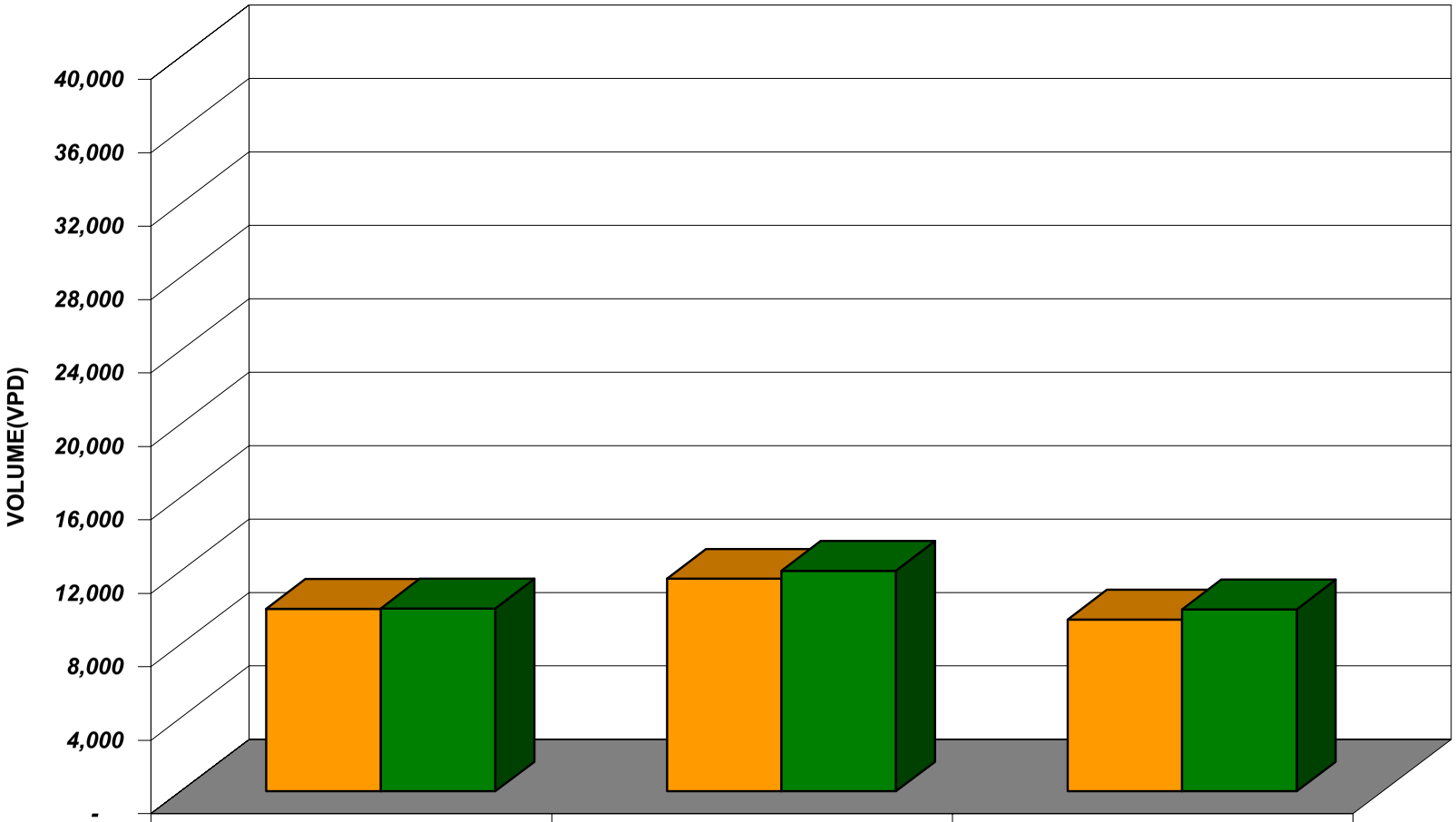
	I-75	Barrett Pkwy	Chastain Road	Bells Ferry Road	SR 92	Town Lake Pkwy
Total	54,950	62,540	74,020	68,880	74,280	65,210
SOV	34,470	40,390	48,460	45,890	50,710	45,570
HOV	4,100	5,180	6,640	5,650	5,550	4,110
TRUCK	16,380	16,970	18,920	17,340	18,020	15,530

Figure 2-12: I-75 2030 Daily Volume in the Managed Lanes



	Akers Mill Road	I-285	Terrell Mill Road	Franklin Road	SR 120	I-575	Big Shanty Road
HOV NB	20,800	28,980	27,170	26,050	20,170	10,230	5,560
HOV SB	22,230	29,950	27,180	26,230	19,790	9,830	5,840

Figure 2-13: I-575 2030 Daily Volume in the Managed Lanes



	I-75	Big Shanty Road	Dupree Road
HOV NB	9,940	11,580	9,360
HOV SB	9,960	12,020	9,910

Figure 2-14: 2005 A.M. Peak Period V/C Ratios

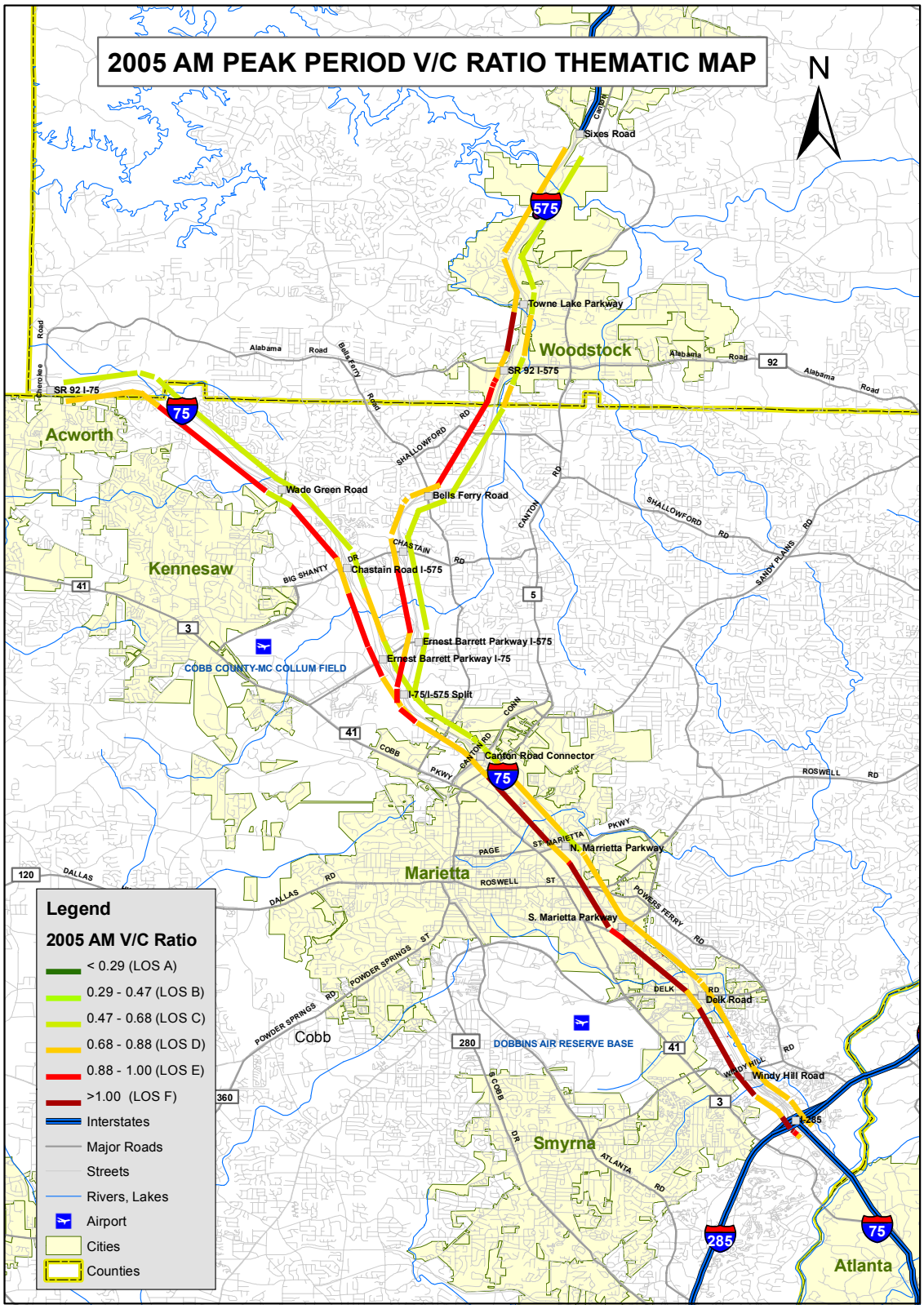


Figure 2-15: 2005 P.M. Peak Period V/C Ratios

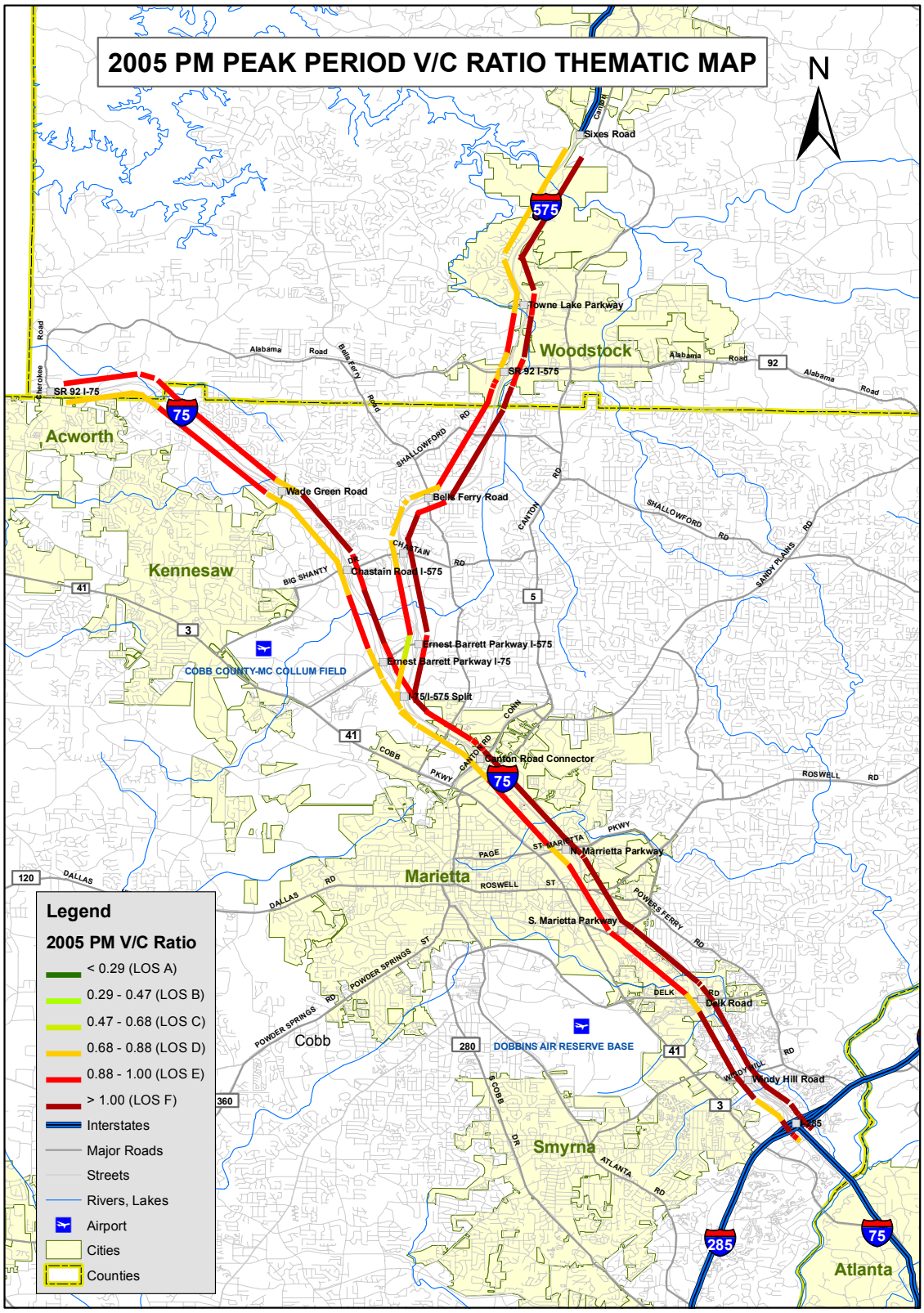


Figure 2-16: 2030 A.M. Peak Period V/C Ratios

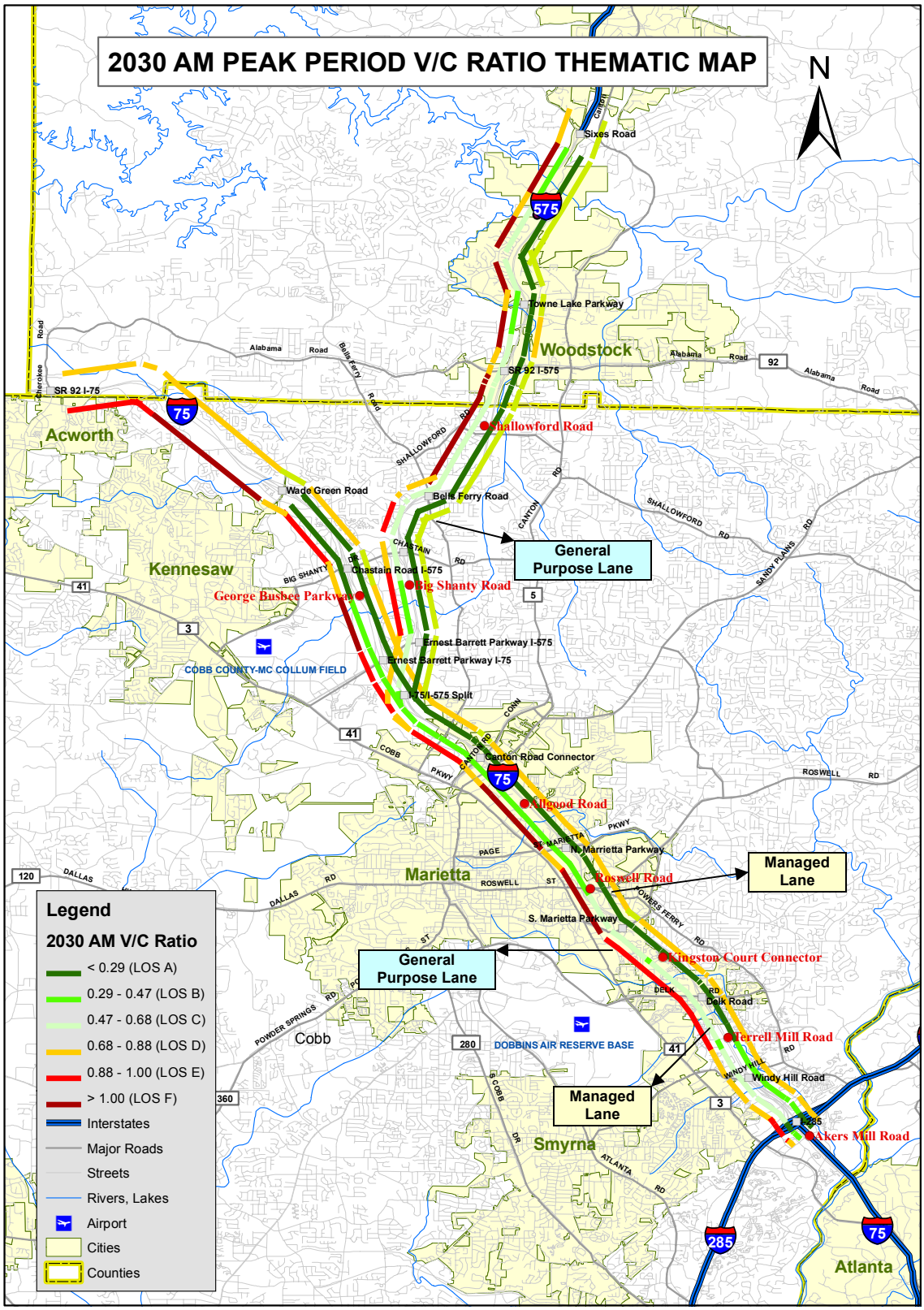


Figure 2-17: 2030 P.M. Peak Period V/C Ratios

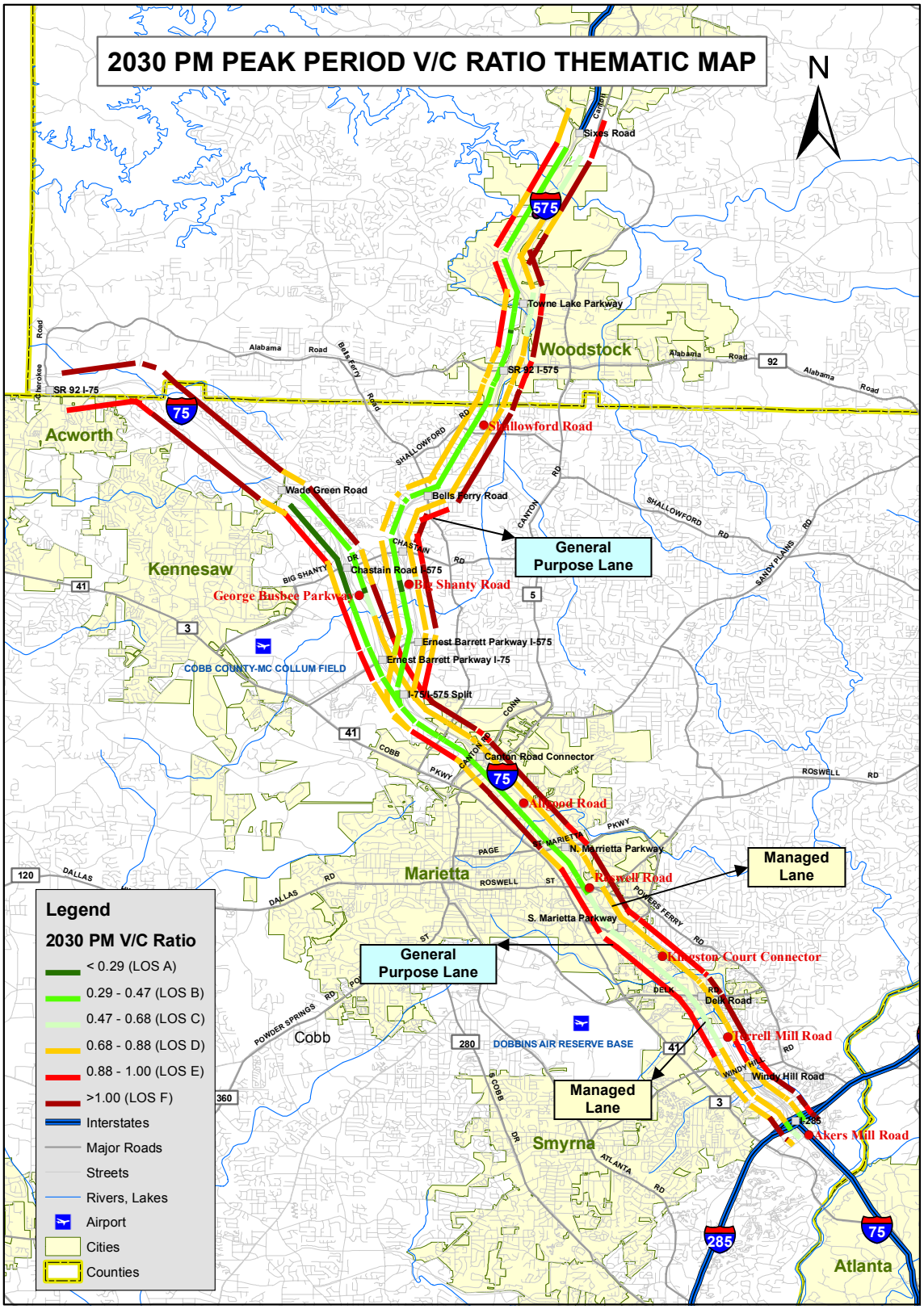


Table 2-4: 2005 Travel Times

Analysis Segment	Direction	2005 CORRIDOR TRAVEL TIME (Minutes)							
		AM Peak Period		Midday Period		PM Peak Period		Over Night	
		GP Lane	HOV Lane	GP Lane	HOV Lane	GP Lane	HOV Lane	GP Lane	HOV Lane
I-75 from Akers Mill Road to I-575 Split	NB	13	N/A	13	N/A	25	N/A	11	N/A
	SB	21		13		14		11	
I-75 from I-575 Split to Wade Green Road	NB	5		5		8		4	
	SB	7		5		5		4	
I-575 from I-75 Split to Sixes Road	NB	13		13		28		11	
	SB	21		13		15		11	

Table 2-5: 2030 No-Project Travel Times

Analysis Segment	Direction	2030 CORRIDOR TRAVEL TIME (Minutes)							
		AM Peak Period		Midday Period		PM Peak Period		Over Night	
		GP Lane	HOV Lane	GP Lane	HOV Lane	GP Lane	HOV Lane	GP Lane	HOV Lane
I-75 from Akers Mill Road to I-575 Split	NB	17	10	19	12	33	16	11	10
	SB	25	12	20	12	23	12	11	10
I-75 from I-575 Split to Wade Green Road	NB	7	4	8	4	13	5	4	4
	SB	10	4	8	4	8	4	4	4
I-575 from I-75 Split to Sixes Road	NB	14	11	17	11	39	18	11	11
	SB	29	13	18	12	21	12	11	11

2.3 Traffic and Operational Issues

A planning level traffic analysis was performed to benchmark the performance of future alternatives.

2.3.2 Planning Level Capacity Analysis

A planning level analysis for the I-75/575 corridor was developed to determine overall congestion levels under existing and future year no-project conditions. No-project conditions are defined as the entire project listing currently documented in ARC's long-range transportation plan. Build alternatives, the subject of future chapters of this report, include the addition of pricing to the managed lanes network. This analysis was primarily focused on peak period travel, or the time when management strategies are the most effective.

Level of Service Definition

Planning level of service (LOS) is a measure of the adequacy of the number of lanes during the peak hour or period of travel. This planning LOS analysis does not

incorporate the effects of weaving and merging of ramps at interchange junctions. The analysis of the ramps and interchanges, including the effects of downstream congestion, was not performed as part of this analysis.

Level of service is measured on a scale of "A" through "F," with LOS A being the best operating condition and LOS F being the worst. Although LOS D represents a desirable minimum for traffic operations in larger urban areas, LOS E is considered tolerable in areas with very severe congestion.

Table 2-6 provides a general description of the various LOS categories and congestion

Table 2-6 Level of Service Descriptions for a Freeway

LOS	Description	Congestion Level
A	Free traffic flow with low volumes and high speeds. Speeds controlled by driver desires, speed limits, and roadway physical conditions.	**Low**
B	Stable traffic flow, with operating speeds remaining near free flow. Drivers still have reasonable freedom to maneuver.	**Low**
C	Stable flow, but higher volumes more closely control speeds and maneuverability.	**Moderate**
D	Approach unstable flow with tolerable operating speeds maintained, but considerably affected by changes in operating conditions.	**Moderate**
E	Unstable flow with low speed and momentary stoppages.	**Severe**
F	Forced flow with low speed. Stop-and-go with stoppages for long periods are possible.	**Severe**

Source: Highway Capacity Manual

The I-75 corridor currently experiences congestion as a result of insufficient capacity to accommodate the peak period travel demand. Some of the factors constraining capacity include: inadequate number of travel lanes and critical travel bottlenecks caused by lane drops, merges, diverges, and weaving areas.

Problem areas were identified through capacity analysis. These areas experience peak period levels of services or E or F. LOS E is an unstable condition that can easily become LOS F or stop-and-go conditions. Results from the existing and future peak period capacity analyses are presented in Tables 2-7 through 2-14.

Table 2-7 2005 Northbound AM Peak Period Capacity Analysis

	NORTHBOUND									
	GENERAL PURPOSE LANES									
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	18,720	11,370	890	5,320	1,140	22,520	5,630	6,600	0.85	D
I-285	17,930	11,030	680	5,130	1,090	21,585	5,396	6,150	0.88	D
Windy Hill Road	30,360	17,310	830	8,740	3,480	38,210	9,553	12,300	0.78	D
SR 280	27,260	15,490	670	7,840	3,260	34,440	8,610	11,400	0.76	D
S. Marietta Pkwy	22,520	12,890	530	6,270	2,830	28,485	7,121	8,250	0.86	D
N. Marietta Pkwy	23,150	13,300	660	6,340	2,850	29,170	7,293	8,750	0.83	D
Canton Road Conn.	23,470	13,630	770	6,210	2,860	29,435	7,359	10,500	0.70	D
I-575	14,960	9,000	400	3,460	2,100	18,790	4,698	6,600	0.71	D
Ernest Barrett Pkwy	13,010	7,990	220	2,860	1,940	16,380	4,095	4,950	0.83	D
Chastain Road	12,840	7,930	150	2,800	1,960	16,200	4,050	5,250	0.77	D
Wade Green Road	12,830	8,120	180	2,580	1,950	16,070	4,018	5,400	0.74	D
I-575										
I-75	8,520	4,640	360	2,750	770	10,665	2,666	5,100	0.52	C
Barrett Pkwy	10,740	5,950	570	3,300	920	13,310	3,328	5,100	0.65	C
Chastain Road	11,850	6,610	780	3,460	1,000	14,580	3,645	6,450	0.57	C
Bells Ferry Road	10,990	6,350	640	3,090	910	13,445	3,361	5,400	0.62	C
SR 92	12,710	7,670	710	3,330	1,000	15,375	3,844	5,400	0.71	D
Towne Lake Pkwy	11,290	7,030	520	2,860	880	13,600	3,400	5,250	0.65	C

Table 2-8 2005 Southbound AM Peak Period Capacity Analysis

	SOUTHBOUND									
	GENERAL PURPOSE LANES									
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	17,960	12,280	730	4,080	870	20,870	5,218	6,600	0.79	D
I-285	21,840	14,570	1,080	5,240	950	25,410	6,353	6,600	0.96	E
Windy Hill Road	39,480	25,930	1,130	8,930	3,490	47,435	11,859	12,750	0.93	E
SR 280	32,980	22,130	950	7,000	2,900	39,380	9,845	10,200	0.97	E
S. Marietta Pkwy	28,410	19,100	810	5,900	2,600	33,960	8,490	8,250	1.03	F
N. Marietta Pkwy	30,920	21,260	840	6,100	2,720	36,690	9,173	8,750	1.05	F
Canton Road Conn.	34,050	23,880	930	6,370	2,870	40,105	10,026	10,500	0.95	E
I-575	19,500	13,480	320	3,610	2,090	23,395	5,849	6,600	0.89	E
Ernest Barrett Pkwy	18,130	12,870	330	3,000	1,930	21,560	5,390	5,250	1.03	F
Chastain Road	17,310	12,480	240	2,700	1,890	20,550	5,138	5,250	0.98	E
Wade Green Road	17,290	11,960	670	2,680	1,980	20,610	5,153	4,800	1.07	F
I-575										
I-75	14,560	10,400	610	2,770	780	16,725	4,181	5,100	0.82	D
Barrett Pkwy	17,500	13,050	850	2,810	790	19,695	4,924	5,100	0.97	E
Chastain Road	20,770	15,750	1,030	3,100	890	23,210	5,803	6,450	0.90	E
Bells Ferry Road	19,850	15,250	800	2,950	850	22,175	5,544	5,400	1.03	F
SR 92	21,980	17,020	810	3,190	960	24,535	6,134	5,400	1.14	F
Towne Lake Pkwy	19,050	14,840	600	2,760	850	21,280	5,320	5,250	1.01	F

Table 2-9 2005 Northbound PM Peak Period Capacity Analysis

	NORTHBOUND									
	GENERAL PURPOSE LANES									
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	24,680	17,170	1,790	4,820	900	27,990	6,998	6,600	1.06	F
I-285	23,440	16,540	1,390	4,640	870	26,630	6,658	6,150	1.08	F
Windy Hill Road	43,680	30,460	2,150	8,330	2,740	50,585	12,646	12,300	1.03	F
SR 280	39,410	27,940	1,870	7,120	2,480	45,450	11,363	11,400	1.00	E
S. Marietta Pkwy	31,110	21,980	1,530	5,530	2,070	35,945	8,986	8,250	1.09	F
N. Marietta Pkwy	34,810	25,050	1,600	5,920	2,240	40,010	10,003	8,750	1.14	F
Canton Road Conn.	37,570	27,340	1,590	6,150	2,490	43,135	10,784	10,500	1.03	F
I-575	21,060	15,010	700	3,540	1,810	24,640	6,160	6,600	0.93	E
Ernest Barrett Pkwy	19,170	14,110	630	2,800	1,630	22,200	5,550	4,950	1.12	F
Chastain Road	18,990	14,240	430	2,680	1,640	21,970	5,493	5,250	1.05	F
Wade Green Road	20,430	14,760	1,020	2,850	1,800	23,655	5,914	5,400	1.10	F
I-575										
I-75	16,500	12,330	890	2,610	670	18,475	4,619	5,100	0.91	E
Barrett Pkwy	19,760	14,950	1,350	2,790	670	21,825	5,456	5,100	1.07	F
Chastain Road	23,510	18,070	1,520	3,140	780	25,860	6,465	6,450	1.00	F
Bells Ferry Road	22,510	17,440	1,360	2,970	740	24,735	6,184	5,400	1.15	F
SR 92	24,960	19,500	1,470	3,170	820	27,365	6,841	5,400	1.27	F
Towne Lake Pkwy	21,790	17,130	1,180	2,750	730	23,895	5,974	5,250	1.14	F

Table 2-10 2005 Southbound PM Peak Period Capacity Analysis

	SOUTHBOUND									
	GENERAL PURPOSE LANES									
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	18,840	12,310	1,250	4,480	800	21,880	5,470	6,600	0.83	D
I-285	23,460	14,920	1,830	5,830	880	27,255	6,814	6,600	1.03	F
Windy Hill Road	38,240	24,250	1,850	9,090	3,050	45,835	11,459	12,750	0.90	E
SR 280	32,250	20,690	1,440	7,450	2,670	38,645	9,661	10,200	0.95	E
S. Marietta Pkwy	27,090	17,430	1,200	6,110	2,350	32,495	8,124	8,250	0.98	E
N. Marietta Pkwy	29,380	19,180	1,340	6,400	2,460	35,040	8,760	8,750	1.00	F
Canton Road Conn.	31,340	20,590	1,670	6,510	2,570	37,165	9,291	10,500	0.88	E
I-575	17,830	11,960	680	3,390	1,800	21,325	5,331	6,600	0.81	D
Ernest Barrett Pkwy	16,300	11,150	570	2,890	1,690	19,435	4,859	5,250	0.93	E
Chastain Road	15,640	10,840	340	2,770	1,690	18,715	4,679	5,250	0.89	E
Wade Green Road	16,190	11,240	540	2,680	1,730	19,260	4,815	4,800	1.00	F
I-575										
I-75	13,500	8,630	1,000	3,110	760	15,815	3,954	5,100	0.78	D
Barrett Pkwy	14,760	9,540	1,210	3,220	790	17,160	4,290	5,100	0.84	D
Chastain Road	17,230	11,220	1,650	3,480	880	19,850	4,963	6,450	0.77	D
Bells Ferry Road	16,120	10,750	1,410	3,160	800	18,500	4,625	5,400	0.86	D
SR 92	18,140	12,370	1,510	3,370	890	20,715	5,179	5,400	0.96	E
Towne Lake Pkwy	16,630	11,540	1,350	2,950	790	18,895	4,724	5,250	0.90	E

Table 2-11 2030 Northbound AM Peak Period Capacity Analysis

	NORTHBOUND															
	GENERAL PURPOSE LANES										MANAGED LANES					
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS		HOV	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	18,720	11,370	890	5,320	1,140	22,520	5,630	6,600	0.85	D	Akers Mill Road	3,370	843	3,300	0.26	A
I-285	17,930	11,030	680	5,130	1,090	21,585	5,396	6,150	0.88	D	I-285	4,590	1,148	3,300	0.35	B
Windy Hill Road	30,360	17,310	830	8,740	3,480	38,210	9,553	12,300	0.78	D						
SR 280	27,260	15,490	670	7,840	3,260	34,440	8,610	11,400	0.76	D	Terrell Mill Road	3,840	960	2,800	0.34	B
S. Marietta Pkwy	22,520	12,890	530	6,270	2,830	28,485	7,121	8,250	0.86	D	Franklin Road	3,540	885	3,500	0.25	A
N. Marietta Pkwy	23,150	13,300	660	6,340	2,850	29,170	7,293	8,750	0.83	D	SR 120	2,110	528	3,300	0.16	A
Canton Road Conn.	23,470	13,630	770	6,210	2,860	29,435	7,359	10,500	0.70	D						
I-575	14,960	9,000	400	3,460	2,100	18,790	4,698	6,600	0.71	D	I-575	1,180	295	1,650	0.18	A
Ernest Barrett Pkwy	13,010	7,990	220	2,860	1,940	16,380	4,095	4,950	0.83	D						
Chastain Road	12,840	7,930	150	2,800	1,960	16,200	4,050	5,250	0.77	D	Big Shanty Road	590	148	1,800	0.08	A
Wade Green Road	12,830	8,120	180	2,580	1,950	16,070	4,018	5,400	0.74	D						
I-575																
I-75	8,520	4,640	360	2,750	770	10,665	2,666	5,100	0.52	C	I-75	930	233	1,700	0.14	A
Barrett Pkwy	10,740	5,950	570	3,300	920	13,310	3,328	5,100	0.65	C						
Chastain Road	11,850	6,610	780	3,460	1,000	14,580	3,645	6,450	0.57	C	Big Shanty Road	1,010	253	1,750	0.14	A
Bells Ferry Road	10,990	6,350	640	3,090	910	13,445	3,361	5,400	0.62	C						
SR 92	12,710	7,670	710	3,330	1,000	15,375	3,844	5,400	0.71	D	Dupree Road	900	225	1,800	0.13	A
Towne Lake Pkwy	11,290	7,030	520	2,860	880	13,600	3,400	5,250	0.65	C						

Table 2-12 2030 Southbound AM Peak Period Capacity Analysis

	SOUTHBOUND															
	GENERAL PURPOSE LANES										MANAGED LANES					
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS		HOV	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	17,960	12,280	730	4,080	870	20,870	5,218	6,600	0.79	D	Akers Mill Road	5,850	1,463	3,300	0.44	B
I-285	21,840	14,570	1,080	5,240	950	25,410	6,353	6,600	0.96	E	I-285	7,230	1,808	3,300	0.55	C
Windy Hill Road	39,480	25,930	1,130	8,930	3,490	47,435	11,859	12,750	0.93	E						
SR 280	32,980	22,130	950	7,000	2,900	39,380	9,845	10,200	0.97	E	Terrell Mill Road	6,930	1,733	3,300	0.53	C
S. Marietta Pkwy	28,410	19,100	810	5,900	2,600	33,960	8,490	8,250	1.03	F	Franklin Road	6,840	1,710	3,500	0.49	C
N. Marietta Pkwy	30,920	21,260	840	6,100	2,720	36,690	9,173	8,750	1.05	F	SR 120	6,060	1,515	3,300	0.46	B
Canton Road Conn.	34,050	23,880	930	6,370	2,870	40,105	10,026	10,500	0.95	E						
I-575	19,500	13,480	320	3,610	2,090	23,395	5,849	6,600	0.89	E	I-575	2,910	728	1,650	0.44	B
Ernest Barrett Pkwy	18,130	12,870	330	3,000	1,930	21,560	5,390	5,250	1.03	F						
Chastain Road	17,310	12,480	240	2,700	1,890	20,550	5,138	5,250	0.98	E	Big Shanty Road	1,930	483	1,800	0.27	A
Wade Green Road	17,290	11,960	670	2,680	1,980	20,610	5,153	4,800	1.07	F						
I-575																
I-75	14,560	10,400	610	2,770	780	16,725	4,181	5,100	0.82	D	I-75	3,160	790	1,700	0.46	B
Barrett Pkwy	17,500	13,050	850	2,810	790	19,695	4,924	5,100	0.97	E						
Chastain Road	20,770	15,750	1,030	3,100	890	23,210	5,803	6,450	0.90	E	Big Shanty Road	4,390	1,098	1,800	0.61	C
Bells Ferry Road	19,850	15,250	800	2,950	850	22,175	5,544	5,400	1.03	F						
SR 92	21,980	17,020	810	3,190	960	24,535	6,134	5,400	1.14	F	Dupree Road	3,360	840	1,800	0.47	B
Towne Lake Pkwy	19,050	14,840	600	2,760	850	21,280	5,320	5,250	1.01	F						

Table 2-13 2030 Northbound PM Peak Period Capacity Analysis

	NORTHBOUND															
	GENERAL PURPOSE LANES										MANAGED LANES					
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS		HOV	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	24,680	17,170	1,790	4,820	900	27,990	6,998	6,600	1.06	F	Akers Mill Road	7,550	1,888	3,300	0.57	C
I-285	23,440	16,540	1,390	4,640	870	26,630	6,658	6,150	1.08	F	I-285	10,980	2,745	3,300	0.83	D
Windy Hill Road	43,680	30,460	2,150	8,330	2,740	50,585	12,646	12,300	1.03	F						
SR 280	39,410	27,940	1,870	7,120	2,480	45,450	11,363	11,400	1.00	E	Terrell Mill Road	10,820	2,705	2,800	0.97	E
S. Marietta Pkwy	31,110	21,980	1,530	5,530	2,070	35,945	8,986	8,250	1.09	F	Franklin Road	10,620	2,655	3,500	0.76	D
N. Marietta Pkwy	34,810	25,050	1,600	5,920	2,240	40,010	10,003	8,750	1.14	F	SR 120	9,590	2,398	3,300	0.73	D
Canton Road Conn.	37,570	27,340	1,590	6,150	2,490	43,135	10,784	10,500	1.03	F						
I-575	21,060	15,010	700	3,540	1,810	24,640	6,160	6,600	0.93	E	I-575	4,550	1,138	1,650	0.69	D
Ernest Barrett Pkwy	19,170	14,110	630	2,800	1,630	22,200	5,550	4,950	1.12	F						
Chastain Road	18,990	14,240	430	2,680	1,640	21,970	5,493	5,250	1.05	F	Big Shanty Road	2,530	633	1,800	0.35	B
Wade Green Road	20,430	14,760	1,020	2,850	1,800	23,655	5,914	5,400	1.10	F						
I-575																
I-75	16,500	12,330	890	2,610	670	18,475	4,619	5,100	0.91	E	I-75	5,040	1,260	1,700	0.74	D
Barrett Pkwy	19,760	14,950	1,350	2,790	670	21,825	5,456	5,100	1.07	F						
Chastain Road	23,510	18,070	1,520	3,140	780	25,860	6,465	6,450	1.00	F	Big Shanty Road	6,140	1,535	1,750	0.88	D
Bells Ferry Road	22,510	17,440	1,360	2,970	740	24,735	6,184	5,400	1.15	F						
SR 92	24,960	19,500	1,470	3,170	820	27,365	6,841	5,400	1.27	F	Dupree Road	4,860	1,215	1,800	0.68	C
Towne Lake Pkwy	21,790	17,130	1,180	2,750	730	23,895	5,974	5,250	1.14	F						

Table 2-14 2030 Southbound PM Peak Period Capacity Analysis

	SOUTHBOUND															
	GENERAL PURPOSE LANES										MANAGED LANES					
I-75	Total Vehicles	SOV	HOV	Light Truck	Heavy Truck	Total Passenger Car Equivalents	Avg. Hourly Volume	Capacity	V/C Ratio	LOS		HOV	Avg. Hourly Volume	Capacity	V/C Ratio	LOS
Akers Mill Road	18,840	12,310	1,250	4,480	800	21,880	5,470	6,600	0.83	D	Akers Mill Road	6,550	1,638	3,300	0.50	C
I-285	23,460	14,920	1,830	5,830	880	27,255	6,814	6,600	1.03	F	I-285	9,120	2,280	3,300	0.69	D
Windy Hill Road	38,240	24,250	1,850	9,090	3,050	45,835	11,459	12,750	0.90	E						
SR 280	32,250	20,690	1,440	7,450	2,670	38,645	9,661	10,200	0.95	E	Terrell Mill Road	8,070	2,018	3,300	0.61	C
S. Marietta Pkwy	27,090	17,430	1,200	6,110	2,350	32,495	8,124	8,250	0.98	E	Franklin Road	7,660	1,915	3,500	0.55	C
N. Marietta Pkwy	29,380	19,180	1,340	6,400	2,460	35,040	8,760	8,750	1.00	F	SR 120	5,510	1,378	3,300	0.42	B
Canton Road Conn.	31,340	20,590	1,670	6,510	2,570	37,165	9,291	10,500	0.88	E						
I-575	17,830	11,960	680	3,390	1,800	21,325	5,331	6,600	0.81	D	I-575	2,830	708	1,650	0.43	B
Ernest Barrett Pkwy	16,300	11,150	570	2,890	1,690	19,435	4,859	5,250	0.93	E						
Chastain Road	15,640	10,840	340	2,770	1,690	18,715	4,679	5,250	0.89	E	Big Shanty Road	1,530	383	1,800	0.21	A
Wade Green Road	16,190	11,240	540	2,680	1,730	19,260	4,815	4,800	1.00	F						
I-575																
I-75	13,500	8,630	1,000	3,110	760	15,815	3,954	5,100	0.78	D	I-75	2,690	673	1,700	0.40	B
Barrett Pkwy	14,760	9,540	1,210	3,220	790	17,160	4,290	5,100	0.84	D						
Chastain Road	17,230	11,220	1,650	3,480	880	19,850	4,963	6,450	0.77	D	Big Shanty Road	3,110	778	1,800	0.43	B
Bells Ferry Road	16,120	10,750	1,410	3,160	800	18,500	4,625	5,400	0.86	D						
SR 92	18,140	12,370	1,510	3,370	890	20,715	5,179	5,400	0.96	E	Dupree Road	2,520	630	1,800	0.35	B
Towne Lake Pkwy	16,630	11,540	1,350	2,950	790	18,895	4,724	5,250	0.90	E						

2.4 Overall Key Findings

Congestion is a significant problem in the I-75 and I-575 corridors today. Even with anticipated roadway improvements, congestion will continue to increase. Specific findings of the analysis of existing and future traffic conditions include:

- The primary reason for increasing congestion is the projected increases in population and roadway use that significantly exceeds the planned roadway capacity. Under existing forecasts for the study area, population and employment are expected to increase approximately 60 percent compared to a 12 percent increase in lanes miles.
- Average daily traffic is expected to increase by 20-25 percent along the I-75 corridor and 83 percent along I-575. Traffic volumes are projected to exceed 370,000 vehicles per day on I-75 just north of I-285.
- Afternoon travel in severe congestion for the Atlanta region is forecast to increase from 25 percent to 34 percent over the planning horizon.
- Very high volumes in the AM and PM peak periods will continue to result in peak spreading as commuters adjust their travel times to avoid the most congested hours of the day. As a result, more of the corridor will experience congestion over more hours of the day.
- The most congested section of the I-75 corridor is located between North Marietta Parkway and Canton Road.
- The travel time from Akers Mill Road to I-575 in the PM peak is expected to increase from 25 minutes to 33 minutes. The same trip in the managed lanes is expected to take 16 minutes.
- Future roadway LOS is expected to worsen along the majority of sections of the corridor. This finding occurs even with the currently planned improvement on I-75 and I-575 (two managed lanes in each direction etc.) and other roadway improvements assumed in ARC's Mobility 2030 long-range transportation plan.
- The I-75 interchange with I-575 requires operational improvements to provide desirable existing and future operating conditions.

CHAPTER 3

STATE PREFERENCE SURVEY

3.1 Role of the Stated Preference Research

The assessment of potential managed lanes users' willingness to pay tolls in exchange for improved transportation services was accomplished through stated preference (SP) research. The SP analysis was designed to provide behavioral values for use in modeling traffic and revenue impacts of alternative strategies in the proposed managed lanes. SP surveying was conducted during July-September 2005. The results of the SP analysis were applied within ARC's travel demand model adapted for use in the EIS by Parsons Brinkerhoff.

The primary outputs sought from the SP research were values of travel time savings and possibly 'alternative-specific constants', which measures underlying bias towards an alternative. Values were required for each key market segment within the ARC model. The travel demand model contains a detailed coded and validated network of the Atlanta regional highway system. The managed lanes have been coded into forecast year networks for which vehicle matrices have also been created. The impact of alternative roadway allocations resulting from allowing SOVs to buy into the managed lanes at various toll rates can be tested by modifying the networks and re-running the model. The purpose of this report is to present the methodology used to evaluate the SP research, offer conclusions on its suitability for predictive purposes, and detail estimates of value of travel time savings derived from statistical analysis of SP research results.

SP analysis was organized for compatibility with the ARC model. Specific analysis was oriented by time-of-day and trip purpose as illustrated below.

Separated networks exist for four time periods:

- Morning peak (06:00:10:00)
- Midday inter-peak (10:00-15:00)
- Evening peak (15:00-19:00)
- Evening/night (19:00-06:00).

And separate matrices for four trip purposes:

- Home-Based Work (HBW)
- Non-Home Based (NHB)
- Home-Based Other (HBO)
- Home-Based School (HBSchool).

3.1.1 Study Method

The application of SP techniques to toll road traffic and revenue forecasting is now widespread. It has the primary advantage of avoiding problems of co-linearity between time and cost, both of which are typically determined by distance traveled. This occurs in real-life choices and makes revealed preference (RP) methods problematic, where econometric choice models are derived from actual choice decisions.

In contrast, SP methods avoid correlation between time and costs by presenting users with hypothetical choices; in this case between using the general and managed (e.g. tolled SOV & HOV) lanes on I-75/575. One potential weakness is that users may not subsequently act as they state they would for a number of reasons.

The questionnaire was designed by survey and research firm NuStats. The survey design, implementation and preliminary analysis are described in their report 'Interstate 75 Stated Preference Survey - Final Report' included as Appendix A.

3.1.2 Survey Sample

Computer-aided telephone interview surveying (CATI) was used to obtain the SP data. Respondents who resided within the travel-shed of the study corridor, were over 18 years old and had used the route within the past week were considered in-scope and eligible for SP analysis. A total sample of 1,500 interviews was sought with quotas set for the mid-July to mid-August & mid-August to mid-September periods (50% each), and for peak and non-peak (including weekends) periods (70%, 30% respectively).

The sample frame was purchased from a sample provider and an overall response rate of 47% achieved. The survey sampling process and targets is described in more detail in Appendix B: 'Technical Memorandum on Sample Design'.

3.1.3 Stated Preference Choices

The questionnaire contained two questions which elicit willingness-to-pay information:

- A set of four stated preference choices; and,
- A 'transfer price' question.

In the SP choices, SOV respondents were asked to choose between traveling in the managed lanes or general lanes with these alternatives defined in terms of two attributes; toll assessed and travel time savings. The general lanes were free but more congested and therefore slower; the managed lanes were tolled but faster. Ten levels of tolls were used, ranging from $0.50 to $8.00, and four levels of travel time difference between the general and managed lanes (5, 10, 15 & 20 minutes). Unlike most SP designs, experimental design methods were not used to create orthogonal (uncorrelated) attribute values. Instead, the toll and travel time savings were selected randomly from the above sets of values.

A third option, 'Carpool with someone to use the carpool lane for free', was also offered. If chosen, respondents were probed as to how realistic this option really was for them.

Depending on their response, they were then either asked to choose between the tolled SOV use of the managed lane or the free general lanes, or rejected for further analysis.

Following the SP question, a further 'transfer price' question was posed. In this line questioning, respondents were asked if they would use the managed lane at the various toll levels until the range within which their transfer price for willingness-to-pay for the managed lanes was determined.

Responses from transfer price questions are considered less reliable than SP choices as they are more prone to policy response bias, caused when respondents guess the purpose of the research and seek to influence its findings in their favor by responding strategically. In the case of I-75/575 respondents may try to understate the value they place on time savings to discourage tolling.

3.2 Documentation of Methods

The following section document the methods used to conduct the Stated Preference Survey

3.2.1 Questionnaire

NuStats and Mark Bradley collaboratively designed the survey instrument, with input from the State Road and Tollway Authority, the Georgia Department of Transportation and other members of the project team. Upon approval of the instrument it was programmed into a computer assisted telephone interviewing (CATI) environment for dialing. The questionnaire contained 179 data items and four screener questions to confirm the eligibility of respondents for participation in the survey. The survey instrument is included in Appendix C.

3.2.2 Data Collection

Survey specialists conducted pilot data collection for the survey from 5:30 PM to 8 PM CST on July 14, 2005. All survey specialists received a training session and were required to perform simulated interviews before beginning actual data collection activities. In addition, interviewers were continually monitored to ensure the highest level of quality was maintained. The pilot was dialed in English only.

A total of 30 completed surveys ("completes") were collected during the interview phase utilizing computer-assisted telephone interviewing (CATI) software. The use of CATI interviewing was essential to the research process to ensure that the right information was collected in the most efficient manner. The average length of each completed pilot survey was 14 minutes. Upon reviewing the pilot data and consulting with both interviewers and survey leads, a few minor revisions were made to the instrument to streamline data collection. Upon approval, dialing for the full study began on July 15, with the completes from the pilot sample counting toward the ultimate goal of 1,500 completed surveys. The last of the contractually required completes was obtained on September 3, 2005. The final average survey length was 12.9 minutes. It should be noted that the data collection was split equally (750-surveys each) between the summer (7/14/05 to 8/14/05) and fall (8/15/05 to 9/3/05).

3.2.3 Edit Checks

Prior to any data analysis, a comprehensive edit check for each completed interview was performed. During this phase, each interview was required to pass a routine edit check program before it could be included in the final data set. Routine edit checks include such items as data range limitations, skip patterns, logic checks and coding of open end questions.

3.2.4 Survey Population

The population of inference (or population under study) for the SRTA SP Survey consists of those individuals 18 years of age or older, residing within the I-75/575 survey sampling areas (see Appendix B: Technical Memorandum on Sample Design), who travel the target segment at least once per week. Eligible respondents had at least one vehicle available for use by members of the household.

3.2.5 Sample Sizes, Targets and Quotas

A total of 1,500 valid interviews were required to meet project objectives. Of these, 750 were completed in summer 2005 and 750 were completed in fall 2005. Quotas were established to equalize seasonal distribution. Quotas were also established to obtain 70 percent of trips in the peak periods (AM peak is defined as 6 AM to 10 AM, and PM peak is defined as 3 PM to 7 PM) and 30 percent in all other times including Saturday and Sunday.

At the onset of the survey, it was estimated that approximately 75% (1,125 interviews) would be conducted with drivers of single occupancy vehicles (SOV) who would be respondents for the SP questions on willingness to pay and potential use of priced facilities. Upon completion of the survey, it was observed that 73% of interviews were conducted with drivers of SOVs.

3.2.6 Sampling Frame Generation

The sampling frame initially consisted of listed (known residential address) and unlisted (no known residential address) telephone numbers for households located in the I-75/575 sampling area. Upon completion of summer data collection, it was noted that dialing productivity was not sufficient to maintain the project budget or schedule. As such, the summer data was analyzed and no statistically significant differences were noted between surveys captured with listed and unlisted sample. Furthermore, the productivity of the listed sample was significantly better than unlisted sample. As such, the project team decided to exclusively dial listed telephone numbers for the remainder of data collection, which included all of the fall season.

The sample was ordered proportional to pre-defined census tract aggregations defined in the technical sampling memorandum. A total of 16,179 sample records were received for dialing in the SRTA SP survey, of which 12,092 (75%) had address information and

4,087 (25%) had no address information[1]. All samples were procured from Marketing Systems Group (MSG) based in Fort Washington, PA.

3.2.7 Sample Preparation

The sample was prepared for administration by partitioning it into 51 sub-samples (or replicates) of approximately 315 records each. A replicate is a systematically selected sub-sample of a sample that is geographically representative of the entire sample; the primary benefit of which is that the interviewers did not need to contact the entire sample in order to ensure proper representation. These replicates were released sequentially over the field period.

3.2.8 Survey Rates

Table 3-1 below provides a description of the final dispositions of the 12,692 sample pieces that were used during the I-75/575 SP survey. As indicted in the table, the final response rate was 47% and the final refusal rate was 15%.

Table 3-1: Final Dispositions

Label	Count	%
Answering Machine	2,065	16%
Busy	179	1%
Complete	1,501	12%
Disconnect	1,669	13%
Business/Government	509	4%
Language Barrier/Deaf	269	2%
Fax/Modem	686	5%
Caller ID	2	0%
Not Qualified	2,019	16%
Over Quota	21	0%
Specific Callback, Respondent	12	0%
General Callback, Household	222	2%
No Answer	873	7%
Partial Complete	2	0%
1st Refusal	1,226	10%
Hang Up	1,179	9%
Hard, Final Refusal	234	2%
Hard Refusal (Conversion Attempt)	24	0%
Total	12,692	100%
	All Sample	
Sample Pieces Used	12,692	
Completed Surveys	1,501	12%
HHlds eligible for participation	1,761	

[1] Upon generating the unlisted sample, NuStats requested that MSG match the sample to their listed database and append address information for all matching records. As a result, the 75% of sample records with address information is a mixture of both listed and unlisted sample.

Label	Count	%
Ineligible sample	5,175	41%
Sample still working	5,756	
Ratio of good to bad sample	25.39%	
Expected eligible sample to come	1,461	
Official Response Rate	46.58%	
Refusal Rate	14.65%	
Ratio of CM to Eligible	85.24%	
Average Interview Length	12.90	Minutes

3.3 Stated Preference Analysis

Data from the two survey periods, following general quality checks, were merged into a single file for analysis. Four time period and four trip purpose segmentations, consistent with the structure of the ARC travel demand model, were identified as appropriate levels of analysis. The four time periods were subsequently reduced to peak and non-peak for analytical purposes, reflecting their similar traffic conditions and trip purpose profiles.

Stated preference responses were analyzed using Alogit choice modeling software. The logit functional form adopted within Alogit is the most widely applied in consumer choice modeling, in part because of its computational ease. The Alogit software, also used in the calibration of the ARC model's mode choice module, uses maximum likelihood procedures to estimate parameter values for a logit choice model of the general form:

$$\mathbf{Pr\ (m) = 1 / 1 + exp\ (\beta 0 + \beta 1(JT_m - JT_g) + \beta 2(TOLL_m))}$$

Where:

Pr (m)	=	probability of using managed lane
β0…β3	=	estimated coefficients
JT	=	journey time in minutes
Toll	=	toll in Dollars
m, g	=	subscripts for managed and general lane alternatives.

The value of time is derived from the β1 and β2 coefficients, the marginal utilities of toll and time. The β0, also termed the alternative-specific constant, provides an indication of the net impact of any other determinants of lane choice. Models were run for a range of market segmentations although the focus was the eight combinations of peak/non-peak and HBW, NHB, HBO & HB-School segments.

Analysis results were judged against a number basic diagnostic criterion, including:

- The sign of the attribute (time & toll) coefficients. Both time and toll coefficients are expected to be negative as increases in either will result in reduced utility.
- The statistical significance of attribute coefficients. The coefficient's t-statistics should be significant at the 95% confidence level (i.e. t-statistic > 1.96).

- The overall "goodness-of-fit" of the model, as measured by the adjusted rho-squared. Note that rho-squared values for choice models are typically relatively low, e.g. 0.10 - 0.20
- Consistency of the derived values of time when additional explanatory variables are added to the model.

3.3.1 SP Sample

The 1,500 responses yielded 6,045 individual SP choices. Quota sampling was not adopted for specific market segments and the profile of survey respondents therefore reflects both their frequency within the in-scope population and sampling factors, such as interview times. The composition of the SP choices by traffic model market segment is summarized in Table 3-2.

Table 3-2: Summary of SP Choices

	Peak	Non-peak	Total
Home-Based Work (HBW)	2875	337	3212
Non-Home Based (NHB)	1018	513	1531
Home-Based Other (HBO)	817	485	1302
Total	4710	1335	6045

Fifty-three percent of the SP choices relate to home-based work (HBW) and 25% to Non-Home Based (NHB) trips. Seventy-eight percent of choices relate to peak (morning or evening) period trips. There were insufficient observations to develop models for home-based school trips. Therefore, these trips were incorporated within the HBO segment.

3.3.2 Values of Time

The estimated models for the key market segments proposed for traffic modeling are shown in Table 3-3. Successful models were estimated for the HBW, NHB and HBO segments in both the peak and non-peak periods. Coefficients were significant and correctly-signed and the level of explanation of the models, as measured by the adjusted rho-squared statistic, was also satisfactory. The values of time, derived as the ratio of the toll and time coefficients, appear reasonable in absolute terms. The relative levels between market segments are also in line with expectations.

Table 3-3: Lane Choice Models

Segment		Coefficients			Rohr-squared	Value of time ($/hr)	Standard Error of Value of Time ($/hr)
Time of day	**Trip purpose**	**ASC**	**Toll ($)**	**Time (mins)**			
Peak periods	Home-Based Work (HBW)	-0.682 (-4.6)	-0.798 (-19.3)	-0.122 (-12.9)	0.22	9.15	0.472
	Non-Home Based (NHB)	-0.718 (-3.1)	-0.596 (-10.6)	-0.109 (-7.7)	0.17	10.96	1.032
	Home-Based Other/School (HBO/HBSchool)	-0.710 (-2.5)	-0.815 (-10.0)	-0.118 (-6.7)	0.22	8.71	0.869
Non-peak periods	Home-Based Work (HBW)	-0.763 (-1.8)	-0.663 (-6.1)	-0.10 (-3.4)	0.18	8.75	1.430
	Non-Home Based (NHB)	-1.214 (-3.6)	-0.520 (-6.8)	-0.11 (-5.2)	0.14	12.84	1.892
	Home-Based Other/School (HBO/HBSchool)	-1.131 (-2.5)	-0.827 (-6.1)	-0.092 (-3.5)	0.19	6.71	1.094

Notes:
1. t-statistics are shown in parentheses. They have not been deflated to adjust for repeated measurement from the same respondent.
2. There was insufficient sample for a Non-peak Home-Based School (HB-School) model to be estimated.
3. Values in *italics* are based on insignificant coefficients

The value of time for home-based work (HBW) trips differs little between the peak and non-peak period respondents (Peak = $9.15/hr, Non-peak = $8.75/hr). Non-home based trips (NHB), primarily those undertaken on employers' business, have as expected the highest values; $10.96/hr in the peak period and $12.84/hr in the non-peak period. The difference between the peak and non-peak period values is relatively small and may reflect differences in the income profile between users in this heterogeneous group which includes both skilled/unskilled manual and senior managerial occupations. Home-Based Other (HBO) trips, which include shopping, recreation, school and personal business trips, have the lowest values of time (Peak= $8.71/hr, Non-peak = $6.71/hr).

There were insufficient data to estimate a home-based school (HBSchool) model for the non-peak period. The peak period model for this segment also suffered for a small sample size with insignificant coefficients. The home-based school responses were therefore combined with the respective home-based other (HBO) responses for the peak and non-peak periods, as shown in Table 3-3. The inclusion of the home-based school responses had a small impact on HBO values of time for the peak period.

3.3.3 Alternative-Specific Constants

The estimated choice models contained a constant term - often referred to as the Alternative-Specific Constant (ASC). This coefficient was included within the utility function of the managed lane option and captured any systematic preference for either the general purpose lanes or managed lanes that is not explained by toll or travel time differences.

As specified in the I-75/575 models, a significant positive ASC indicates an underlying preference for the managed lanes and a significant negative ASC an underlying preference for the general lanes. An insignificant ASC indicates that the value is not significantly different from zero. In the case of the I-75/575, other lane choice factors might include less stressful driving conditions or more predictable travel times on the managed lanes.

The ASC's obtained are always negative and generally significant, although the peak HBO and non-peak HBW ASC's are only significant at the 90% confidence level. The negative ASC values suggest an underlying preference for the general lanes and have a monetary equivalent varying between $0.61 and $2.33 per trip.

The underlying preference in favor of the general lanes is contrary to our expectations and we believe the ASC is likely to be capturing a degree of 'policy response bias' - i.e. some respondents selected the general lanes, contrary to their preferences, in order to deter policy makers from introducing tolling on the managed lanes. In view of this, we recommend that no ASC be applied in traffic modeling.

3.3.4 Other Lane Choice Determinants

A brief analysis was undertaken of other factors which might influence lane choice, in addition to the time and toll variables included in the SP choices. It is often difficult to apply the results of such econometric models within traffic models where there are practical constraints on the number of market segments that can be modeled. However,

the analysis provides an indication of the robustness of the recommended values of time to alternative model specifications.

A number of potential lane choice determinants were identified by examination of the correlation matrix, including the number of vehicles in the household, intermediate stops and gender. These were added individually to the managed lane utility function within Alogit and the model re-estimated. The test was undertaken on the peak period home-based work model as this is arguably the most important segment.

The addition of the new variables mainly reduced the significance of the ASC, effectively de-composing it into some of its constituent parts. The new variables had no effect on the significance of the time or toll coefficients and the values of time remained virtually unchanged (<$0.05 change). The results suggest that the values of time reported above are robust.

3.3.5 Distribution of values of time

The ARC traffic model, using TP+ software, accepts a distribution of values of time. This enables more accurate forecasts to be made, especially as the value of time distribution is expected to be skewed.

It was not possible to determine individual values of time from the econometric modeling. Instead, the coefficients provide the average value of time for each market segment. The transfer price questions provided a range for each respondent's value. The distributions are generally skewed to the left, as expected, but often have more than one peak (mode). They are also relatively coarse as values can only be determined to one of a few ranges.

For travel demand modeling purposes we have therefore adopted a theoretical lognormal distribution. The lognormal distribution is skewed to the left as the value of time distribution is expected to be as it is strongly influenced by the underlying, skewed income distribution. The shape of the lognormal distribution varies according to the mean and standard error of the values of time, obtained from the econometric modeling. Figures 3-1-3-12 illustrate the resulting value of time distributions for each market segment, both as probability and cumulative distributions.

For traffic modeling purposes, we have derived the associated decile (i.e. 10th, 20th, . . . percentiles) values of time from the cumulative distributions (Table 3-4). A maximum value of time of $50/hour has been assumed.

Table 3-4: Distribution of Values of Time ($/hour)

Percentile	Peak			Non-peak		
	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HBSchool)	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HBSchool)
10	4.98	2.92	2.84	1.40	1.12	1.64
20	6.14	4.58	4.02	2.62	2.60	2.66
30	7.14	6.38	5.16	4.12	4.76	3.78
40	8.10	8.42	6.38	6.08	7.94	5.10
50	9.14	10.96	7.78	8.74	12.84	6.74
60	10.30	14.22	9.48	12.56	20.74	8.90
70	11.72	18.82	11.72	18.52	34.62	12.00
80	13.60	26.12	15.02	29.16	50.00	17.00
90	16.74	41.14	21.18	50.00	50.00	27.56

Figure 3-1: Value of Time Probability Distribution: Peak – Home-Based Work

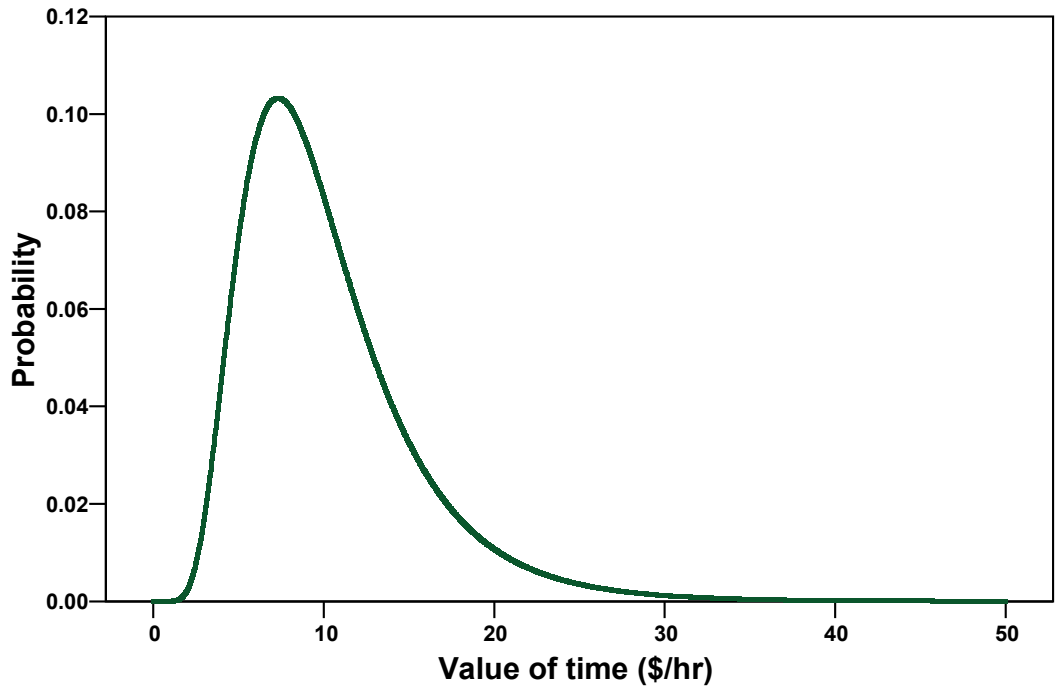


Figure 3-2: Value of Time Cumulative Distribution: Peak – Home-Based Work

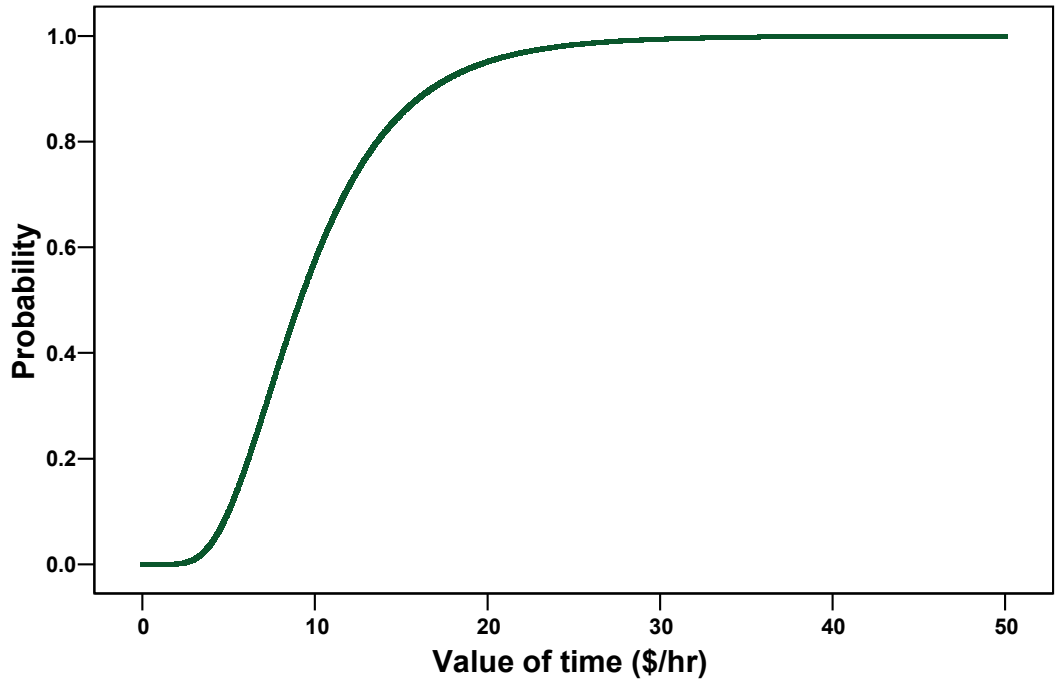


Figure 3-3: Value of Time Probability Distribution: Peak – Non-Home-Based

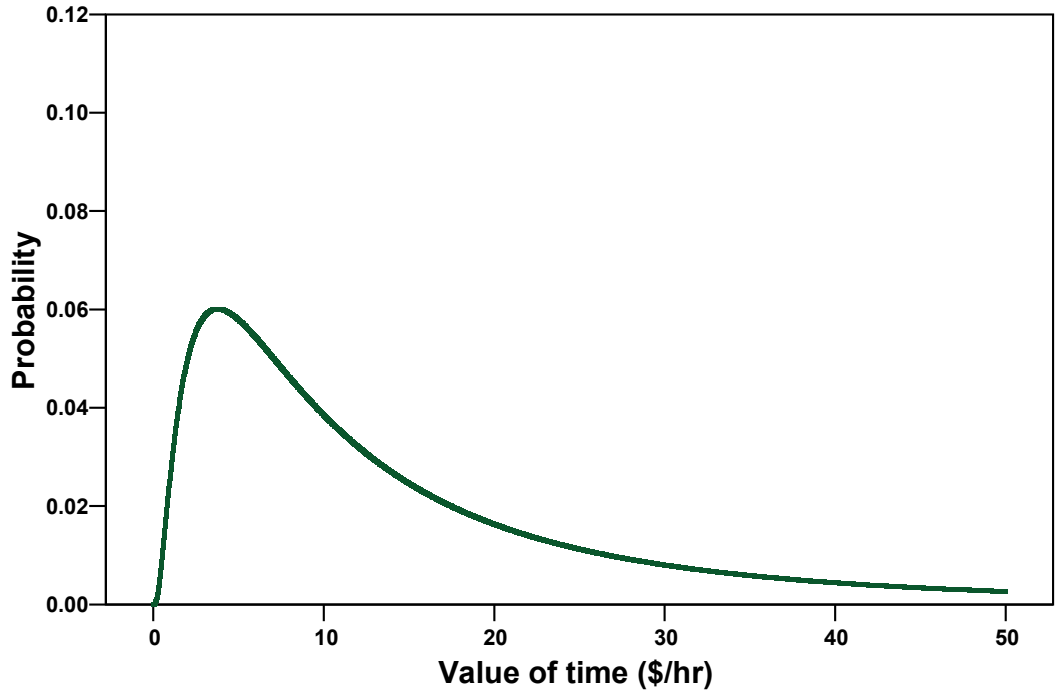


Figure 3-4: Value of Time Cumulative Distribution: Peak – Non-Home-Based

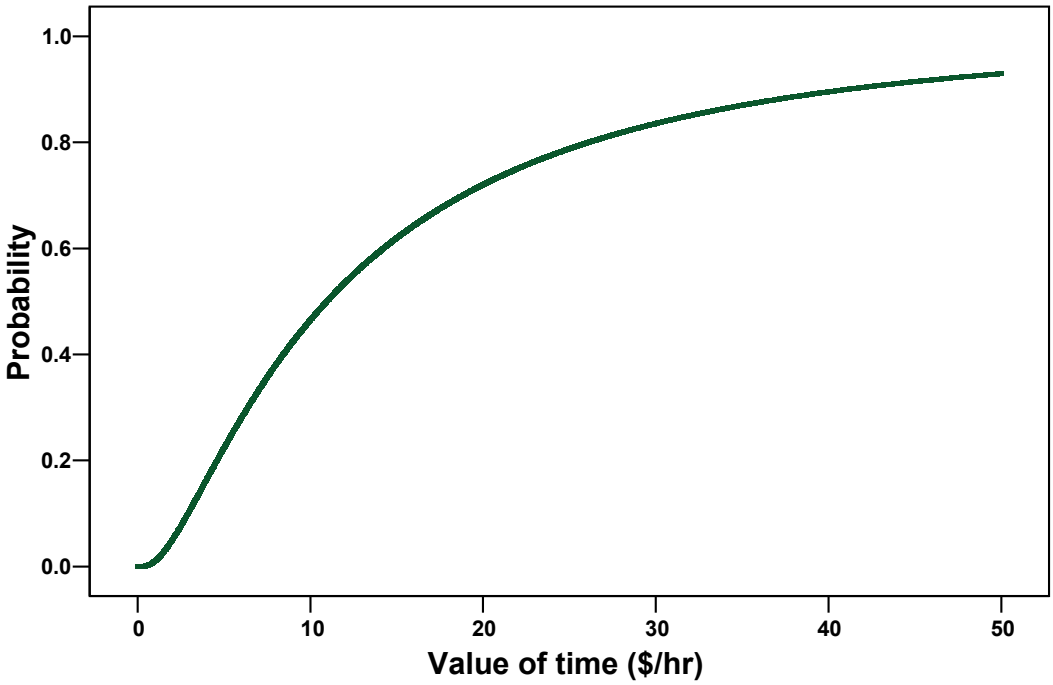


Figure 3-5: Value of Time Probability Distribution: Peak – Home-Based Other/School

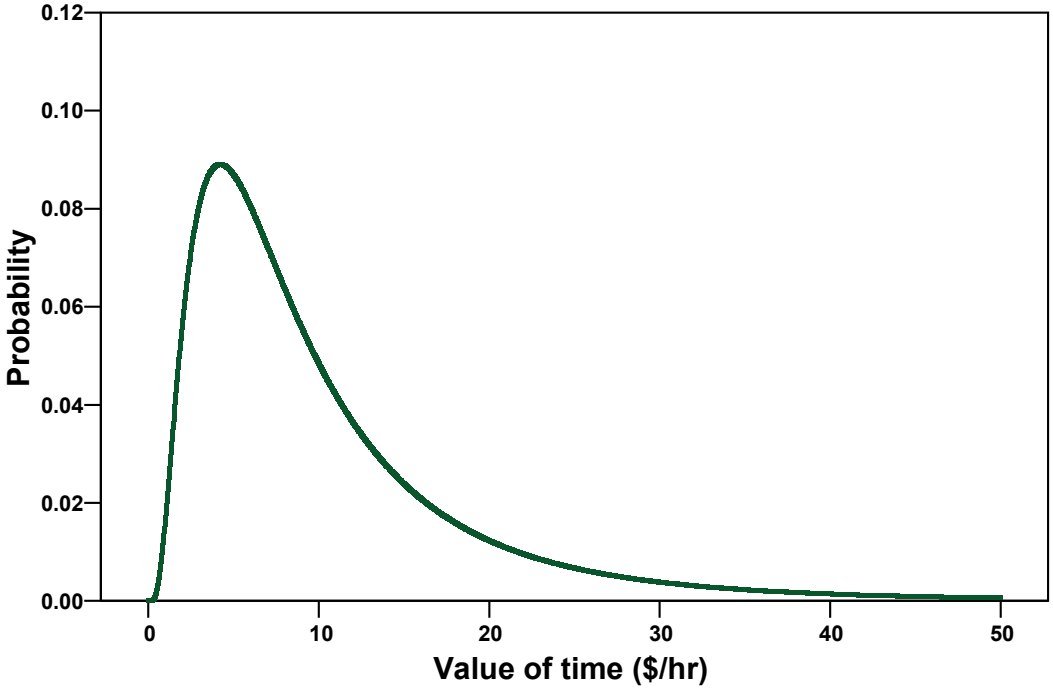


Figure 3-6: Value of Time Cumulative Distribution: Peak – Home-Based Other/School

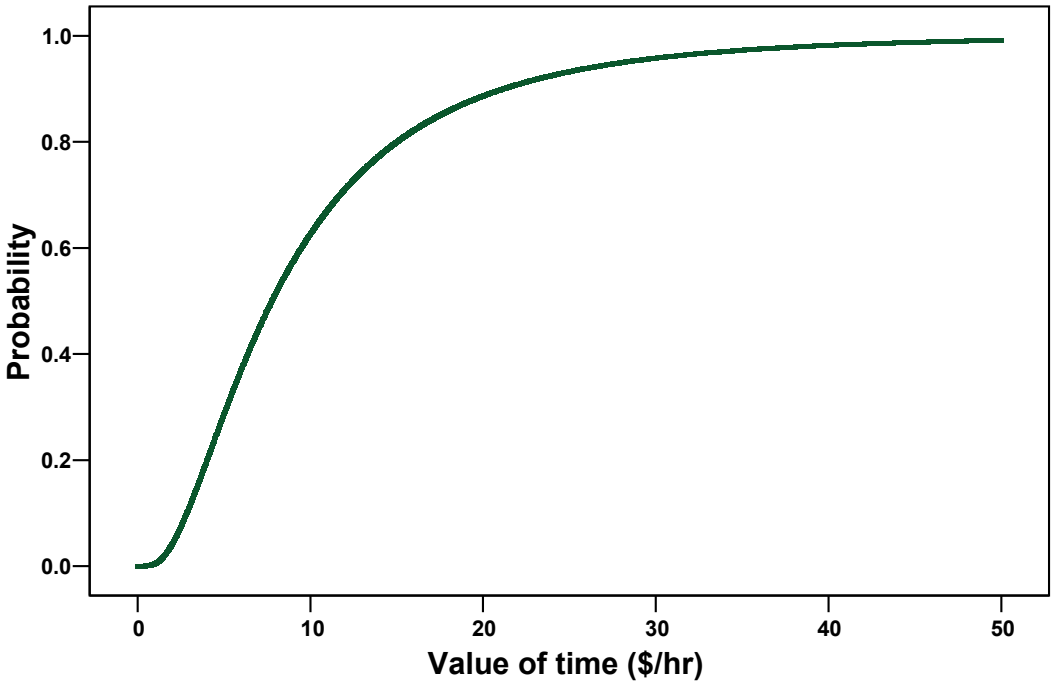


Figure 3-7: Value of Time Probability Distribution: Non-Peak – Home-Based Work

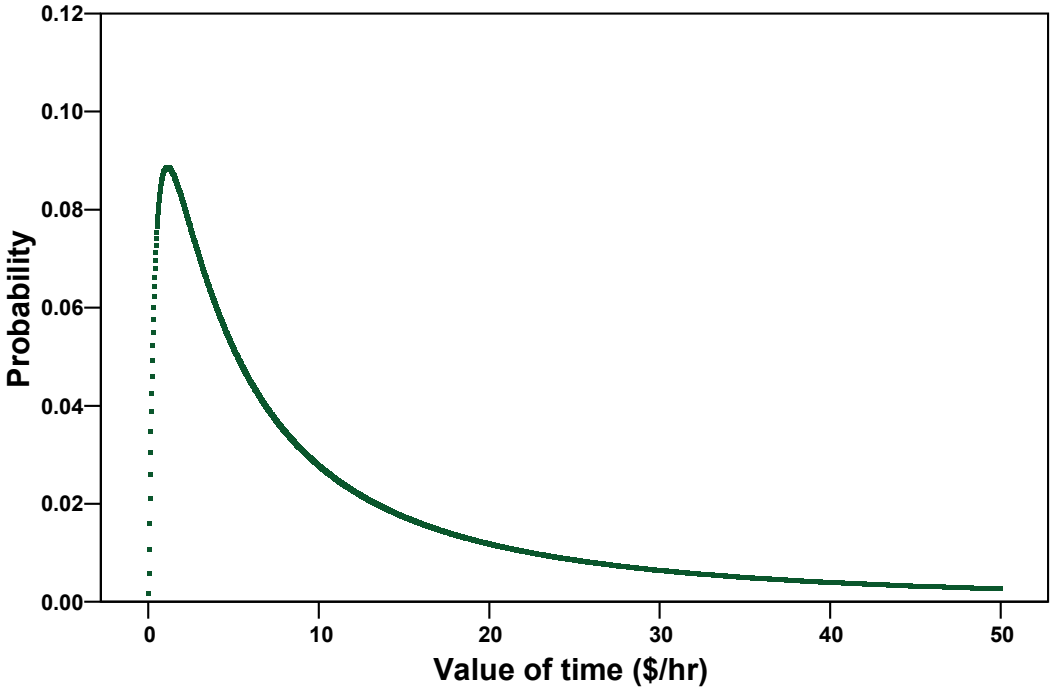


Figure 3-8: Value of Time Cumulative Distribution: Non-Peak – Home-Based Work

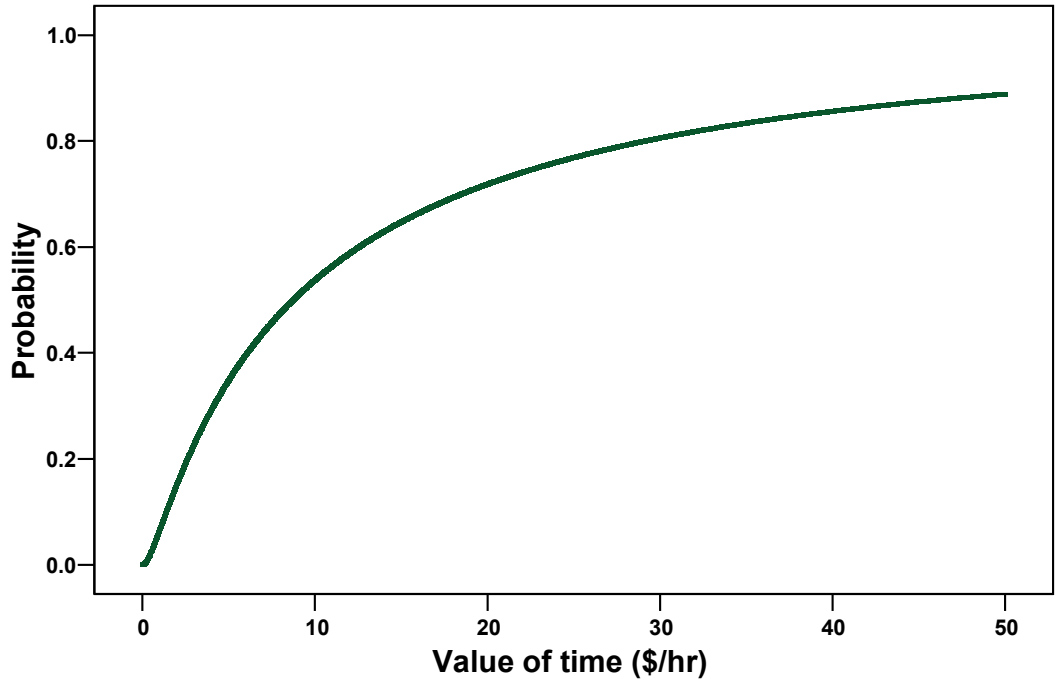


Figure 3-9: Value of Time Probability Distribution: Non-Peak – Non-Home-Based

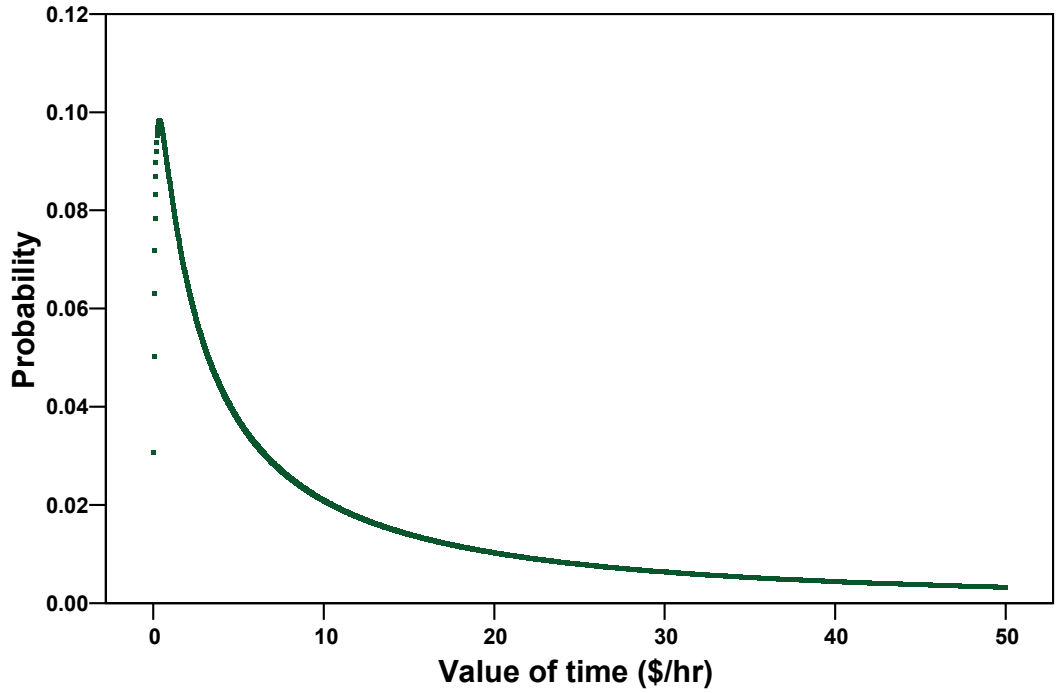


Figure 3-10: Value of Time Cumulative Distribution: Non-Peak – Non-Home-Based

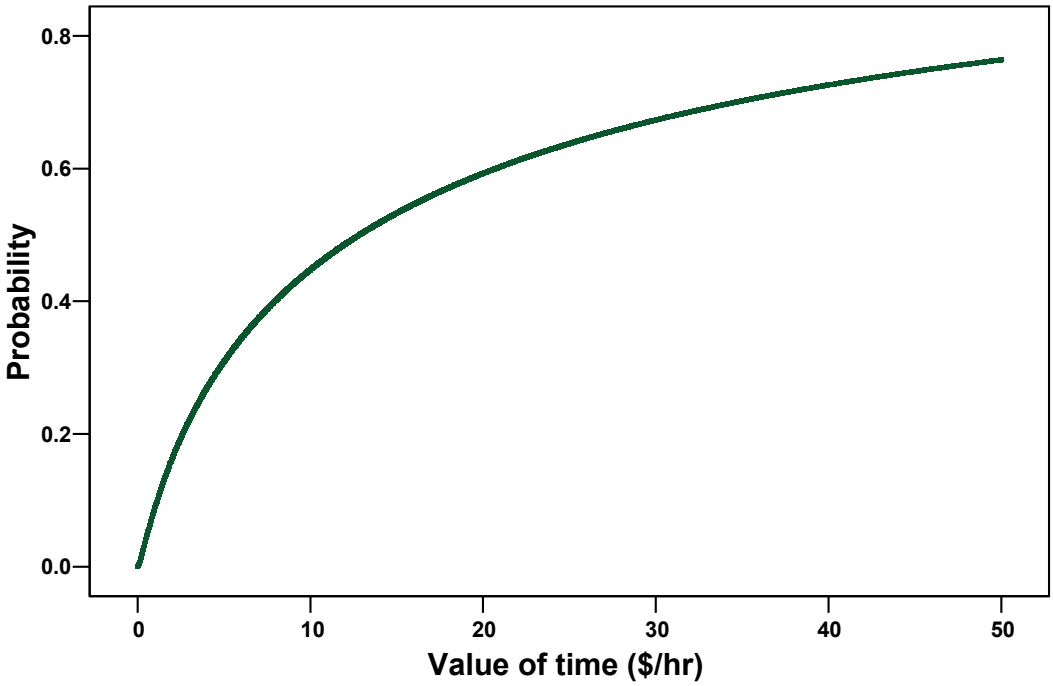


Figure 3-11: Value of Time Probability Distribution: Non-Peak – Home-Based Other/School

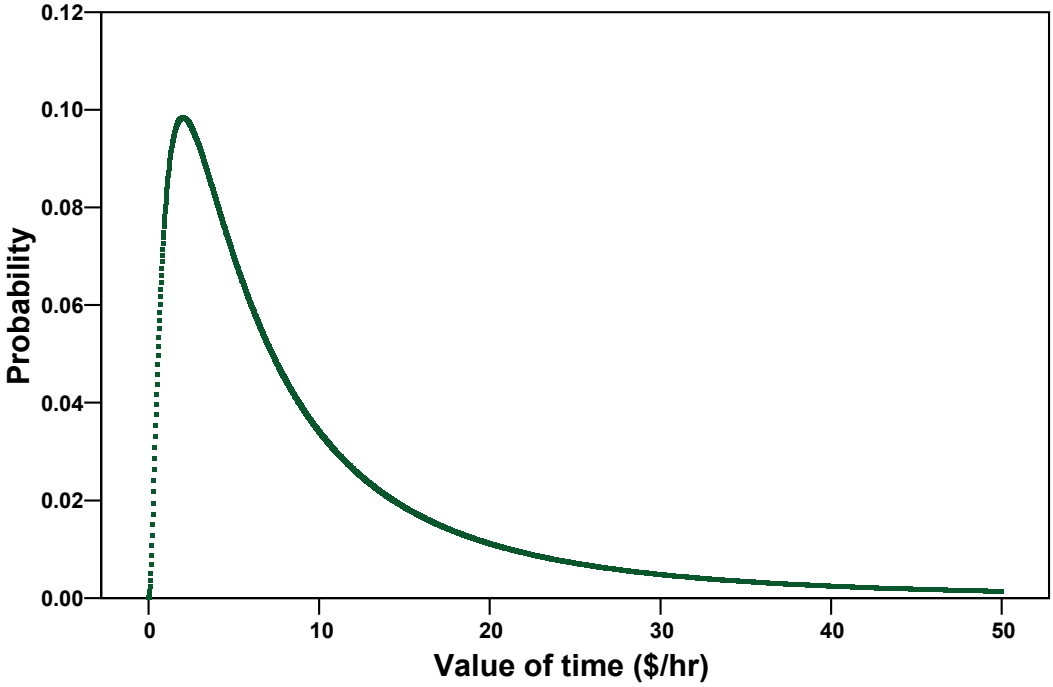
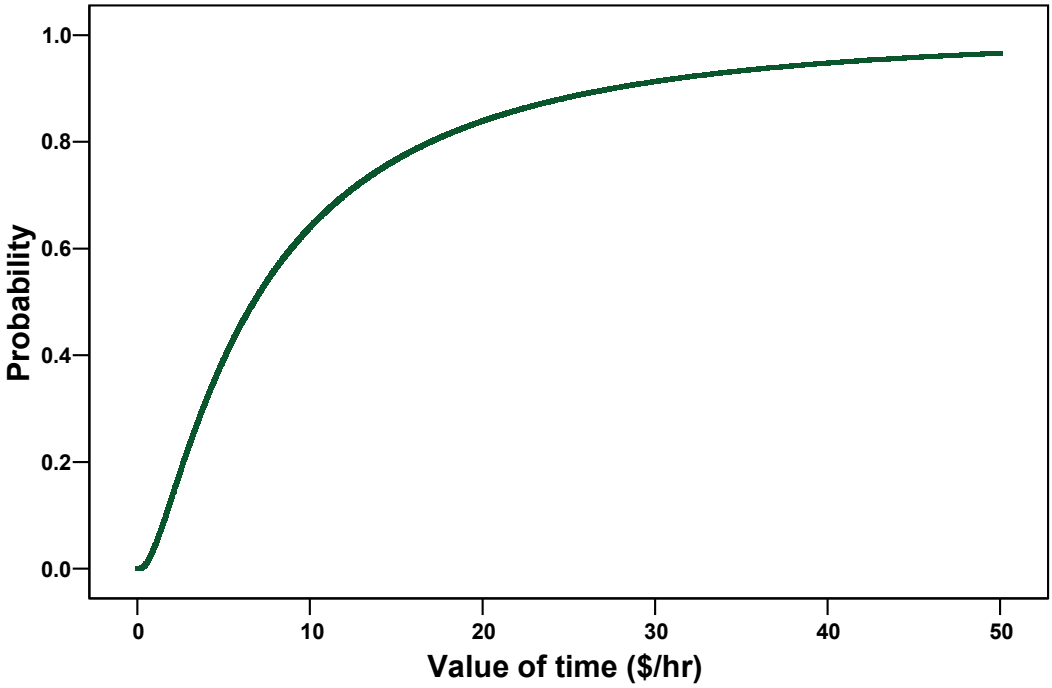


Figure 3-12: Value of Time Cumulative Distribution: Non-Peak – Home-Based Other/School



3.4 Recommended Values

Table 3-5 summarized the recommend values for travel demand modeling.

Table 3-5: Recommended behavioral values ($/hour)

	Peak			Non-peak		
	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HB-School)	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HB-School)
Average value of time ($/hr)	9.15	10.96	8.71	8.75	12.84	6.71
Percentile values of time ($/hr)						
10th	4.98	2.92	2.84	1.40	1.12	1.64
20th	6.14	4.58	4.02	2.62	2.60	2.66
30th	7.14	6.38	5.16	4.12	4.76	3.78
40th	8.10	8.42	6.38	6.08	7.94	5.10
50th	9.14	10.96	7.78	8.74	12.84	6.74
60th	10.30	14.22	9.48	12.56	20.74	8.90
70th	11.72	18.82	11.72	18.52	34.62	12.00
80th	13.60	26.12	15.02	29.16	50.00	17.00
90th	16.74	41.14	21.18	50.00	50.00	27.56
Alternative-specific constant ($/trip)	0	0	0	0	0	0

CHAPTER 4

STATE-OF-PRACTICE TOLL MODELING REVIEW

4.1 Introduction

High Occupancy Toll (HOT) lanes describe facilities that employ pricing and vehicle eligibility and occupancy management techniques as a mechanism to preserve free-flow conditions and continue to provide preferential treatment to HOV vehicles in dedicated lanes. A simple example would allow single occupant vehicles to utilize High Occupancy Vehicle (HOV) lanes, for a fee, in exchange for improved travel times. Attracting traffic from General Purpose (GP) lanes to HOT lanes, if excess capacity is available, can potentially relieve congestion in the GP lanes resulting in overall system travel-time savings. Recent HOT lane installations have reported success from both HOT lane patrons and general purpose lanes travelers alike. This level of public acceptance strengthens the case that managed lanes provide broad-reaching benefits to all users of a corridor and combats the illusion that HOT lanes are only beneficial to affluent population groups.

The Atlanta Regional Commission's (ARC) travel demand model is the primary tool for evaluating and quantifying the impacts of tolls on travel demand and assessing the resulting impacts to the transportation system. Since there is only one toll facility in the Atlanta area, off-the-shelf toll modeling techniques have historically been employed to forecast demand when assessing priced facilities. These techniques have proven reliable in the past. However, modeling managed lanes presents a level of precision that traditional travel demand models and their associated toll modeling techniques fail to possess.

This chapter presents a summary of available literature and documented model procedures on toll value pricing modeling techniques. The literature search was conducted primarily for the purpose of investigating, developing and implementing the best methodology, taking into consideration costs and achievable results, to model the impacts of tolls on the I-75/I-575 managed lanes system and to estimate toll rates and forecast traffic and toll revenue streams.

4.2 Value of Time and Willingness to Pay

Since tolls within the modeling framework are expressed initially as monetary cost (fixed fee or per-mile rate), it is necessary to convert these amounts to time costs or time penalties using value-of-time (VOT) information. In this context, VOT can be described as a roadway user's willingness to pay to avoid delay, measured in dollars per hour. The concept of time as a commodity that has a monetary value is based on two main premises: (i) Time that is spent traveling can be used for other activities that provide a

direct or indirect monetary benefit and can be viewed as travel time savings; (ii) Benefits from travel time reduction if travel is associated with undesirable characteristics like congestion, stress, risk, etc.

Congestion often increases the willingness to pay for travel time reductions. Recent research on the SR-91 Express lanes suggests a strong correlation between express lane patronage and travel time savings, ranging from 7% in the midday with minimal delay in the free GP lanes to 35% during the heavy peak period when travel time savings were 12-13 minutes. The research concluded by implying the value of time for SR-91 commuter to be $12-14 per hour; noting implied values of time across points in time vary considerably. Market research and mode choice model estimation for SR-15 in San Diego suggest a mean value of time of about $16 per hour, although it is noted that the users of the corridor are relatively affluent.

Several other factors such as traveler characteristics and trips characteristic have been investigated in our research and study as factors potentially affecting the willingness of commuters to use a toll road. It was found in the SR-91 study that females aged 30-50 are more likely to choose a toll road than any other age/gender classifications. Also other factors like high income; high educational attainment; and work related trips appear to have a higher propensity to use a toll road. The findings from Orlando toll model development (TRB Record No. 1858) demonstrated that the trip length and the household income are two significant factors in the choice between tolled and non-tolled routes selection.

In the Atlanta HOT Lane Study[1], a single value of time number was applied without differentiating between trip purposes and traveler's characteristics. As discussed above, ideally, time equivalent tolls should not be identical for all travelers since value of time differs by trip characteristics itself (like trip purpose and trip length) and trips maker's characteristics (like income and gender). Hence, one of the challenges in this study is to estimate and measure appropriate values of time with an understanding that it represents a willingness to pay for managed lane use.

Stated Preference (SP) surveys were conducted to gauge motorists' opinions regarding willingness to pay for various tradeoffs regarding travel time, cost, and other trip characteristics when they choose their mode, route, and time of travel. The data from the survey was reviewed and utilized to frame value of time and willingness to pay (Chapter 3).

4.3 Price Elasticity of Demand

A key question raised by policy-makers when considering the implementation of a toll facility is how traffic and toll revenue will be impacted by changes in toll price. The essence of this phenomenon is the concept of price elasticity of demand.

Elasticity is an economic concept that measures responsiveness of one variable to a change in another. Price elasticity of demand measures sensitivity of quantity of demand

[1] High Occupancy Toll Lanes: Potential for Implementation in the Atlanta Region, Parson Brinkerhoff, Quade & Douglas, Inc., April 2005

(travel time savings) to change in price (tolls). Thus, the measure used is the percentage of users retained for every percentage change in toll. If the elasticity is greater than 1.0, it implies that the demand is elastic i.e. a small increase in toll charges causes large diversions in traffic from the tolled facility, which also results in declining revenue. In contrast, if a large increase in toll causes a relatively small change in users on the tolled facility, the demand is inelastic. When demand is inelastic, marginal increases in the toll rate will generate additional total revenue.

The price elasticity of demand is sensitive to the availability of substitutes. In the case of the I-75/I-575 HOT scenarios, it is sensitive to the availability of alternate toll-free routes like freeway general purpose lanes and parallel principal arterials. For SRTA's HOT Lane Feasibility Study, a linear relationship was assumed between the SOV demand and change in toll price, which infers that price elasticity is always constant. However, experience has shown that the demand for any good or service is inelastic at relatively low prices, but becomes increasingly elastic as prices rise.

4.4 State-of-Practice Toll Modeling Review

Several approaches have been developed in the United States for toll modeling. They are: a travel demand orientation, dynamic traffic assignment, microscopic simulation, and quick–response analysis. These approaches are summarized in the following subsections.

4.4.1 Travel Demand Model - Macroscopic

A travel demand model is widely used as a mathematic tool in most metropolitan areas in United States to forecast roadway and transit travel demand based on projected socio-economic data and expected roadway and transit improvements. Travel demand models can be adapted to estimate optimal toll rates and forecast the travel demand and toll revenue from managed/HOT lane applications.

The current state-of-practice has numerous travel demand modeling approaches that have been applied and used in different metropolitan areas for a variety of HOT lane feasibility studies. Some examples include SR 91 Value-Pricing Express Lanes study in Orange County, CA; HOT Lanes on Hwy 217 in Portland, Oregon; I-15 HOT lanes in San Diego, CA; and HOT Lanes on I-95 in Florida. In general, the sophistication of the approaches applied depends on the structure of the regional travel demand model and can be grouped into the following categories:

4.4.1.1 Activity-Based Model

Portland metro is one of the first MPOs in the United States to experiment with, and implement the activity-based model. The model was developed initially as part of the travel model improvement program and designed to capture the sensitivity of traveler's choice to activity (purpose and priorities) and travel conditions (timing, mode and destination).

The activity-based model consists of several model components including a pattern model, tour model and choice models, etc[2]. The pattern model identifies purposes, priorities and structure of the day's activities and travel. The tour models describe timing, location and access mode of on-tour activities. This component includes all on-tour activities, as well as all primary at-home activities and secondary at-home maintenance activity, enabling the model to capture at-home versus on-tour activity participation tradeoffs. The model also includes enough detail about on-tour activity purpose, priority, sequence, location and access modes to capture inter-tour and trip chaining behavior. An accessibility parameter is included in the model to measure the impact of expected tour utility for primary and secondary tours of all purposes. Accessibility is relatively more important for the primary tour on subsistence patterns and for secondary tours on maintenance and leisure patterns. An integrated multinomial logit and nested logit discrete choice models were also incorporated in the system to calculate the probability of each alternative activity.

The value pricing modeling was built in this activity-based travel demand model and it is by far the most sophisticated methodology currently developed. The advantages of the approach include: (i) the activity-based model predicts not only the shifts in travel mode and timing, but also the shifts on pattern, purpose and structure as a result of value pricing projects. The travel costs change due to the value pricing affects on the pattern choice and capture the sensitivity to different trip mode and trip purpose. (ii) It addresses the different in values of time by income class. The Origin-Destination (O-D) trip tables generated in the activity-based model are grouped by mode, purpose, time of day and income. Based on survey data and base year demands, different toll weights are assigned to eight vehicle classes (SOV low, medium, and high income; HOV low, medium, and high income; external vehicles and trucks). The weights adopted in the Portland model show that high-income travelers are twice as likely as to use a tolled facility than those in lower income brackets. (iii) Toll cost varies by level of congestion. Toll rates are converted to the time cost and added to the travel time to calculate the composite travel cost, which is used in the assignment. A special toll cost volume delay function was implemented to calculate time-equivalent toll for each individual tolled link based on the supply and demand.

However, these pricing modeling procedures posses some limitations including: (i) there are a limited number of activity-based travel demand models currently in operation in the Unites States. Portland Metro is the pioneer MPO in implementing such a model. (ii) an activity-based model requires extensive survey data for successful development and calibration. An extensive household survey was carried out in Portland and surrounding counties for the development of this activity-based model. This survey data set includes household size, its members and a completed two-day diary listing all on-tour activities, major at-home activities, and all other travels for each member of the household. Stated Preference (SP) surveys regarding mode choice, time of day choice, route choice and travel frequency in response to changes in travel times, fuel costs, transit fares and hypothetical tolls introduced on major roads, were also carried out in

[2] John L. Bowman, The Day Activity Schedule Approach to Travel Demand Analysis; May, 1998

conjunction with the household survey. (iii) activity-based modeling requires significant processing time.

4.4.1.2 Traditional 4-step Modeling Process

Compared to the activity-based model, the traditional 4-step travel demand model (trip generation, trip distribution, mode-choice, and trip assignment) is used more widely to forecast roadway and transit travel in the United States. To evaluate and assess the impacts of pricing, 4-step travel demand models are frequently modified and used as summarized in the following sections:

Embedded in the Mode Choice Model

One approach within a four-step modeling framework is to develop a mode choice model that has the ability to capture the influence of time and toll variations on travel behavior. Examples of such use are as follows:

SR 91 Value-Priced Express Lanes, Orange County, CA

As part of the impacts evaluation conducted for the SR 91 Express Lanes in Orange County, CA, three choice models were developed within the TP+ based travel demand model: one joint logit model and two nested logit models[3]. The joint logit model considers choice among alternative routes through the corridor (toll and non-toll). The initial nested logit model considers choice of mode, and the second considers time of day, transponder type and route. Variables such as gender, age, income, education level, and employer policies for commuting were reflected in the travel choice model. Hence the model is sensitive to capturing the traveler's choice relative to travel time and toll rate for each option, along with characteristics of trips and travelers. The parameters of the logit modeling were estimated from random and choice-based sub samples conducted from the survey. The Weighted Exogenous Sample Maximum Likelihood Estimator (WESMILE) was used to eliminate the biases of the parameters in the "alternative-specific constants". Travel cost skim matrices were generated for all combinations of O-D zone numbers for the following parameters: eleven different time periods in the day (5 periods from 4 AM -10 AM in the morning and 6 periods from 2 PM - 8 PM), as well as different modes (SOV and HOV) and toll paying decision (SR 91 Express lanes, Eastern Toll Road, or Non Toll). The resulting matrices (Trip Tables) were then used in the TP+ assignment procedure to estimate demand and use of the Express Lanes.

Florida's Turnpike System, Orlando and Tampa Metropolitan Area, Florida

The choice of toll versus toll-free route is included in the nested logit mode choice model as a part of Florida's Turnpike Enterprise Toll Model Development effort[4]. The toll mode choice models are statistically estimated based on survey data collected around Orlando, Tampa Bay, and Southeast Florida. The toll

[3] Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes, Final Report, State of California Department of Transportation December 2000.
[4] Adler, Thomas, and Dehghani, Youssef. Florida's Turnpike Enterprise Toll Model Development Program, Transportation Research Board Annual Meeting, April 2005

modeling components include specific decision-tree hierarchies for different auto occupancy classes (i.e., SOVs vs. HOVs), for toll and toll-free choices and for transit sub-modes (i.e., primary transit vs. walk or auto access). The model is sensitive for both highway and transit services. Akcelik volume/delay curves, which proved to be more representative of actual delays under over-capacity conditions, were implemented in the Florida Turnpike's toll mode choice modeling system. The 24-hour highway assignment procedure was replaced with the time-of-day (i.e., AM peak, mid-day, PM peak, and night) highway equilibrium assignment procedure that uses both travel time and travel costs (rather than travel time alone). This approach allows the model to be responsive to socioeconomic characteristics of trip makers such as income and the attributes of trips such as trip purposes (Home-Based Work, Home-Based Non-Work, and Non-Home Based), trip length and travel time variability, etc.

MAG Freeway HOT System, Phoenix, Arizona

The Maricopa Association of Governments (MAG) is another case that accommodates the toll/non-toll nest in the mode choice model for toll alternative modeling and evaluation[5]. Tolls are coded as per-mile cost on the managed lane link and converted to the travel cost based on the value of time. It is included in the utility calculation of the SOV/Toll alternative under the drive alone hierarchy tree in the nested logit mode choice model as well as total travel cost calculation. Reliability factors were added into the travel time savings term equivalency to recognize the attractiveness of the HOV and managed lanes. The mode choice model produces toll-eligible and non toll-eligible trip tables that are assigned using EMME2's iterative assignment procedure to the transportation network with the goal of achieving full use of the managed lane's excess capacity while maintaining desired levels of service.

Houston-Galveston Area, Texas

Houston-Galveston Area Council employs an expanded nested logit mode choice structure in their regional travel models[6]. Within EMME2's platform, single or multiple identifiers for each mode are coded on each network link, thereby establishing a permissions hierarchy. The coefficient values for the Home-Based Work, Home-Based Non-Work and Non-Home Based in the nested logit model were developed based upon surveys and experiences from around the country. In the case of auto travel, the second level nest distinguishes between drive alone and shared ride, while the third level differentiates between SOV non-toll, SOV toll, 2-person non-toll, 2-person toll, 3+ person non-toll and 3+ person toll. The coefficients on travel time savings were set uniquely between HOV and SOV (HOV time savings variable was preset at 70 percent of in-vehicle time when compared to drive-alone travel time). In this model, toll costs are stratified by income group and household size. The inclusion of a broad range of variables resulted in the model being sensitive to different modes in addition to travelers' attributes like income level and household size.

[5] Maricopa Association of Governments (MAG), Arizona Department of Transpiration; High Occupancy Lanes and Value Lanes Study, Final Report, December 2002
[6] Houston-Galveston Area Council Model Validation and Documentation Report, February, 2001

Embedded in Highway Assignment with Feedback Loops

Another approach when assessing pricing within a four-step modeling framework is to incorporate toll variables in the highway assignment process. The feedback loop between the highway assignment and trip distribution or mode choice, depending on the model, allows toll variables to interact with the traditional components.

MWCOG, Washington, D.C.

Metropolitan Washington Council of Governments (MWCOG) added toll modeling capabilities to their TP+ based travel demand model in late 2004 according to the COG/TPB Travel Forecasting Model Calibration Report[7]. The monetary costs related to tolls are considered and modeled in the trip distribution and traffic assignment steps. Several new toll related variables such as toll vs. non-toll, toll facility type (fixed-fee or per-mile rate) in addition to toll policies such as time equivalencies by income group and vehicle type were added in the network. The link-coded highway tolls are then converted into equivalent minutes and added to the normal highway travel time generated during the path building function from TP+. While the demand remains constant, this approach reduces travel demand on tolled paths and increases demand for competing non-tolled paths. Furthermore, secondary TP+ scripts were developed to ensure the model is sensitive to income levels and vehicle type. The first procedure stratifies work time-cost equivalents and non-work time-cost equivalents by income level in the trip distribution process. The second procedure stratifies time-cost equivalents by type including; airport auto, single occupant auto, multi-occupant auto and truck. Airport vehicle time equivalents are based on the average value of time for all time periods. The SOV time equivalents are based on a 50% and 35% time valuation in the peak and off-peak periods respectively. The HOV time equivalents are based on a 40% and 30% time valuation in the peak and off-peak periods. Truck time equivalents are set to 2.5 times the prevailing SOV values. These equivalents are applied to the toll values for different vehicle types.

Applied Exclusively in Highway Assignment

Another approach is to apply toll variables solely in the highway assignment procedure of the travel demand model.

FasTrakTM High Occupancy Toll (HOT) Lane system, San Diego, California

The San Diego Association of Governments (SANDAG) uses highway assignment processing to evaluate the existing FasTrakTM High Occupancy Toll (HOT) Lane system and HOV and managed lanes on certain freeways proposed in 2030 RTP[8,9]. The SANDAG model simulates optimal HOV/managed lane operations by: (1) shifting traffic from over-capacity general purpose lanes to

[7] Metropolitan Washington Council of Governments, COG/TPB Travel Forecasting Model, Version 2.1 Calibration Report, November 2004
[8] San Diego Association of Governments, Final 2030 Forecast Process and Model Documentation, March 2004.
[9] San Diego Association of Governments, I-15 Congestion Pricing Project Monitoring and Evaluation Services, September 2001.

adjacent managed lanes that have excess capacity; and (2) shifting traffic from over-capacity HOV/managed lanes to adjacent freeway main lanes in an iterative fashion. SANDAG assumes that traffic on high occupancy vehicles (HOV) and managed lanes will be controlled so that the level-of-service "C" or 1,600 vehicles per lane will be maintained. The model also permits the lane changes on managed-lane facilities by time period (AM and PM), for example, the existing I-15 HOV lanes are operated and modeled as two lanes southbound in the morning, and the same two lanes operate northbound in the afternoon.

4.4.1.3 Post-Processor

An evaluation of demand for priced facilities, whether HOT lanes or tradition toll lanes, can be achieved through post-processing techniques. Although this approach runs external to the travel demand model, it uses data generated by the model. Surface Transportation Efficiency Analysis Model (STEAM) developed in 1990's by FHWA is the most commonly used software for this type of evaluation.

STEAM uses information developed through the travel demand modeling process to compute net values of mobility attributable to regionally important transportation projects[10]. STEAM reports mobility and safety benefits by user-defined districts. The district-level reporting feature allows users to compare the impacts of transportation investments to resident trip-makers across aggregations of zones, which may represent neighborhoods, policy areas or political jurisdictions. An accessibility feature produces estimates of employment opportunities within a user-defined travel-time threshold of a district across a base and improvement scenario.

STEAM is highly flexible in terms of the transportation modes, trip purposes, and time periods analyzed[11]. STEAM provides analysis parameters for seven modes (auto, truck, carpool, local bus, express bus, light rail, and heavy rail) and allows the user to accommodate special circumstances or new modes by modifying these parameters. The model can analyze different trip purposes separately. STEAM can also be applied using average weekday travel inputs as well as using separate peak and off-peak travel inputs. STEAM consists of four modules:

- A User Interface Module – Designed for default analysis parameters and on-line help files.

- A Network Analysis Module – Designed to read network link attributes such as volumes, distances, capacities, and etc and produce zone-to-zone travel times and distances based on shortest time paths.

- A Trip Table Analysis Module – Designed to produce estimates of user benefits, pollutant emissions, noise costs, accident costs, energy consumption, and other external costs associated with highway use.

[10] U.S. Department of Transportation, FHWA, Surface Transportation Efficiency Analysis Model (STEAM)
[11] DeCorla-Souza, P., and J. Hunt. Use of STEAM in Evaluating Transportation Alternatives. FHWA, 1998.

- An Evaluation Summary Module – Designed to calculate the net present worth and a benefit-to-cost ratio for improvements under consideration, individual benefit-to-cost ratio, as well as the probability distributions of several performance measures based on a risk analysis.

4.4.2 Dynamic Traffic Assignment and Microscopic Simulation Model

A study by Eil Kwon and Csaba Kelen[12] proposed a hierarchical structure consisting of dynamic traffic assignment and microscopic simulation-assignment for evaluating the effects of HOT lanes on network traffic patterns. A hypothetical HOT lane operation on I-394 in Minneapolis, Minnesota was designated as the pilot corridor for this analysis.

PARAMICS, a suite of microscopic simulation modules providing a powerful, integrated platform for modeling a complete range of real world traffic and transportation problems was selected for the analysis. This combination of dynamic assignment with a microscopic simulation model improves estimations of the effects of different toll options on a network-wide traffic pattern and operational level. The dynamic traffic assignment - developed by the University of Wisconsin (Ran, et al., 1998) formulates a process as a discrete variational inequality problem and directly finds the time-variant link flow patterns that satisfy dynamic user equilibrium conditions. The stochastic dynamic user optimum (SDUO) assignment which is based on the principle that no drivers can improve their travel times by unilaterally changing routes and the drivers always follow the perceived least cost routes was used to evaluate different toll scenarios. A uniform distribution of error term is added to the link cost formula to generate the perceived travel cost. PARAMICS employs a car-following model and provides link travel times to the assignment module, which assigns each vehicle to the least cost route depending on its origin/destination (Duncan, 1995).

A linear link cost function was applied to dynamic assignment model. The coefficients were calibrated with data from a HOT lane perception survey. The survey, conducted in July 1997, solicited travel choice desires from Twin Cities' drivers commuting to downtown Minneapolis. The calibration process assumed that link cost is a linear function of the expected travel time and the amount of toll that a driver is willing to pay to achieve the expected travel time.

4.4.3 Quick-response Analysis Tools

When a four-step travel demand model is not available or time does not allow for extensive modifications to more accurately forecast priced demand, quick-response analysis tools can be utilized to assist in evaluation of pricing alternatives.

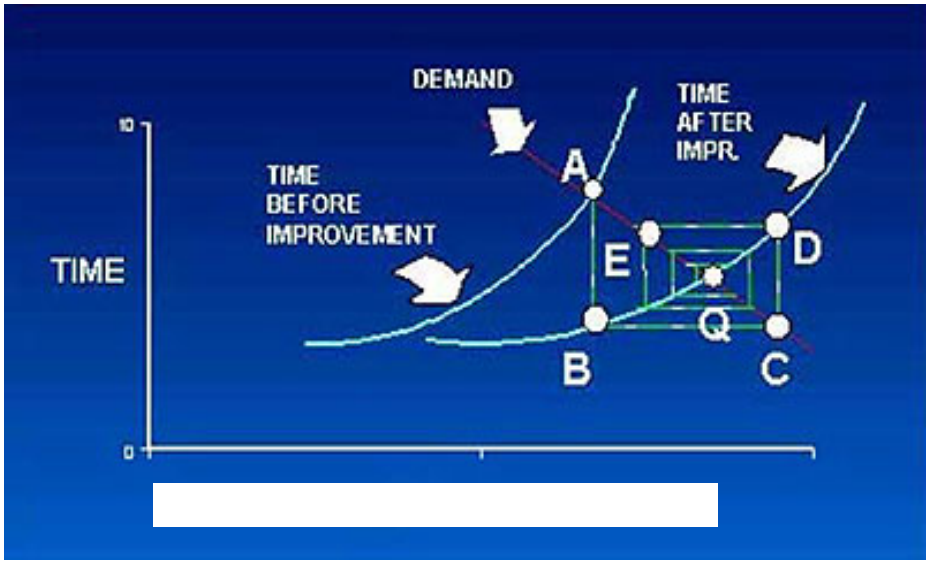
<u>Spreadsheet Model for Induced Travel Estimation (SMITE)</u>

SMITE is a sketch-planning tool that uses demand elasticity with respect to travel time to estimate induced travel that might result from faster travel speeds, highway expansion, diversion from other destination or from other modes of travel, etc. A recent version

[12] Eil Kwon and Csaba Kelen, Hierarchical Evaluation of HOT Lane Operations Using Dynamic Network Models, 2000

called SMITE-Managed Lanes (SMITE-ML)[13] was modified to evaluate managed lanes projects. The key procedure of SMITE-ML is to seek the equilibrium point (Point Q) at which demand and price are in balance by equilibrium process of estimating induced travel demand and the resulting time price change, as illustrated in Figure 4-1[14]. The user is allowed to provide demand elasticity estimates for the demand curve.

Figure 4-1 Equilibrating Demand and Price



In the case study of SMITE_ML model conducted for the Capital Beltway in Northern Virginia[15], a "pivot point" mode choice model has been incorporated into SMITE-ML to estimate the changes in travel demand on different modes due to the changes in user cost generated by highway capacity improvements, tolls and new/improved transit services. An elasticity of demand with respect to travel time of -0.2 was used to estimate "induced" travel.

Overall the SMITE_ML model provides a fairly simple analytical procedure to evaluate performance measures such as delay reductions, toll revenue, transit subsidy etc. for value pricing alternatives.

<u>Sketch Planning for Road Use Charge Evaluation (SPRUCE)</u>

[13] Metropolitan Washington Council of Governments, Qualitative Analysis of the Potential Regional Air Quality Impacts of HOT Lanes on the Capital Beltway in Virginia, March 2003.

[14] Point A is the initial equilibrium point, i.e., the point at which demand and supply are in balance, prior to highway expansion. After highway expansion, travel time "price" is initially reduced to the level represented by point B. However, at that price, travel demand would increase to the level represented by point C on the demand curve. But at this higher demand level, the price would actually be much higher, as represented by point D on the price curve after highway expansion. At this price, demand would in reality be lower, as represented by point E on the demand curve. As the figure demonstrates, one might continue to follow this process and finally end up at point Q. At this point, demand and price are in balance.

[15] Patrick DeCorla-Souza, AICP, Evaluation of Toll Options Using Quick-Response Analysis Tools, a Case Study of the Capital Beltway; Transportation Research Board Annual Meeting, January 2003.

Another model called Sketch Planning for Road Use Charge Evaluation (SPRUCE) was developed to evaluate both HOT Fast and Intertwined Regular (FAIR) Networks[16,17]

For HOT lane evaluation under SPRUCE, the model estimates changes in a commuter's choice of travel mode and resulting changes in vehicle demand assuming that variable pricing will ensure that the entire capacity of HOT lane would be fully utilized and that there will be no delays to vehicles travel in the HOT lane.

The SPRUCE framework is illustrated in Figure 4-2. Vehicle travel demand and associated delays on freeway segment and parallel arterials are estimated by hour of the day based on the input of total daily freeway and arterial traffic in the base scenario. A "pivot point" mode choice model then is used to estimate commuter mode shifts based on the expected changes in travel time and travel cost by travel mode. The model produces vehicle travel demand, throughput and delays for each alternative for each hour. SPRUCE also considers the difference in capacity between separated lanes and a multilane cross-section due to gaps building up in front of slower moving vehicles.

The SPRUCE model can also be used to estimate performance measures, such as toll revenues, network overall delay, traveler benefits, external costs (including air pollution, noise and crashes) and total social benefits, for different pricing scenarios.

Figure 4-2 SPRUCE Model Framework

[16] Fast and Intertwined Regular (FAIR) Lanes, like HOV and HOT lanes, divide a road into two sections: fast lanes and regular lanes. Like HOT lanes, drivers can opt for a quicker trip by paying a toll and using the fast lanes. But with FAIR lanes, drivers who chose to remain in the regular lanes receive rewards in the form of transportation credits. They can then apply these credits towards future use of the fast lanes (a driver, for instance, may have time to spare early in the week and chose to remain in the regular lanes, receiving a credit for one-half or one-quarter of the fast lane toll, then apply this credit toward the fast lane toll later in the week if late for work).

[17] Patrick DeCorla-Souza, AICP, An Evaluation of "High Occupancy Toll" and "Fast And Intertwined Regular" Networks, Transportation Research Board Annual Meeting in January 2004

4.5 Atlanta Model Review

The Atlanta Regional Commission (ARC) is the regional planning and inter-governmental coordination agency for the 10-county planning area including Cherokee, Clayton, Cobb, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Henry and Rockdale counties, as well as the City of Atlanta. A four-step TP+ travel demand model has been developed by ARC for these 10 counties plus three additional counties, Coweta, Forsyth and Paulding, comprising the non-attainment area. This computer-based travel demand model has evolved into an effective tool used to assess current and future travel demand for the transportation system and quantify the impacts associated with planned transportation investments. Toll modeling has historically been accomplished through standard modeling functions contained within the TP+ software package. More recently, with variable pricing gaining momentum in the region, ARC has developed a "managed lane" script to forecast demand for HOT lanes. Furthermore, Parsons Brinkerhoff, under contract to SRTA, developed a modeling methodology to assess the feasibility of implementing a region-wide HOT lane system in the Atlanta area.

4.5.1 Atlanta Regional Commission's Managed Lanes Script

In the current version of ARC's travel demand model, tolls, whether fixed or variable, are included in the highway assignment procedure. The procedure to estimate demand resulting from the implementation of managed lanes and/or the conversion of the existing HOV facilities is incorporated in the highway assignment script within the TP+ software platform. Single occupant vehicles and truck costs to use the managed lane network is set up as $/mile. A managed lanes toll look-up table is used to assign a per-mile toll rate on each managed lane link based on the V/C ratio of that particular link. Therefore, as the assignment converges towards equilibrium a unique pre-defined toll rate is dynamically assigned resulting from changes to supply and demand. Different toll rates are then converted to travel time equivalents by multiplying per miles rates by value of time, and are then added to the travel time of the link. The shortest highway path is calculated based on the travel cost (travel time cost determined by distance and congested-speed and monetary cost). Truck and SOV time-of-day trips, for any given origin-destination pair, are then assigned to the path with the shortest composite travel time during each assignment iteration. This is based on the assumption that all the trips will choose the lowest combined time and money cost path. The resulting demand is a weighted average of all iterations' volumes.

4.5.2 Atlanta HOT Lane Study

In the Atlanta HOT Lane Feasibility Study performed by Parson Brinkerhoff (PB)[18], the procedure for estimating tolls for managed lanes is summarized as follows.

(i) Apply the ARC travel demand model specifying the HOT lanes as simply HOV lanes;

[18] Parson Brinkerhoff HOT Lanes Study, Procedure to Estimate Tolls for Managed Lanes PB model document, Nov. 2004

(ii) Apply the dynamic toll procedure. In the dynamic toll procedure, four major steps were conducted as follows: (a) identify the HOT links for each corridor. The critical links were selected based on the most vehicles assigned for each corridor and used for toll estimation for that certain corridor. (b) Perform a "normal" ARC assignment, specifying the HOT lanes as simply HOV lanes. The assigned HOV volume will be preloaded in the following assignment steps. The desired maximum number of SOV vehicles is calculated based on assigned HOV and acceptable capacity (An ideal capacity of 2,400 vehicles per lane per hour and an acceptable V/C ratio of 0.64 were assumed for this study). Calculations are then performed for the critical link of each corridor. (c) Perform two assignments allowing SOV vehicles in the managed lanes with the required payment of a toll of five cents a mile and seven cents a mile. A linear relationship of (SOV Volume) = A + B $\times$ toll in cents per mile is assumed. With the SOV volume generated from the two assignments from different toll rate, A and B coefficients in the equation can be derived, and furthermore, the optimal toll can be obtained given the desired maximum SOV volume. Still, the calculation is only being performed for the critical link of each corridor. (d) Examine SOV volumes on the highway assignment using the toll estimated by the linear equation. The calculation of tolls and volumes (step c and step d) is repeated until the SOV volumes are within five percent to the desired maximum SOV volumes.

(iii) Apply the ARC travel demand model using the tolls derived from the dynamic toll procedure with the preloaded HOV volume from step (i).

The dynamic toll procedure is applied for each individual time period used in the assignment process, which at the present time is the morning peak period, mid-day, afternoon peak period and the evening / early morning period. The application of the procedure for the evening / early morning period is probably not warranted since this period does not have much congestion.

4.6 Proposed Methodology

After a thorough review of the state-of-practice it was decided that the desired tolling modeling approach for this project should reside in the traffic assignment procedure for the following reasons:

- Time and schedule restrictions prevented an overhaul of the current mode choice model;
- A dynamic micro-level assignment process was deemed too data/cost intensive for this level of study; and
- Data collected as part of this study, namely the stated preference survey, are more suited to support enhancements to the assignment procedure.

In summary, the proposed methodology for I-75/I-575 HOT lanes study falls under the traditional four-step travel demand model. This methodology utilizes ARC's travel demand model as the foundation and expands the assignment procedure to better reflect managed lanes applications. It should be noted that the methodology is not

transportable; the data utilized in the calibration and validation of this methodology was corridor specific.

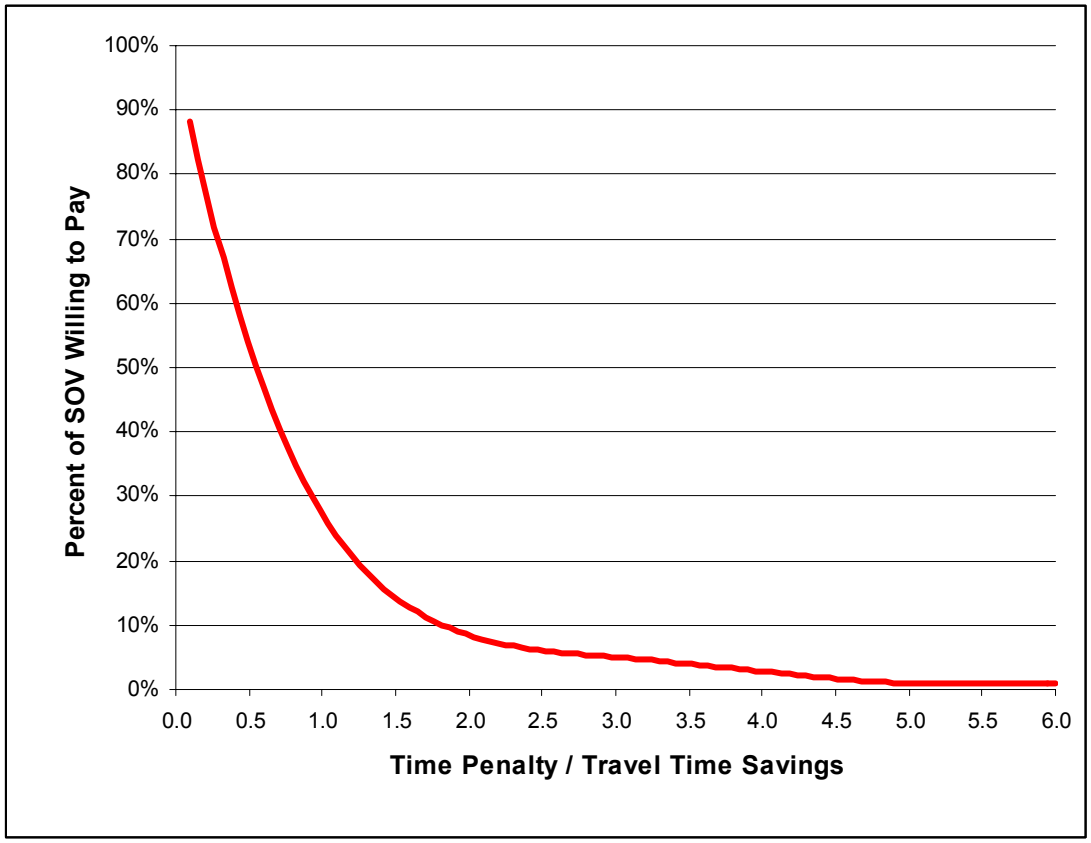
With the framework methodology established, HNTB tested four different tolling methodologies.

- Introduce a new willingness to pay curve;
- Utilize stated preference probability equations;
- Income sensitive assignment; and,
- Random value of time assignment.

4.6.1 Willingness to Pay Curve Methodology

ARC's toll methodology relies on a simple toll diversion curve – the least cost path. While this methodology assigns either 100 or 0 percent to tolled and toll-free routes, HNTB's methodology seeks to expand the detail of the curve between the extremes. Specifically, SOV travelers are differentiated into those willing to pay to use the managed lanes and those who chose to continue on the free alternative. Willingness to pay is determined based on value of time and travel time savings. After the determination of willingness to pay, standard assignment methodologies are applied to determine route choice with occupancy restrictions on managed lanes usage lifted for those travelers willing to pay. The willingness to pay curve is illustrated in Figure 4-3.

Figure 4-3: Peak Period Willingness to Pay



Willingness to pay is calculated by comparing the costs of utilizing the managed lanes to time savings provided. This relationship drives the fraction of the population who are willing to pay. Several examples are provided below.

Toll = $0.10 per mile or ~ $1.00 with 10 minutes of travel time savings

Equation 4-1

$$\frac{toll(\$)}{hour} * \frac{hour}{\text{Value of Time}(\$)} * \frac{60\text{ minutes}}{hour} = \text{minutes}$$

$$\frac{\$1.00}{hour} * \frac{hour}{\$9.37} * \frac{60\text{ minutes}}{hour} = 6.4\text{ minutes}$$

$$\frac{6.4\text{ minutes}}{10\text{ min. saving}} = 0.64 \xrightarrow{\text{lookup (Figure 4-3)}} \text{44\% are willing to pay.}$$

Toll = $0.10 per mile or ~ $1.00 with 30 minutes of travel time savings

Equation 4-2

$$\frac{toll(\$)}{hour} * \frac{hour}{\text{Value of Time}(\$)} * \frac{60\text{ minutes}}{hour} = \text{minutes}$$

$$\frac{\$1.00}{hour} * \frac{hour}{\$9.37} * \frac{60\text{ minutes}}{hour} = 6.4\text{ minutes}$$

$$\frac{6.4\text{ minutes}}{30\text{ min. saving}} = 0.21 \xrightarrow{\text{lookup (Figure 4-3)}} \text{77\% are willing to pay.}$$

Toll = $0.25 per mile or ~ $2.50 with 20 minutes of travel time savings

Equation 4-3

$$\frac{toll(\$)}{hour} * \frac{hour}{\text{Value of Time}(\$)} * \frac{60\text{ minutes}}{hour} = \text{minutes}$$

$$\frac{\$2.50}{hour} * \frac{hour}{\$9.37} * \frac{60\text{ minutes}}{hour} = 16.0\text{ minutes}$$

$$\frac{16.0\text{minutes}}{20\text{ min. saving}} = 0.80 \xrightarrow{\text{lookup (Figure 4-3)}} \text{36\% are willing to pay.}$$

This methodology is applied on an origin-destination basis, meaning calculations are performed for each individual trip, and the percent of SOV travelers willing to pay varies between origin destination pairs. Once the fraction of SOV travelers willing to pay tolls is established, a standard equilibrium assignment process is employed to assign trips to

the network. Willingness to pay represents the maximum usage of a priced facility. Actual usage is determined through the standard assignment process.

The application of this methodology produced stable results for a wide range of toll rates. The most important element of this methodology is the value-of-time calculations. Values of time ascertained from the stated preference survey were distilled to a single time for peak and non-peak trips. Table 4-1 displays the calculations.

Table 4-1: Value of Time Calculations

Segment		Value of time ($/hr)	Percent Trips (1)	Weighted Value of Time ($/hr)
Time of day	**Trip purpose**			
Peak periods	Home-Based Work (HBW)	9.15	41%	3.75
	Non-Home Based (NHB)	10.96	21%	2.35
	Home-Based Other/School (HBO/HB School)	8.71	38%	3.27
			Peak Period VOT	**$9.37**
Non-peak periods	Home-Based Work (HBW)	8.75	12%	1.01
	Non-Home Based (NHB)	12.84	46%	5.96
	Home-Based Other/School (HBO/HB School)	6.71	42%	2.84
			Non-Peak Period VOT	**$9.81**

(1) Atlanta Regional Commission's Regional Travel Demand Model

Select results are presented in Tables 4-2 and 4-3.

Table 4-2: No-Toll Assignment Results (No-Project/No-Build Scenario)

Corridor		Average Volume Weighted by Distance					Corridor Travel Time (min)	
		GP Total	ML HOV Volume	ML SOV Volume	ML Total	Total	GP Lane	Managed Lanes
I-75 from Akers Mill Rd to I-575 Split	NB	29,484	3,088	0	3,088	32,572	17.2	10.3
	SB	33,467	6,478	0	6,478	39,946	25.1	11.5
I-75 from I-575 Split to Wade Green Rd	NB	16,187	881	0	881	17,069	6.8	4.1
	SB	20,432	2,414	0	2,414	22,846	10.1	4.4
I-575 from I-75 Split to Sixes Road	NB	12,957	948	0	948	13,905	13.7	10.6
	SB	20,224	3,771	0	3,771	23,995	28.5	12.7

Table 4-3: Willingness to Pay Curve Methodology Results – AM peak Period with $0.30 per mile toll Northbound and $0.40 per mile toll Southbound

Corridor		Average Volume Weighted by Distance					Corridor Travel Time (min)	
		GP Total	ML HOV Volume	ML SOV Volume	ML Total	Total	GP Lane	Managed Lanes
I-75 from Akers Mill Rd to I-575 Split	NB	29,303	3,054	422	3,476	32,779	17.0	10.4
	SB	32,879	6,268	1,479	7,748	40,627	24.0	12.4
I-75 from I-575 Split to Wade Green Rd	NB	16,004	872	299	1,171	17,175	6.7	4.1
	SB	19,676	2,315	922	3,237	22,913	9.3	4.7
I-575 from I-75 Split to Sixes Road	NB	12,885	938	80	1,018	13,904	13.6	10.6
	SB	19,816	3,503	1,031	4,534	24,350	26.9	14.5

4.6.2 Probability Equation

When probabilities are used to describe a particular event, they are describing the likelihood of that event happening. For example, the probability function describing managed lanes use stands at 40 percent, this indicates that 4 out 10 users are likely to use the managed lanes system. A probability function was developed from the stated preference survey and employed as an indicator of managed lanes use subject to variety of toll rates.

Stated preference responses were analyzed using Alogit choice modeling software. The logit functional form adopted within Alogit is the most widely applied in consumer choice modeling, in part because of its computational ease. The Alogit software, also used in the calibration of the ARC model's mode choice module, uses maximum likelihood procedures to estimate parameter values for a logit choice model of the general form:

Equation 4-4 $$Pr(m) = 1 / 1 + \exp - (\beta 0 + \beta 1(JT_m - JT_g) + \beta 2(TOLL_m))$$

Where:

Pr (m)	=	probability of using managed lane
β0…β3	=	estimated coefficients
JT	=	journey time in minutes
Toll	=	toll in Dollars
m, g	=	subscripts for ML and GL alternatives.

The value of time is derived from the β1 and β2 coefficients, the marginal utilities of toll and time. The β0, also termed the alternative-specific constant, provides an indication of the net impact of any other determinants of lane choice. Models were run for a range of market segmentations although the focus was the eight combinations of peak/non-peak and HBW, NHB, HBO & HB-School segments.

Table 4-4: Probability Function Methodology Results – AM peak Period with $0.30 per mile toll Northbound and $0.40 per mile toll Southbound

Corridor		Average Volume Weighted by Distance					Corridor Travel Time (min)	
		GP Total	ML HOV Volume	ML SOV Volume	ML Total	Total	GP Lane	ML
I-75 from Akers Mill Rd to I-575 Split	NB	29,010	3,029	1,042	4,071	33,081	16.8	10.6
	SB	33,195	6,213	1,714	7,927	41,122	24.5	12.8
I-75 from I-575 Split to Wade Green Rd	NB	15,873	862	583	1,446	17,318	6.6	4.1
	SB	19,689	2,301	1,203	3,504	23,192	9.3	4.8
I-575 from I-75 Split to Sixes Rd	NB	12,818	896	276	1,172	13,991	13.6	10.6
	SB	20,013	3,450	1,182	4,632	24,645	27.5	14.9

4.6.3 Distribution of Value of Time Assignment Procedure

The distribution of value of time approach splits each trip table into deciles each with independent values of time. ARC's traffic model set was modified to accept a distribution of value of time. This enables more precise forecasts to be made, especially as the value of time distribution is skewed as noted in Chapter 3.

It was not possible to determine individual values of time from the econometric modeling. Instead, the coefficients provide the average value of time for each market segment. Transfer price questioning provided a range of values for each respondent. The distributions are generally skewed to the left, as expected, but often have more than one peak (mode). They are also relatively coarse as values can only be determined to one of a few ranges.

For travel demand modeling purposes we have therefore adopted a theoretical lognormal distribution. The lognormal distribution is skewed to the left as the value of time distribution is expected to be as it is strongly influenced by the underlying, skewed income distribution. For traffic modeling purposes, we have derived the associated decile (i.e. 10th, 20th, . . . percentiles) values of time from the cumulative distributions which are presented in Table 4-5. A maximum value of time of $50/hour has been assumed.

Table 4-5: Distribution of Values of Time ($/hour)

Percentile	Peak			Non-peak		
	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HBSchool)	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HBSchool)
10	4.98	2.92	2.84	1.40	1.12	1.64
20	6.14	4.58	4.02	2.62	2.60	2.66

Percentile	Peak			Non-peak		
	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HBSchool)	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HBSchool)
30	7.14	6.38	5.16	4.12	4.76	3.78
40	8.10	8.42	6.38	6.08	7.94	5.10
50	9.14	10.96	7.78	8.74	12.84	6.74
60	10.30	14.22	9.48	12.56	20.74	8.90
70	11.72	18.82	11.72	18.52	34.62	12.00
80	13.60	26.12	15.02	29.16	50.00	17.00
90	16.74	41.14	21.18	50.00	50.00	27.56

Standard equilibrium assignment procedures were applied to each trip matrix simultaneously. The results are illustrated in Table 4-6.

Table 4-6: Distribution of Value of Time Assignment Methodology Results – AM peak Period with $0.30 per mile toll Northbound and $0.40 per mile toll Southbound

Corridor		Average Volume Weighted by Distance					Corridor Travel Time (min)	
		GP Total	ML HOV Volume	ML SOV Volume	ML Total	Total	GP Lane	Managed Lanes
I-75 from Akers Mill Rd to I-575 Split	NB	29,321	3,082	408	3,490	32,810	17.0	10.4
	SB	32,880	6,177	1,908	8,085	40,965	23.9	12.8
I-75 from I-575 Split to Wade Green Rd	NB	16,024	872	313	1,186	17,210	6.7	4.1
	SB	19,932	2,264	1,322	3,586	23,518	9.5	4.9
I-575 from I-75 Split to Sixes Rd	NB	12,951	948	31	979	13,930	13.7	10.6
	SB	19,844	3,381	1,362	4,743	24,587	26.9	15.2

4.7 Summary and Recommendations

Each approach presented a unique set of challenges and produced a range of traffic estimates. The procedures and results were evaluated and it was determined that the willingness to pay approach produced the most stable and consistently produced intuitive results over a range of toll rates. The following list of observations were garnered from applying each approach and reviewing the results and served as the basis of our proposed approach.

4.7.1 Summary of Approaches

Willingness to Pay Approach:

- This approach is relatively easy to understand and apply when compared to the other approaches.
- The resulting traffic forecasts in the managed lanes are stable and continue to provide benefits to HOV travelers. This is illustrated in the minimal change to HOV demand in the managed lanes under all priced scenarios.
- This approach replaces the need to build multiple paths (tolled vs. free) in the assignment process with a market assessment based approach applied to individual trip characteristics.

Logit Approach:

- This approach produces relatively high willingness to pay percentages at low travel time savings when compared with the SP results.
- Value of time is not a direct input variable into the calculation of use.
- The approach is easily understood and applied within the existing model structure.
- The resulting traffic forecasts are generally producing a higher number of SOV travelers buying into the managed lanes in the early years since the time savings are not as significant as the same trip in the horizon year.

Distribution of Value of Time

- The distributions are assumed to be uniform across all TAZs. This may dilute SOV buy-in since incomes are generally higher in this quadrant of the region.
- Toll diversions are static above and below the break-even point. With a specific decile, the assignment between a tolled path and a free path is 0 or 100 percent. Therefore, if a 10 minute travel savings results in the lowest composite impendence path being the managed lanes, 100 percent of the decile will be assigned to the managed lanes, this percent will not vary if the travel time saving are 20 or even 30 minutes. This results in an over-estimation of low toll rate / low travel time saving conditions, and under-estimation of break-even conditions.
- Limitations to this approach can generally be attributed to the omission of a willingness to pay condition.
- This approach does provide a more detailed assessment by income, which is one of the most important components of usage.

4.7.2 Recommended Approach

After a thorough review, the willingness to pay approach was chosen and applied in assess traffic and toll revenue for the following reasons:

- The results were stable across all price points and generally preserved the condition that HOV users would continue to utilize the managed lanes;
- The approach could be easily integrated into the current travel demand model structure;
- The value of time and willingness to pay data was readily available form the stated preference survey; and,
- The resulted under priced conditions produced meaningful and intuitive results from very low per mile toll rates to extremely high per mile toll rates.

4.7.3 Willingness to Pay Application

The willingness to pay approach is applied in the assignment process of the regional travel demand model. A step-by-step description of how this approach was applied within the model framework is presented below:

1. Travel time skims are run for paying customers, SOVs in this application, with and without use of the managed lanes system.
2. The appropriate willingness to pay curve is then used to determine the percentage of SOV travelers who are willing to pay to use the managed lanes for the predetermined price. This percent willing to pay is determine by: value of time, per mile toll rate, and the travel time saving offered by the managed lanes. Several examples of these calculations were provided previously in this chapter.
3. Once the fraction of SOV motorists who are willing to pay is determined, the SOV trip table is parsed resulting in two SOV trips table – those willing to pay, and those not willing to pay.
4. A standard assignment process is then applied with eligibility restrictions lifted on the managed lanes for the “willing to pay” SOV travelers. The SOV wiling to pay trip table represents the universe of those eligible to use the managed lanes for a price and dose not reflect actual usage. Actual usage is determined through the assignment process and assigned based on minimum composite impedance.
5. This process is performed iteratively for each analysis period until the prescribed equilibrium tolerance is achieved.
6. Per mile toll rates are then modified to achieve the desired operating profile.

CHAPTER 5

TRAFFIC AND TOLL REVENUE ESTIMATES

5.1 Global Demand Estimates

The corridor global demand is defined as the total traffic using the I-75/575 corridor, whether utilizing the general purpose (GP) or the managed lanes (ML). This includes single occupant vehicles (SOV), high occupant vehicles (HOV) and trucks. Global demand estimates for the study corridor were developed using data provided by the Atlanta Regional Commission's travel demand model modified for use in this corridor by Parsons Brinkenhoff (PB) as part of the I-75 HOV/BRT Environmental Impact Study.

5.1.1 Regional Travel Demand Inputs

The Atlanta regional highway network, already being used by PB for the I-75 HOV/BRT Environmental Impact Statement (EIS), was used to develop global demand estimates for this study. ARC's highway network was modified to include additional detail in the study corridor.

Trip tables used for this analysis reflect the latest socio-economic forecasts available for the region, developed in the Mobility 2030 plan. Trip tables were provided for a.m. peak period (6:00-10:00 a.m.), p.m. peak period (4:00-7:00 p.m.), midday (10:00 a.m. – 4:00 p.m.), and night (7:00 p.m. – 6:00 a.m.) analysis periods.

5.1.2 Interchange-to-Interchange Trip Tables

Traffic assignments were run on the regional travel demand model in order to identify the magnitude of traffic accessing the I-75/575 corridor within the project limits (Akers Mill Road to Wade Green Road on I-75 and Sixes Road on I-575). The global demand estimates include the traffic using both the general purpose and managed lanes. Interchange-to-interchange trip matrices were extracted from the model to understand travel movements in the corridor.

Open year (2010) and future year (2030) trip matrices were also extracted from the model to understand how travel patterns are predicted to change over time. Travel patterns are affected by growth in the region, the addition of a new managed lane system, and projects planned and programmed in the long-range transportation plan.

5.1.3 Latent Demand

Global demand in any corridor varies depending on assumptions regarding level of access, occupancy restrictions, eligibility criteria and price. For example, if the new lanes were designated to be HOV-only lanes, the corridor would attract less traffic to the

freeway than if the lanes were constructed as general purpose lanes. The total traffic entering the corridor, or global demand, changes between these two scenarios due to latent demand for travel.

Latent demand is the amount of traffic that would like to use the I-75/575 corridor, but due to congestion levels, use alternative routes such as US 41 and other parallel arterials or adjust their travel time to avoid congested conditions. As capacity is added to I-75 and I-575, traffic that would otherwise use parallel arterials returns to the corridor. The additional capacity is absorbed until the congestion again reaches a condition where arterial travel time once again becomes competitive and travelers start to utilize these routes.

If new lanes are constructed as HOV-lanes, the amount of additional capacity is limited to the amount of HOV demand whose trip making characteristics are such that utilizing the HOV lanes system is advantageous. Utilization levels would be limited, and as illustrated in Chapter 2, levels of service remain acceptable through the planning horizon. If constructed as general purpose lanes, the additional capacity would very likely be absorbed entirely opening day. If constructed as managed lanes, where some lower-occupant traffic is allowed to use the system for a price, and the price is set to ensure that an optimum level of service is provided in the managed lanes, the total global demand in the corridor falls somewhere between the two previous conditions. In effect, pricing is a mechanism to control the use of the new capacity and preserve desirable operating conditions in these lanes.

The importance of global demand is critical to forecasting traffic and toll revenue. Specifically, global demand drives congestion levels, especially in the general purpose lanes, which in turn drives the use of the managed lanes. Higher global demand increases the congestion in the general purpose lanes, resulting in greater travel time saving in the managed lanes and ultimately increasing the propensity of motorist to pay tolls.

If tolls are set very high, the amount of paying traffic in the managed lanes would be low, and the managed lanes would begin to resemble an HOV-only condition, with lower global demand. If tolls were set very low, the lanes would fill up and would become as congested as the general purpose lanes, with a high global demand.

To take into account variations in global demand, ARC's travel demand model was run under two different conditions to frame the limit of demand in the corridor. An initial run was conducted where the managed lanes were assumed to be open to HOV-2+ traffic only. This condition was used to represent a high toll condition where toll-paying traffic is essentially priced out of the managed lanes. In the second run, the managed lanes were assumed to be open to all traffic. This was used to represent a condition under which lower tolls are charged for use of the managed lane. In both cases, access to the managed lanes system was limited to those locations described previously.

At 2030 levels, on an average daily basis, the difference between the lower global demand for the corridor (high toll rate) and the higher global demand for the corridor (lower toll rate) was about 4 percent.

5.2 Traffic and Toll Revenue Estimates

The results of the assessment of the travel and revenue characteristics of the proposed I-75 /575 managed lane facility are presented in this section. The goal of this effort was to understand the impacts to the HOV facility if the system is converted to a managed lanes facility in the future with priced buy-in. It was not the intent of this study to investigate policy analysis relative to occupancy, eligibility and access.

The HOV tolling and policy framework evaluated as part of this effort was HOV-2+. HOV-2+ refers to a tolling alternative that would allow HOVs with two or more people to ride free along with bus rapid transit vehicles, emergency/police vehicles, motorcycles and other transit vehicles.

Single Occupant Vehicles (SOV) would pay a toll to use the managed lanes. It was assumed that light and heavy duty trucks would not be allowed to utilize the managed lanes system at this time. In other managed lanes applications trucks are permitted to use the managed lanes system during off-peak times to maximize the use of the lanes during non-commute oriented times of the day. The impact of trucks on the managed lanes was not evaluated in detail in this study.

5.2.1 Toll Sensitivity Analysis

Each project alternative phase was evaluated under several toll rates, separately by time-of-day and direction. A summary of the results of the toll sensitivity analysis is presented in Figures 5-1 through 5-21. The unique characteristics of managed lanes, the optimum toll rates, defined as the rate that produced the maximum amount of revenue, varies by time of day and travel direction are also presented. The revenues for each condition are depicted for a range of toll rates, and the curves represent collection over the entire facility for each defined direction and time period. The maximum revenues, associated toll rate per mile, is also shown. The optimum per mile toll rate is converted to a dollar value as a point of reference. These rates are rounded to the nearest quarter. At this time, the optimum toll rate is not necessarily coincident with the recommended toll schedule.

As shown in Figure 5-1, the toll rate resulting in the maximum a.m. peak period revenue is expected to be $0.23 per mile southbound and $0.08 per mile northbound. The difference between the toll rates is expected since a.m. peak period demand in the southbound direction far exceeds the northbound direction.

Figure 5-2 portrays revenue for the p.m. peak period. This figures show the directional results reversed. This is expected as southbound morning commuters are returning home. Generally, the p.m. peak period exhibits a higher global demand resulting in a higher demand for the managed lanes.

In most cases, the optimum toll for a given condition is higher in the p.m. peak period than in the a.m. peak period, and intuitively, much higher than the midday and over-night periods. For example, the optimum a.m. peak period toll rate is $0.23 per mile when compared to $0.32 per mile for the northbound p.m. peak period.

Figure 5-3 shows the same information for the midday period. The revenue curves are much more pronounced than the peak period curves. This is expected since there is substantially less hourly demand and correspondingly less achievable time saving in the managed lanes. In this time period the overall relationships presented for the peak periods do not hold. The distribution of demand between the northbound and southbound direction is fairly uniform resulting in optimum toll rates that are very similar.

Similar conclusions can be garnered from studying toll sensitivity in 2020, the point in time when the managed lanes system reaches build-out, and 2030 the horizon year of this analysis.

Table 5-1 summaries the result of the toll sensitivity analysis by time period, travel direction, analysis year and segment. However, as will be discussed in more detail in the following sections, the determination of the true "optimum" or recommended toll structure will ultimately be a policy decision which will take into consideration the need for revenue maximization, travel efficiency and traffic distribution between the general purpose and managed lanes. Optimum toll rates for the over night period are $0.02 per mile for either direction. These rates do not change over the analysis period. For this reason they are not included in the summary below.

Table 5-1: Summary of Toll Rates for Revenue Maximization

		A.M. Peak Period			Midday Period			P.M. Peak Period		
		Opening Year	System Build Out	Horizon Year	Opening Year	System Build Out	Horizon Year	Opening Year	System Build Out	Horizon Year
Segment 1										
I-75: Akers Mill - I-575	NB	$ 0.50	$ 1.00	$ 1.25	$ 0.50	$ 1.25	$ 1.50	$ 1.50	$ 4.25	$ 4.50
	SB	$ 1.25	$ 2.75	$ 2.75	$ 0.50	$ 1.50	$ 1.50	$ 1.00	$ 2.00	$ 2.00
Segment 2										
I-75: I-575 - Wade Green Road	NB		$ 0.50	$ 0.50		$ 0.75	$ 0.75		$ 1.75	$ 1.75
	SB		$ 1.50	$ 1.25		$ 0.75	$ 0.75		$ 1.00	$ 1.00
Segment 3										
I-575: I-75 - Sixes Road	NB		$ 0.50	$ 0.50		$ 1.25	$ 1.50		$ 4.50	$ 6.00
	SB		$ 3.25	$ 3.25		$ 1.25	$ 1.50		$ 1.50	$ 2.00

Note: Toll Rates are rounded to the nearest $0.25 and represent trips that travel the entire analysis segment

Figure 5-1: Opening Year A.M. Peak Period Toll Sensitivity Curve

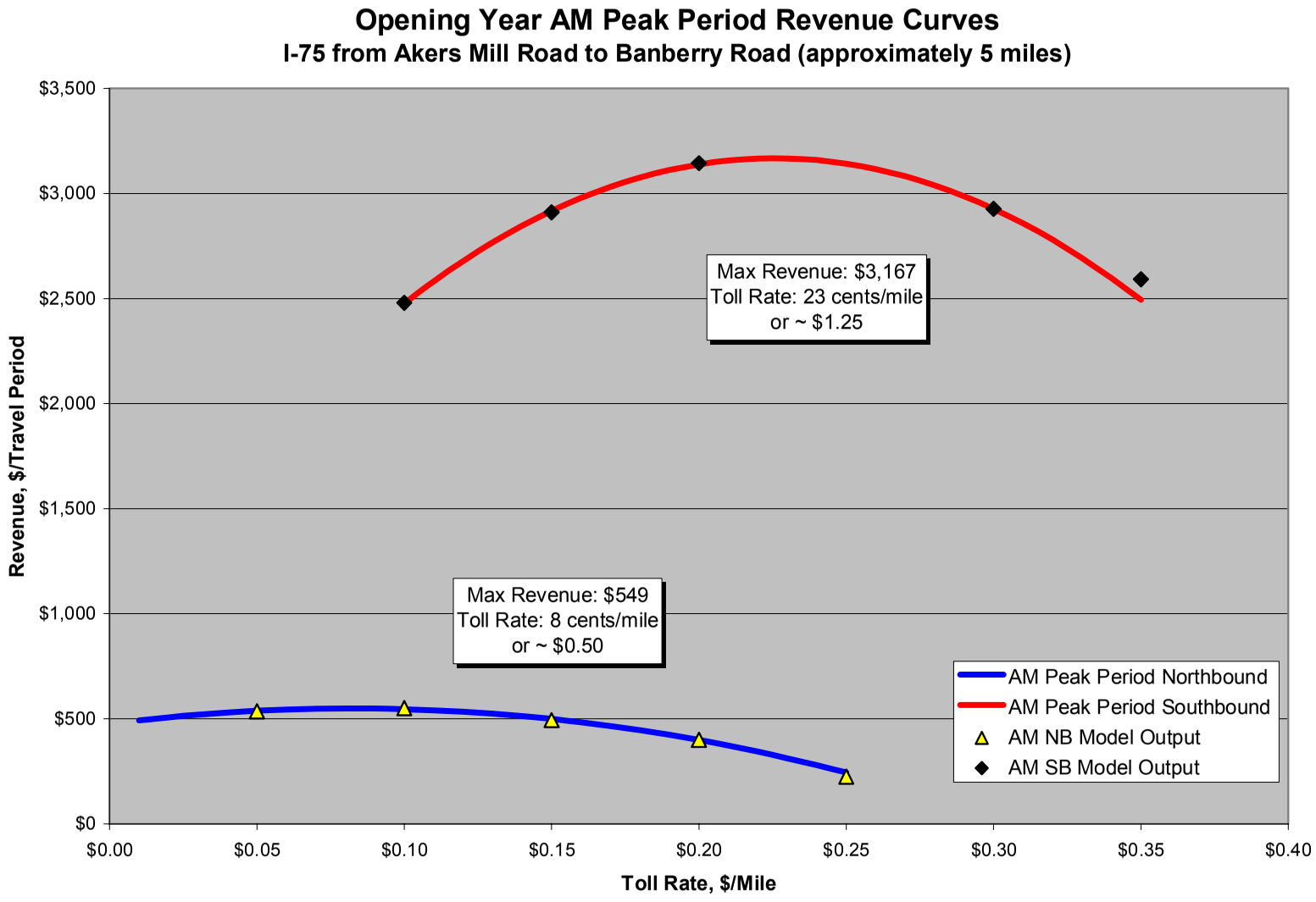


Figure 5-2: Opening Year P.M. Peak Period Toll Sensitivity Curve

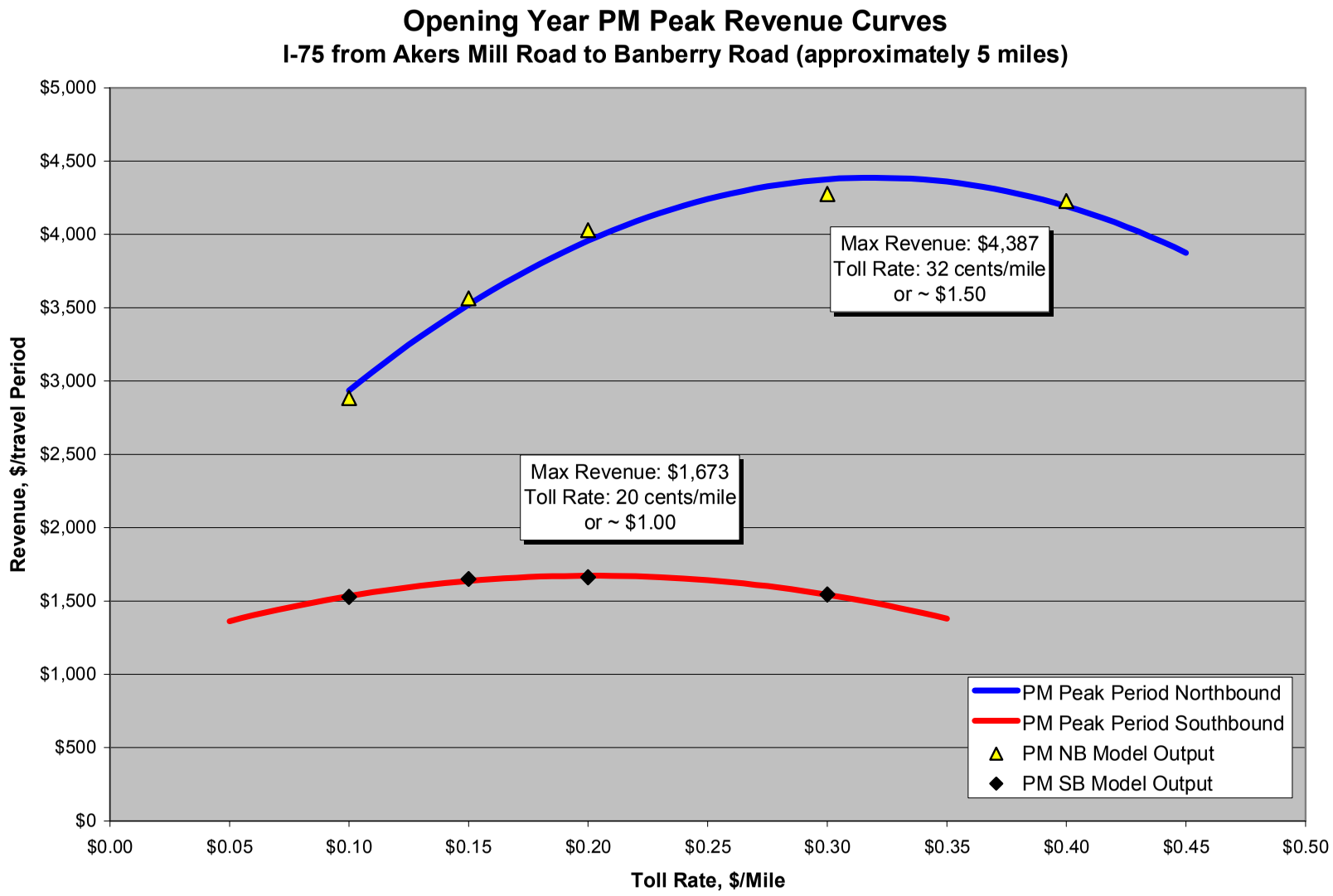


Figure 5-3: Opening Year Off-Peak Period Toll Sensitivity Curve

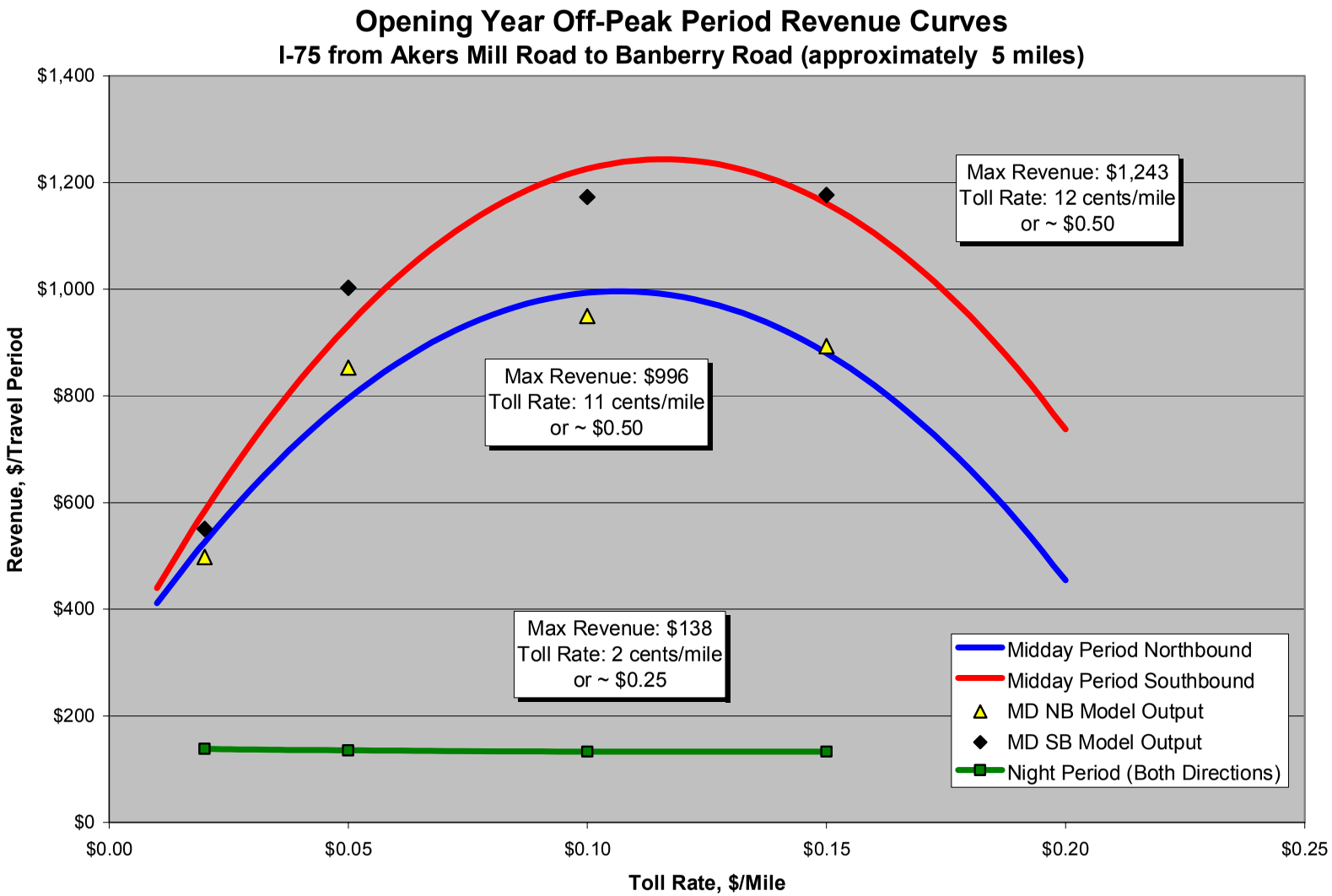


Figure 5-4: 2020 A.M. Peak Period Toll Sensitivity Curve – Segment 1

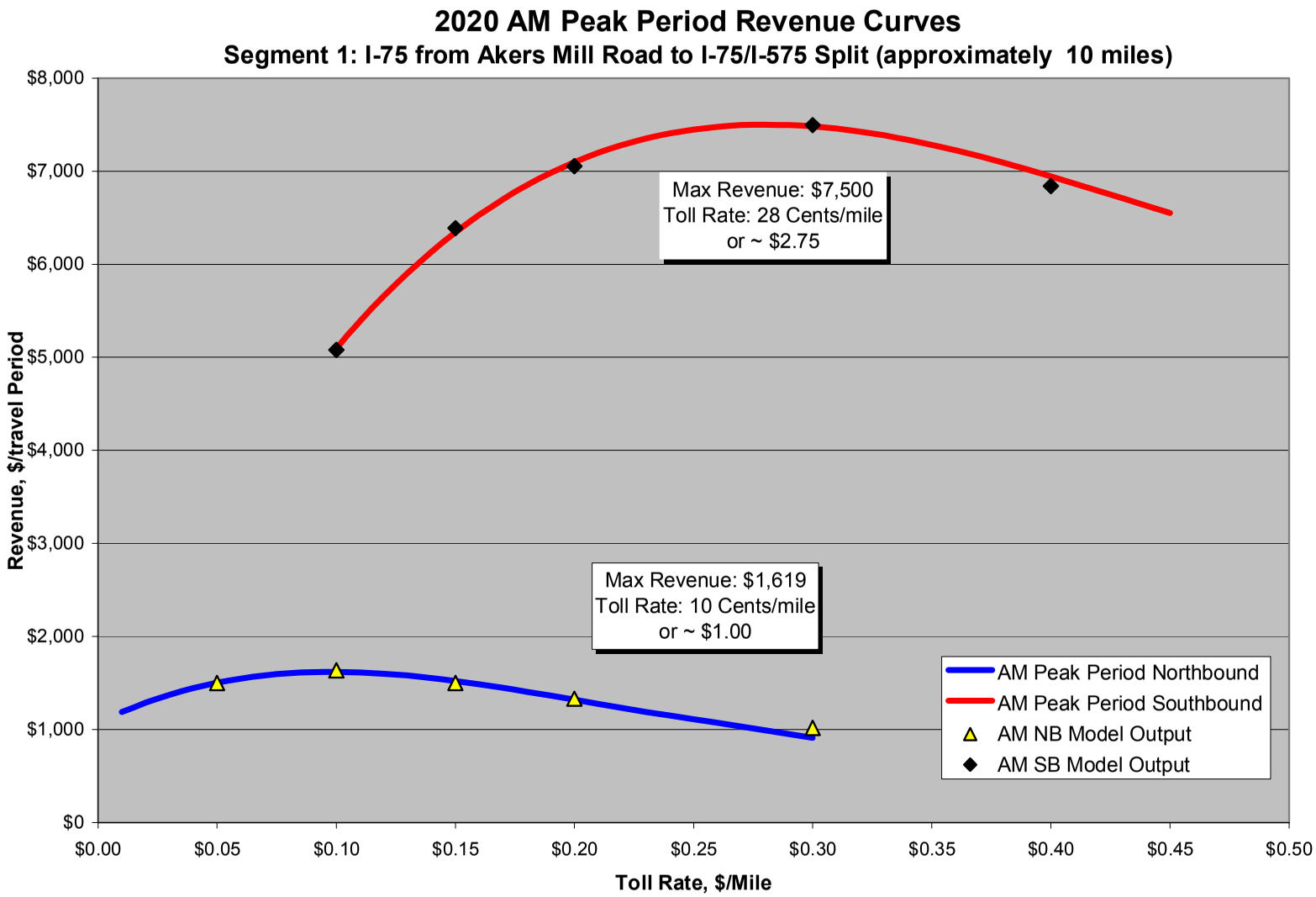


Figure 5-5: 2020 A.M. Peak Period Toll Sensitivity Curve – Segment 2

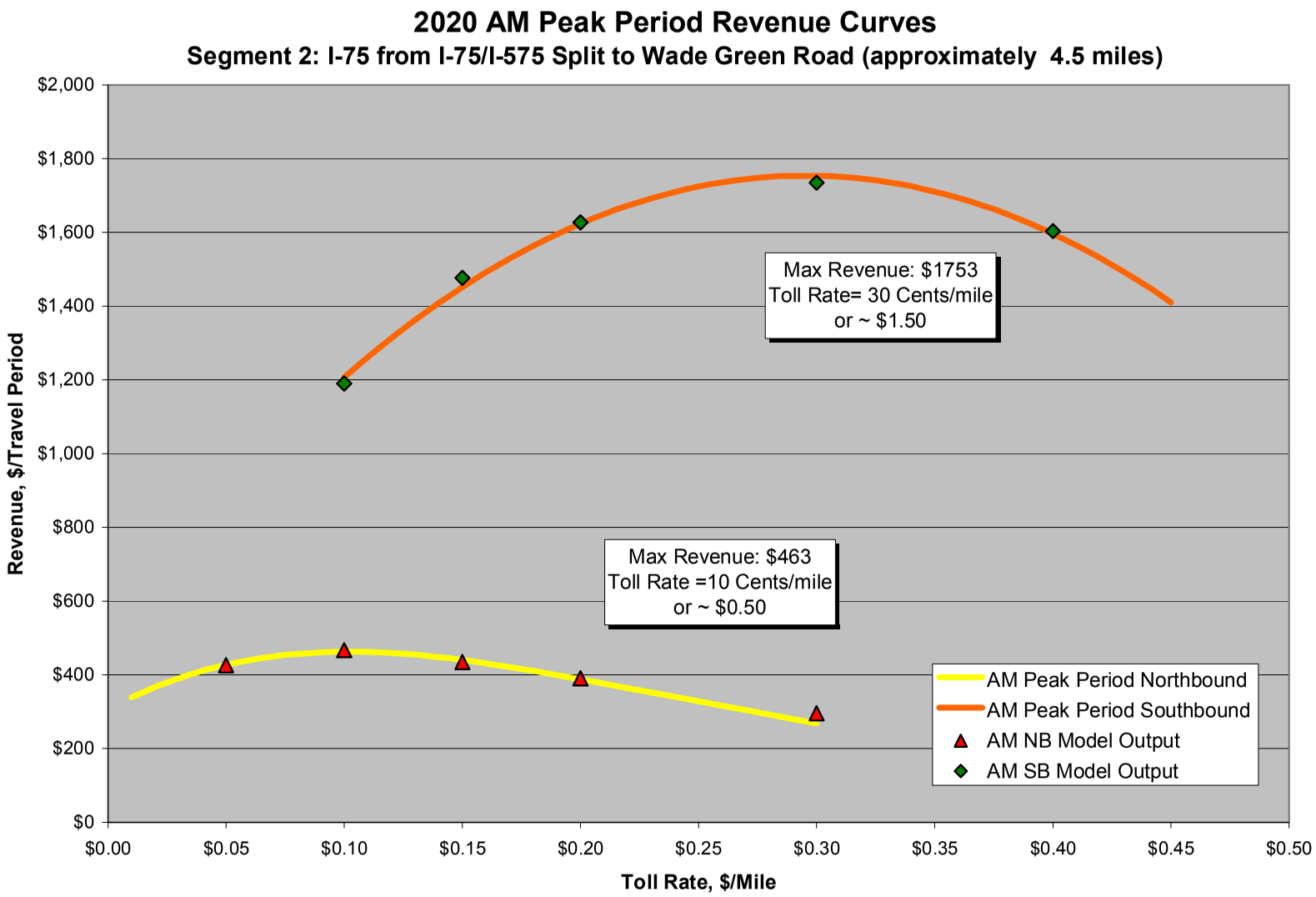


Figure 5-6: 2020 A.M. Peak Period Toll Sensitivity Curve – Segment 3

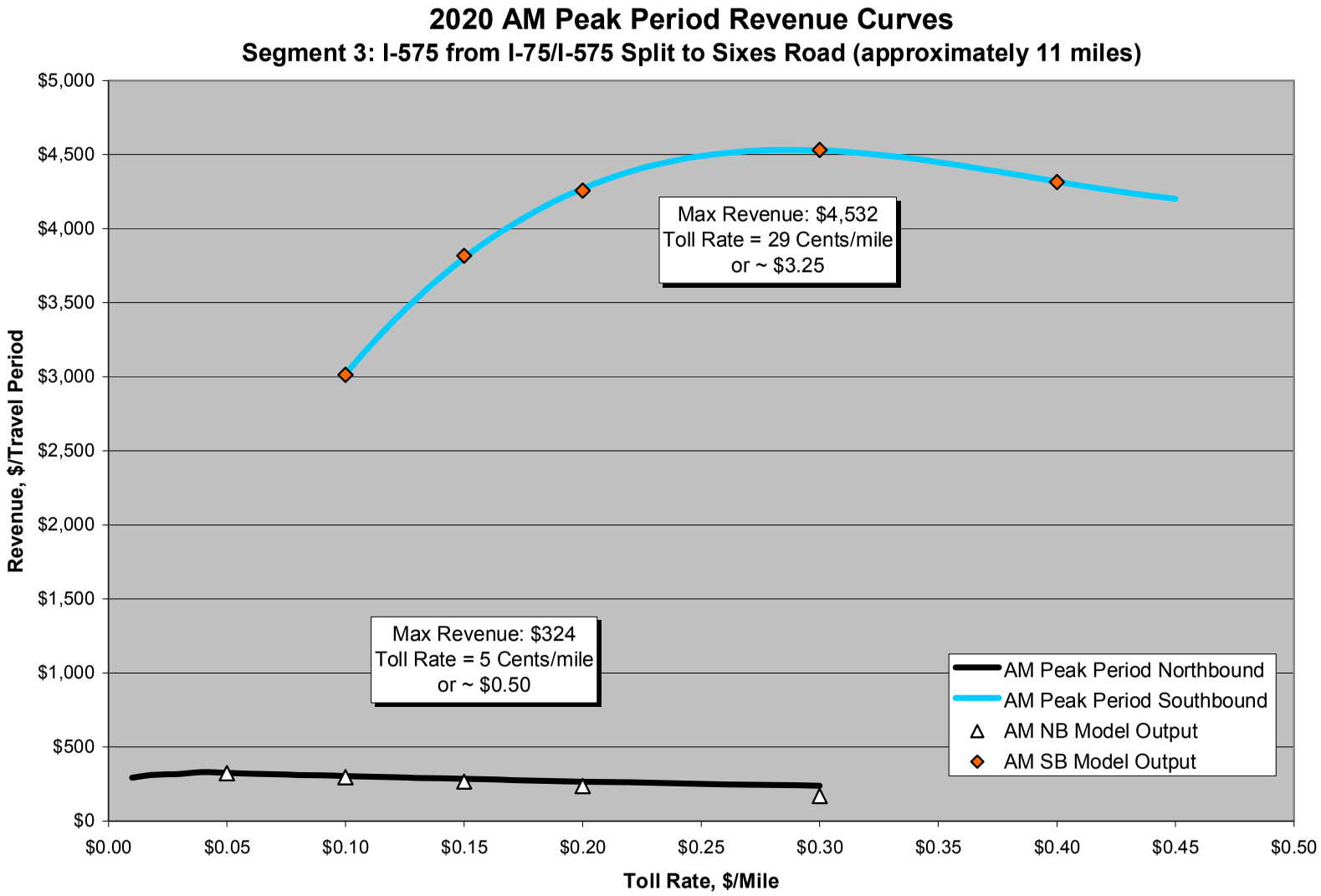


Figure 5-7: 2020 P.M. Peak Period Toll Sensitivity Curve – Segment 1

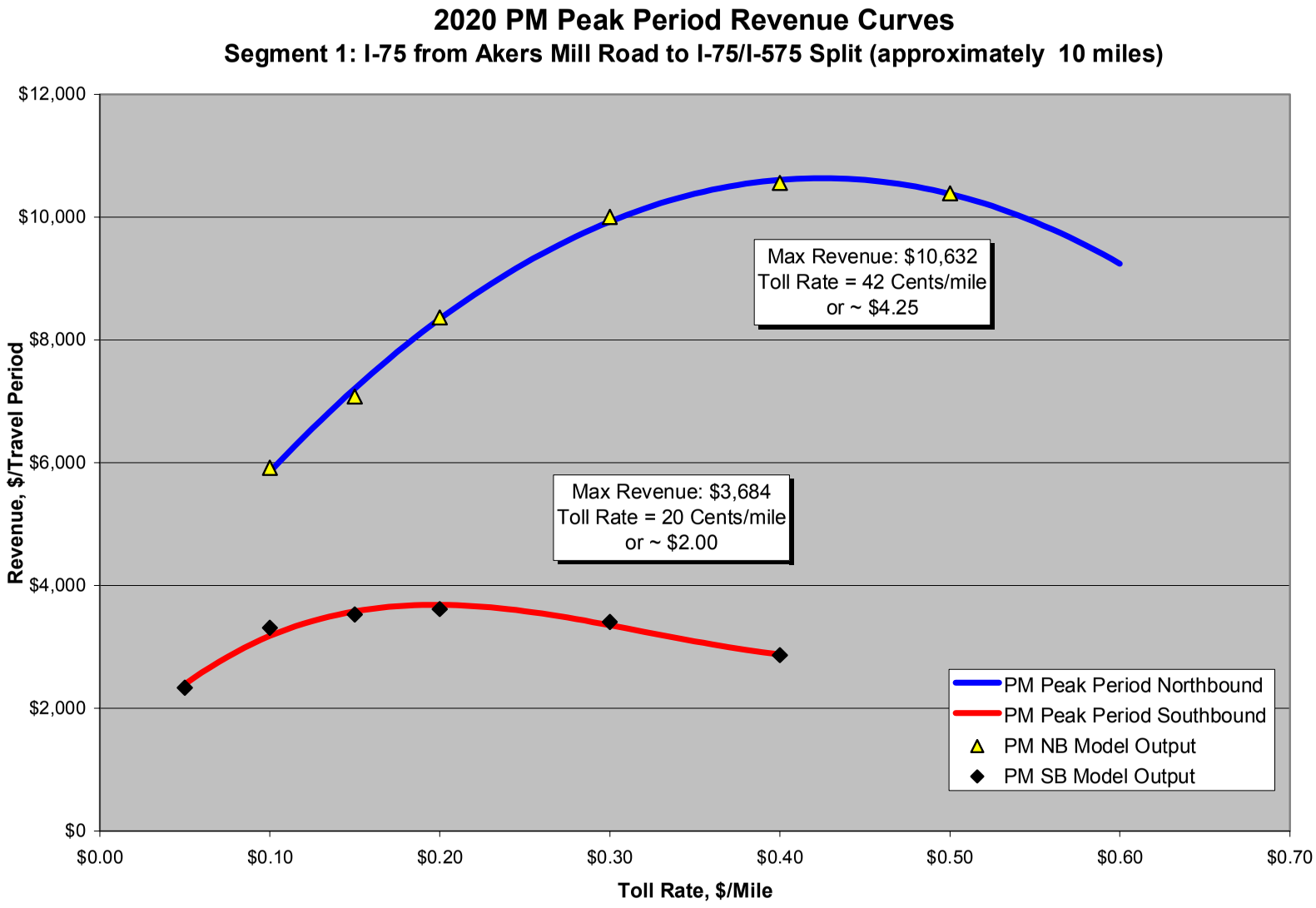


Figure 5-8: 2020 P.M. Peak Period Toll Sensitivity Curve – Segment 2

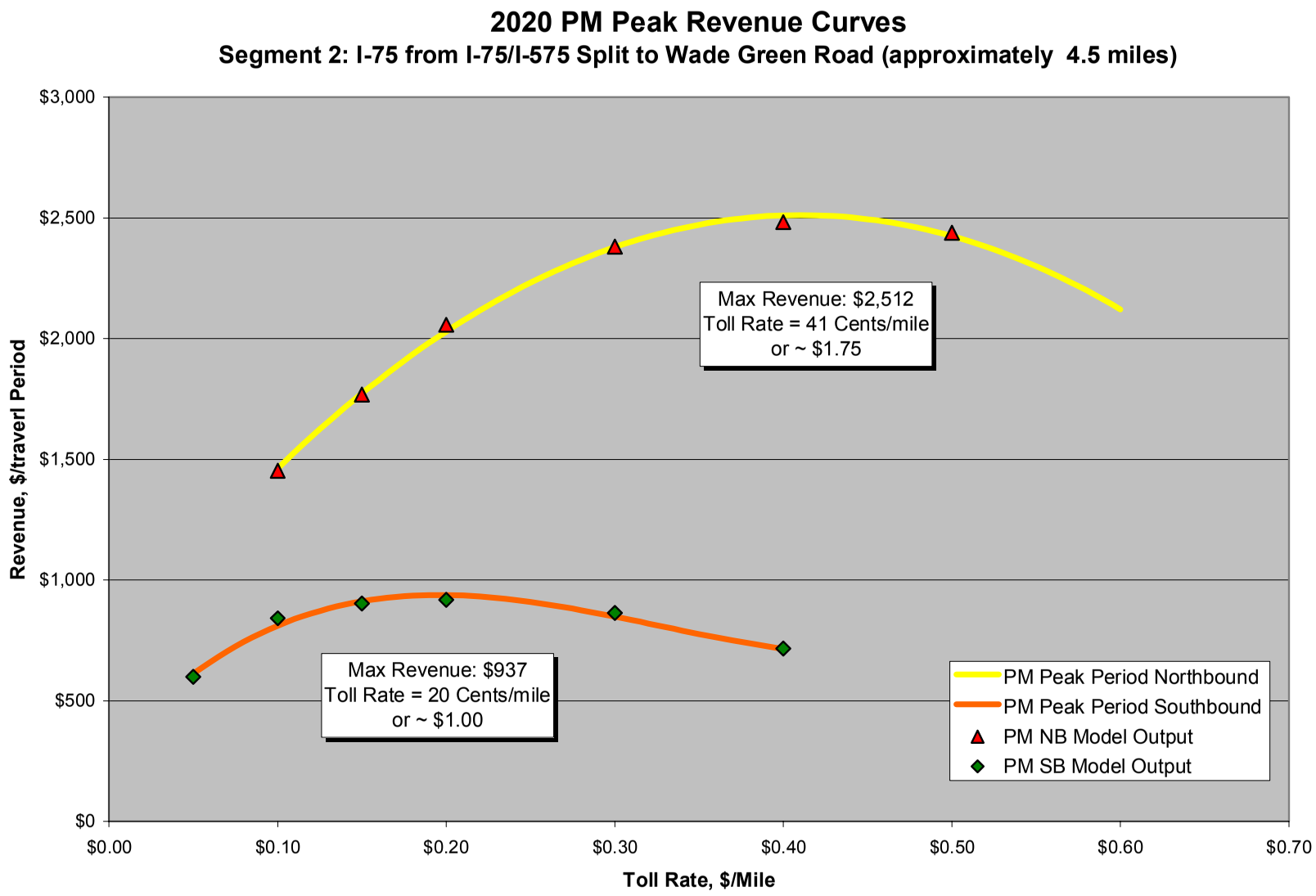


Figure 5-9: 2020 P.M. Peak Period Toll Sensitivity Curve – Segment 3

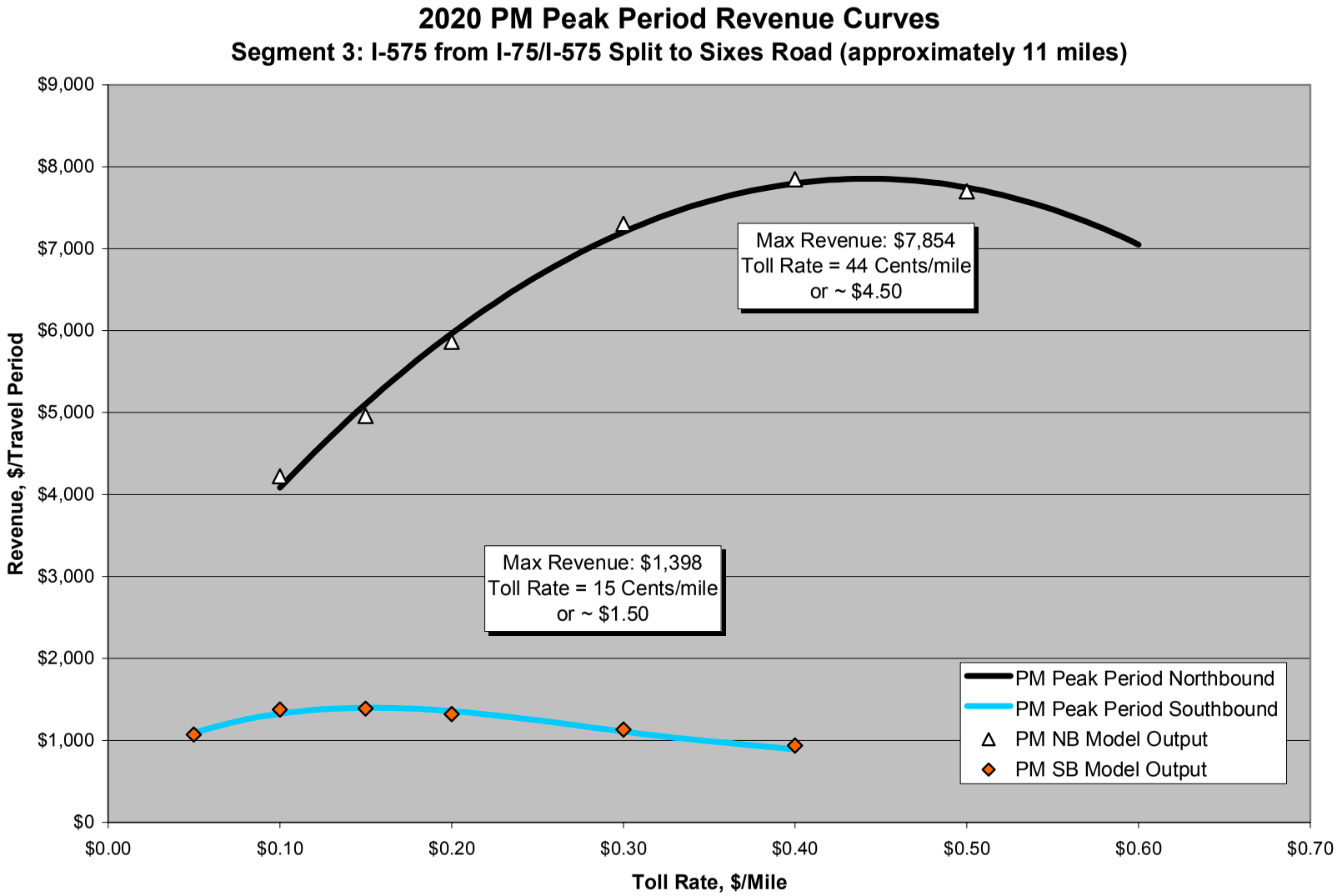


Figure 5-10: 2020 Off-Peak Period Toll Sensitivity Curve – Segment 1

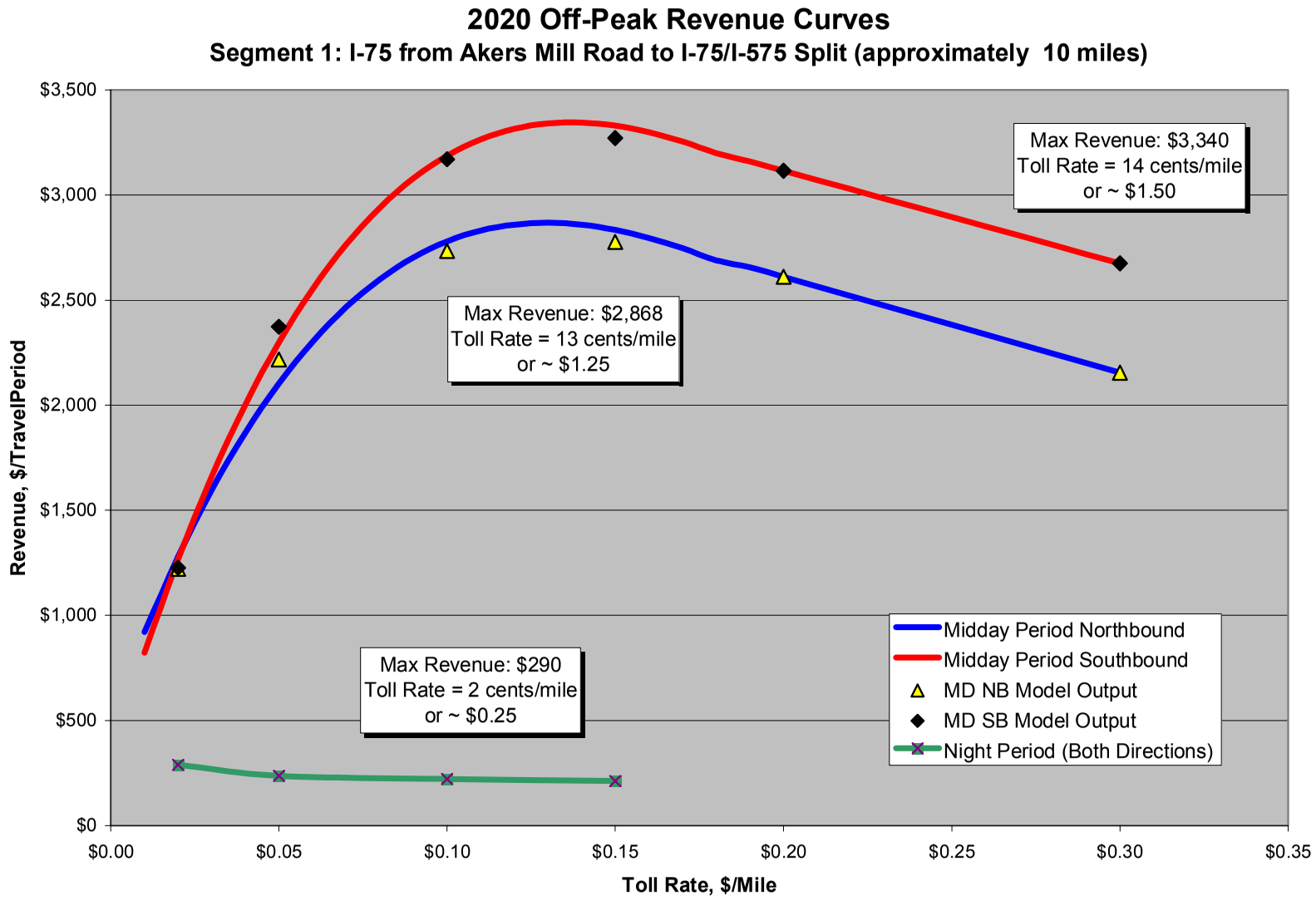


Figure 5-11: 2020 Off-Peak Period Toll Sensitivity Curve – Segment 2

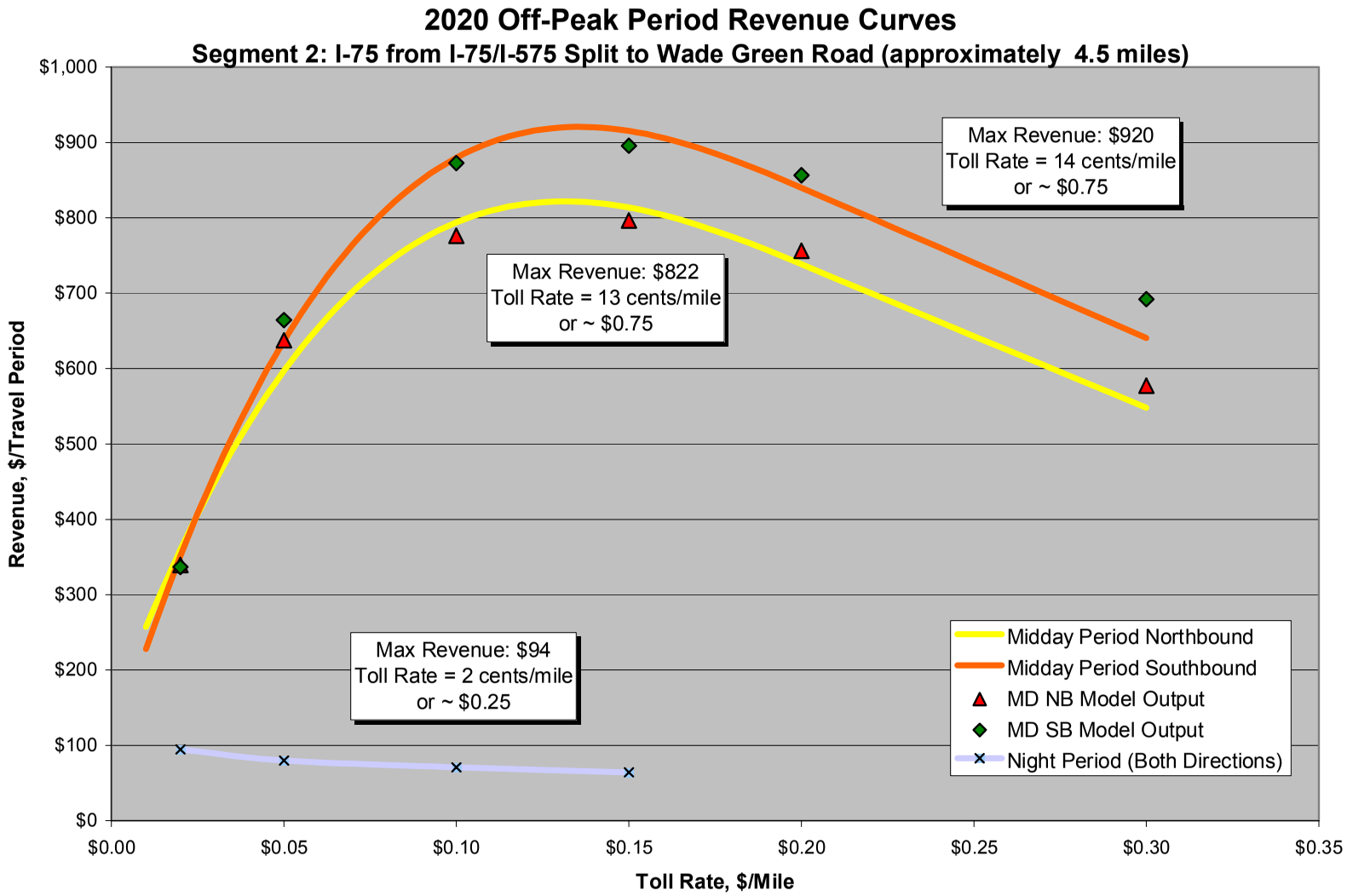


Figure 5-12: 2020 Off-Peak Period Toll Sensitivity Curve – Segment 3

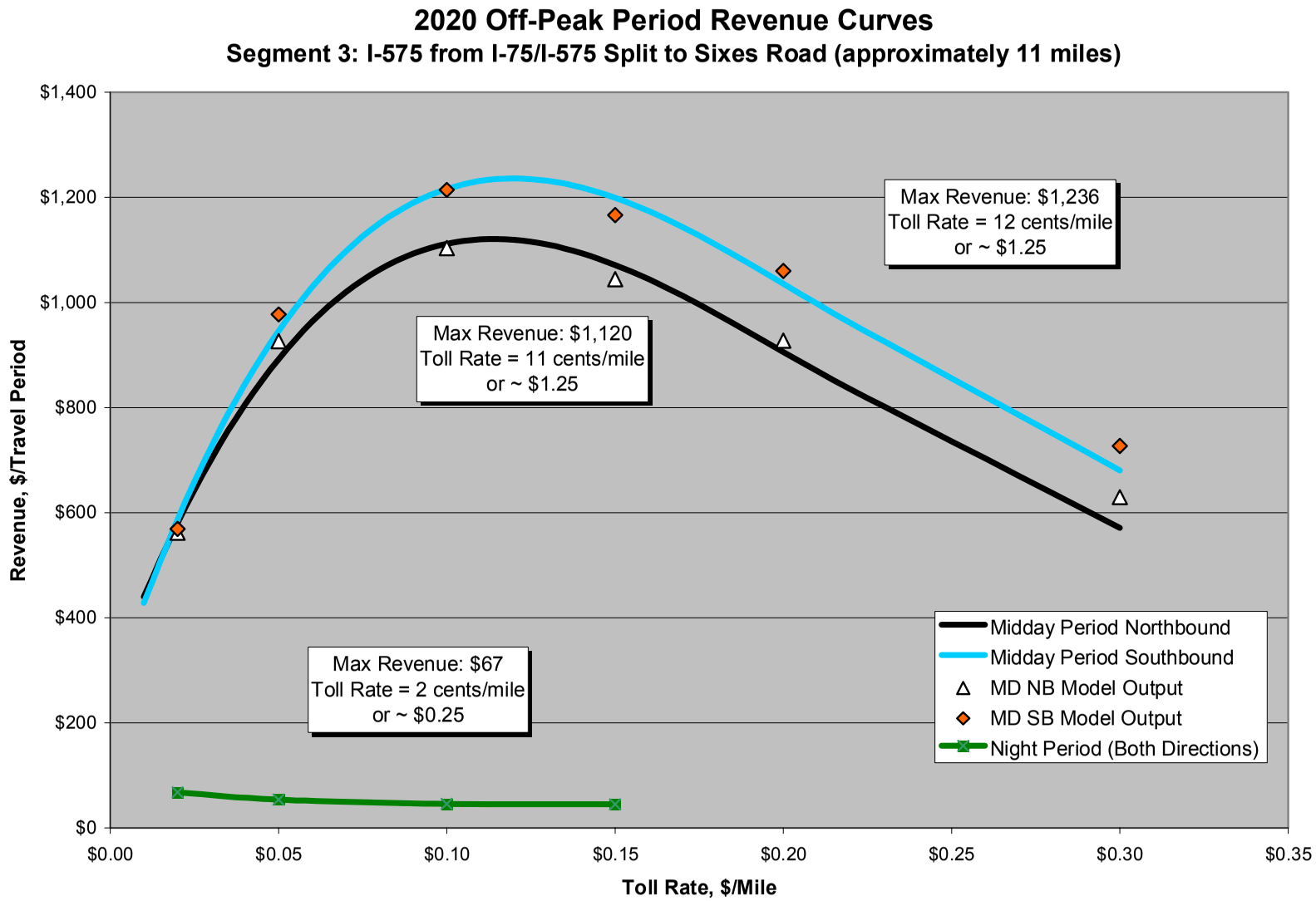


Figure 5-13: Horizon Year A.M. Peak Period Toll Sensitivity Curve – Segment 1

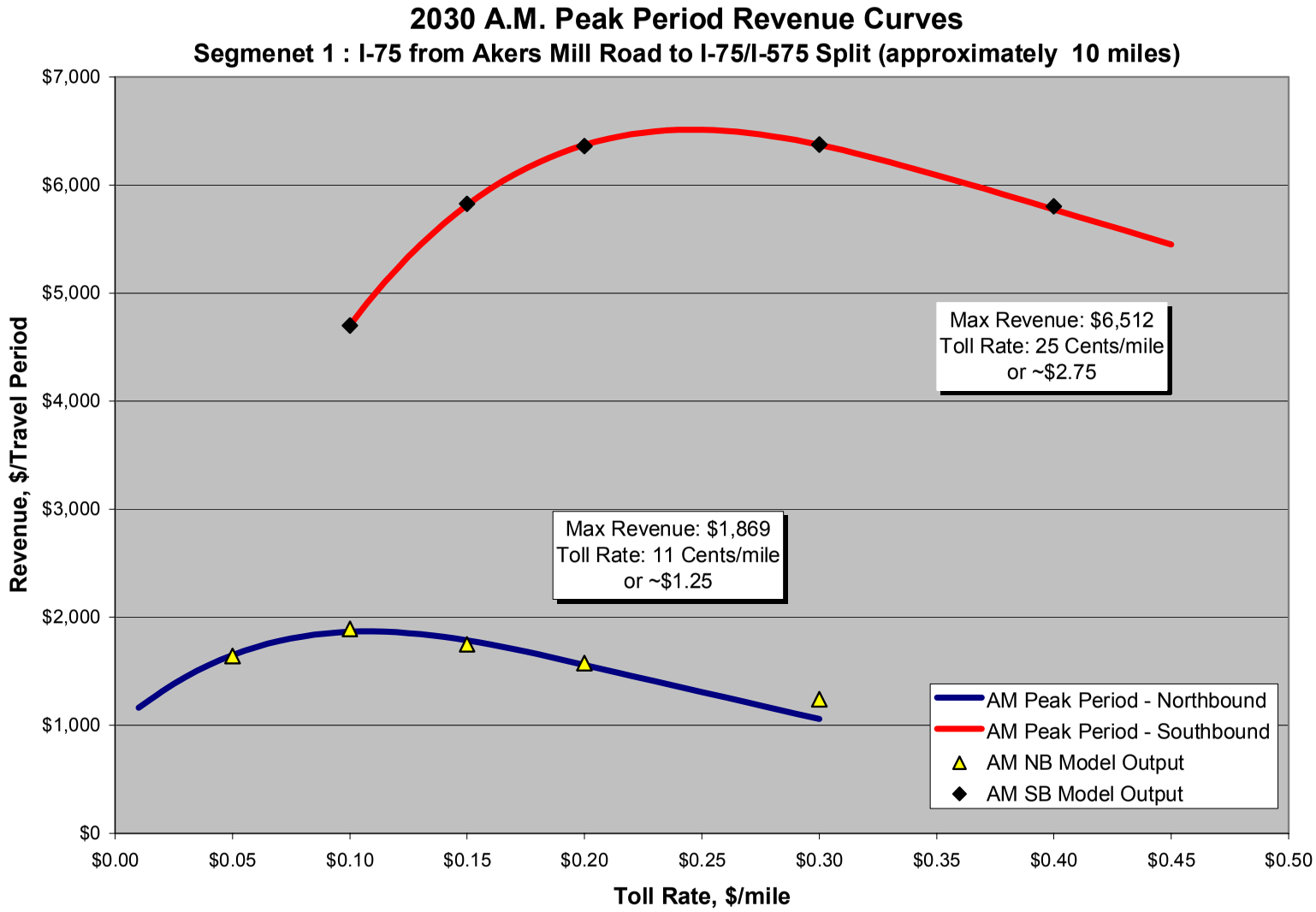


Figure 5-14: Horizon Year A.M. Peak Period Toll Sensitivity Curve – Segment 2

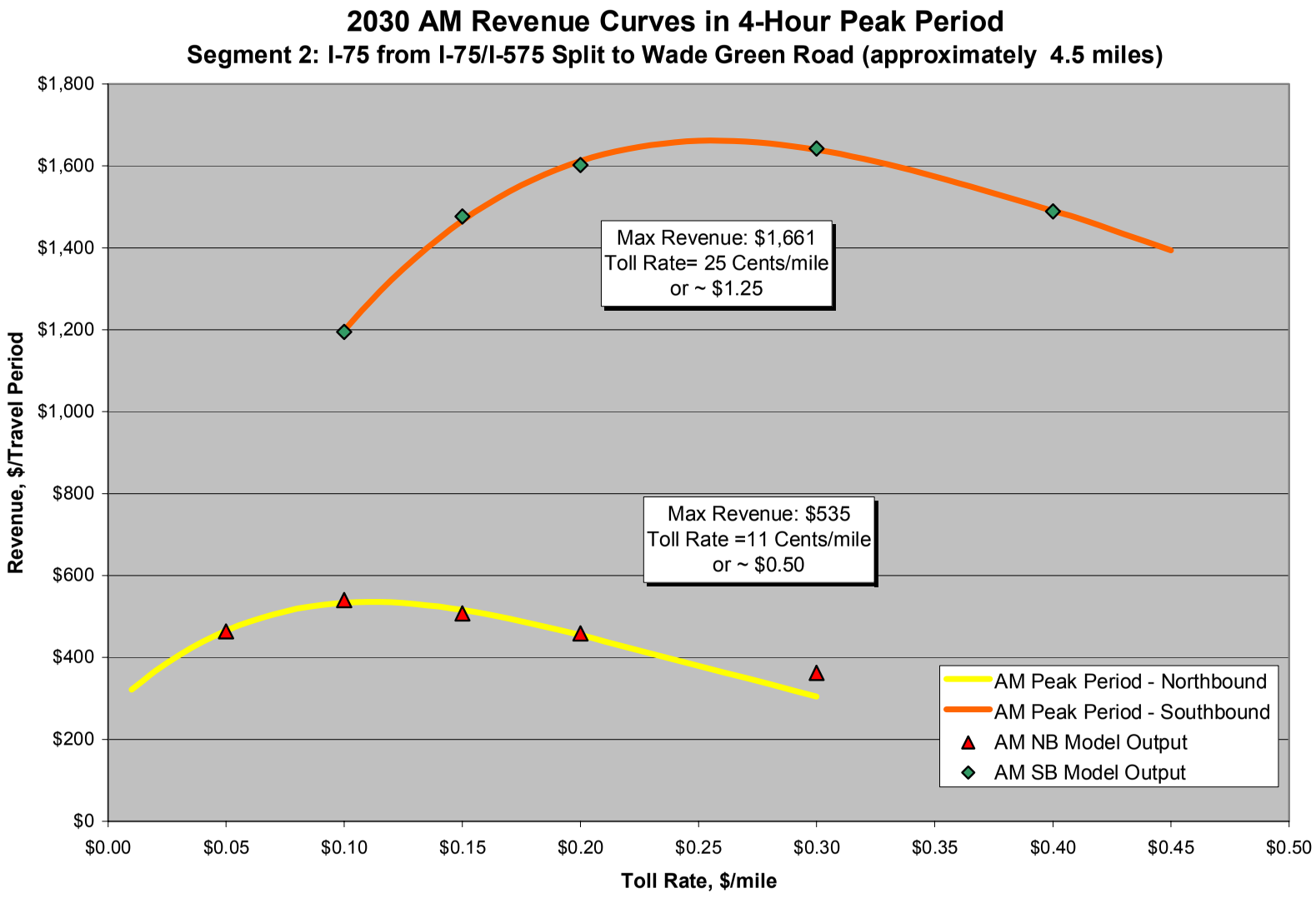


Figure 5-15: Horizon Year A.M. Peak Period Toll Sensitivity Curve – Segment 3

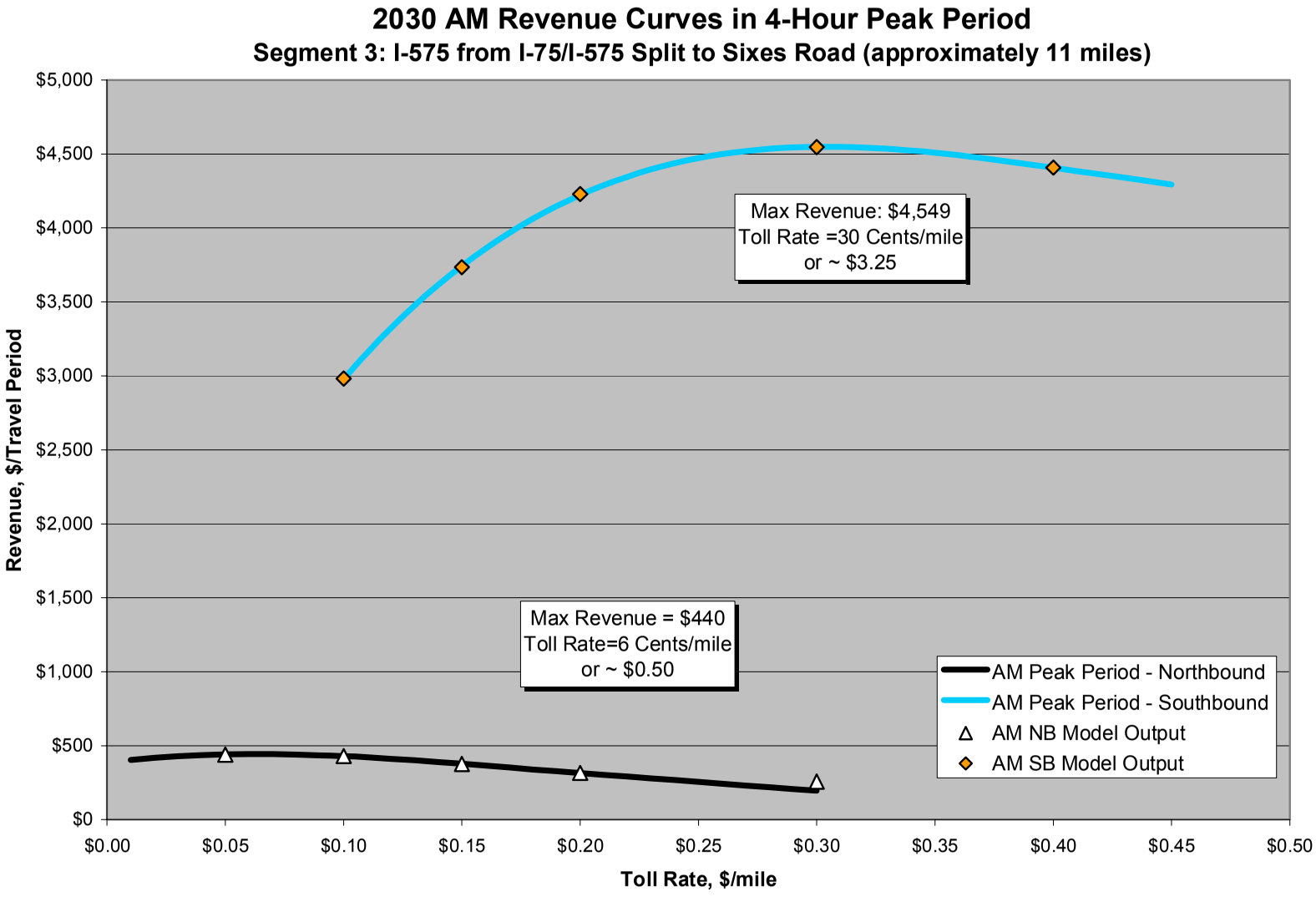


Figure 5-16: Horizon Year P.M. Peak Period Toll Sensitivity Curve – Segment 1

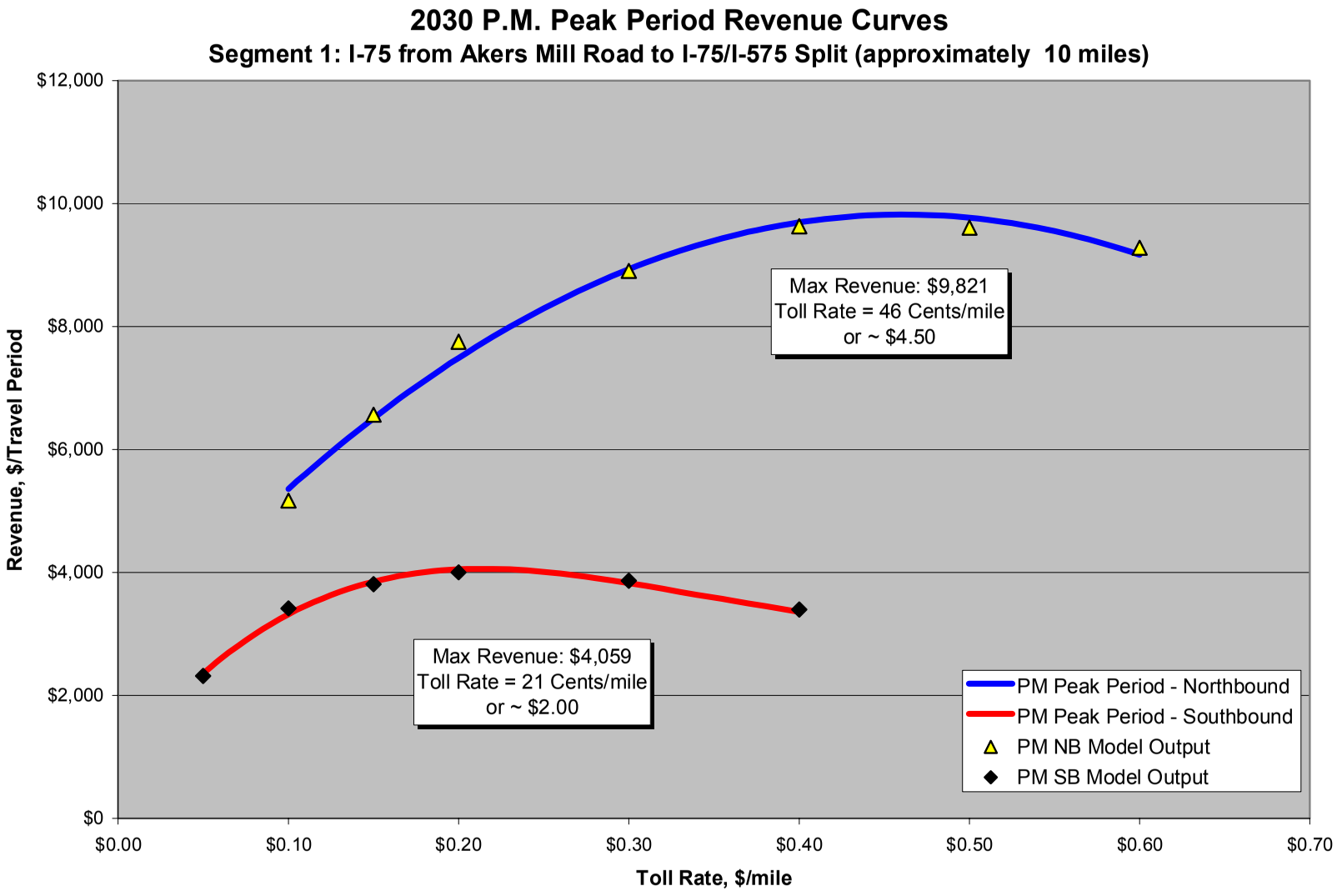


Figure 5-17: Horizon Year P.M. Peak Period Toll Sensitivity Curve – Segment 2

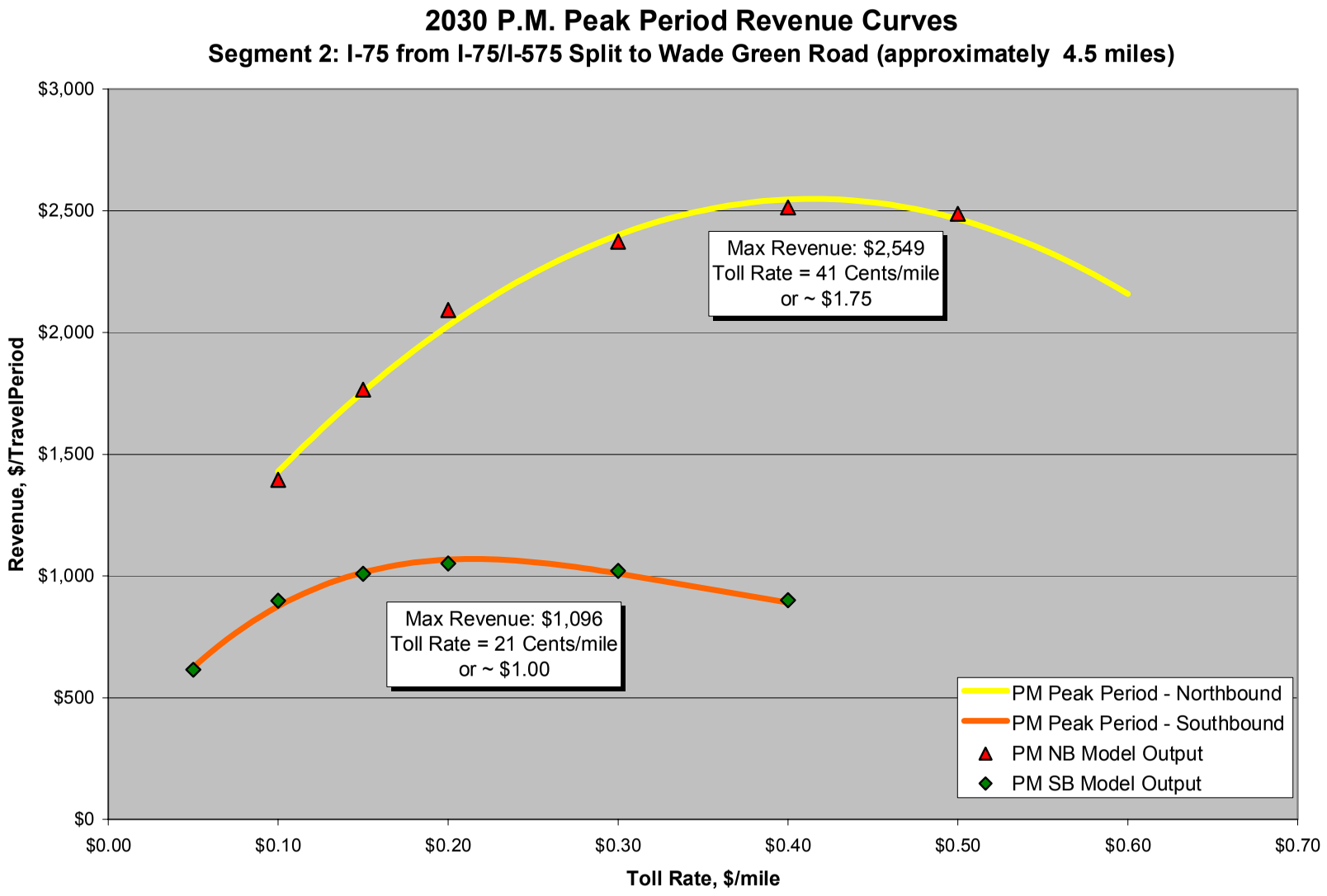


Figure 5-18: Horizon Year P.M. Peak Period Toll Sensitivity Curve – Segment 3

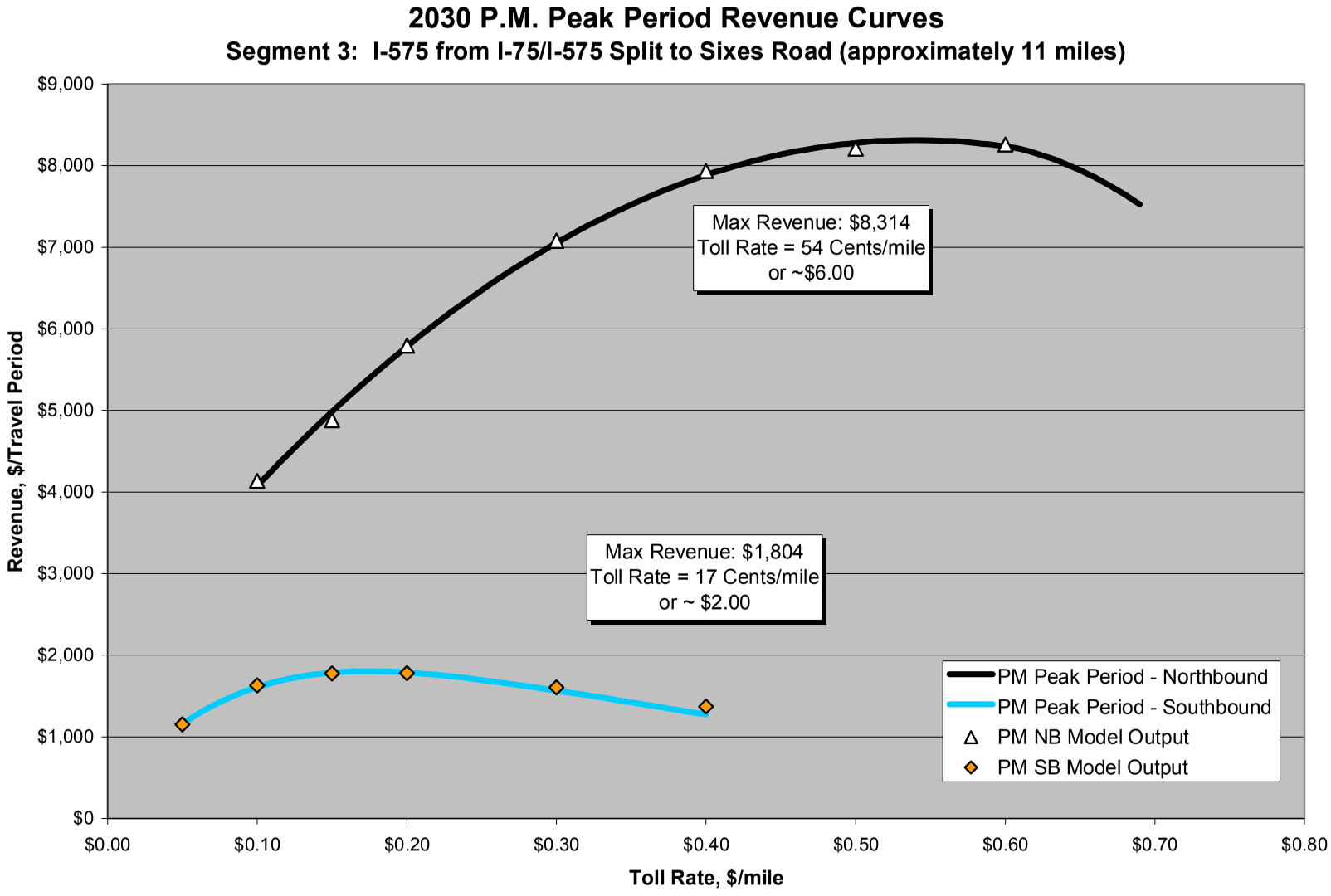


Figure 5-19: Horizon Year Midday Period Toll Sensitivity Curve – Segment 1

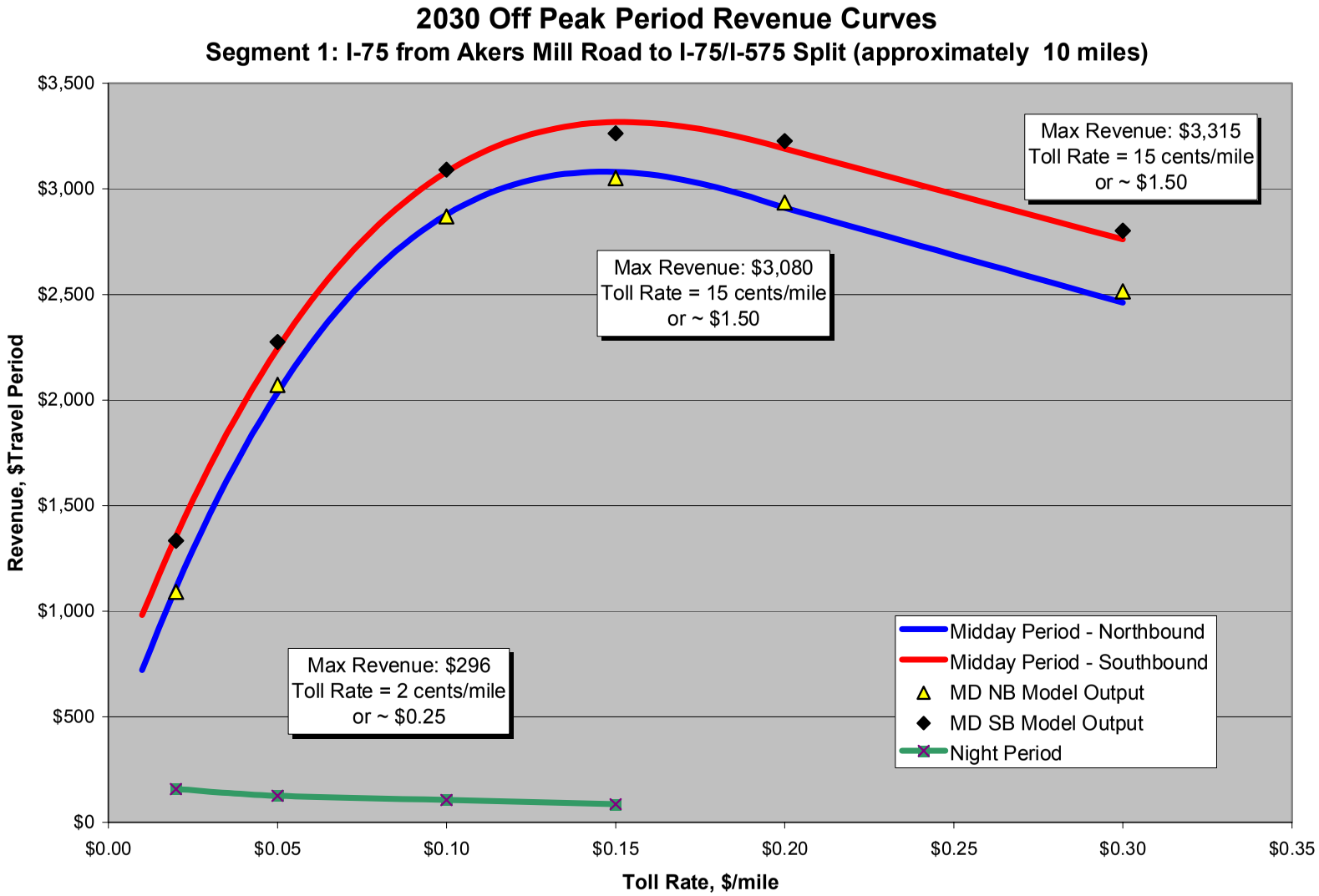


Figure 5-20: Horizon Year Midday Period Toll Sensitivity Curve – Segment 2

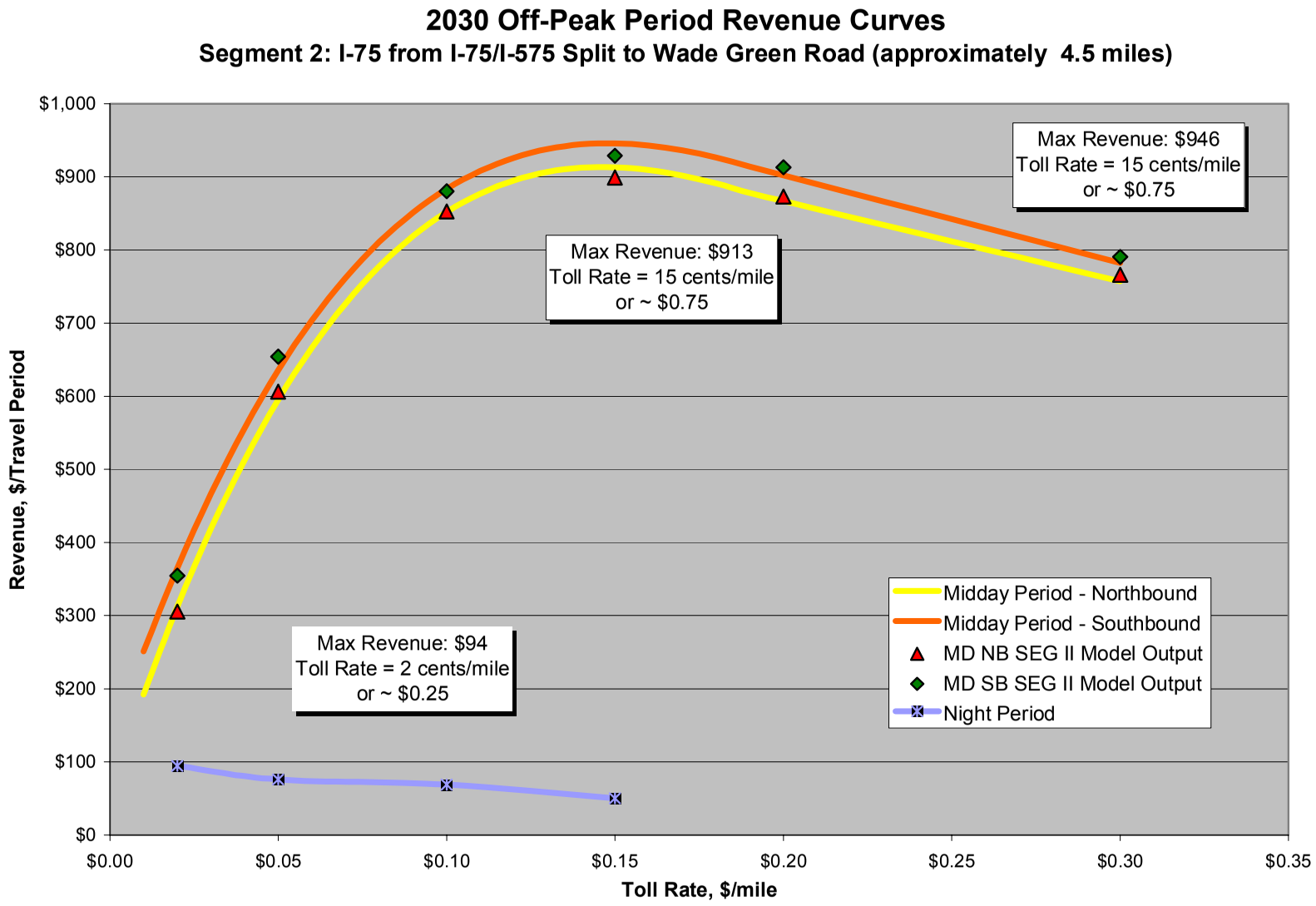
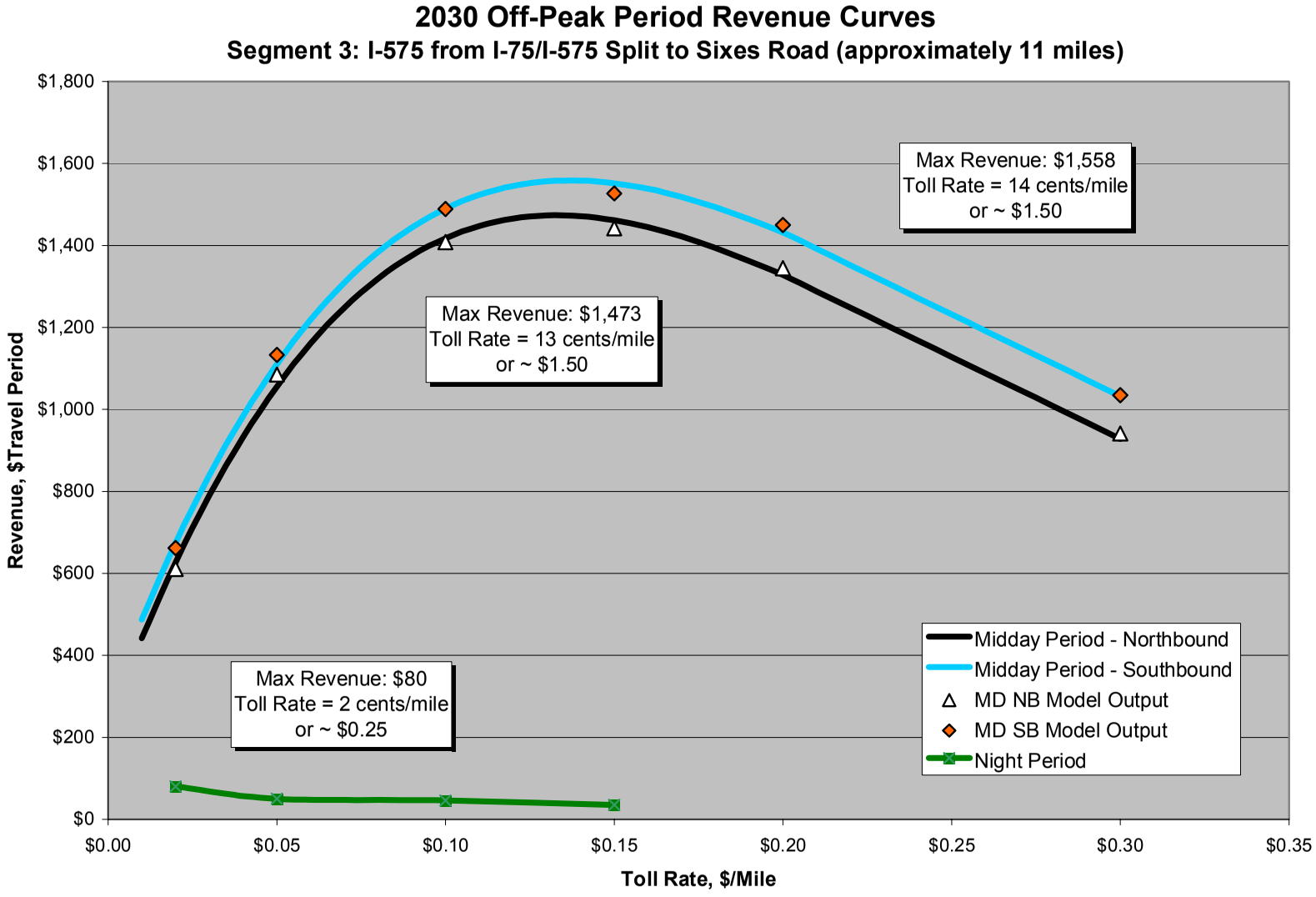


Figure 5-21: Horizon Year Midday Period Toll Sensitivity Curve – Segment 3



5.3 Toll Revenue Verses Operational Tradeoffs

There is a high degree of sensitivity and compromise between revenue maximization and optimizing travel efficiency. Generally, lower toll rates in the managed lanes results in higher usage. With a higher percent of the corridor's global demand in the managed lanes, demand, and more specifically operating speeds, in the general purpose lanes improve leading to an overall reduction in congestion. Consequently, improving the conditions in the general purpose lanes erodes the value of the managed lane to paying traffic. Constantly changing conditions results in a delicate balance between the operating conditions in the managed lanes and the general purpose lanes and the price associated with the managed lanes.

The previous section of this report illustrated the toll sensitivity analysis, or the impact to demand and usage under various per mile toll rates. The analysis resulted in the identification of optimum toll rates for each analysis period and direction. Depending on policy assumptions it is important to investigate revenue maximization, travel efficiency maximization, utilization rates in the general purpose and managed lanes, HOV travel pattern impacts and other factors when selecting pricing strategies and rate levels. To illustrate the tradeoffs between revenue optimization and operational efficiency toll rate operational profiles were developed for the a.m. peak period, p.m. peak period and midday period conditions. By studying these operational profiles it is easy to see the impact of pricing on operating conditions which in turn can help guide the achievement of policy objectives of the managed lanes in the I-75/575 corridor.

Figures 5-22 through 5-24 provide comparative operating profiles for opening year a.m. peak period, p.m. peak period and midday period. Each family of figures portrays:

- The revenue vs. toll rate;
- Vehicle-Miles Traveled (VMT) by occupancy class vs. toll rate; and,
- The travel speed in the managed lanes and general purpose lanes vs. toll rate.

This is further disaggregated by travel direction.

In Figure 5-22, data for Opening Year (2011) in the a.m. peak period is presented by direction. The optimum toll rate established in the previous section is annotated on the figure and is translated to the following figure as a black horizontal line. In the northbound direction the optimum toll rate is $0.08 per mile generating approximately $549 during that period for a typical weekday. In the southbound direction, the peak direction in the morning, the revenue toll rate and revenue are significantly higher. The southbound optimum toll rate and revenue are $0.23 per mile and $3,167 respectively.

In the second series of charts, vehicle-miles of travel (VMT) by direction are shown for:

- Total Vehicles on the managed lanes;
- Priced vehicles on the managed lanes (SOVs in this application); and,
- Free vehicles on the managed lanes (all HOVs in this application).

Again performance in the southbound direction substantially exceeds that of the northbound direction for each vehicle class.

In general, the volume of HOV-2+ vehicles (free vehicles) remains relatively constant regardless of toll rates. Obviously, since these vehicles are free they are not influenced by toll rate changes. The modest fluctuations in VMT can be attributed to change in operations in the general purpose lanes. However, the toll paying traffic steadily decreases as toll rates increase.

The two lower figures illustrate average speed drawn from the traffic assignment results in the general purpose and managed lanes with respect to various toll rates. As toll rates increase, average speed in the managed lanes increase slightly as more SOVs migrate back to the general purpose lanes. At very low toll rates the travel time savings provided by the managed lanes has tremendous value, attracting many SOV motorists. As a result, the managed lanes are inundated with SOV traffic driving the average speed down from the base condition where SOVs are prohibited from the managed lanes. This speed in the managed lanes steadily rebounds as willingness to pay decreases as the toll rate increases.

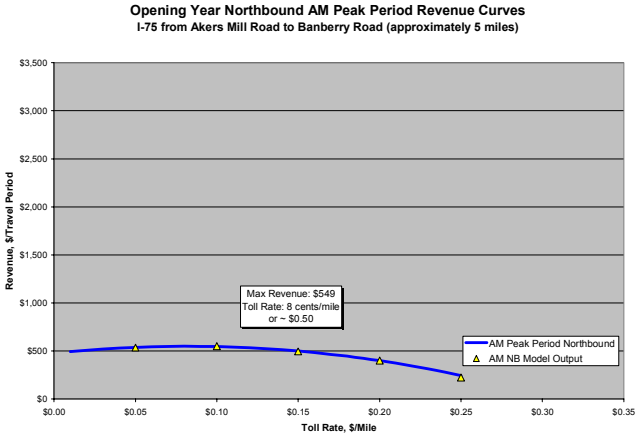
In Figure 5-23, data for Opening Year (2011) in the p.m. peak period is presented by direction. The major distinction is the reversal of travel patterns as the southbound peak direction swivels to the northbound direction in the p.m. peak period. Total revenue in the p.m. is close to 40 percent higher than in the a.m. peak period. This increase in revenue can be attributed to lower speeds in the general purpose lanes; 40 mph versus 20 mph, producing attractive travel time savings offered by the managed lanes.

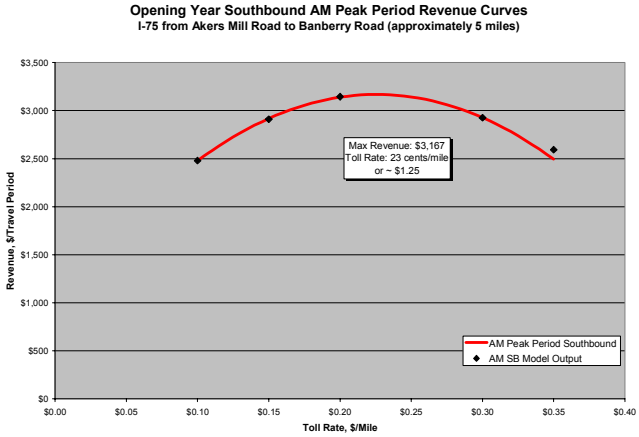
Managed lane usage, measured by VMT, illustrates consistent patterns in both directions. Generally, free traffic is steady and is not impacted by toll rates and paying traffic decreases at toll rates increase. Travel speeds in the general purpose lanes in the peak direction hover just above 20 mph while the managed lanes drop below 40 mph for lower toll rates but gradually climb close to 50 mph as the tolls increase.

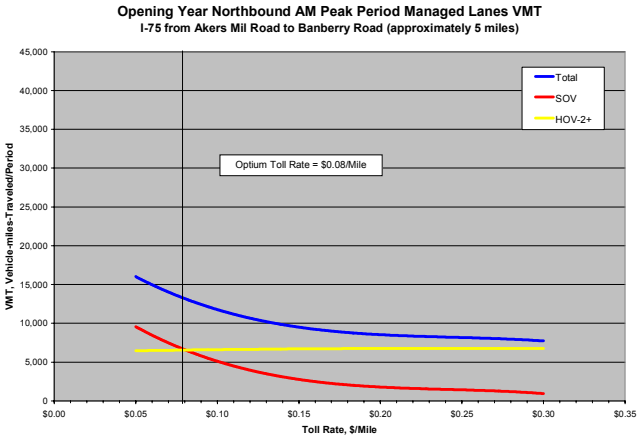
Similar data is presented for the midday analysis period. Revenue, VMT and average travel speed follow a similar logic as the peak periods, so a detailed description will not be repeated.

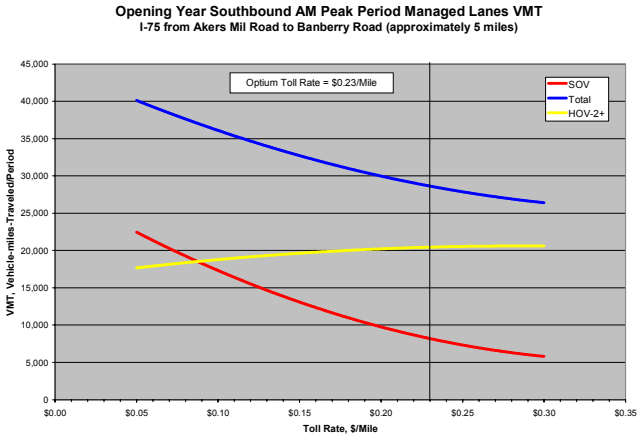
Figure 5-25 through 5-27 present the same information for the horizon year. The premise behind managed lanes is that as demand grows, the toll rates must escalate to preserve the operational characteristics of the system. Therefore, as traffic builds through the analysis period it is expected that growth in traffic is mainly carried by the general purpose lanes. In the I-75 corridor growth in HOV traffic is expected to keep pace with SOV demand basically absorbing the majority of capacity in the managed lanes and driving down the average speed. This is illustrated by reductions in both the managed lanes speeds and general purpose speed under toll-free conditions.

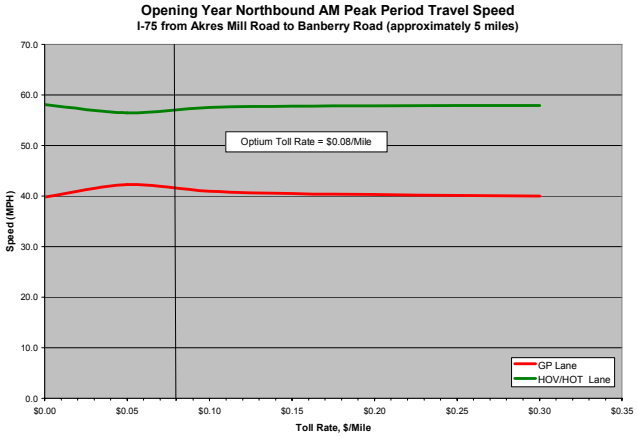
Figure 5-22: Toll Rate Operational Profile – Opening Year A.M. Peak Period











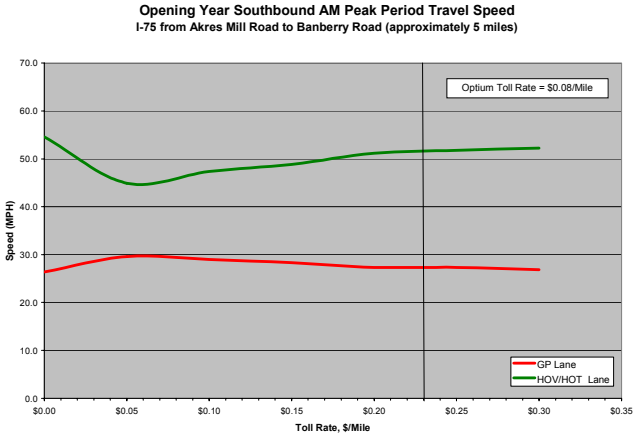
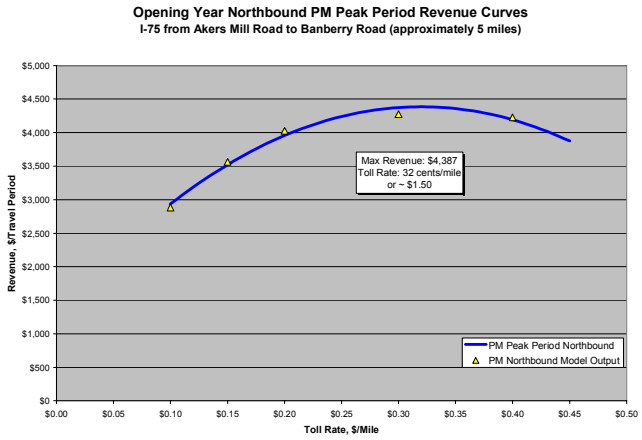
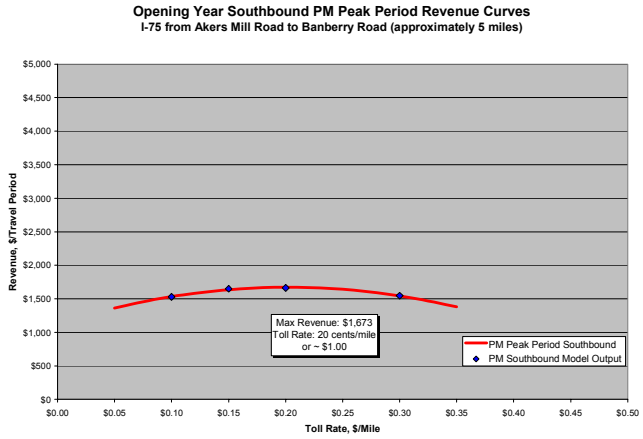
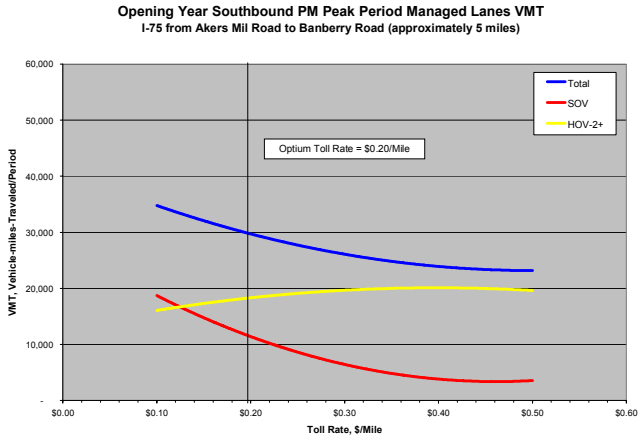
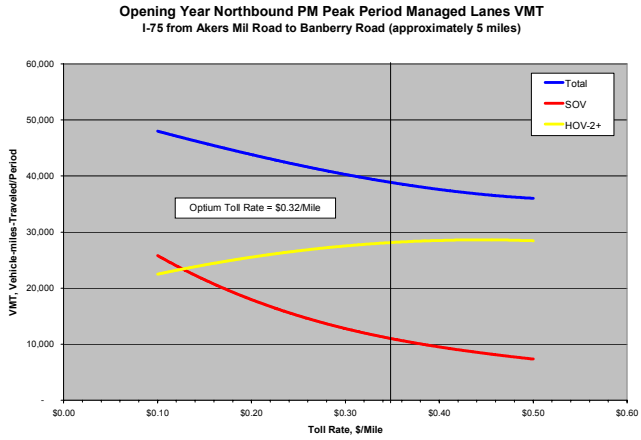


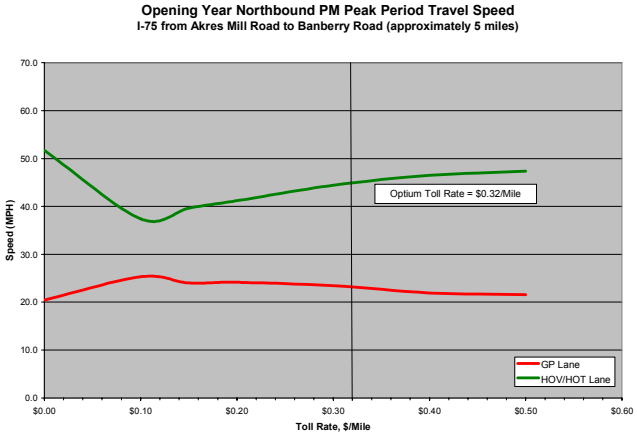
Figure 5-23: Toll Rate Operational Profile – Opening Year P.M. Peak Period











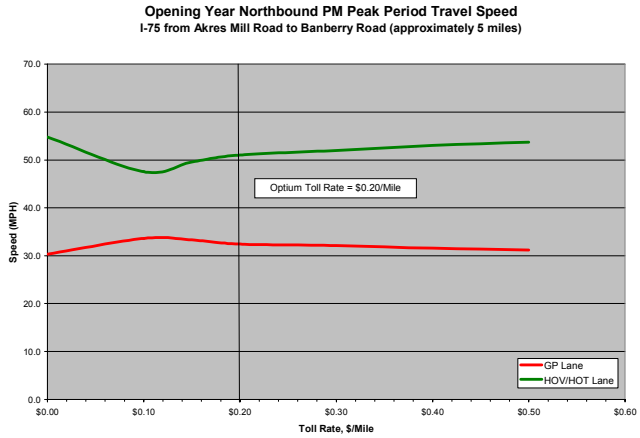
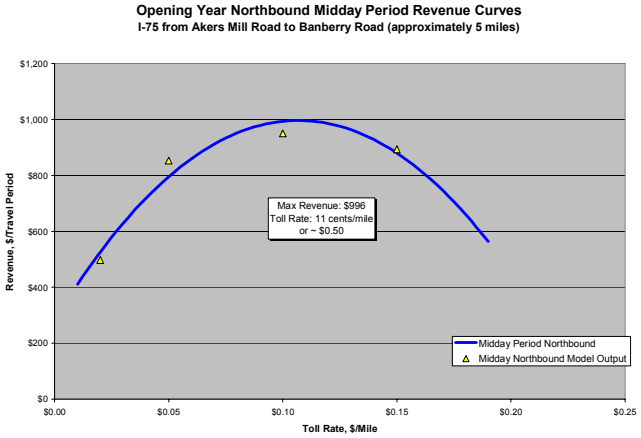
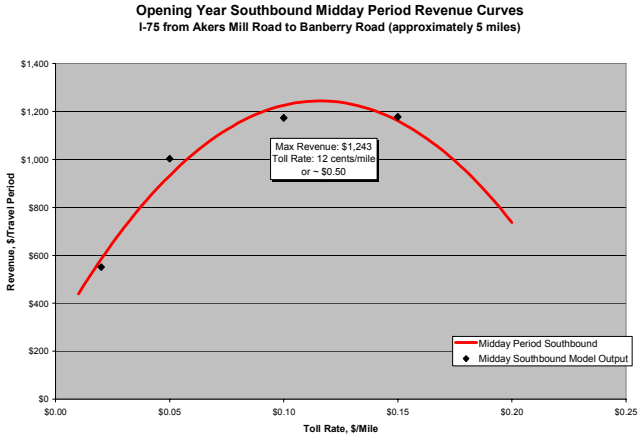
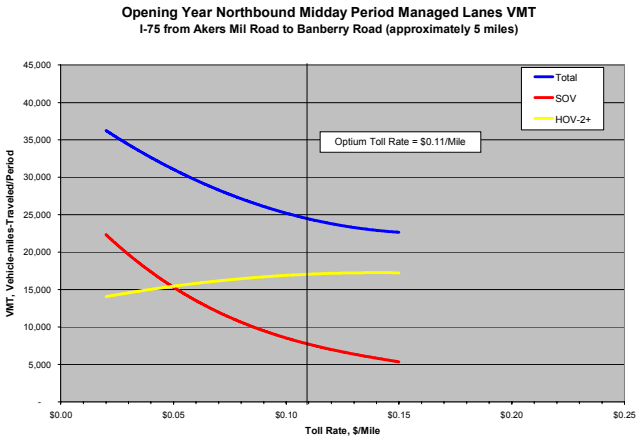
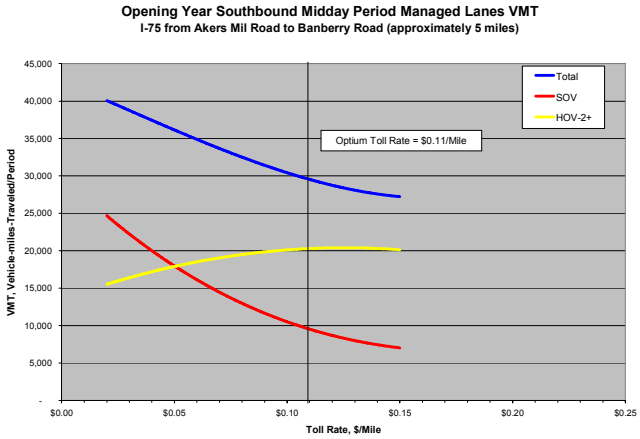


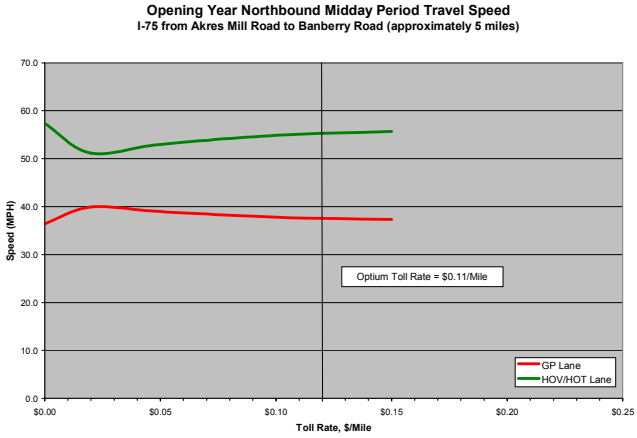
Figure 5-24: Toll Rate Operational Profile – Opening Year Midday Period











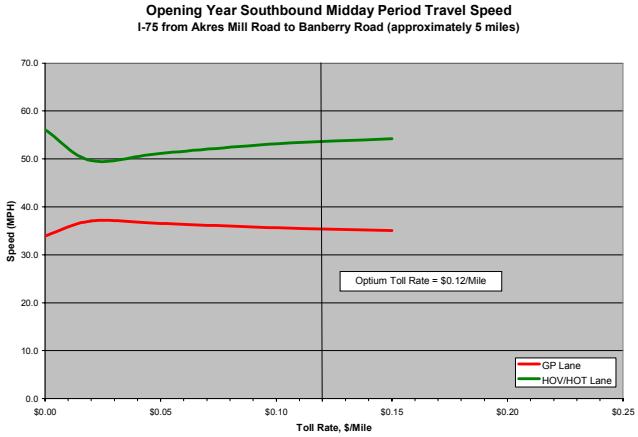


Figure 5-25: Toll Rate Operational Profile – Horizon Year A.M. Peak Period

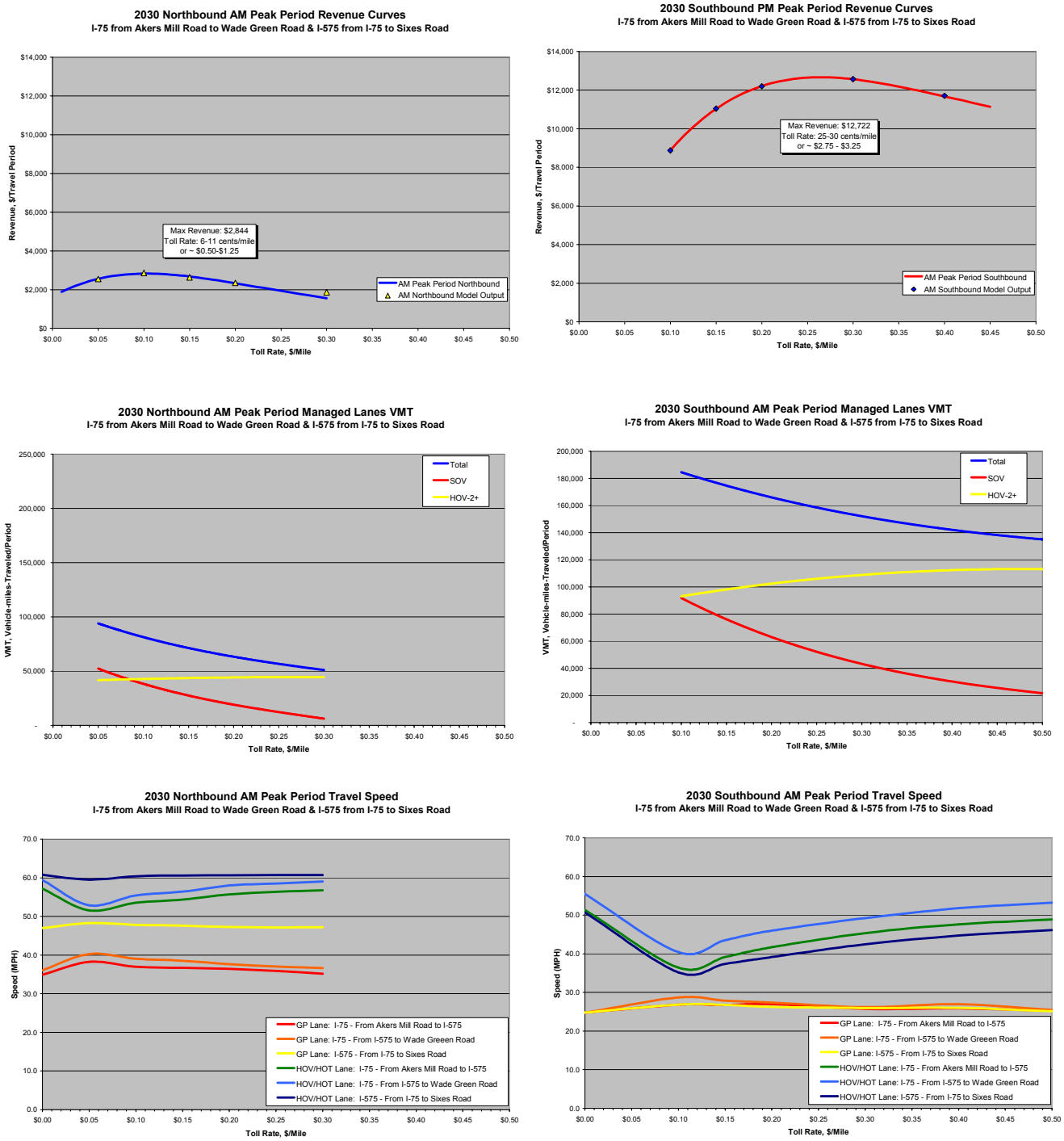


Figure 5-26: Toll Rate Operational Profile – Horizon Year P.M. Peak Period

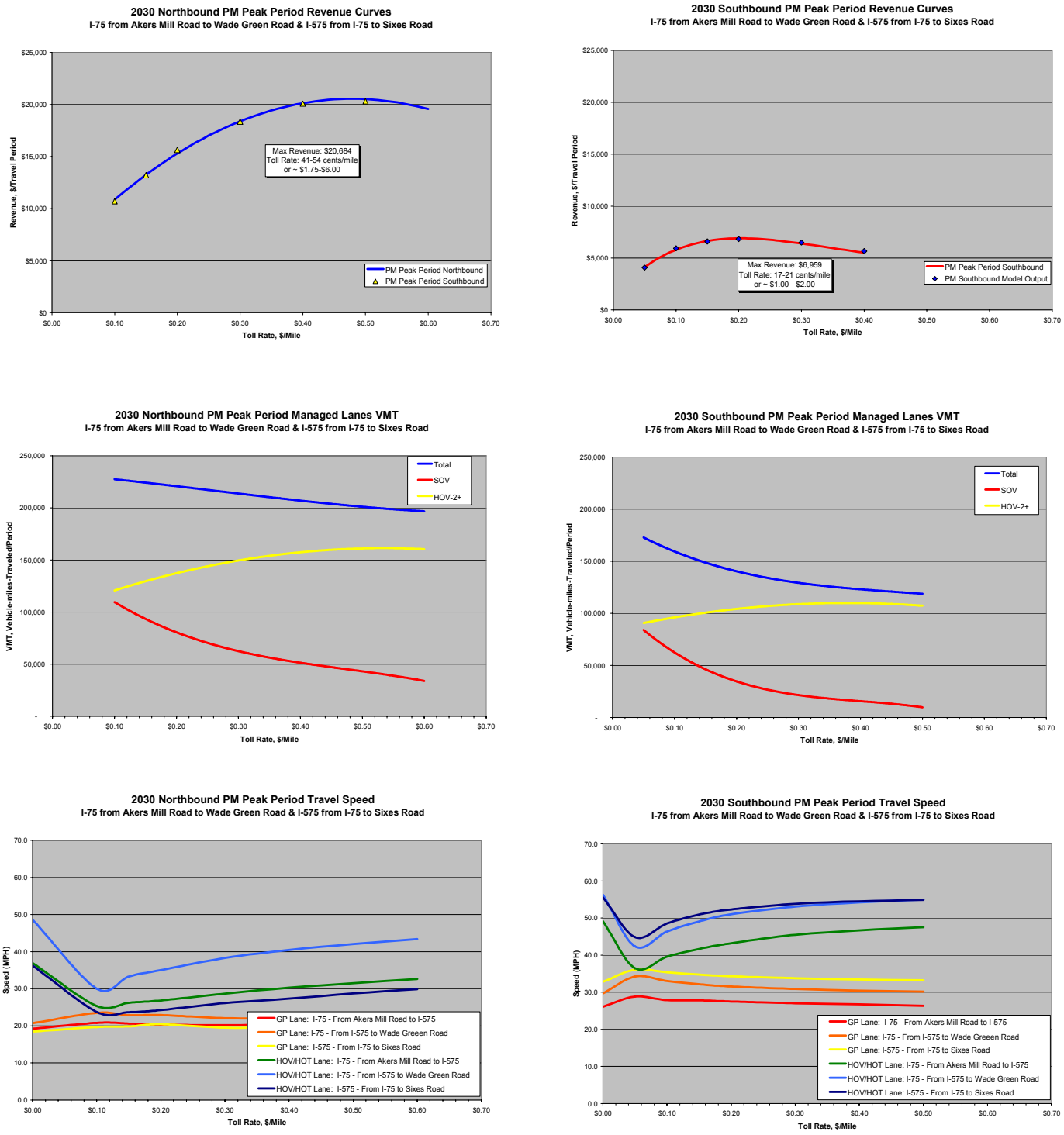
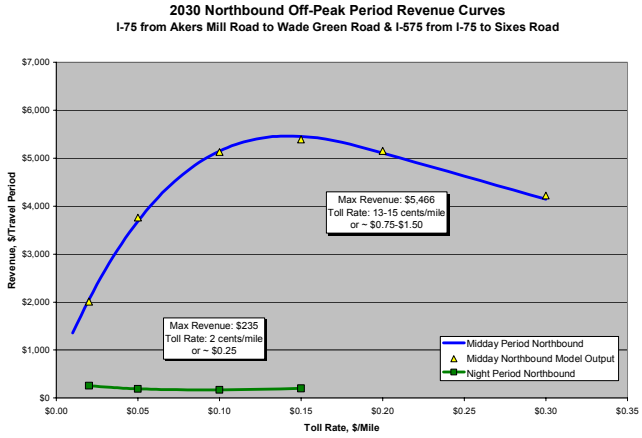
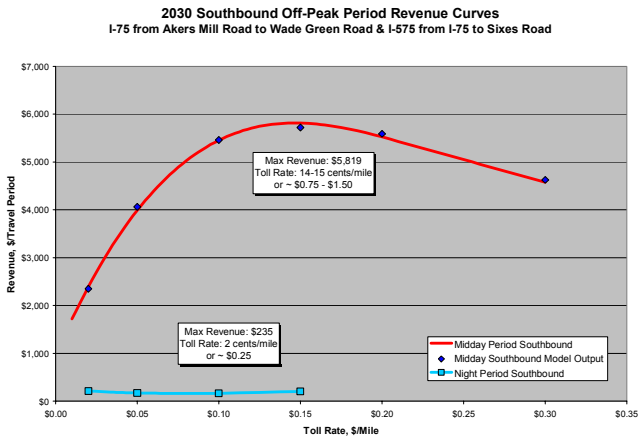
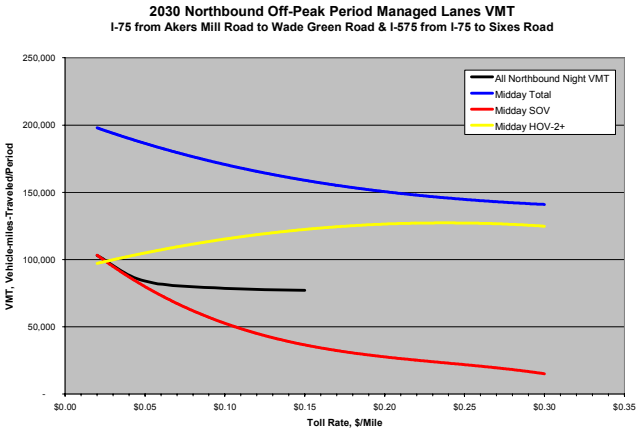
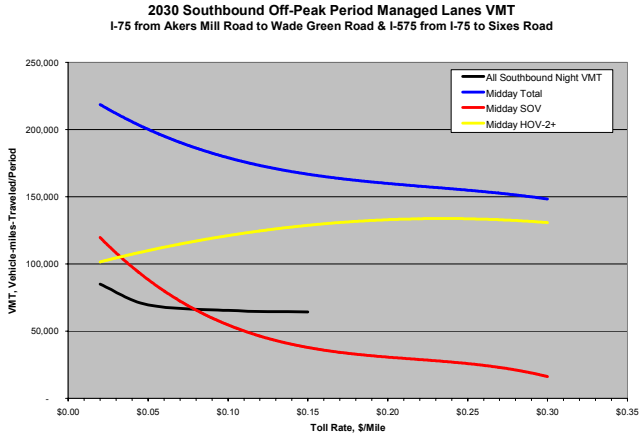


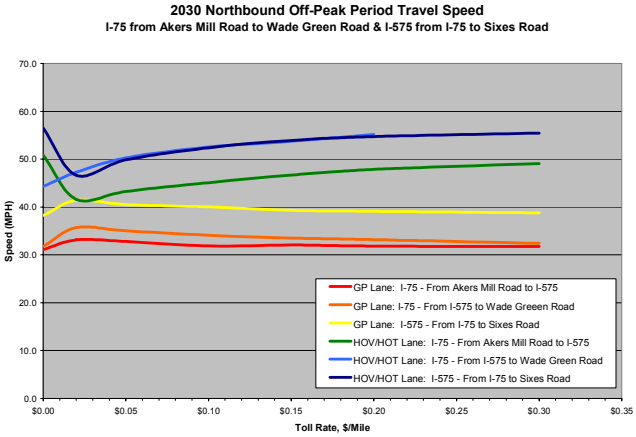
Figure 5-27: Toll Rate Operational Profile – Horizon Year Off-Peak Period

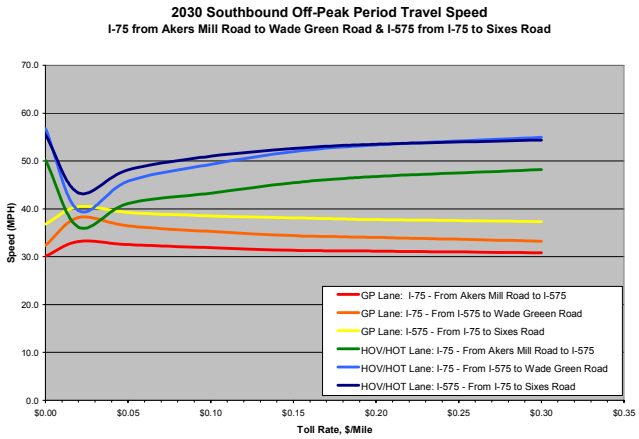












5.4 Toll Rate Selection Process

As presented earlier in this report there are four management techniques available to protect managed lanes operations: access, eligibility, occupancy and price. Two of the four variables are required to remain constant for this study, access and occupancy, with price and eligibility being the available mechanisms to protect mobility. The operational profiles help ascertain the most desirable combination of price and eligibility to achieve the goals of the project; specifically, the feasibility of selling excess capacity in the HOV lanes and the resulting traffic and revenue forecasts and impacts. The toll rate selection process framework blends management techniques with the overarching goals of the study. Therefore, the selection of toll rates must:

- Not erode managed lane average travel speed below 45 mph; and
- Optimize available toll rates.

The optimum toll rate is traditionally lower than the toll rate that produces the maximum amount of revenue. The logic is that if additional revenues are required an upwards rate adjustments can be made. This flexibility is exercised if revenues are not achieving desired performance levels. If there are no eligible toll rates after navigating this process SOV eligibility is revoked.

Table 5-1 presented the results of the toll rate selection process.

5.5 Revenue Projections

There are many ways to explain and measure toll revenue, each with a distinct purpose. For the toll objectives considered in this study, revenues have been categorized into two general sets of numbers.

- Modeled Gross Revenue – the predicted toll collections in every year of the forecast horizon, in which it is assumed that the modeled nominal toll rates will be adjusted annually for both inflation and growing demand so as to maintain optimality for the assumed tolling objectives. Given that 100 percent electronic toll collection (ETC) is a key assumption of this study, which carries with it potential efficiency losses from violations, errors, and/or an allotment of free trips per vehicle, a five percent deduction for ETC losses is included as an adjustment to the modeled revenue.
- Net Revenue – a measure of net financial revenue during the years that potential bonds are outstanding, which is based on the modeled adjusted gross revenue in the year of opening, less operating and maintenance costs and less a deduction for a traffic “ramp-up” period during which public acceptance is developing. Net revenues are those available for debt service payments.

Table 5-2 presents estimated gross toll revenue by period. Weekday revenue by travel direction was output from the travel demand model for each recommended toll rate. Revenues shown in the table for each period were obtained at the optimum toll levels described previously, for each travel direction and then aggregated to each daily period. For example, approximately $31,310 in daily revenue would be expected on a typical year 2020 weekday.

Table 5-2: Recommended Toll Rates

Year	Analysis Period	Direction	Maximum Revenue Toll Rates			Optimum Toll Rates			ML Speed @ Optimum Toll Rate			Recommended Toll Rate
			Seg. 1	Seg. 2	Seg. 3	Seg. 1	Seg. 2	Seg. 3	Seg. 1	Seg. 2	Seg. 3	
2011	AM Peak Period	Northbound	$ 0.08	N/A	N/A	$ 0.05	N/A	N/A	57	N/A	N/A	$ 0.05
		Southbound	$ 0.23	N/A	N/A	$ 0.15	N/A	N/A	49	N/A	N/A	$ 0.15
	Midday Period	Northbound	$ 0.11	N/A	N/A	$ 0.08	N/A	N/A	54	N/A	N/A	$ 0.08
		Southbound	$ 0.12	N/A	N/A	$ 0.08	N/A	N/A	53	N/A	N/A	$ 0.08
	PM Peak Period	Northbound	$ 0.32	N/A	N/A	$ 0.25	N/A	N/A	43	N/A	N/A	$ 0.30
		Southbound	$ 0.20	N/A	N/A	$ 0.15	N/A	N/A	52	N/A	N/A	$ 0.15
	Night	Northbound	$ 0.02	N/A	N/A	$ 0.02	N/A	N/A	59	N/A	N/A	$ 0.02
		Southbound	$ 0.02	N/A	N/A	$ 0.02	N/A	N/A	59	N/A	N/A	$ 0.02
2020	AM Peak Period	Northbound	$ 0.10	$ 0.10	$ 0.05	$ 0.05	$ 0.05	$ 0.05	58	54	60	$ 0.05
		Southbound	$ 0.28	$ 0.30	$ 0.29	$ 0.20	$ 0.20	$ 0.20	40	46	43	$ 0.30
	Midday Period	Northbound	$ 0.13	$ 0.13	$ 0.11	$ 0.08	$ 0.08	$ 0.08	47	51	55	$ 0.08
		Southbound	$ 0.14	$ 0.14	$ 0.12	$ 0.08	$ 0.08	$ 0.08	45	50	55	$ 0.08
	PM Peak Period	Northbound	$ 0.42	$ 0.41	$ 0.44	$ 0.30	$ 0.30	$ 0.30	30	40	31	**No SOV**
		Southbound	$ 0.20	$ 0.20	$ 0.15	$ 0.10	$ 0.10	$ 0.10	43	49	54	$ 0.15
	Night	Northbound	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	59	60	61	$ 0.02
		Southbound	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	59	60	61	$ 0.02
2030	AM Peak Period	Northbound	$ 0.11	$ 0.11	$ 0.06	$ 0.08	$ 0.08	$ 0.08	52	54	60	$ 0.08
		Southbound	$ 0.25	$ 0.25	$ 0.30	$ 0.20	$ 0.20	$ 0.20	42	39	40	$ 0.30
	Midday Period	Northbound	$ 0.15	$ 0.15	$ 0.13	$ 0.10	$ 0.10	$ 0.10	45	50	53	$ 0.10
		Southbound	$ 0.15	$ 0.15	$ 0.14	$ 0.10	$ 0.10	$ 0.10	43	49	52	$ 0.10
	PM Peak Period	Northbound	$ 0.46	$ 0.41	$ 0.54	$ 0.35	$ 0.35	$ 0.35	29	39	27	**No SOV**
		Southbound	$ 0.21	$ 0.21	$ 0.17	$ 0.15	$ 0.15	$ 0.15	41	49	50	$ 0.15
	Night	Northbound	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	58	60	61	$ 0.02
		Southbound	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	58	60	61	$ 0.02

If price alone can't preserve a desired 45 mph operating speed in the managed lanes then SOVs will not be permitted to buy-in during the designated analysis period. This condition is annotated in the table as "No SOV". Changes from optimum toll rates are highlighted in blue.

This study did not specifically evaluate weekend conditions. While traffic levels can sometimes be quite high on weekends, hourly traffic variations are generally significantly different than weekdays, resulting in both different utilization patterns and different pricing patterns for the managed lanes facility. Weekend revenue was estimated to be approximately 50 percent of weekday revenue, generally based upon comparable experience on currently operating managed lanes facilities around the country.

The nature of the capacity in the I-75 corridor is such that a small decrease in overall demand will result in substantial decrease in the managed lane volumes and revenues. Similarly, an increase in overall demand could produce a disproportionate increase in revenue. Additional investigation of these phenomena will be under taken in subsequent studies as GDOT moves forward into investment–grade studies and ultimately implementation.

Finally, estimated annual toll revenue was computed based on an assumed 250 weekdays per year and 115 weekend/holiday per year. Weekends and holidays were assumed to produce revenue equivalent to 50 percent of the estimated weekday level.

Table 5-3: Annual Gross Toll Revenue (un-inflated dollars)

Year	Weekday Revenue By Period (1)				Total Weekday	Weekend Day (2)	Estimated Annual Revenue (3)	Cumulative Gross Revenue
	AM Peak	Midday	PM Peak	Night				
2011	$3,450	$2,020	$5,930	$140	$11,540	$5,770	$3,371,123	$3,371,123
2012	$3,800	$2,220	$6,640	$150	$12,810	$6,405	$3,742,121	$7,113,244
2013	$4,540	$2,700	$7,440	$190	$14,870	$7,435	$4,343,899	$11,457,143
2014	$5,600	$3,330	$8,330	$200	$17,460	$8,730	$5,100,503	$16,557,645
2015	$6,220	$3,700	$9,330	$220	$19,470	$9,735	$5,687,674	$22,245,319
2016	$8,140	$4,940	$3,530	$290	$16,900	$8,450	$4,936,913	$27,182,231
2017	$9,090	$5,480	$3,840	$310	$18,720	$9,360	$5,468,580	$32,650,811
2018	$12,740	$7,270	$4,920	$380	$25,310	$12,655	$7,393,684	$40,044,495
2019	$14,130	$8,070	$5,340	$410	$27,950	$13,975	$8,164,894	$48,209,389
2020	$16,000	$9,040	$5,820	$450	$31,310	$15,655	$9,146,434	$57,355,823
2021	$16,000	$9,184	$5,894	$452	$31,530	$15,765	$9,210,657	$66,566,480
2022	$16,000	$9,331	$5,968	$454	$31,753	$15,876	$9,275,828	$75,842,307
2023	$16,000	$9,480	$6,044	$456	$31,979	$15,990	$9,341,959	$85,184,266
2024	$16,000	$9,631	$6,120	$458	$32,209	$16,105	$9,409,066	$94,593,332
2025	$16,000	$9,784	$6,198	$460	$32,442	$16,221	$9,477,163	$104,070,494
2026	$16,000	$9,940	$6,276	$462	$32,679	$16,339	$9,546,264	$113,616,759
2027	$16,000	$10,099	$6,356	$464	$32,919	$16,459	$9,616,386	$123,233,144
2028	$16,000	$10,260	$6,436	$466	$33,162	$16,581	$9,687,543	$132,920,687
2029	$16,000	$10,424	$6,518	$468	$33,410	$16,705	$9,759,750	$142,680,438
2030	$16,000	$10,590	$6,600	$470	$33,660	$16,830	$9,832,928	$152,513,365

(1) 2005 Dollars

(2) Weekend day approximated to be 50 percent of weekday total revenue

(3) Annual revenue assume 250 weekdays and 115 weekend/holidays

5.6 Estimated Weekday Managed Lanes Traffic

Figures 5-28 through 5-30 present the estimated traffic on the managed lanes, for each analysis year. In each case, daily traffic levels are shown for each mainline segment of the managed lanes in black. Additionally, a.m. and p.m. peak period volumes are shown in green and red respectively. All volumes are shown in thousands. In addition to the mainline segment volumes, daily and peak period volumes are shown for the access locations.

In general, the peak load point on the managed lanes is just north of I-285, or just south of Terrell Mill Road. At this location, total daily traffic in the managed lanes exceeds 44,000 vehicles per day in 2011 and is expected to grow to over 73,000 by 2030. Peak period volumes in each direction generally fall between 7,000 and 8,500. Even though these peak period volumes consume approximately 50 percent of the available capacity the opportunities exist to accommodate additional growth as demand in the corridor expands.

The ability to accommodate growth is accomplished by modifying the toll rate structure or eligibility requirement to preserve the operational characteristics of the managed lanes system. As HOV demand grows, less of the available capacity of the managed lanes is available to sell to SOV traffic requiring the toll rate be increased. In the p.m. peak period in the northbound direction price alone fails to protect the operational goals of the managed lanes resulting in the need to adjust the eligibility requirements and disallow SOVs to buy into the managed lanes during this time period.

At the northern most sections of the project both daily and peak period volume are generally lower. This is particularly true north of the I-75 / I-575 interchange where the managed lanes are constricted to one lane per direction. At build-out, year 2020, daily volumes on I-75 managed lanes just north of Big Shanty Road are estimated to be 10,000. Similarly, just north of Dupree Road on I-575 daily volume are expected to exceed 19,000.

While the southern sections of the managed lanes system carry the most traffic, the travel sections on I-575 posses the greatest travel time savings ratio - free flow travel time divided by congested travel time. This can be attributed to burgeoning commuting population from Cherokee County and growing delays at the I-75 / I-575 interchange. Travel time savings on this 11-mile section ranges from 15 minutes in the a.m. peak period to over 20 minutes in the p.m. peak period highlighting the advantages of the managed lanes system.

5.7 Managed Lane Operational Summary

Estimated trip volumes on both the managed lanes and general purposes lanes for each per-mile toll rate are provided in Appendix 5-A. Under these conditions, the operational profiles are provided for each analysis period and for each analysis year. The data is organized by geographic section such that the operational data provided is aggregated for simplicity of presentation. In addition to volumes in the general purpose and managed lanes, average corridor travel time, average speed, volume to capacity ratios, average delay and period toll revenues are presented.

Figure 5-28 Estimated Opening Year (2011) Managed Lane Traffic

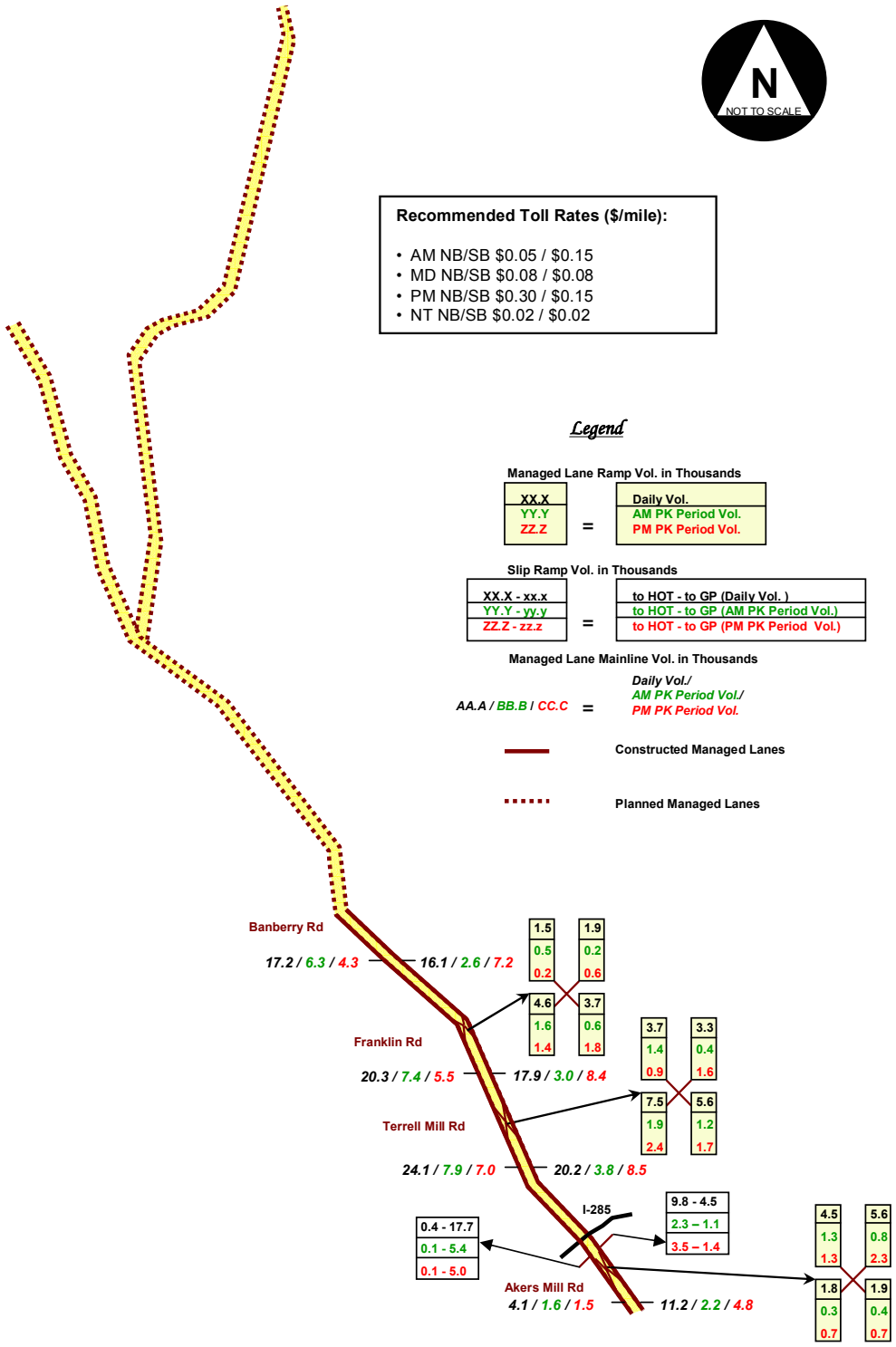


Figure 5-29 Estimated Build-Out (2020) Managed Lane Traffic

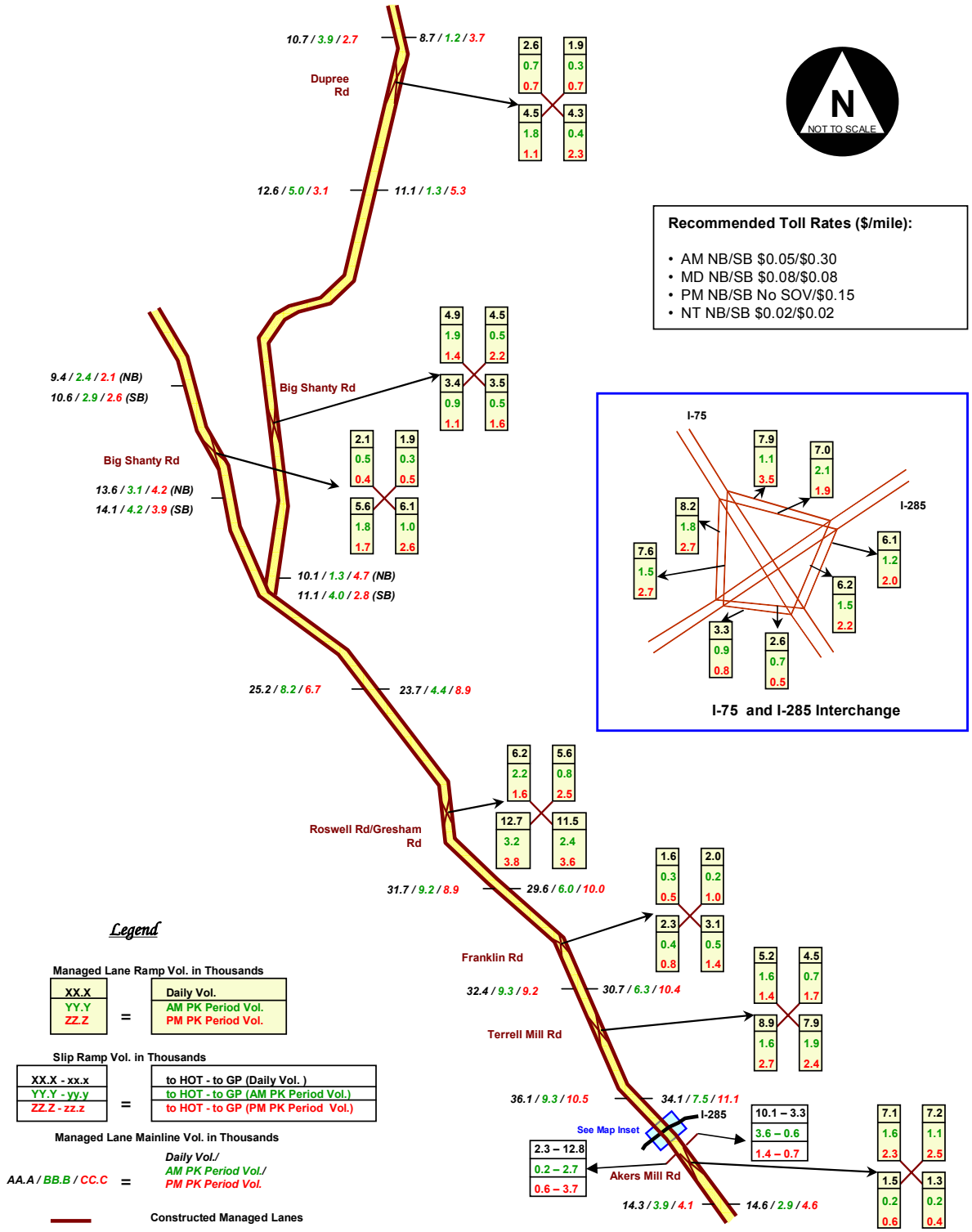
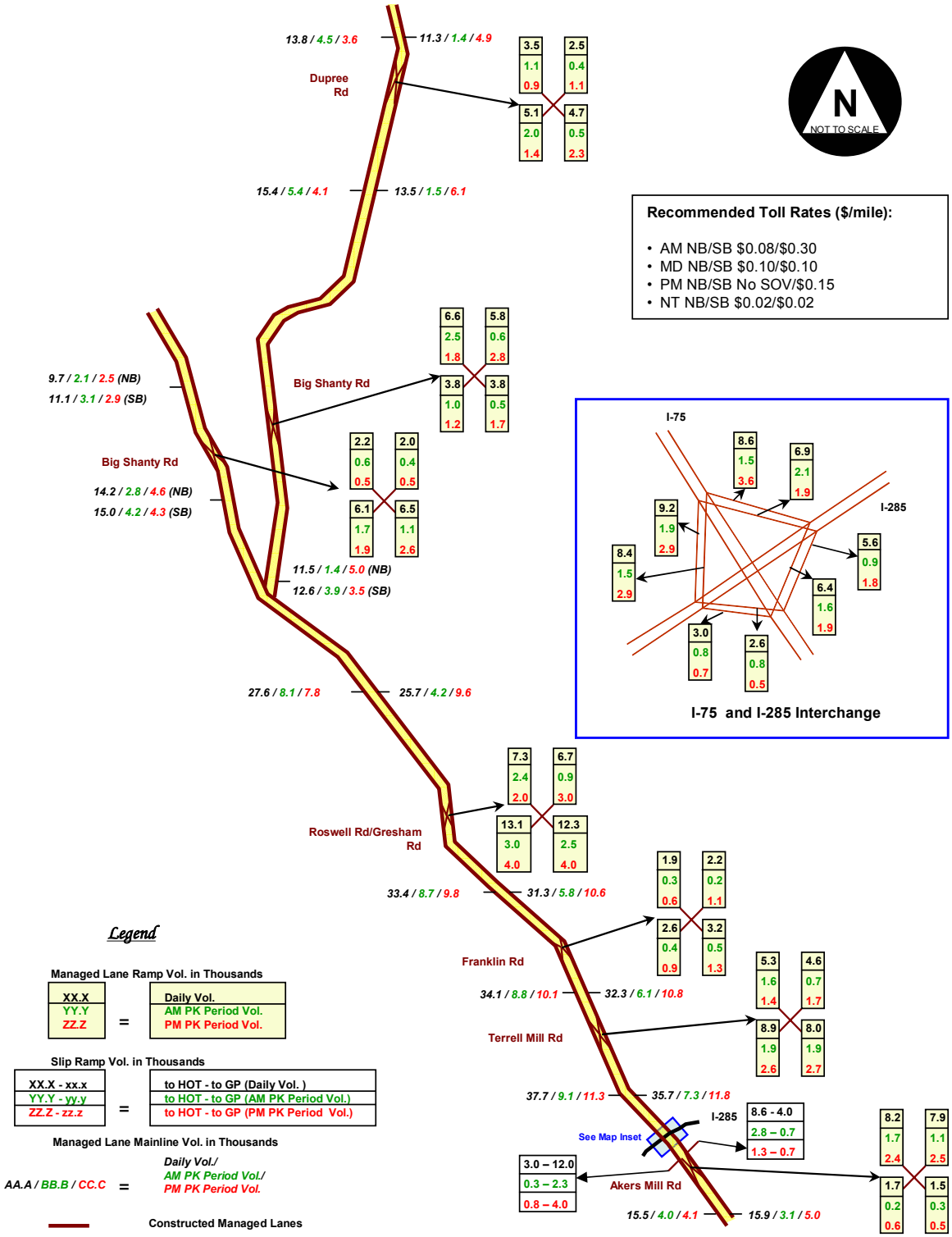


Figure 5-28 Estimated Horizon Year (2030) Managed Lane Traffic



5.7.1 Managed Lanes Traffic Share

Table 5-2 provides a summary of the estimated share of managed lane traffic when compared to the overall corridor demand, which would be expected to be accommodated at 2011, 2020, and 2030 levels. For each analysis period, the table presents the estimated total demand in the general purpose lanes and SOV and HOV demand in the managed lanes.

The managed lanes share is relatively stable from build-out onwards in time, largely because HOV traffic is free and SOV traffic is metered by the toll rates. Generally, managed lanes capacity is approximately 28 percent of the available capacity in the corridor. Without any demand management techniques in place it is expected that the managed lanes share would mirror the available capacity. With occupancy, eligibility, and price constraints the managed lanes share of demand is generally kept below 20 percent preserving the desired operational characteristics. In the p.m. peak period in 2020 and 2030 with per mile toll rates above $0.50 per mile managed lanes shares approached 25 percent impacting the performance of the managed lanes so severely that SOV are prohibited from utilizing the lanes during this time period.

Table 5-4: Managed Lanes Traffic Share

Year	Analysis Period	Direction	General Purpose Lanes	Managed Lanes			Total Corridor	Managed Lanes Share
				HOV	SOV	Total		
2011	A.M. Peak Period	NB	26,673	1,289	1,325	2,614	29,287	8.9%
		SB	32,854	3,772	3,477	7,249	40,103	18.1%
	Midday Period	NB	36,665	3,261	2,249	5,510	42,175	13.1%
		SB	35,815	3,843	2,700	6,543	42,358	15.4%
	P.M. Peak Period	NB	26,673	1,289	1,925	3,214	29,887	10.8%
		SB	32,854	3,772	3,477	7,249	40,103	18.1%
	Night Period	NB	35,332	954	542	1,496	36,828	4.1%
		SB	30,908	734	699	1,433	32,341	4.4%
2020	A.M. Peak Period	NB	53,182	3,815	5,766	9,581	62,763	15.3%
		SB	72,298	11,159	5,392	16,551	88,849	18.6%
	Midday Period	NB	74,650	9,765	7,209	16,974	91,624	18.5%
		SB	74,346	10,293	7,899	18,192	92,538	19.7%
	P.M. Peak Period	NB	81,624	17,155	-	17,155	98,779	17.4%
		SB	63,635	9,480	4,754	14,234	77,869	18.3%
	Night Period	NB	74,858	3,777	1,654	5,431	80,289	6.8%
		SB	66,325	2,875	1,311	4,186	70,511	5.9%
2030	A.M. Peak Period	NB	53,182	3,815	5,766	9,581	62,763	15.3%
		SB	72,616	11,795	4,940	16,735	89,351	18.7%
	Midday Period	NB	79,342	12,696	7,353	20,049	99,391	20.2%
		SB	77,365	13,413	6,722	20,135	97,500	20.7%
	P.M. Peak Period	NB	82,977	19,044	-	19,044	102,021	18.7%
		SB	66,512	11,089	5,366	16,455	82,967	19.8%
	Night Period	NB	77,903	4,270	1,664	5,934	83,837	7.1%
		SB	69,627	3,431	1,395	4,826	74,453	6.5%

5.8 Net Revenue Estimates

The net revenue available for non-operational activities such as financing the construction is the gross revenue collected from the traffic utilizing the managed lanes, minus upfront and ongoing costs of operating the toll collection and billing systems, and the maintenance of the toll collection equipment and the road and bridge maintenance costs. The gross revenue streams are detailed in previous sections of this chapter, toll equipment capital and maintenance costs and billing and administrative costs are detailed in Chapter 6. Roadway and bridge maintenance cost are not considered as part of this analysis.

A detailed toll sensitivity analysis and toll selection process was performed to identify the recommend toll rate structure for each of the analysis years. Tolls are used to manage demand in the lanes and to maintain desirable operating conditions. To optimize toll revenue and traffic operations, toll rates vary by time of day and direction of travel. For each set of toll rates, traffic volume utilizing the managed lanes system was calculated in opening year (2011), build-out year (2020), and horizon year (2030).

Traffic and revenue for intermediate years was linearly interpolated. Over the 20-year analysis period, traffic utilizing the managed lanes system increased dramatically as the managed lanes system expanded. Annual toll transactions are expected to grow by almost 100 percent over the first 10-years. Much of this growth can be attributed to the expansion of the system although organic growth is still significant. After 2030, annual growth was held to a flat rate of 0.25% to reflect increases in demand in the corridor but also recognizing that HOV traffic (free) continues to consume more and more of the available capacity in the managed lanes thereby reducing sellable capacity.

For the financial calculations from 2011 to 2050, all revenue and cost numbers are in 2005 dollars, with no inflation, to provide a direct comparison to estimated cost of construction and potential capital financing packages. Based upon the projected traffic volumes and toll rates detailed previously, daily gross revenue was calculated for each year. The daily gross revenue was annualized by multiplying average weekday volumes by 250 weekdays per year and 115 weekend/holidays per year. Weekend/holiday demand was assumed to be one half of the average weekday demand.

From the gross annual gross revenue, several sets of costs are deducted to determine net revenue.

5.8.1 Upfront and Ongoing Cost

The upfront and ongoing costs are detailed in Chapter 6. In summary these costs are:

- Toll Equipment Costs – Installed in phases with 10-year updates;
- Toll Equipment Maintenance Costs - ~10 percent of installed equipment costs;
- Transaction Processing Costs - $0.12 per tolled transaction;
- Administrave Staff – Current SRTA staff would be utilized (no cost);
- Maintenance Staff – Covered as part of the toll equipment maintenance costs;
- Billing and Customer Service Staff/Cost - $1.40 per month per transponder;

- Bridge and Roadway Maintenance Costs – none assumed;
- Cost of Underwriting the Debt – 2% of assumed debt;
- Rehabilitation and Repair Reserve – 5% of construction costs.

In addition to the above costs, some of the vehicle tolls will be uncollectable due to violations, or inability to collect. Combined it is estimates that 2.0 percent of the transactions will fall into one of these categories.

5.8.2 Debt Service

Although not a formal part of this analysis, debt service has been estimated to provide a simple tool for determining what level of debt could be covered by the forecasted toll revenue stream. These calculations are included in the tables below.

5.8.3 Net Revenue Summary

Table 5-3 summarizes the net revenue stream. Table 5-4 presents the net revenue summary for current year 2005 dollars and inflated dollars.

Table 5-5 Net Revenue Summary ($000)

Year	Gross Annual Toll Revenue (1)	Annual Transactions (2)	Uncollectable / Non-Revenue (3)	Cost per Transaction (4)	Toll Equipment Maintenance Costs (5)	Customer Service Operations Cost (6)	Net Annual Revenue	Cumulative Annual Revenue	Toll Equipment Capital Costs (5)	Debt Service Payments (7)	Net Annual Revenue - Debt Service	Cumulative Net Revenue - Debt Service
2010									$11,133			
2011	$2,528	4,410	$225	$529	$1,113	$556	$105	$105	$0	$912	-$807	-$807
2012	$3,368	5,215	$266	$626	$1,113	$657	$706	$811	$0	$912	-$206	-$1,013
2013	$3,910	6,020	$307	$722	$1,113	$759	$1,008	$1,819	$0	$912	$96	-$917
2014	$5,101	6,860	$350	$823	$1,113	$864	$1,950	$3,770	$0	$912	$1,038	$121
2015	$5,688	7,665	$391	$920	$1,378	$966	$2,034	$5,803	$2,644	$1,132	$902	$1,023
2016	$4,937	8,470	$432	$1,016	$1,378	$1,067	$1,044	$6,847	$0	$1,132	-$88	$935
2017	$5,469	9,275	$473	$1,113	$1,378	$1,169	$1,337	$8,184	$0	$1,132	$205	$1,140
2018	$7,394	10,080	$514	$1,210	$1,378	$1,270	$3,023	$11,206	$0	$1,132	$1,891	$3,030
2019	$8,165	10,885	$555	$1,306	$1,378	$1,372	$3,554	$14,761	$0	$1,132	$2,423	$5,453
2020	$9,146	11,690	$596	$1,403	$2,367	$1,473	$3,307	$18,068	$11,806	$2,101	$1,206	$6,659
2021	$9,211	11,865	$605	$1,424	$2,367	$1,495	$3,320	$21,387	$0	$2,101	$1,219	$7,878
2022	$9,276	12,040	$614	$1,445	$2,367	$1,517	$3,333	$24,720	$0	$2,101	$1,232	$9,110
2023	$9,342	12,180	$621	$1,462	$2,367	$1,535	$3,357	$28,078	$0	$2,101	$1,256	$10,366
2024	$9,409	12,355	$630	$1,483	$2,367	$1,557	$3,372	$31,450	$0	$2,101	$1,271	$11,637
2025	$9,477	12,530	$639	$1,504	$2,367	$1,579	$3,388	$34,838	$434	$2,101	$1,287	$12,925
2026	$9,546	12,670	$646	$1,520	$2,367	$1,596	$3,416	$38,254	$0	$2,101	$1,315	$14,239
2027	$9,616	12,845	$655	$1,541	$2,367	$1,618	$3,434	$41,688	$0	$2,101	$1,333	$15,572
2028	$9,688	13,020	$664	$1,562	$2,367	$1,641	$3,454	$45,141	$0	$2,101	$1,353	$16,925
2029	$9,760	13,195	$673	$1,583	$2,367	$1,663	$3,474	$48,615	$0	$2,101	$1,373	$18,298
2030	$9,833	13,335	$680	$1,600	$2,367	$1,680	$3,505	$52,120	$4,288	$2,101	$1,404	$19,702
2031	$9,858	13,370	$682	$1,604	$2,367	$1,685	$3,520	$55,640	$0	$2,101	$1,419	$21,121
2032	$9,883	13,405	$684	$1,609	$2,367	$1,689	$3,534	$59,175	$0	$2,101	$1,433	$22,554
2033	$9,908	13,440	$685	$1,613	$2,367	$1,693	$3,549	$62,724	$0	$2,101	$1,448	$24,002
2034	$9,933	13,475	$687	$1,617	$2,367	$1,698	$3,564	$66,287	$0	$2,101	$1,463	$25,465
2035	$9,958	13,510	$689	$1,621	$2,367	$1,702	$3,578	$69,866	$434	$2,101	$1,477	$26,942
2036	$9,983	13,545	$691	$1,625	$2,367	$1,707	$3,593	$73,459	$0	$2,101	$1,492	$28,434

Year	Gross Annual Toll Revenue (1)	Annual Transactions (2)	Uncollectable / Non-Revenue (3)	Cost per Transaction (4)	Toll Equipment Maintenance Costs (5)	Customer Service Operations Cost (6)	Net Annual Revenue	Cumulative Annual Revenue	Toll Equipment Capital Costs (5)	Debt Service Payments (7)	Net Annual Revenue - Debt Service	Cumulative Net Revenue - Debt Service
2037	$10,008	13,580	$693	$1,630	$2,367	$1,711	$3,607	$77,066	$0	$2,101	$1,506	$29,941
2038	$10,033	13,615	$694	$1,634	$2,367	$1,715	$3,622	$80,688	$0	$2,101	$1,521	$31,462
2039	$10,058	13,650	$696	$1,638	$2,367	$1,720	$3,637	$84,325	$0	$2,101	$1,536	$32,998
2040	$10,083	13,685	$698	$1,642	$2,367	$1,724	$3,651	$87,976	$4,288	$2,101	$1,550	$34,548
2041	$10,108	13,720	$700	$1,646	$2,367	$1,729	$3,666	$91,642	$0	$1,189	$2,477	$37,025
2042	$10,133	13,755	$702	$1,651	$2,367	$1,733	$3,680	$95,322	$0	$1,189	$2,492	$39,516
2043	$10,158	13,790	$703	$1,655	$2,367	$1,738	$3,695	$99,018	$0	$1,189	$2,506	$42,023
2044	$10,183	13,825	$705	$1,659	$2,367	$1,742	$3,710	$102,727	$0	$1,189	$2,521	$44,543
2045	$10,208	13,860	$707	$1,663	$2,367	$1,746	$3,724	$106,452	$434	$1,189	$2,535	$47,079
2046	$10,234	13,895	$709	$1,667	$2,367	$1,751	$3,740	$110,191	$0	$969	$2,771	$49,850
2047	$10,260	13,930	$710	$1,672	$2,367	$1,755	$3,756	$113,947	$0	$969	$2,786	$52,636
2048	$10,286	13,965	$712	$1,676	$2,367	$1,760	$3,771	$117,718	$0	$969	$2,802	$55,438
2049	$10,312	14,000	$714	$1,680	$2,367	$1,764	$3,787	$121,505	$0	$969	$2,818	$58,256
2050	$10,338	14,035	$716	$1,684	$2,367	$1,768	$3,802	$125,307	$4,288	$969	$2,833	$61,089

(1) Revenues and Costs are in 2005 dollars.

(2) Annual transaction do not include non-toll paying vehicles

(3) Uncollectable / Non-revenue assumes a 2% violation rate with a $3.00 per violation processing cost and shared operations.

(4) Transaction cost are estimated to be $0.12 per tolled transaction.

(5) Toll Equipment Maintenance costs are for Concept B-1.

(6) Customer Service Center costs are for Concept B-1 with reduced/shared operations.

(7) Debt service payments were estimated based capitalizing initial toll equipment costs over a 30-year period @ 7.0% APR.

Table 5-6: Annual Toll Revenue in Inflated Dollars

Year	UNINFLATED DOLLARS (000)				Inflation Factors		INFLATED DOLLARS (000)			
	Total Gross Annual Toll Revenue	Total Capital, O&M, Debt Service	Net Annual Revenue	Net Cumulative Annual Revenue	Toll Revenue	Capital & Operating	Total Gross Annual Toll Revenue	Total Capital, O&M, Debt Service	Net Annual Revenue	Net Cumulative Annual Revenue
2010					1.131	1.159				
2011	$2,528	$3,335	-$807	-$807	1.160	1.194	$2,933	$3,950	-$1,017	-$1,017
2012	$3,368	$3,574	-$206	-$1,013	1.189	1.230	$4,004	$4,331	-$327	-$1,345
2013	$3,910	$3,813	$96	-$917	1.218	1.267	$4,762	$4,733	$29	-$1,316
2014	$5,101	$4,063	$1,038	$121	1.249	1.305	$6,371	$5,169	$1,202	-$113
2015	$5,688	$4,786	$902	$1,023	1.280	1.344	$7,281	$6,264	$1,017	$904
2016	$4,937	$5,025	-$88	$935	1.312	1.384	$6,477	$6,741	-$264	$640
2017	$5,469	$5,264	$205	$1,140	1.345	1.426	$7,356	$7,245	$111	$751
2018	$7,394	$5,503	$1,891	$3,030	1.379	1.469	$10,196	$7,774	$2,422	$3,173
2019	$8,165	$5,742	$2,423	$5,453	1.413	1.513	$11,537	$8,328	$3,209	$6,382
2020	$9,146	$7,940	$1,206	$6,659	1.448	1.558	$13,243	$11,960	$1,284	$7,665
2021	$9,211	$7,992	$1,219	$7,878	1.485	1.605	$13,678	$12,318	$1,361	$9,026
2022	$9,276	$8,044	$1,232	$9,110	1.522	1.653	$14,118	$12,686	$1,432	$10,458
2023	$9,342	$8,086	$1,256	$10,366	1.560	1.702	$14,574	$13,048	$1,525	$11,983
2024	$9,409	$8,138	$1,271	$11,637	1.599	1.754	$15,045	$13,451	$1,594	$13,577
2025	$9,477	$8,190	$1,287	$12,925	1.639	1.806	$15,533	$13,859	$1,674	$15,251
2026	$9,546	$8,231	$1,315	$14,239	1.680	1.860	$16,037	$14,265	$1,773	$17,024
2027	$9,616	$8,283	$1,333	$15,572	1.722	1.916	$16,559	$14,708	$1,851	$18,875
2028	$9,688	$8,335	$1,353	$16,925	1.765	1.974	$17,099	$15,169	$1,931	$20,806
2029	$9,760	$8,387	$1,373	$18,298	1.809	2.033	$17,656	$15,642	$2,014	$22,819
2030	$9,833	$8,429	$1,404	$19,702	1.854	2.094	$18,230	$16,113	$2,118	$24,937
2031	$9,858	$8,439	$1,419	$21,121	1.900	2.157	$18,730	$16,534	$2,196	$27,133
2032	$9,883	$8,450	$1,433	$22,554	1.948	2.221	$19,252	$16,963	$2,290	$29,423
2033	$9,908	$8,460	$1,448	$24,002	1.996	2.288	$19,776	$17,412	$2,365	$31,788
2034	$9,933	$8,470	$1,463	$25,465	2.046	2.357	$20,323	$17,875	$2,448	$34,236
2035	$9,958	$8,481	$1,477	$26,942	2.098	2.427	$20,892	$18,346	$2,546	$36,782
2036	$9,983	$8,491	$1,492	$28,434	2.150	2.500	$21,463	$18,838	$2,626	$39,407
2037	$10,008	$8,502	$1,506	$29,941	2.204	2.575	$22,058	$19,344	$2,714	$42,121
2038	$10,033	$8,512	$1,521	$31,462	2.259	2.652	$22,665	$19,864	$2,800	$44,922
2039	$10,058	$8,522	$1,536	$32,998	2.315	2.732	$23,284	$20,405	$2,879	$47,801
2040	$10,083	$8,533	$1,550	$34,548	2.373	2.814	$23,927	$20,961	$2,966	$50,766
2041	$10,108	$7,631	$2,477	$37,025	2.433	2.898	$24,593	$20,475	$4,118	$54,885
2042	$10,133	$7,641	$2,492	$39,516	2.493	2.985	$25,262	$21,066	$4,196	$59,080
2043	$10,158	$7,652	$2,506	$42,023	2.556	3.075	$25,964	$21,679	$4,285	$63,365
2044	$10,183	$7,662	$2,521	$44,543	2.620	3.167	$26,679	$22,306	$4,373	$67,738
2045	$10,208	$7,673	$2,535	$47,079	2.685	3.262	$27,408	$22,955	$4,453	$72,192
2046	$10,234	$7,463	$2,771	$49,850	2.752	3.360	$28,164	$23,330	$4,834	$77,026
2047	$10,260	$7,474	$2,786	$52,636	2.821	3.461	$28,943	$24,022	$4,922	$81,948
2048	$10,286	$7,484	$2,802	$55,438	2.892	3.565	$29,747	$24,735	$5,012	$86,959
2049	$10,312	$7,494	$2,818	$58,256	2.964	3.671	$30,565	$25,464	$5,101	$92,060
2050	$10,338	$7,505	$2,833	$61,089	3.038	3.782	$31,407	$26,228	$5,179	$97,239

Notes: Uninflated revenues and costs are in 2005 dollars.
Annual inflation rates of 2.5% and 3.0% are applied for toll revenue and O&M cost respectively.

CHAPTER 6

TOLL TECHNOLOGY AND OPERATIONAL ANALYSIS

As priced facilities, managed lanes entail operational needs above and beyond those of traditional HOV facilities – such as toll collection and enforcement. This chapter provides a narrative of the elements of operation required to successfully plan and implement HOT lanes in the I-75 corridor.

Toll collection technology has evolved in response to the introduction of managed lane systems that require complex transactions and have multiple occupancy and eligibility requirements. This adaptation is evident in the use of electronic toll collection (ETC) technology on the majority of new tollway systems or lanes currently in planning, design, or implementation stage. Even mature facilities such as New Jersey have spent millions of dollars retrofitting their system from traditional ticket systems utilizing toll collectors to a state-of-practice fully electronic system.

Given the conceptual characteristics of the managed lanes project on I-75/575, it is inevitable that the collection mechanism should be fully electronic. Similar managed lane facilities in California, Texas and Minnesota are all fully electronic systems.

It is assumed that this project will be open for traffic in 2011. Due to the length of time prior to opening, it is safe to assume that ETC technology shall significantly advance before opening day. It is quite possible that occupancy detection and enforcement systems maybe developed and in place, with all vehicles equipped with some form of pricing and detection equipment. This anticipated evolution notwithstanding, discussion of current technology, issues and opportunities is presented in this section as a foundation for planning.

6.1 Lane Management

A fully operational “managed lane” employs a series of strategies to ensure reliable travel speed advantages over adjacent general purpose lanes. Absent this advantage, managed lanes can exhibit the same congested conditions as general travel lanes, eliminating the potential for an enhanced customer experience. There are two underlying principals to ensure successful managed lanes:

- Different strategies can be employed and adjusted to influence demand to preserve ideal speeds; and,
- Traffic characteristics may be constantly monitored to determine the availability of excess managed lane capacity for sale to travelers that do not meet eligibility or occupancy requirements.

A discussion of these themes is presented in the following sections.

Management Tools
The elements associated with facility management are dynamic and complex. Historically, the term managed lanes stirs thoughts of pricing, when in fact it is one of four categories used to maintain superior operational levels. The four categories are:

- **Pricing** – Imposing a user fee on the lanes helps regulate demand. Traditionally pricing floats on a fixed schedule to varying prescribed demand levels by time-of-day and day-of-week. The introduction of dynamic pricing has propelled this concept into real time, meaning user fees are adjusted instantaneously (every 5 minutes or so) depending on the conditions in the managed lanes and adjacent general purpose lanes. This management technique is the most adaptable and flexible tool for managing traffic operations on a day-to-day basis.
- **Occupancy** – Occupancy restrictions establish the passenger requirements for free or discounted use. Most facilities require two (HOV 2) or three (HOV 3) minimum occupancy constraints. The Atlanta region maintains an HOV 2 occupancy policy that is assumed to be in effect on the I-75/575 managed lanes opening day. If at some point in time demand management cannot be accomplished with price, occupancy requirements should be reevaluated.
- **Eligibility** – Limiting lane use to specific types of users, such as HOV, motorcycle or trucks provides a broad management of global demand. Eligibility management can be enforced by location or time-of-day. For example, the facility could limit use in the peak periods to HOVs and then convert eligibility to all users, or even truck only use, in the midday and over night hours.
- **Access** – Controlling access points and rates ensures that lane demand can't flood downstream capacity. This is typically accomplished by spacing access points. Since the facility on I-75 has limited access locations, the ability to manage the facility through access is predetermined. In the unlikely event that a combination of other management strategies are unsuccessful in limiting use, operational access controls, such as ramp metering, could be put into place.

Employed in combination, these management strategies provide a broad mechanism to manage demand and protect the integrity of the managed lanes. The implementation and continual adjustment of these strategies requires a constant stream of information on how the lanes are operating, the cause and effect of each of the management strategies has on overall demand, and achievement of operational and customer service performance goals.

6.2 Design Challenges and Opportunities

In developing the toll collection and operational concepts, numerous design challenges and opportunities were identified as key issues that needed to be addressed as part of this study. These challenges and opportunities include:

- It is anticipated that HOVs will be allowed to travel the managed lanes for no charge. The ability to differentiate HOV from non-HOV traffic must be addressed to ensure HOV vehicles are exempted. There are two ways to segregate vehicles by occupancy and eligibility.

    - Assuming all users would be required to have an ETC transponder, HOV traffic would be separated from non-HOV traffic in the tolling zones to ensure each class is assessed the correct toll.
    - Assuming that HOV traffic is not required to possess a transponder, car pools would have to register with the operating agency prior to use. This raises complex enforcement issues relative to both eligibility and occupancy.

  Ongoing research in the field of automated vehicle occupancy systems show promise that occupancy requirements can be monitored and enforced via a variety of human characteristics such as skin recognition, heat, and profile. However, the development of such systems is just beginning and may not be sufficiently advanced in time for implementation.

- Enforcement of both toll collection and occupancy compliance continues to be a challenge in the toll arena. Minimizing violations and preserving revenue is critical to the operational efficiency and financial health of managed lanes.

    - Toll collection enforcement is traditionally accomplished via license plate recognition. A vehicle is considered to be in violation if a valid transponder is not detected when traversing the tolling zone. Video enforcement is supplemented through roving enforcement officers. While video enforcements are reliable, the processing costs are significant.
    - Occupancy enforcement is also a continual challenge for those operators employing varying toll schedules by occupancy class. As mentioned previously, the ability to accurately identify HOV traffic is accomplished by either establishing registered car pools; separating HOV and non-HOV traffic in the tolling zone; or implementing an automated vehicle occupancy system.

- Interoperability between the managed lanes and the current ETC enterprise on SR 400. The technology must be compatible across both applications.
- The potential for a multi-use smart-card is a great opportunity for seamless transactions between a variety of uses and applications. The platform should be flexible enough to cover not only the managed lanes and other priced roadway facilities in the state of Georgia, but also have the ability to be integrated into parking systems and transit operations. The ability to control price across multiple applications would create opportunities to implement a broad variety of travel demand management measures. A price and fare system could potentially result in modal and temporal shifts in travel behavior.
- Advanced information management remains a challenge for all priced facilities, but it is especially difficult for fixed variable and dynamic facilities. Relaying the toll rates in effect at each entry point will be particularly challenging since there are multiple entry and exist opportunities throughout the 10 mile facility.

The study has assumed the use of a mileage-based toll structure. Tolls could be either fixed variable or dynamically priced. While dynamic pricing offers the greatest flexibility to manage demand on an hour-by-hour, day-by-day basis on the facility, a fixed variable price structure was assumed in this study.

6.3 Pricing Opportunities

When developing pricing concepts, or toll schedules, certain fundamental ground rules were established providing the framework upon which the ultimate recommendations were formed. Specifically, the assumptions that framed price points and toll rates for this project include:

- Pricing will be distance-based; meaning the toll charged for use of the facility will be directly related to the distance of travel on the facility. Tolls are assumed to vary by usage and can be collected by tolling zone and/or entry and exit locations.
- The toll assessed shall be variable in the sense that higher per mile rates will be in effect during the most congested times of the day and lower rates in place during less congested times of the day. While the toll schedule shall be variable, the pricing scheme shall be fixed. The toll schedule shall be established prior to implementation and will be active until deemed ineffective to manage the demand for the facility. This is in contrast to a dynamic pricing schedule that varies depending upon the level of congestion on a cycle in the neighborhood of five minutes.
- High-occupant vehicles (HOV) are assumed to be permitted to travel in the managed lanes free of charge. The HOV definition is vehicles with two or more occupants. As noted previously, the challenge associated with varying the toll structure based on occupancy is identification and enforcement. Allowing HOV traffic to travel for free doesn't necessarily mean that they are exempt from having a transponder.

The proposed I-75/575 managed lanes project would be a complex blend of current and prevailing technology. Of the facilities open and operational today, none features the complex movements proposed on this project. A facility that possesses multiple access and egress points will result in a complex pricing structure and the need for an extensive motorist information network.

6.4 Electronic Toll Collection Assessment

Electronic Toll Collection (ETC) is a family of technologies that results in the ability of highway users to pay tolls electronically. Today's ETC systems employ vehicle-to-roadside communication technologies including Automatic Vehicle Identification (AVI), or transponders, and Automatic Vehicle Classification (AVC), to perform an electronic monetary transaction between a vehicle passing through a toll zone and the toll collection agency. In a managed lanes application, ETC equipment takes the place of a human toll collector who manually collects tolls at tollbooths. In addition, it allows such

transactions to be performed while vehicles travel at highway cruising speed eliminating the need to slow or stop every time a transaction is required. Electronic Toll Collection is quickly becoming a globally accepted method of toll collection, a trend greatly aided by the growth of interoperable ETC technologies. These advancements have allowed a single user to navigate multiple toll facilities under different toll collection agencies. This is nowhere more successful than in the Northeastern United States where *EZPass* is utilized interoperable between:

- New York State Thruway Authority;
- MTA Bridges and Tunnels;
- New York State Bridge Authority;
- Port Authority of NY & NJ;
- Peace Bridge;
- Virginia DOT;
- DelDOT;
- Atlantic City Expressway;
- Massachusetts Turnpike;
- New Jersey Highway Authority;
- Burlington County Bridge Commission;
- Delaware River Joint Toll Bridge Authority;
- Delaware River port Authority;
- West Virginia Turnpike Authority
- Pennsylvania Turnpike Commission;
- Delaware River and Bay Authority;
- Maryland Transportation Authority;
- Maine Turnpike; and,
- New Hampshire DOT.

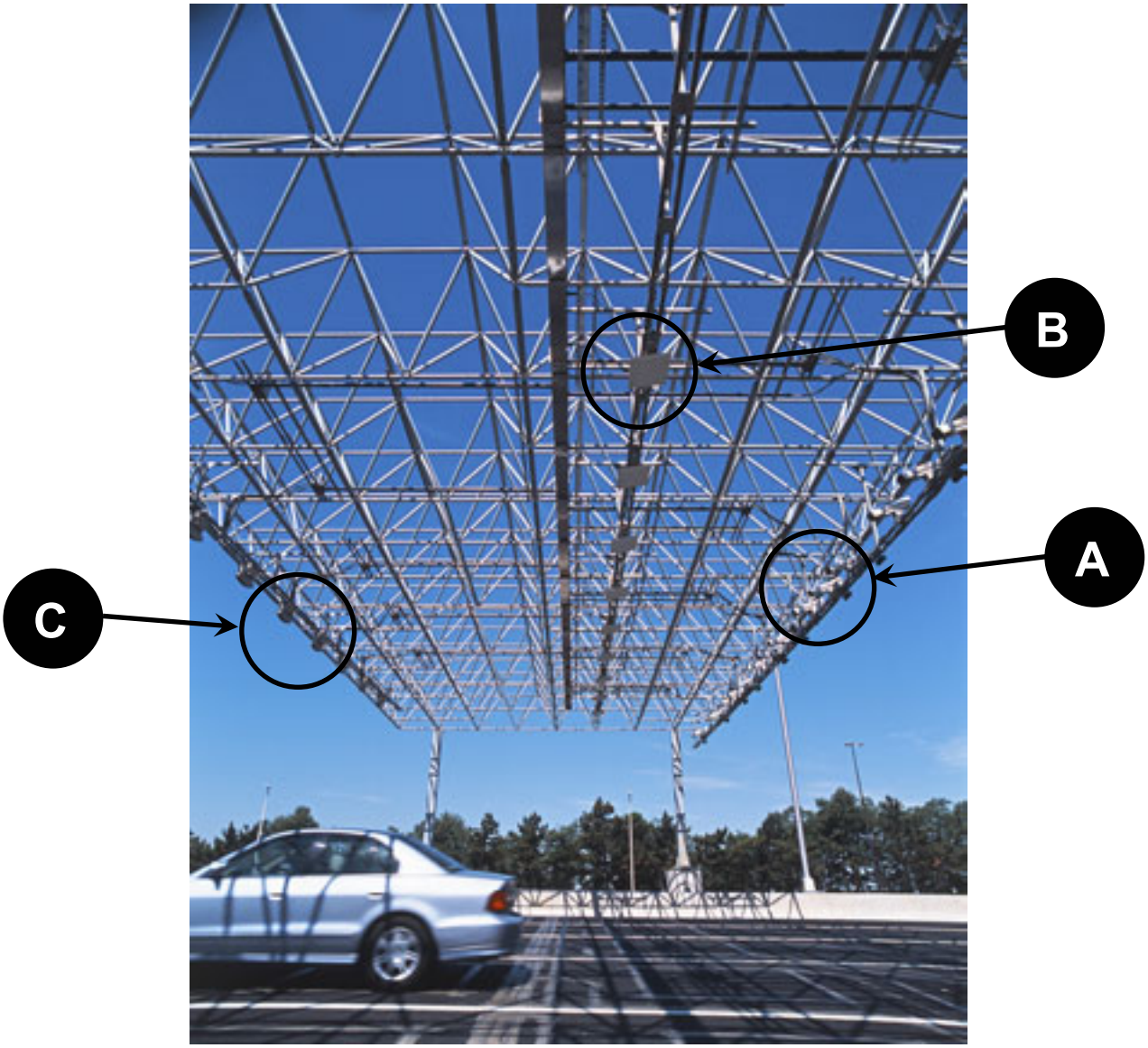
6.4.1 Open Road Electronic Tolling

All of the potential alternatives discussed in this assessment employ full ETC systems. A full or all electronic ETC system is as it sounds, all electronic, there are no traditional toll plazas, no toll collection personnel, and no introduced delay at toll plazas. As an introduction to the concept of all electronic “open road” tolling, a brief discussion of the various elements is presented in the following paragraphs.

Figure 6-1 illustrates a typical ETC tolling zone with both a toll collection and enforcement system. While there are numerous configurations, the illustration depicts the state-of-the-practice toll zone structure. The hardware consists of a single gantry that hosts both the toll collection and enforcement equipment along with support systems such as lighting and vehicle separator equipment. The specific hardware elements located on the gantry system are, from right to left – the direction of the traffic flow:

A. The Violation Enforcement System (VES) – The video-based violation enforcement system is used to capture license plates via imaging if a vehicle is determined to be in violation.
B. ETC Antenna – The ETC antenna establishes a linkage between the vehicle and system, establishing eligibility, registering usage and assessing the appropriate toll.
C. The laser vehicle separator – this equipment is used to detect the beginning and end of each vehicle. This information is critical in determining vehicle classification, violation enforcement, and ensures the linkage between identified toll transponders and associated vehicles.

Figure 6-1: Typical Electronic Tolling Zone



NEW JERSEY TURNPIKE, RARITAN, NJ

6.4.2 Electronic Tolling Concepts

As described in previous sections of this report, the physical location of the managed lanes is still under evaluation. However, the access locations are set and the operational concepts will not change if the managed lanes are located in the median or on one side of the general purpose lanes or another. There are eleven access points on the 10 mile facility including direct entry and exit slip ramps on I-75 and I-575 and direct ramp entry and exit to/from intersecting routes or intermodal stations.

Understanding the assumptions that tolls shall be levied based upon distance traveled; two operational plans have been developed.

> **CONCEPT A** – A series of mainline tolling zones located at strategic locations spanning the managed lanes system. The tolling zones concept is particularly effective when a single gantry can span both directions of the managed lanes

facilities. Understanding that three of the build options (U2, U3, and U4) split the managed lanes on either side of the general purpose lanes, two tolling zones, one in each direction, would be required. This concept is similar to the all ETC system now in use on SR 91, Melbourne City Link, and the New Jersey Turnpike (as depicted in the photograph above).

CONCEPT B – An entry/exit electronic closed system in which toll readers are placed on each entry and exit location. Tolls are assessed based on the point of entry and point of exit. Toll zones are mounted on gantries similar to Concept A. This concept is currently employed on Highway 407 in Toronto, Canada.

CONCEPT A

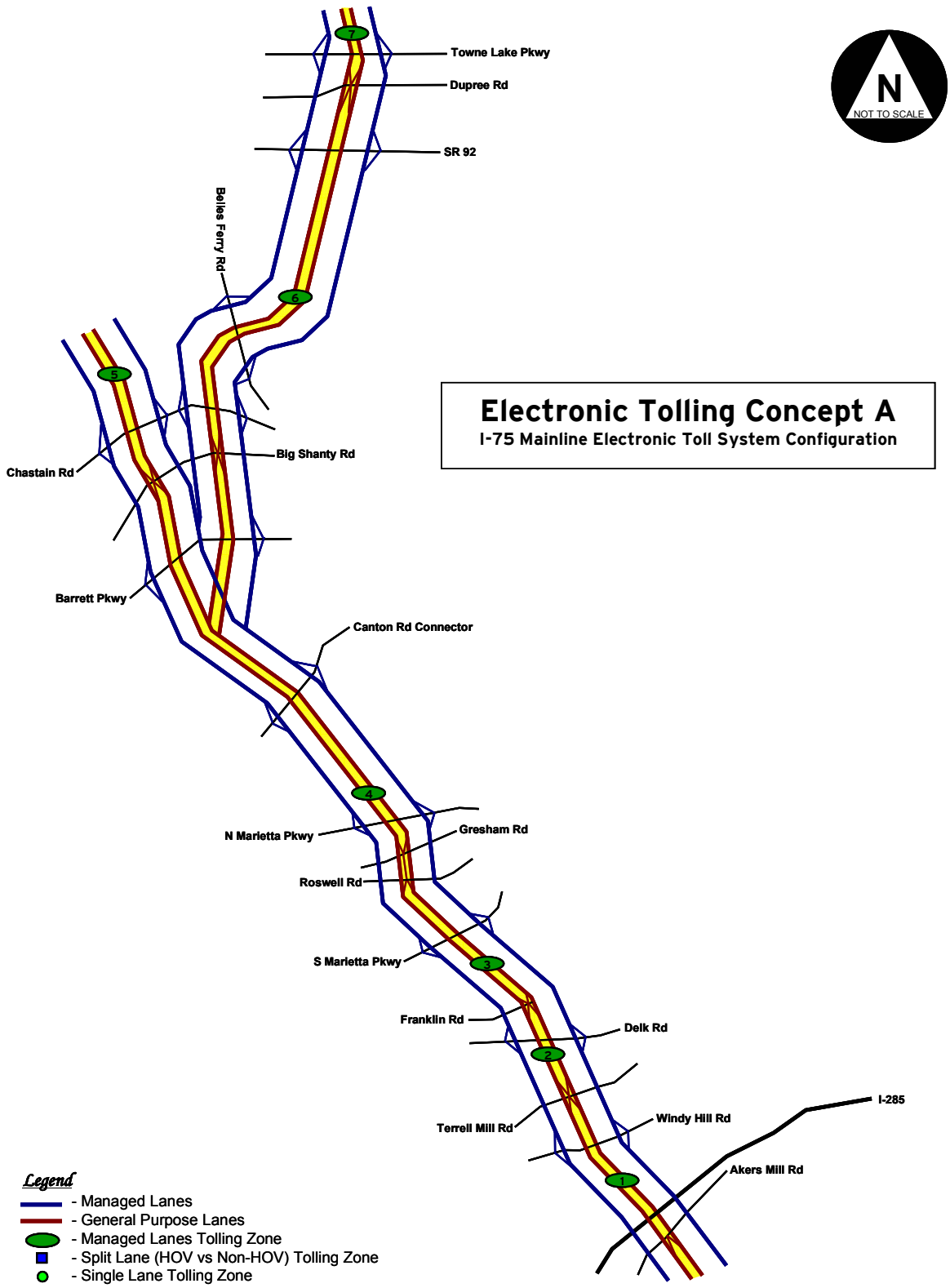
The electronic tolling Concept A is shown in Figure 6-3. As illustrated, nine mainline tolling zones will be required to cover all movements on the mainline. Under this configuration it would not be possible to utilize the managed lanes without passing one of the nine tolling zones. The associated toll rate with each tolling zone would be set according to the distance traveled and the toll rate in effect at the time of entry.

The toll charged to each user would be directly related to the number of tolling zones traversed during the trip. A trip originating at Allgood Road traveling south to the I-285 would travel through four tolling zones, while a trip from Terrell Mill Road to the I-285 would only pass through one tolling zone. The tolling zones would be basically invisible to the users; meaning the user would not be required to stop or slow down from prevailing travel speeds. The one thing that might cause some friction is the channelization of HOV traffic through the tolling zone. Depending how the system handles occupancy enforcement, the tolling zone may require the segregation of HOV and non-HOV users. This topic is discussed further in subsequent sections. This approach is currently in effect on SR 91 Express Toll Lanes project in southern California. The photograph below illustrates the channelization concept where HOV 3+ vehicles are permitted to use the managed lanes for free while all others are subject to the toll. As you can see in the photograph in the tolling zone, HOV 3+ vehicles are required to use the inside lane, while all others utilize the two outside lanes. Enforcement for this concept is through visual inspection. An alternate approach to separating paying (non-HOV) and non-pay (HOV) users would be to require eligible HOVs to register with the operating agency. Upon registration, the associated toll tag device would be debited when tolls are assessed.

Figure 6-2: Mainline Tolling Zone

SR 91 MANAGED LANES, CALIFORNIA

Figure 6-3: Electronic Tolling Collection Concept A



While the open gantry system would be relatively simple to implement on the currently planned HOV network, there are several disadvantages when compared with similar entry/exit configurations. Most notably:

- The ability to implement and enforce maximum and minimum tolls would be extremely complex and would require post trip reconstruction. The time and effort required to determine the number of tolling zones a particular user traversed on any given trip to determine if a minimum of maximum toll adjustment is required would be a monumental task given the anticipated volumes and number of tolling zones.
- The ability to dynamically adjust toll rates would be complex since toll rates are in effect at the point of entry. The numerous entry exit points coupled with the length of the facility could results in hundreds of different tolls at any point in time at a single tolling zone.
- If HOV channelization were required to delineate occupancy in each tolling zone, the additional weaving movements could be counterproductive to the goal of optimizing travel efficiency by maintaining optimum travel speeds.
- Trip reporting would not be as robust since entry and exit locations would not be known. This could limit the operating agency's ability to maximize facility use and/or toll revenue during future updates of traffic and revenue projections.
- Given the nature of the facility, it maybe difficult to construct tolling zones at some of the locations identified especially if each zone is required to accommodate three lanes per direction for occupancy delineation. These design issues are further complicated with potential "splitting" of the managed lanes system, one on each side of the general purpose lanes.

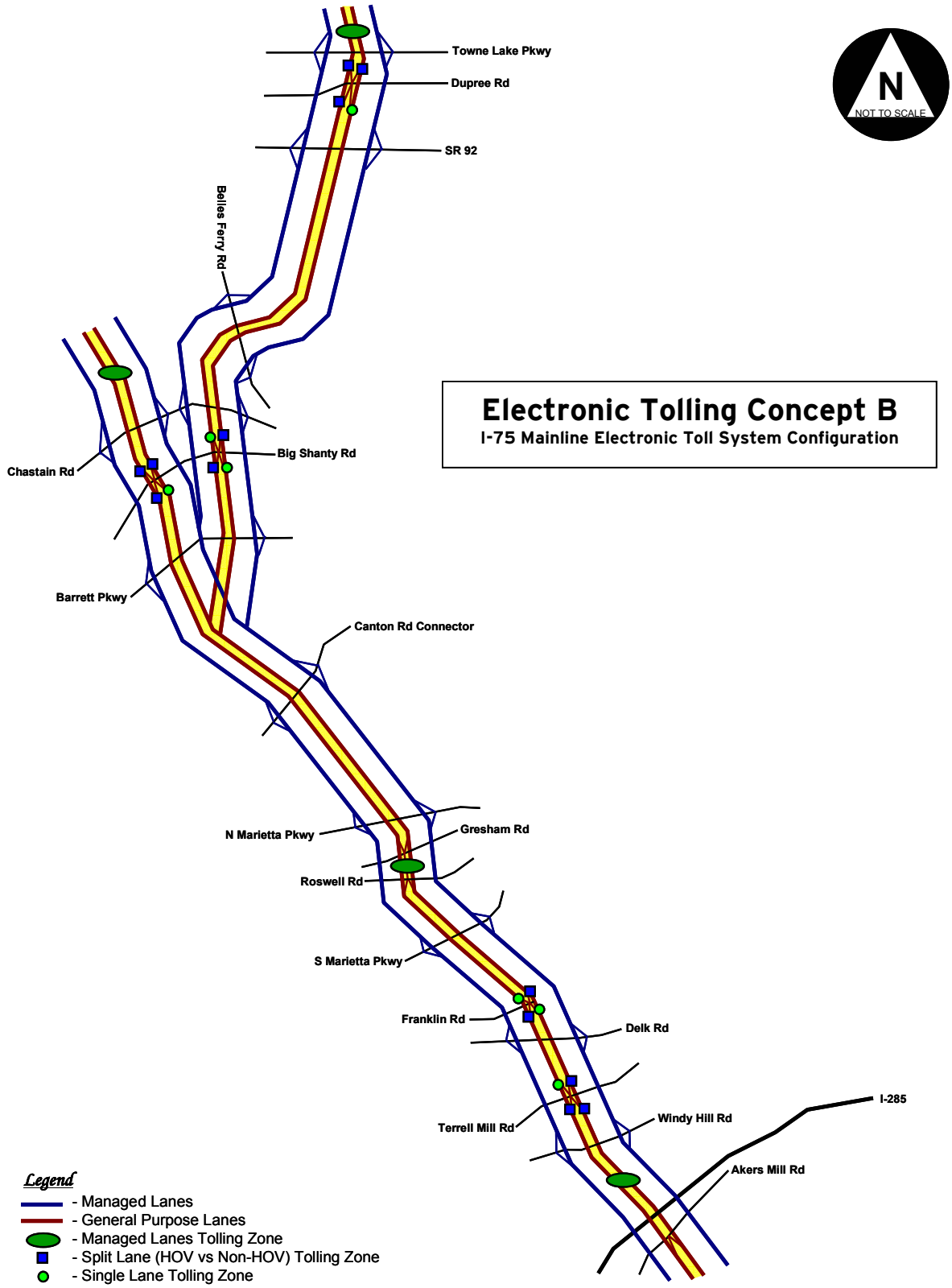
CONCEPT B

Figure 6-4 illustrates the second tolling concept considered in this evaluation. Concept B employs an entry/exit system where users are tracked by point of entry and point of departure. Whereas in Concept A all of the hardware is located along the mainline, Concept B locates toll collection equipment on the ramps with the exception of facility termini. The location of the tolling zones at the termini could be located inside the last entry/exit locations with all of the occupancy technology on the ramps. This would add some flexibility to the design of the facility. This generic concept is supported with two sub-options:

- Concept B-1 would feature split-lane entry points so that occupancy delineation can be achieved. This would require that each entry location be capable of accommodating split-lanes (two lanes). The practicality of accommodating two lanes of entry ramp maybe challenging, especially under the build concept with the managed lanes in the middle of the general purpose lanes. The remaining build alternatives would be much more suited to accommodating split-lane entry points.
- Concept B-2 would not provide split-lane entry points but would rely on HOV registration or onsite visual inspection to delineate and enforce occupancy requirements.

Figure 6-4 generally reflects Concept B.

Figure 6-4: Electronic Tolling Collection Concept B



Each of the entry ramp locations would have to be widened for a short distance into two lanes to accommodate one lane for HOV (non-paying vehicles), and one lane for paying vehicles. By employing an entry/exit style approach in concert with smart card (read/write capability) trip specific information can be written, or stored to the smart card upon entry. It is anticipated that the following information be stored upon entry to the system:

- Location of entry (i.e. Delk Road);
- Time of entry;
- Applicable toll rate; and,
- Appropriate toll rate (Full for non-HOV or discounted or free for HOV)

When the vehicle exits the system, an exit reader marks the point of exit, collects the information on the smart card, and calculates the toll to be charged to the account. The exceptions to this configuration would be if HOV traffic were allowed to travel the managed lanes without a transponder. In this situation, two-lane toll zones would be required upon both entry and exit. Compliance would be accomplished via visual enforcement.

Figure 6-5 illustrates a typical slip lane ramp tolling zone where a single entry ramp is widened for a short distance to accommodate the delineation of vehicle occupancy. An observational station is also included to monitor HOV compliance. Based on the current occupancy policy, vehicles with two or more occupants would be channelized to the left lane through the tolling zone. Even if the policy were to change, delineation of two types of users could be accomplished. Depending on which lane is utilized to enter the managed lanes system, a tag would be issued to the vehicle's transponder identifying the vehicle as HOV or Non-HOV, to be used upon exit to calculate the appropriate toll. Occupancy classification would essentially be accomplished automatically without any user interface. Periodic enforcement would be required via visual inspection. In addition to occupancy enforcement, a violation enforcement system (VES) would be required to ensure non-HOV vehicles have active transponders and valid accounts. This system would include cameras that photograph the license plate of the vehicle upon entry. These images are matched through the Department of Revenue database and citations issued. A similar system is currently in place on SR 400.

Figure 6-6 illustrates a typical single lane entry/exit configuration as proposed in Concept B exit ramps. Once again, with read/write capability the exit location would read the information written to the transponder upon entry and calculate the associated toll charge. Since occupancy was previously determined, the distance based toll would be adjusted appropriately. The exit location would be outfitted with vehicle enforcement indicator lights. These lights would either illuminate indicating a valid transaction or illuminate green or red indicating a legitimate transponder or a violator. If no channelization is provided on either entry or exit, occupancy enforcement would be limited to visual inspection. Toll enforcement could still be accomplished via the VES for those users with transponders. If HOV traffic was not required to have transponders, toll enforcement would be extremely complex and require substantial investment potentially negatively impacting the ability of the facility to generate adequate revenue to cover operational costs.

Figure 6-5: Typical Slip Ramp Tolling Zone

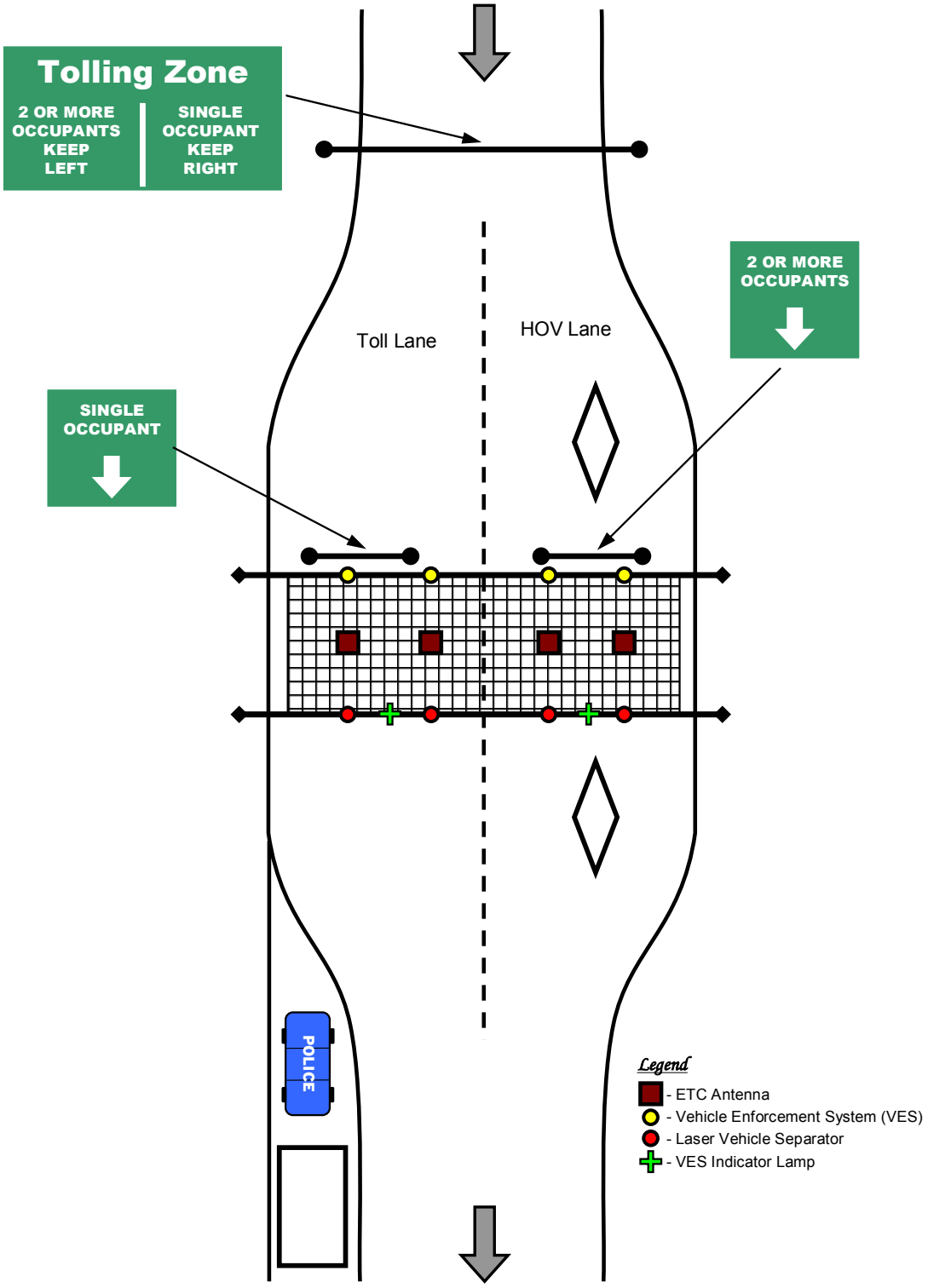


Figure 6-6: Typical Single Lane Entry/Exit Configuration

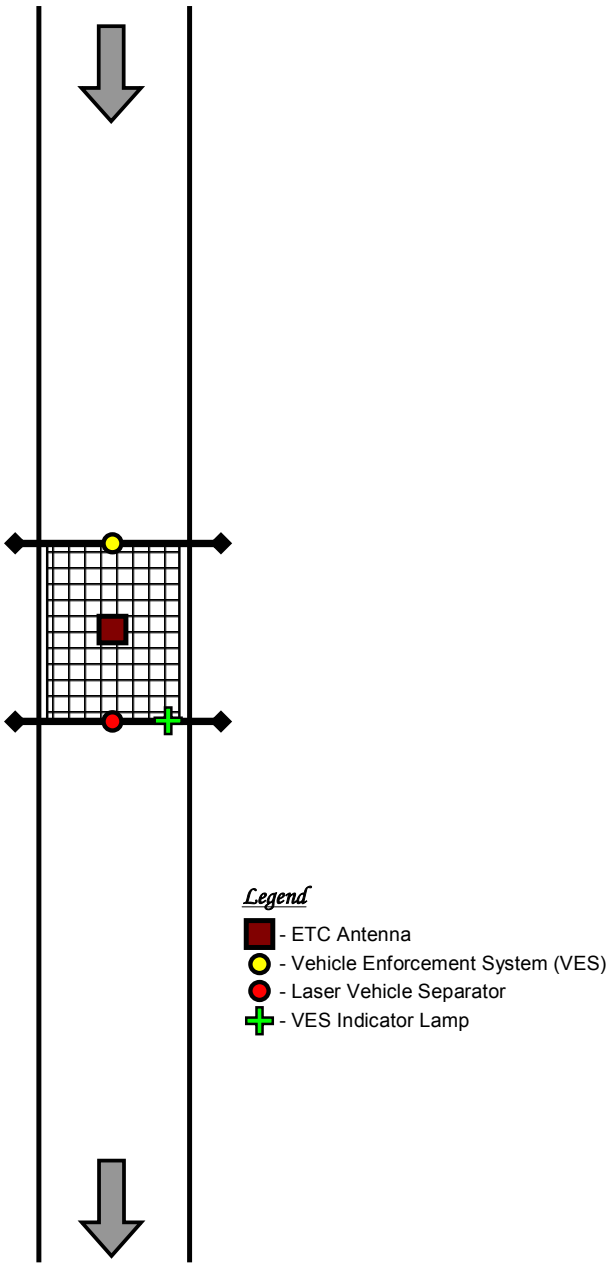
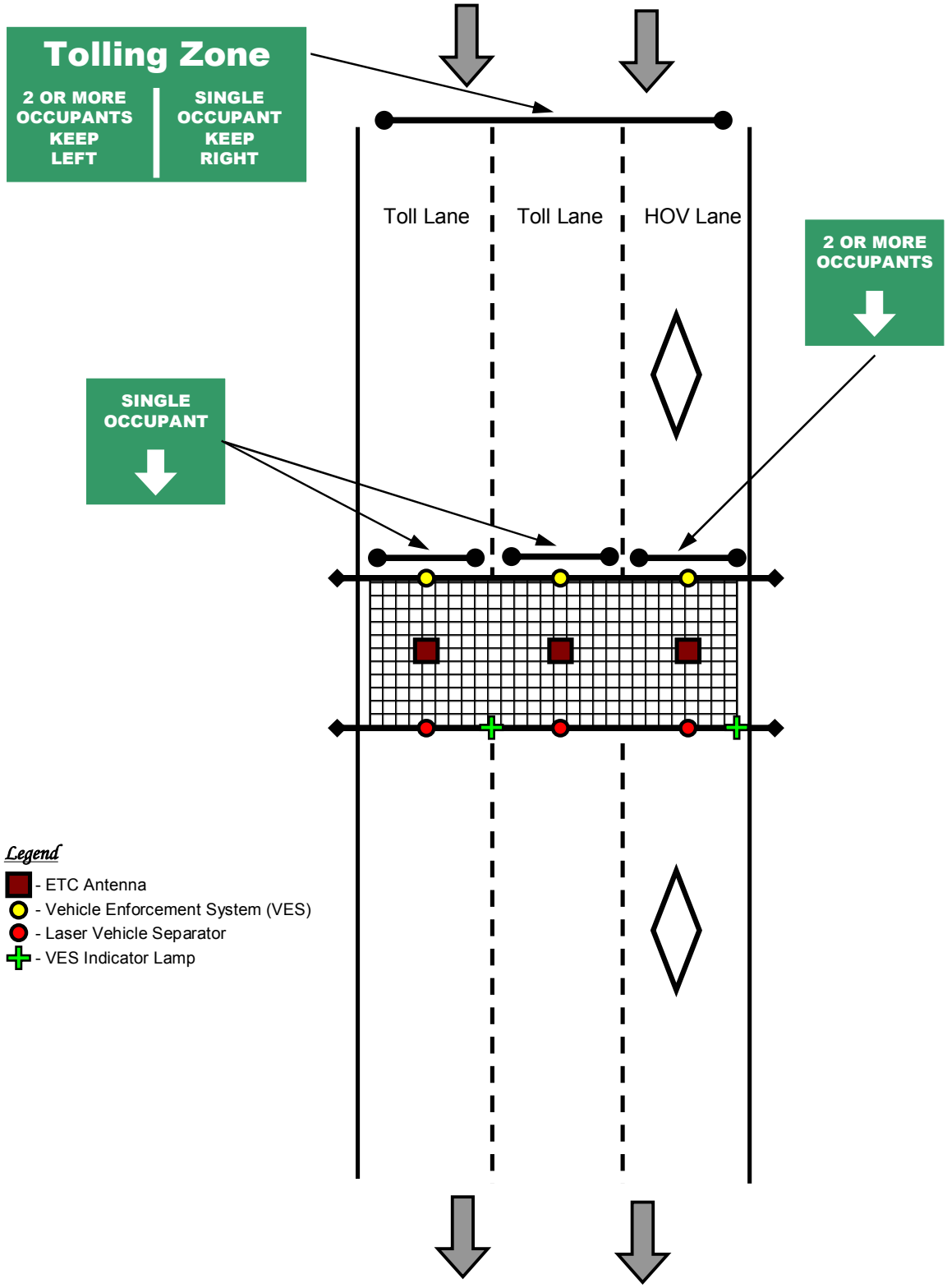


Figure 6-7 illustrates a typical mainline tolling zone. Traffic entering the managed lanes would be separated into HOV and non-HOV components. Traffic exiting the managed lanes system would not have to segregate unless HOV users were not required to possess transponders.

Figure 6-7: Typical Mainline Tolling Zone



Recommended Approach

Each concept was subjected to a qualitative assessment. The assessment includes the following evaluation criteria. Results from the evaluation are presented in Table 6-1.

Ease of Toll Collections: The ease and ability to collect revenue is an integral component of any toll system. Since toll rates will be based upon distance traveled an entry-exit system is easier to administer than solely a barrier style system. This is especially true for fixed variable and dynamically priced applications where the toll rate for a particular trip is assessed upon entry to the system. Since Concept A could potentially have to process multiple combinations of tolls, rates, and eligibility at a single location, it was considered less favorably than Concepts B-1 and B-2.

Ability to Dynamically Price: With the evolution of toll technology, dynamically pricing a facility is becoming a more attractive option to manage demand than fixed variable pricing. At the federal level, dynamic pricing is now required to be evaluated under the Value Pricing Program. As technology advances and mainstreams, the ability to dynamically price a facility becomes easier and more acceptable to potential users. Dynamically adjusting toll rates to manage demand requires an extensive communications network and the ability to monitor entering and exiting traffic. Additionally, dynamic pricing would ensure the same per-mile toll rate would be charged, or written to the toll tag, upon entry to the system. The ability to effectively dynamically price a facility requires an entry/exit system with a sophisticated information system. For this reason, Concepts B-1 and B-2 were considered more favorably than Concept A.

Ease of Enforcement: Enforcement issues generally gravitate towards occupancy since toll enforcement (having a transponder and valid account) is performed electronically via license plate imaging. As described in previous sections, occupancy enforcement will be accomplished by delineating HOV and SOV in each tolling zone. Enforcement shall be upon visual inspection. In Concept B-2, HOV traffic would not be separated from the SOV traffic, but HOVs would be required to register as a car pool to be eligible for free or discounted travel. Enforcement would be administered through random checks. Since the rules of occupancy enforcement were the same for all three Concepts, the amount of enforcement required was the driving factor in the evaluation process. Concept A was consider more favorably than Concept B due to fewer locations to monitor. Concept B-2 was considered more complex than Concept B-1 since there wouldn't be any delineation and enforcement would rely solely on visual inspection.

Cost of Implementation: Implementation costs are an important consideration when evaluating toll operating systems. Since this study builds upon planned infrastructure, the majority of implementation costs are associated with toll collection hardware and software. Concept B-1 would require widening each entry ramp to two lanes to accommodate the delineation of HOV and SOV vehicles. Similarly, each mainline tolling zone would need to be widened to accommodate a three lane cross-section. Estimated capital cost of each Concept is:

- Concept A - $20,896,850
- Concept B-1 - $23,672,750

- Concept B-2 - $21,348,750

***Policy Flexibility*:** The policy framework sets the parameters of the managed lanes system – which vehicles are eligible to use the managed lanes; what are the occupancy requirements to receive free or reduced tolls; what are the toll rates. The ability to exercise each of these management strategies to manage demand provides a level of flexibility and adoptability to the operating agency. Having all the hardware in place, as illustrated in Concept B, affords the operating agency the flexibility to modify occupancy requirements, toll rates, etc without substantial investment in additional hardware and software. Concept B-1 possesses the most flexibility of the three concepts considered.

Accounting and Trip Reconstruction: The ability to reconstruct trips of managed lanes patrons provides valuable information to the operating agency when analyzing travel patterns and usage, especially if demand increases above manageable levels and counter measures have to be implemented. Point-to-point transactions are much more conducive to trip reconstruction activities. Similarly, the accounting system is simplified when specific origins and destinations are known. Concept B-1 possesses the greatest ability to understand travel patterns and motorist behavior of the three concepts considered.

Operations and Maintenance: Operations and maintenance costs can accrue rapidly when dealing with complex toll systems. Generally, toll equipment costs consume 10% of installation costs per year. While most of the toll equipment installed will last the length of the thirty-year analysis timeframe, major updates will be required at intermediate intervals. Typical operations and maintenance costs are:

- Transaction processing costs ($0.12 per transaction);
- Toll equipment costs: Initially installed in 2011, updated in 2021 and 2031; and,
- Toll equipment maintenance costs: 10%/year of installed toll equipment cost.

A more detailed assessment of capital and operations and maintenance costs are presented in subsequent sections of this report.

Customer Service and Public Understanding: Customer service and public understanding are critical success factors for any tolled facility. The public must fully understand the toll structure and experience real benefits for continued loyalty. For this analysis it was assumed that a point to point system would be more easily understood by the general public.

The evaluation results are summarized in Table 6-1.

Table 6-1: Tolling Concept Evaluation Matrix

	Evaluation Criteria							
	Easy of Toll Collections	Ability to Dynamically Price?	Ease of Enforcement	Cost of Implementation	Policy Flexibility and Equity	Accounting / Trip Reconstruction	Operations and Maintenance	Customer Relations and Public Understanding
Concept A	●	●	○	○	●	●	○	●
Concept B-1	○	○	●	●	○	○	●	○
Concept B-2	○	○	●	◉	◉	◉	◉	◉

○ **Most Desirable** ◉ **Less Desirable** ● **Least Desirable**

	Evaluation Criteria (1)								
	Easy of Toll Collections	Ability to Dynamically Price?	Ease of Enforcement	Cost of Implementation	Policy Flexibility and Equity	Accounting / Trip Reconstruction	Operations and Maintenance	Customer Relations and Public Understanding	Total
Concept A	**0**	**0**	**2**	**2**	**0**	**0**	**2**	**0**	**6**
Concept B-1	**2**	**2**	**0**	**0**	**2**	**2**	**0**	**2**	**10**
Concept B-2	**2**	**2**	**0**	**1**	**1**	**1**	**1**	**1**	**9**

(1) Points were assigned to each Tolling Concept – 2 points for the most desirable, 1 point for less desirable and 0 points for least desirable. The highest scoring concept is considered the most favorable.

6.4.3 Vehicle Classification Systems

While not evaluated in detail in this report, the possibility exists for the managed lanes to be opened to medium and heavy trucks in addition to passenger cars and light trucks. If multiple classifications of vehicles were introduced, and assessed a different toll than passenger vehicles, an automated vehicle classification (AVC) system would be required in addition to the system described previously.

Automatic vehicle classification systems are relatively simple and can be easily added to existing or planned ETC systems. The key is simplicity. A simple toll schedule with minimal classifications, maybe three at the most, is desirable. Typically, classifications are defined as passenger cars and light trucks, single unit/axle trucks, and heavy multi-axle trucks. This level of classification can be accomplished with a laser profiling system. Lasers are installed on the existing gantry system resulting in minimal capital cost.

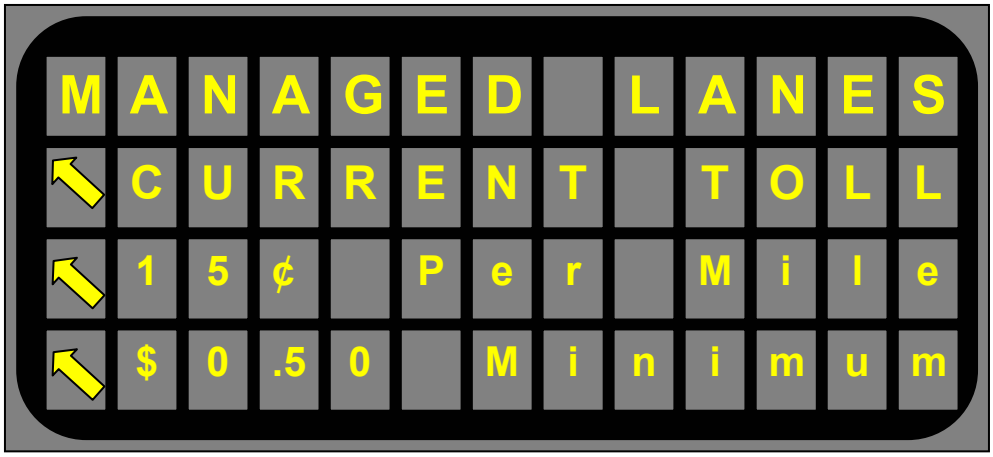
In summary, changing the eligibility criteria would not substantially breech the operating system as recommended in this study **providing the number of classes is minimized**.

6.4.4 Motorist Information Systems

One of the most challenging aspects of any variable pricing scheme is communicating the appropriate toll rates to potential users before they choose to enter the managed lanes system. Current applications in California utilize single points of entry and exit making this task relatively simple. As described previously, the I-75/575 facility pricing is likely to employ a distance-based rate that is highly variable, if not dynamic, and includes multiple entry and exit locations resulting in the need for a complicated information system. Due to the infinite number of charges motorist could be assessed at any of the entry locations a simplistic hand-off of information is required.

One concept would be to show the prevailing per-mile toll rate in effect at the time of entry coupled with a minimum charge were applicable. These signs would be located at each of the entry points to the system sufficiently in advance to allow motorists to safely choose their course of action. Figure 6-8 depicts a typical variable message sign.

Figure 6-8: Typical Variable Message Sign



All of the variable messages signs would need to be fully integrated into the electronic toll system to ensure vehicles are being charged the advertised rate. The ability to marry the vehicle information system with the electronic toll collection system effectively is one of the advantages of an entry / exit design (Concept B) over a barrier style system (Concept A). Concept A would require the introduction of tolerance criteria due to the time required to travel from the entry point through the tolling zones. This would prove challenging to maintain and administer especially during times of high congestion, extremely variable rates, and incidents.

6.4.5 Electronic Toll Integrated Users

One of the key features on the I-75/575 managed lanes project is the direct connections to Bus Rapid Transit (BRT) transit centers. Since the managed lanes will serve as the guideway for BRT operation in the corridor there is an opportunity to integrate the electronic toll collection system with the transit fare system. Furthermore, it is possible to design the system to recognize intermodal transfers and incorporate these into the pricing strategies. For example, users transferring from the transit line could be afforded discounted or free travel in the managed lanes. This could provide further incentive for modal transfer and expand the demand management techniques available in the corridor.

Integrated users would be somewhat limited with traditional toll tags since the technology would be vehicle based. Integrated use with parking facilities would be easy, integrated uses with transit providers would be much more complicated. Recent advances in smart card technology would allow this technology to be transportable and interoperable between modes and other applications seamless.

6.4.6 Transaction Processing

Current ETC processing is accomplished by each user desiring to use the managed lanes establishing an account with the operating agency. Each time the facility is utilized, the toll is subtracted from the customer's established account. When the account balance reaches a pre-determined low level, it is supplemented by an agreed upon amount via a guaranteed revenue source such as a credit card.

While at one time efficient, this method is now relatively expensive and frequently requires customers to maintain accounts with multiple operators. Even when a single account can be used with multiple agencies, the agencies are required to distribute transponders number between agencies which is time consuming and cumbersome in a real time environment.

Once again, smart cards offer a technology solution. Smart card technology can store funds from a financial institution, similar to a pre-paid credit card, which then in turn can be used in concert with a transponder. The smart card would be inserted into the transponder when using the managed lanes and the fee would be subtracted from the smart card. Each transaction would result in the financial institution, or its processing clearing house, transmitting vital information back to the toll agency. Utilizing this approach, the transponders and antenna must be interoperable between agencies, a technological hurdle that has already been mastered. Importantly, the smart card controls the movement of funds, and the toll agency is relieved of this responsibility.

Since a smart card is not tied to a vehicle it could be efficiently used for other transportation modes. Readers could be located at transit stations for use with rail and bus services. Parking facilities are another prime candidate for this technology. Furthermore, transponders could be capable of hosting multiple smart cards eliminating the need for occupancy delineation. In each of these applications, the customer controls the value of the card and the toll operating agency back office processing can focus on statistical reporting and violation processing functions.

The use of smart cards for transportation fee collection is an emerging technology in the Untied States. Since technology development is extremely dynamic and changes frequently, the state of practice opening day is well beyond what can be predicted, monitoring the research and development of these technologies over the life of the project is critical to the development cycle.

6.5 Toll Collection Capital and Maintenance Cost

Introducing roadway pricing, specifically electronic toll collection, raises two basic questions about costs: 1) what are the capital costs to implement the necessary roadside and back office equipment and functions to collect tolls and provide enforcement, and 2) what are the ongoing operations, administration and maintenance costs of collecting tolls?

Of particular interest to this study are the costs associated with converting an HOV system to a HOT system. In addition, it is important to establish the ongoing costs, operations and maintenance, associated with a toll facility. The collections, enforcement, violations processing, and customer services cost must be deducted from the gross revenue to arrive at the available funds for payment of debt service on bonds. Furthermore, in many cases, the marketability of bonds would be dependant on covenants requiring that toll revenue be used to properly maintain the facility, a further deduction from the gross revenue stream. While it is not anticipated that toll revenue bonds will be used to finance the HOT lanes, it remains important to maintain the quality of the driver experience in the managed lanes.

In contrast, the capital investment costs for a fully electronic toll collection system are almost negligible when compared with the costs of constructing the managed lanes, which is estimated to exceed a billion dollars. A preliminary cost estimate of the combined costs of in-road electronic toll equipment and back-office systems range from $20.9 million for Concept A to $23.7 million for Concept B at build out.

The following subsections focus on the capital and ongoing costs associated with the I-75/575 facility as a fully electronic toll facility. Assumptions and other bases are summarized to estimate capital and reoccurring costs for operations and maintenance associated with toll collection activity. The level of detail associated with the costs cited herein should not be construed as investment-grade.

For the purposes of this study, cost estimates were developed for the three operational Concepts described previously (Concept A, Concept B-1, and Concept B-2). In addition two back office alternatives were analyzed:

- A full scale Customer Service Center (CSC) / Violations Center (VC); and
- A reduced scale CSC/VC option.

Consideration of the latter reflects the presence of a regional CSC/VC – a scenario involving a shared CSC/VC with the current SR 400 toll facility – or the ability to join with other toll operators and exercise economy of scale.

While the cost of providing a violations center for processing violators was estimated, no attempt was made to assess the magnitude of the fine or associated fee revenue streams. It was assumed that with an enforceable license plate detection system, collected revenue would cover the processing cost which is typical of the industry.

6.5.1 Toll Collection Equipment Capital and Maintenance Costs

A preliminary estimate of system costs were prepared based on each concept plan. It should be noted that these cost are subject to considerable refinement during the detailed design phase. The table below summarizes anticipated capital and maintenance cost expenditures for each of the various subsystems. All costs are shown in current year (2005) dollars and subject to inflation.

Toll collection equipment has an effective life span of approximately 10 years, after which it becomes more costly to maintain than to replace it. The tables below summarize the costs of installing the initial set of toll collection equipment in 2010 (Phase 1: from Akers Mill Road to Banberry Road), 2015 (Phase 2 and 3: from Banberry Road to the I-575 Interchange, and 2020 (Phase 4 and 5: from I-75 to Sixes Road on I-575 and from I-575 to Wade Green Road on I-75) and updating the electronic components and rehabilitating some of the electronic distribution infrastructure every 10 years.

Maintenance costs of toll equipment typically average 10% per year of the installed costs. Maintenance of toll equipment collections systems is typically contracted to firms that specialize in this type of maintenance. The costs of labor, vehicles, maintenance shops, and spare parts are included in the 10% per year cost noted above.

Spreadsheets detailing the calculations of each phase's toll equipment capital and maintenance expenditures are included in Appendix A.

Table 6-2: Annual Toll Equipment Capital and Maintenance Expenditures

	CONCEPT A			CONCEPT B-1			CONCEPT B-2		
Year	Toll Equipment Capital	Toll Equipment Maintenance Cost	Annual Capital Expenditures	Toll Equipment Capital	Toll Equipment Maintenance Cost	Annual Capital Expenditures	Toll Equipment Capital	Toll Equipment Maintenance Cost	Annual Capital Expenditures
2010	$ 10,450,150	$ 1,045,015	$ 11,495,165	$ 11,132,750	$ 1,113,275	$ 12,246,025	$ 10,453,750	$ 1,045,375	$ 11,499,125
2011		$ 1,045,015	$ 1,045,015		$ 1,113,275	$ 1,113,275		$ 1,045,375	$ 1,045,375
2012		$ 1,045,015	$ 1,045,015		$ 1,113,275	$ 1,113,275		$ 1,045,375	$ 1,045,375
2013		$ 1,045,015	$ 1,045,015		$ 1,113,275	$ 1,113,275		$ 1,045,375	$ 1,045,375
2014		$ 1,045,015	$ 1,045,015		$ 1,113,275	$ 1,113,275		$ 1,045,375	$ 1,045,375
2015	$ 3,235,400	$ 1,368,555	$ 4,603,955	$ 2,644,000	$ 1,377,675	$ 4,021,675	$ 3,269,000	$ 1,372,275	$ 4,641,275
2016		$ 1,368,555	$ 1,368,555		$ 1,377,675	$ 1,377,675		$ 1,372,275	$ 1,372,275
2017		$ 1,368,555	$ 1,368,555		$ 1,377,675	$ 1,377,675		$ 1,372,275	$ 1,372,275
2018		$ 1,368,555	$ 1,368,555		$ 1,377,675	$ 1,377,675		$ 1,372,275	$ 1,372,275
2019		$ 1,368,555	$ 1,368,555		$ 1,377,675	$ 1,377,675		$ 1,372,275	$ 1,372,275
2020	$ 9,056,825	$ 2,089,685	$ 11,146,510	$ 11,806,288	$ 2,367,275	$ 14,173,563	$ 10,022,688	$ 2,197,375	$ 12,220,063
2021		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2022		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2023		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2024		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2025	$ 678,150	$ 2,089,685	$ 2,767,835	$ 433,950	$ 2,367,275	$ 2,801,225	$ 433,950	$ 2,197,375	$ 2,631,325
2026		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2027		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2028		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2029		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2030	$ 3,706,725	$ 2,089,685	$ 5,796,410	$ 4,287,938	$ 2,367,275	$ 6,655,213	$ 3,941,438	$ 2,197,375	$ 6,138,813
2031		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2032		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2033		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2034		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2035	$ 678,150	$ 2,089,685	$ 2,767,835	$ 433,950	$ 2,367,275	$ 2,801,225	$ 433,950	$ 2,197,375	$ 2,631,325
2036		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2037		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2038		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2039		$ 2,089,685	$ 2,089,685		$ 2,367,275	$ 2,367,275		$ 2,197,375	$ 2,197,375
2040	$ 3,706,725	$ 2,089,685	$ 5,796,410	$ 4,287,938	$ 2,367,275	$ 6,655,213	$ 3,941,438	$ 2,197,375	$ 6,138,813

6.5.2 Billing and Administrative Costs

Operation of an ETC facility requires the daily collection of detailed transaction records from each vehicle that drives past the tolling equipment assigning each toll transaction to an individual account, and billing the customer. Most ETC toll facilities operate on a pre-paid basis, in which an individual establishes an account and provides a credit card number for billing purposes. The toll authority initially bills the credit card for a pre-determined amount, and deducts each toll from that balance until the account balance reaches a low threshold, at which time the credit card is again billed. In addition to billing the credit card for the accumulation of tolls, a detailed monthly billing summary is mailed to the customer.

In addition to the customer billing operations, financial reporting and auditing must also be performed on an on-going basis to report and manage all funds collected. There are a variety of business models for these billing and administrative operations. For purposes of cost estimates, the industry average billing cost of 12¢ per transaction has been used. All billing and customer service operations, and associated costs, are covered in this per transaction cost.

Table 6-3: Estimated Annual Transaction Costs

Year	Annual transactions (millions)	Annual Transaction (millions)
2011	5.9m	$0.71m
2020	11.7m	$1.40m
2030	13.4m	$1.60m

6.5.3 Customer Service Center Costs

The Customer Service Center (CSC) operations cost estimate was developed by using the industry average of $1.40 per month, per transaction. The study estimates an annual volume of 5.9 million transactions in 2011 escalating to over 13 million in 2030. Based on an assumed average of 100 transactions per year per transponder, this translated into roughly 100,000 transponders in 2011 and close to 225,000 in 2030. With no experience in the region regarding the frequency of use of a priced managed lanes facility, it is difficult to assess what the average number of transactions per transponder will be, though there will likely be significant variance around this average. Experiences garnered from around the country suggest the average account holder would use the managed lanes 2-3 times per week.

For the reduced operations option, it is assumed that other regional tolling entities exist and provide the same CSC services for compatible transponder technology. In this scenario cost saving can be realized through shared operations. A shared operations unit will result in staff reductions for call center / phone support services, payment processing, statement productions, and other supporting services. Combined these savings could total approximately 25%. This information is presented in Table 6-4.

Table 6-4: Annual Customer Service Center Costs Estimate

Year	Annual transactions (millions)	Annual CSC Costs – Full Scale (millions)	Annual CSC Costs – Reduced Scale (millions)
2011	5.9m	$0.99m	$0.74m
2020	11.7m	$1.97m	$1.48m
2030	13.4m	$2.25m	$1.69m

6.5.4 Violations Center Operations Costs

The Violations Center (VC) operations costs were developed by using industry average violation rates and costs. Industry average violation rates are typically 1.5% to 2.5% of the toll transaction volume. It should be noted that the above rates are predicated on the existence of violation enforcement equipment and a reasonably high probability of capturing intentional violations accompanied by a financial penalty. For the purposes of this study, it is assumed that the violation rate is 2.0%. Within the industry, VC operating costs typically average $2.00 to $3.00 per processed violation.

For the reduced operations option, it is assumed that other regional tolling entities exist and provide the same VC services with identical policies. In this scenario cost savings can be realized through shared operations. A shared operations unit will result in staff reductions for violation image review staff, appeals, payment processing, and other supporting services. Combined, these savings could total approximately 15%.

It should be noted that these costs are gross costs insofar as they include no offset (credit) for violation fines. With the appropriate statutory authority, it may be possible to cover part or all of the violation-related costs, including enforcement, with revenue collected from fines. This would improve the overall bottom line net revenue for the operation. However, to be conservative, it was assumed that any violation fine revenue was not directly available to offset these or any other toll operating costs. This information is presented in Table 6-5.

Table 6-5: Annual Violation Center Cost Estimate

Year	Annual transactions (millions)	Annual VC Costs – Full Scale (millions)	Annual VC Costs – Reduced Scale (millions)
2011	5.9m	$0.35m	$0.30m
2020	11.7m	$0.70m	$0.60m
2030	13.4m	$0.80m	$0.68m

Figures 6-6-6-8 illustrate the distribution of the toll collection costs by the four main categories discussed above for both the full operations and reduced operations options.

Figure 6-9: Distribution of Toll Collection Costs by Function Opening Year (2011)

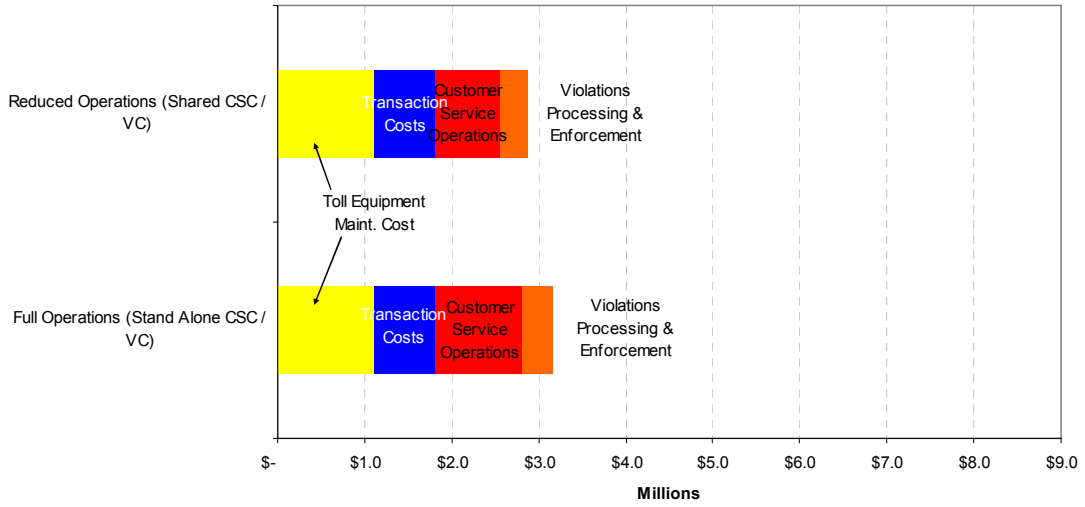


Figure 6-10: Distribution of Toll Collection Costs by Function at Build-out (2020)

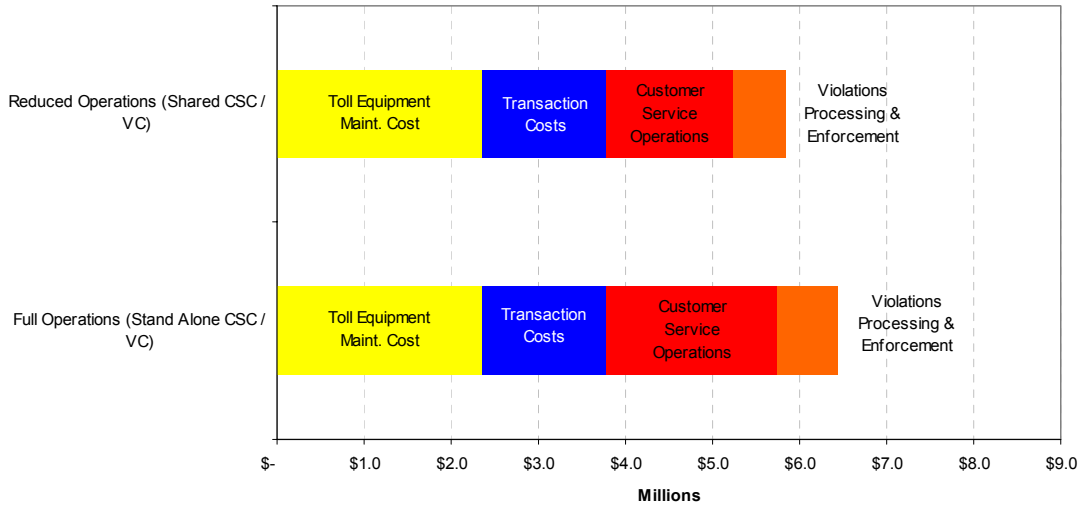
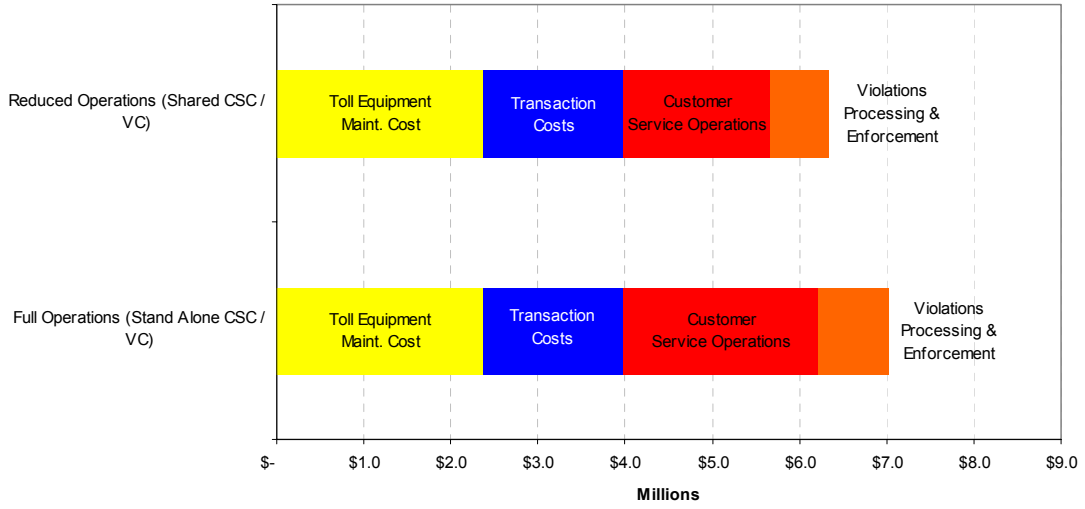


Figure 6-11: Distribution of Toll Collection Costs by Function Horizon Year (2030)



CHAPTER 7

TRUCK ONLY LANES

The primary purpose of this chapter is to evaluate the data resources available to analyze Truck Only lanes in the Interstate 75 and Interstate 575 corridors. These resources include truck related crashes, truck volumes, origin and destination of trucks, commodity flow survey data, rail yards, and intermodal centers. Of the available sources, only the crash data is comprehensive enough to support conclusive analysis, which indicates that truck lanes in the corridor could help reduce the level of truck crash-related injury and expense. More complete data should be collected to evaluate the impact of local and through truck volumes on the operational performance of the corridor.

Review of the truck related crashes in the corridor during the year 2002 through 2004 reveals that there are numerous injuries and fatalities on I-75 and I-575 involving trucks. In 2004, there were 265 crashes per 1 million vehicle miles of travel on I-75 and 650 crashes on I-575. Trucks were involved in 39 percent of the total crashes on I-75 and 22 percent on I-575. Tractor-trailers are involved in around 75 percent of the truck related crashes on I-75 and 50 percent of the truck related crashes on I-575. The majority of truck related crashes in the corridor are rear-end and sideswipe type of collisions. Counting property damage, health care, and the personal cost of such crashes, the average annual cost of truck related crashes in the I-75 and 575 corridors is $7.00 million for the last three years.

Because of the high number of truck related fatalities and injuries, providing Truck Only lanes may be an option to be considered in the corridor. Separating auto and truck traffic will reduce the interaction of trucks and other traffic in the general travel lanes and therefore could potentially reduce the risk of truck/automobile crashes in the corridor. Providing Truck Only lanes in the corridor could help avoid injuries and fatalities on I-75 and on I-575.

Background

According to *Mobility 2030*, the Atlanta Regional Commission's (ARC) recently adopted Regional Transportation Plan, 92.7% of the freight moved through Atlanta region is shipped by trucks. According to ARC's travel demand model projections, commercial vehicle travel will increase an additional 50% over current levels by 2030. In 2005, SRTA commissioned a modeling exercise to evaluate feasibility of Truck Only Toll Lanes in the Atlanta region. According to that study, the potential benefits of providing Truck Only lanes are as follows:

- *Enhance Transportation Options:* By providing shippers and service providers more reliable routes for traveling in Atlanta region during peak periods.
- *Improve Safety and Efficiency in the Corridor:* By providing Truck Only lanes, trucks will be separated from the traffic mix and the performance characteristics

of the remaining traffic on the freeway will be more uniform. This will improve efficiency of travel on the roadway and will reduce the risk of truck/automobile crashes.

- *Improve Freight Productivity:* Truck Only lanes can greatly improve commercial vehicle productivity.
- *Manage Congestion Levels for Truck Travel and Improve General Purpose Highway Congestion:* If a large number of trucks are removed from the general purpose lanes and the local road network, congestion levels might be reduced for other traffic also.

This study found that, were Truck Only lanes available, trucks traveling through the region can save a significant amount of time and also congestion levels in general purpose lanes is significantly improved.

While the results of the study were compelling, they were based on model-generated estimates of truck volumes on the network. To confirm the validity of the conclusions, evaluation of available empirical data collected for the I-75 and I-575 corridors was included within the scope of the SRTA Study of Value Pricing on I-75/575 HOV/BRT Lanes.

7.1 Crash Data

Fatality Analysis Reporting System (FARS): The Fatality Analysis Reporting System (FARS) contains data derived from a census of fatal traffic crashes within the 50 States, the District of Columbia, and Puerto Rico. To be included in FARS, a crash must involve a motor vehicle traveling on a traffic way customarily open to the public and result in the death of a person (occupant of a vehicle or a non-motorist) within 30 days of the crash. A large truck is defined in the FARS as a truck with a gross vehicle weight rating (GVWR) of more than 10,000 pounds.

FARS was conceived, designed, and developed by the National Center for Statistics and Analysis **(**NCSA**)** of the National Highway Traffic Safety Administration (NHTSA) in 1975 to provide an overall measure of highway safety, to help identify traffic safety problems, to suggest solutions, and to help provide an objective basis to evaluate the effectiveness of motor vehicle safety standards and highway safety programs.

Table 7-1 shows the summary of large trucks involved in fatal crashes by roadway type in Georgia and U.S for the year 2004. The percent of fatal crashes for the Interstate highways and Minor arterials for Georgia is higher than the national averages.

Table 7-1: Large Trucks involved in Fatal Crashes by Roadway Type – Georgia (2004)

Roadway Type	USA		Georgia	
	Total	Percent Crashes Involving Trucks	Total	Percent Crashes Involving Trucks
Interstate Highway	1360	28.00%	75	32.20%
Other Principle Arterial	1618	33.30%	56	24.00%
Minor Arterial	918	18.90%	62	26.60%
Collector	617	12.70%	24	10.30%
Local Road/Street	301	6.20%	12	5.20%
Unknown	48	1.00%	4	1.70%

Data Source: FARS

Truck related crash data on I-75 and I-575 for the years 2002 to 2004 is available from Georgia Department of Transportation. These crashes are classified by vehicle type such as Single Unit truck, Panel Truck, Tractor Trailer, Logging Tractor/Trailer, Tractor W/Twin Trailers, Truck Towing House Trailer, and Truck Tractor (Bobtail).

Table 7-2 shows the summary of crashes in the I-75 corridor from year 2002 to 2004. On I-75, there are at an average 1100 crashes per year which resulted in around 800 injuries and 10 fatalities per year.

Table 7-2: Summary of Total Crashes in I-75 Corridor

Year	Total Crashes	Total Vehicles Involved	Total Injuries	Total Fatalities
2002	1120	2413	787	17
2003	1087	2385	974	5
2004	1128	2474	875	9

Table 7-3 shows the summary of crashes in the I-575 corridor from year 2002 to 2004. On I-575, there are at an average 300 crashes per year which resulted in 190 injuries and 1 fatality per year.

Table 7-3: Summary of Total Crashes in I-575 Corridor

Year	Total Crashes	Total Vehicles Involved	Total Injuries	Total Fatalities
2002	285	579	174	0
2003	348	738	241	2
2004	332	693	163	0

Table 7-4 and 7-5 shows the summary of truck related crashes in the I-75 and I-575 corridors from year 2002 to 2004. Trucks are involved at an average of 39 percent of total crashes on I-75 and 22 percent on I-575. Truck related injuries are 18 percent of the total injuries on the I-75 and 24 percent on I-575. On I-75, there were 3 fatalities in

2004 and 4 fatalities in 2002. While no truck related fatalities have occurred on I-575 during the last three years injury crashes have increased fourfold over the same period.

Table 7-4: Summary of Truck Related Crashes in I-75 Corridor

Year	Total Crashes	Truck Related Crashes	Total Vehicles Involved	Total Injuries	Total Fatalities
2002	1120	441	499	134	4
2003	1087	426	478	193	0
2004	1128	438	502	156	3

Table 7-5: Summary of Truck Related Crashes in I-575 Corridor

Year	Total Crashes	Truck Related Crashes	Total Vehicles Involved	Total Injuries	Total Fatalities
2002	285	58	115	29	0
2003	348	56	125	22	0
2004	332	95	226	88	0

Truck related crashes are further classified by vehicle type. From Tables 7-6 and 7-7, it can be seen that Tractor-Trailers are involved in 75 percent of the truck related crashes in I-75 and 50 percent in I-575 corridor.

Table 7-6: Summary of Truck Related Crashes by Vehicle Type on I-75

Year	Vehicle Type								
	Logging Tractor/ Trailer	Logging Truck	Panel Truck	Single Unit Truck	Tractor with Twin Trailer	Tractor Trailer	Truck Towing House Trailer	Bobtail	Total
2002	5	0	13	91	15	361	2	12	499
2003	3	1	21	73	7	367	6	0	478
2004	3	0	24	72	7	384	1	11	502
Total	11	1	58	236	29	1112	9	23	1479

Table 7-7: Summary of Truck Related Crashes by Vehicle Type on I-575

Year	Vehicle Type								
	Logging Tractor/ Trailer	Logging Truck	Panel Truck	Single Unit Truck	Tractor with Twin Trailer	Tractor Trailer	Truck Towing House Trailer	Bobtail	Total
2002	0	3	12	53	0	47	0	0	115
2003	0	0	11	51	1	62	0	0	125
2004	2	0	24	66	2	130	0	2	226
Total	2	3	47	170	3	239	0	2	466

Truck related crashes further classified by collision type on I-75 and I-575 are shown in Tables 7-8 and 7-9. In the I-75 corridor, sideswipe and rear-end collision types

contribute to 73 percent of the truck related crashes. In the I-575 corridor, 40 percent of crashes are of rear-end collision type and 20 percent are of sideswipe type. These types of crashes are associated with heavy volumes of mixed traffic; where stop and go traffic and lane changing creates dangerous conflicts between trucks and passenger vehicles.

Table 7-8: Truck Related Crashes by Collision Type on I-75

Year	Crash Type					
	Angle	Head On	Rear-End	Sideswipe	Not a Collision	Total
2002	49	3	168	238	41	499
2003	41	0	173	227	37	478
2004	51	6	208	216	21	502
Total	141	9	549	681	99	1,479

Table 7-9: Truck Related Crashes by Collision Type on I-575

Year	Crash Type					
	Angle	Head On	Rear-End	Sideswipe	Not a Collision	Total
2002	11	4	50	26	24	115
2003	20	0	61	14	30	125
2004	45	6	79	56	40	226
Total	76	10	150	96	94	466

Economic Cost of Large Truck Crashes

Crashes involving large trucks and buses with gross weight rating of over 10,000 pounds impose a variety of costs on the drivers of those vehicles; and other drivers involved directly or indirectly in the crashes. Such costs include medical expenses, emergency services, property damage, lost productivity, travel delays, and the monetized value of pain, suffering, and quality-of-life lost.

The crash cost for the truck related crashes in the corridor is developed by using the information provided in the report “Revised Costs of Large Truck-and Bus-Involved Crashes: A Final Report for Federal Motor Carrier Safety Administration, Federal Highway Administration by the Pacific Institute in 2002. The cost per victim injured, by crash type in 2000 dollars is used to develop the total crash cost are shown in Table 7-10.

Table 7-10: Costs per Victim Injured, by Crash Type and Police Reported Injury Severity (in 2000 dollars)

Vehicle Type	Injury Severity	Total ($)
Straight Truck with no Trailer, Single Unit Truck, Panel Truck, Logging Truck	No Injury	3,884
	Possible Injury	26,722
	Fatal Injury	2,648,145
Bobtail	No Injury	5,642
	Possible Injury	26,260
	Fatal Injury	2,729,800
Tractor Trailer	No Injury	5,141
	Possible Injury	41,199
	Fatal Injury	2,709,360
Tractor Trailer with Twin Trailer or 3 Trailers	No Injury	9,187
	Possible Injury	50,758
	Fatal Injury	2,617,417
Tractor Trailer with unknown Trailers	No Injury	5,640
	Possible Injury	43,226
	Fatal Injury	2,515,579
Medium/heavy truck unknown if with Trailer, Logging Truck with Trailer	No Injury	3,757
	Possible Injury	26,648
	Fatal Injury	2,399,129
All large Trucks	No Injury	4,685
	Possible Injury	34,310
	Fatal Injury	2,691,537

Source: Ted Miller, Eduard Zaloshnja, Revised Cost of Large Truck and Bus Involved crashes

Tables 7-11 and 7-12 show the crash related cost for the I-75 and I-575 corridors. As seen from these tables the 3-year average cost of truck related crashes in the I-75 corridor is $12.45 million and in I-575 corridor is $1.65 million in 2000 year dollars.

Table 7-11: Truck Related Crash Cost for I-75 Corridor

	2002	2003	2004
Total Injuries	134	193	156
Total Fatalities	4	0	3
Total Crash Cost	$15,884,344	$7,472,280	$13,945,652

Table 7-12: Truck Related Crash Cost for I-575 Corridor

	2002	2003	2004
Total Injuries	29	22	88
Total Fatalities	0	0	0
Total Crash Cost	$919,708	$742,213	$3,292,541

Summary

Crashes involving trucks are persistent and increasing in the I-75/575 Corridors. Such crashes are both more frequent and more likely to result in injury or death when they occur in heavy mixed traffic. Based on the crash experience in the corridor, diverting truck traffic to dedicated lanes could help eliminate the truck related crashes that are associated with mixed traffic in congested corridors. There will be considerable economic savings by reducing cost of these incidents; truck lanes could make a significant contribution to the safety and operational efficiency of this corridor.

7.2 Truck Volume Data

Available truck volume data is sparse in the I-75/575 corridor. Because of the age of the facility, data collection devices maintained by GDOT are not currently installed on I-75 in the study area. Available proprietary data are both expensive and derived from secondary data sources. As a result, few supportable conclusions can be drawn from available data. Other planning efforts under way, including video surveying in the corridor and an ARC Regional Freight Movement Study will supplement available data, and ultimately support more conclusive analysis of truck volumes in the corridor.

The Georgia Department of Transportation's ATR Traffic Data Manual is a document that provides information about the traffic data collected by permanent Automatic Traffic Recorder (ATR) devices throughout the state. These sites are operational seven days a week, 24 hours a day, and 365 days a year. Permanent sites are polled on a daily basis.

The manual provides such information as: Locations of ATR Sites on maps, Statewide Trends, Summarized Reports, Truck Percentages by Functional Classification and Hour; and Vehicle Classification by Functional Classification and Hour.

Figure 7-1 shows the ATR locations in the Cobb County. Automatic Traffic Recorder's truck percent data for weekend and weekday are shown in Table 7-13. I-75 does not have any ATR locations that collect vehicle classification data in the Cobb County. I-575 has two locations, Station ID 0774 and 0781, which has truck percent data available. It can be seen that the truck percentages on I-575 is approximately 2.50 percent.

Figure 7-1 ATR locations in Cobb County

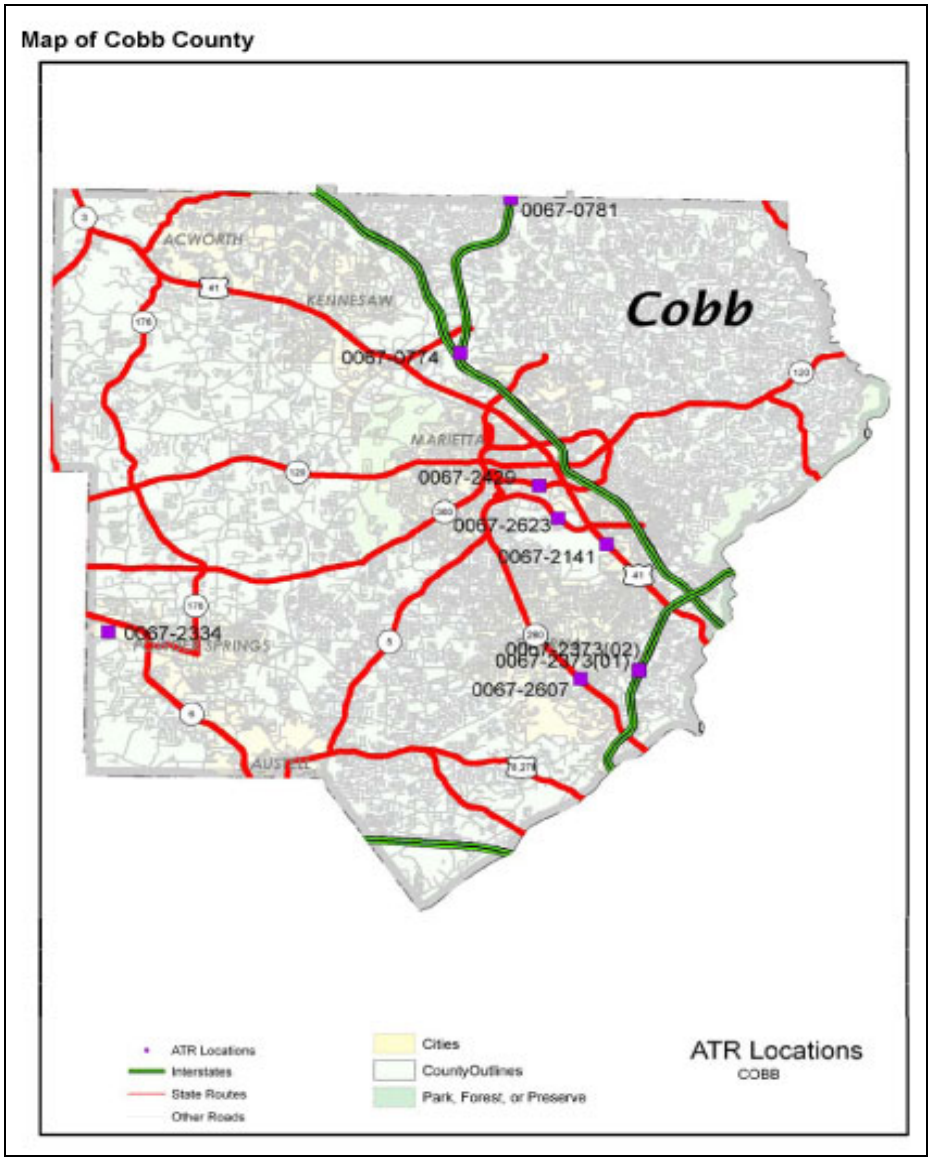


Table 7-13 Cobb County - ATR Locations - Weekend and Weekday Truck Percentages

ATR Station ID	Location	AADT	Weekend Truck Percentage	Weekday Truck Percentage	Weekend Volume	Weekday Volume
0774	Interstate 575 (SR 417) between INTERSTATE 75 and SR 5 connector Ernest Barrett Parkway	71,039	**2.65**	**2.23**	58,010	77,658
0781	Interstate 575 (SR 417) between 0.8 miles South of SR 92	85,062	**2.40**	**2.69**	71,197	90,569
2141	Cobb Parkway (SR 3/US 41); South of Franklin Rd	42,336	1.43	3.01	33,580	45,853
2334	(CR4516) Powder Springs Dallas Road between Finch Road and Warren Farm Road	3,083	1.70	3.65	2,482	3,313
2373	I-285 @ Orchard Road	157,936	6.00	9.00	130,000	182,500
2429	SR120 Loop between Cobb Parkway and Fairground Street	30,927	1.76	3.7	26,018	34,115
2623	S. Cobb Drive (SR 280) @ Dobbins AFB, South of Ridenour Road	31,281	1.53	3.49	22,307	34,713
2607	SR 280 between Cooper Lake Road CR 1892 and King Spring Road CR 1891	28,669	1.66	3.67	23,778	30,667

To assess the volume of data that Truck Only Lanes may carry, further data should be collected on truck volumes, as there is not enough truck volume data available in the study area Interstate facilities to provide a clear picture.

7.3 Rail Yards and Intermodal Facilities

The Atlanta region is a major rail hub and center of intermodal freight distribution. In the past decade, the major railroads that serve the region have invested heavily in this business, and growth of intermodal freight is expected to continue.

Information about intermodal facilities is available from the Office of Intermodal Programs, Georgia Department of Transportation. Figure 7-2 shows the Atlanta Metro Rail map which includes rail yards and intermodal facilities in the Atlanta area and Figure 7-3 shows the Atlanta Tonnage by Rail.

The Atlanta region has the following key freight nodes that provide transportation, transfer, and distribution of goods in the region. Traffic from these locations bound for northwest Georgia, Tennessee and the Midwest could use I-75 in the study area.

- *Austell:* The Norfolk Southern Railroad intermodal yard at Austell is the largest intermodal yard in the southeast U.S. This facility operates over 25 freight trains per day and generates over 2,000 trucks a day, and has over 30,000 container parking spaces. This yard is currently operating only at 50 percent capacity with

future expansions planned to double current capacity. Truck related data from the intermodal facilities is proprietary and was not available for this study.

- *Fulton Industrial Boulevard:* This is the region's main freight warehousing and distribution hub hosts a variety of freight-related activities including warehousing, distribution centers, logistics companies, trucking companies and other related businesses.
- *Fairburn CSX*: This is located in South Fulton County, the Fairburn area is a magnet for freight related activities including warehousing, distribution centers, and logistics.
- *Hartsfield-Jackson Atlanta International Airport (HJAIA):* This is the region's main commercial airport. This airport handled 683,416 tons of cargo in 2003. A significant number of air cargo dependent facilities and companies are located in close proximity of the airport.

Distribution Centers

In Atlanta region, most distribution and warehousing activities are located in close proximity to the airport and also to the intermodal rail yards (including Fulton industrial Boulevard, Fairburn, Mountain Industrial, and Jimmy Carter Boulevard).

- Large distribution centers in Atlanta region includes, but are not limited to: the Home Depot Distribution Center in Dacula (Gwinnett County); Atlanta Beverage Distribution Center (Fulton County); Georgia Pacific Building Products Distribution Center (Cobb County); Georgia Pacific Pulp and Paper Distribution Center (DeKalb County); Rooms to Go Distribution Center in Morrow (Clayton County), Haverty's Furniture Distribution center (Fulton and Jackson County); Publix Distribution Facility (Gwinnett County); UPS Distribution Centers (Fulton and DeKalb Counties); Federal Express Distribution Centers (DeKalb County), and the United States Postal Service Bulk Mail Facility (Fulton County).

Figure 7-2: Atlanta Metro Rail Map showing the Intermodal Facilities and Rail Yards

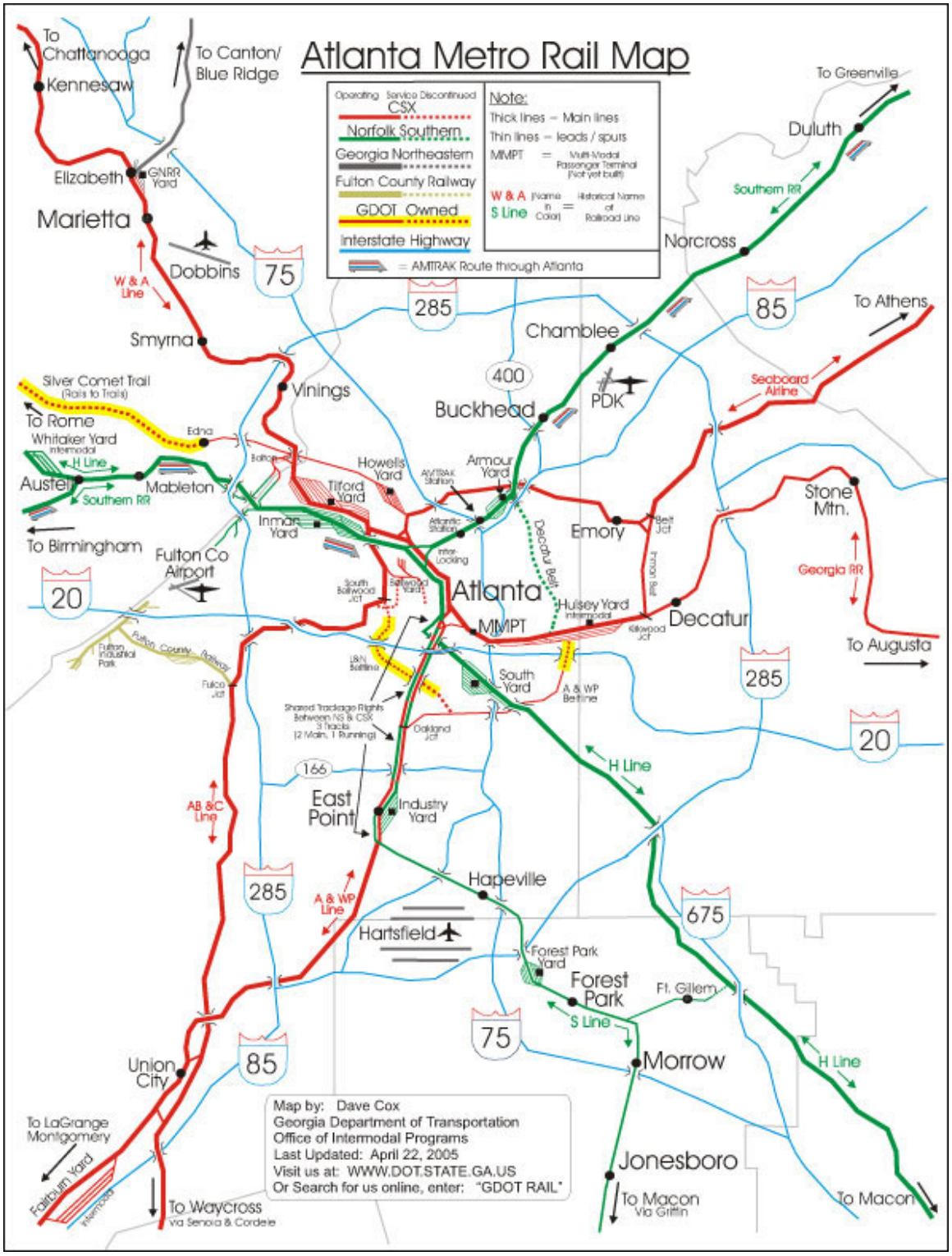
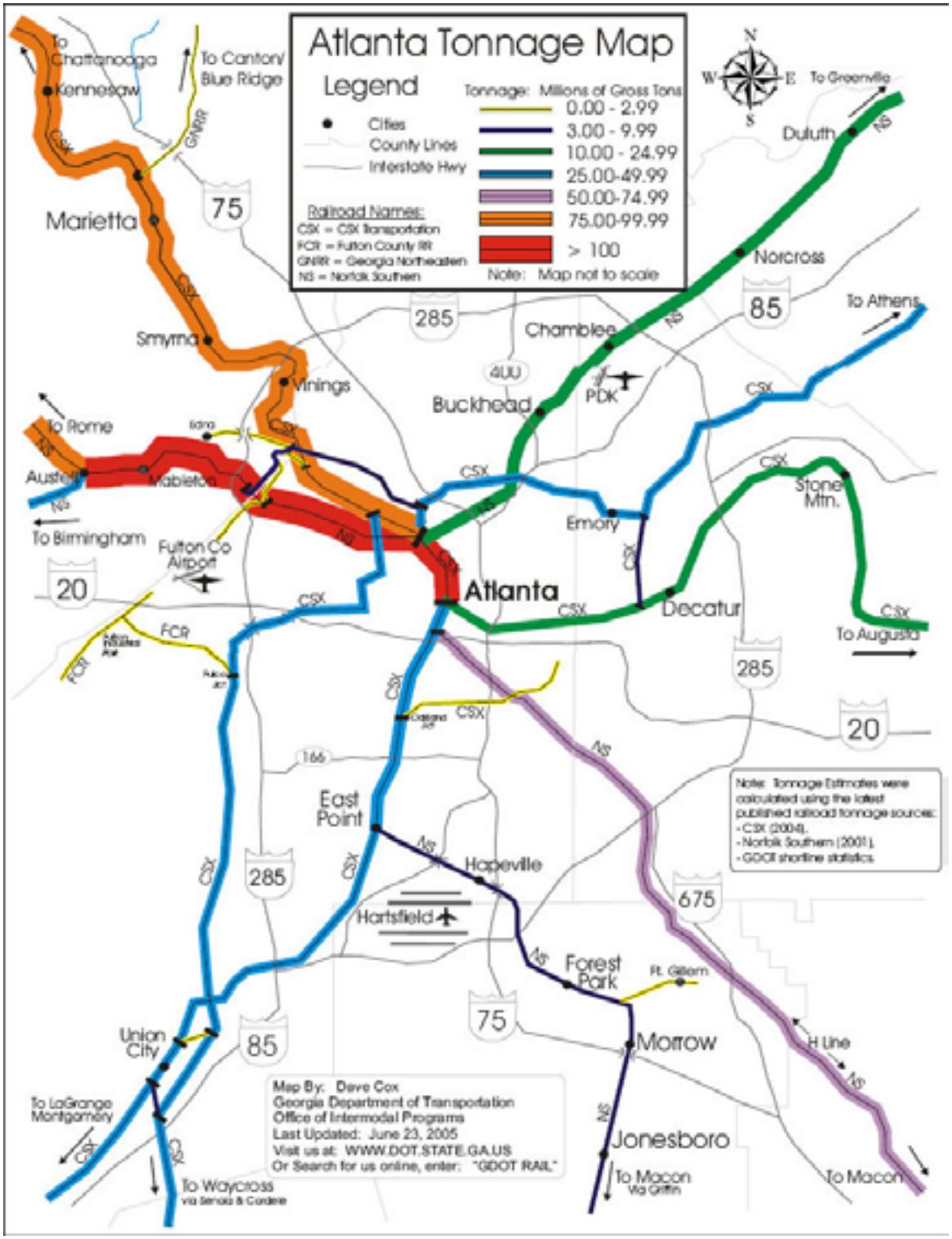


Figure 7-3: Atlanta Rail Tonnage Map showing the Intermodal Facilities in Atlanta.



7.4 Origin and Destination of Trucks

To obtain origin and destination of trucks on the Interstate system, the following public freight data sources were reviewed.

2002 Commodity Flow Survey

The 2002 Commodity Flow Survey (CFS) is conducted as part of the Economic Census by the U.S. Census Bureau in partnership with the Bureau of Transportation Statistics of the U.S. Department of Transportation. This survey produces data on the movement of goods in the United States. It provides information on commodities shipped, their value, weight, and mode of transportation, as well as the origin and destination of shipments of manufacturing, mining, wholesale, and select retail establishments. The data from the CFS are used by public policy analysts and for transportation planning and decision making to access the demand for transportation facilities and services, energy use, and safety risk and environmental concerns. It is useful to develop a general idea of commodity flows, including flows by trucks into and out of Atlanta, and what types of commodities are important to Atlanta.

The commodity data are presented at the state level and all large metropolitan areas within each state, including the Atlanta Standard Metropolitan Area, grouped by the two-digit Standard Classification of Transported Goods (SCTG) code. It contains commodity flows by tons, value, and ton-miles by commodity on different modes for all states. The CFS data contains data on shipments by domestic establishments in manufacturing, wholesaling, mining, and other industries. The database contains the mode information for all the products. The modes discussed include: all modes, single modes, multiple modes, and other unknown modes. In single mode, truck (for hire truck, private truck), rail, water (shallow draft, great lakes, deep draft), air (includes truck and air), and pipeline modes are included. In multiple modes, parcel-US Postal Service or Courier, truck and rail, truck and water, rail and water, and other multiple modes are included in the database.

The 2002 Commodity Flow Survey reports that approximately 80% of all goods shipped from the Atlanta- Sandy Springs-Gainesville Metropolitan Statistical Area were shipped by trucks. Similarly, about 74% of all goods shipped to the Atlanta-Sandy Springs-Gainesville Metropolitan Statistical Area arrived by trucks.
Using the 2002 Commodity Flow Survey, it is estimated that approximately $127 billion in goods, representing 191 million tons, were transported over highways to locations within the state, to neighboring states or other U.S regions. Figure 7-4 shows the flow of domestic goods in the Atlanta area for the year 1998.

Figure 7-4: Total Combined Truck Flows in Atlanta for year 1998

The Transportation and Warehousing Report of the U.S. Economic Census states that the total earnings of all trucking companies located in the Atlanta MSA was approximately $3.01 billion in 2002. It increased from $2.7 billion from 1997. According to this source, about 70% of the Atlanta MSA's freight trucking establishments is long distance carriers. Thirty one percent of (31%) of total shipped goods are transported fifty miles are less and carried by trucks. Table 7-14 shows the percentage of truck freight shipped by distance.

Table 7-14: Distance Shipped (by Trucks) of Freight Originating in the Atlanta Region

Distance Shipped (in miles)	Percentage of Total (Value in $) Shipped
Less than 50 miles	31.9
50 - 99	6.00
100 - 249	19.0
250 - 499	21.5
500 - 749	15.9
750 - 999	2.70
1,000 -1,499	0.80
1,500 - 1,999	1.30
2,000 and more	0.90

Source: 2002 Economic Census – Commodity Flow Survey

The Commodity Flow survey is useful, but is not detailed enough to assign specific number of truck trips to the limited access facilities in the study area.

Freight Analysis Program and Freight Analysis Framework (FAF):
To better understand the challenges that come with increasing demand for freight transportation and to improve mobility and productivity, the Federal Highway Administration (FHWA) is conducting research and analysis on freight flows and commodity movements, developing analytical tools, measuring system performance, and examining the relationships between freight transportation improvements and the economy.

In partnership with other modal administrations, FHWA developed the Freight Analysis Framework (FAF), a database and analytical tool, to capture freight flow data by mode and commodity. This information will help identify points of congestion and highlight areas needing improvement. A series of FAF products have been released, including freight flow maps for states and modes and detailed databases on traffic flows and commodity movements.

The Office of Operations will continue to provide data and develop tools for transportation planners, operations managers, and decision makers. Although the FAF has provided much needed assistance in analyzing current and future freight trends, further work is needed to develop a national database that could be customized for all stakeholders, including State and local users. Future efforts will include integrating economic and geographic databases and linking the data and analyses to existing FHWA models.

Understanding future freight activity is important for matching infrastructure supply to demand and for assessing potential investment and operational strategies. To help decision-makers identify areas in need of capacity improvements, the U.S. Department of Transportation developed the Freight Analysis Framework (FAF), a comprehensive national data and analysis tool. The Freight Analysis Framework (FAF) integrates data from a variety of sources to estimate commodity flows and related freight transportation activity among states, regions, and major international gateways.

Truck traffic is expected to grow throughout the state over the next 20 years. Much of the growth will occur in urban areas and on the Interstate highway system (Figures 7-5 and 7-6). Truck traffic moving to and from Georgia accounted for 13 percent of the annual average daily truck traffic (AADTT) on the FAF road network. Approximately 12 percent of truck traffic involved in-state shipments, and 18 percent involved trucks traveling across the state to other markets. About 57 percent of the AADTT were not identified with a route-specific origin or destination.

FHWA is currently working on the second generation of Freight Analysis Framework (FAF) and using all public data. The geographic coverage in the commodity flow (tonnage) will be based on the resolution of the Commodity Flow Survey (CFS) which is 114 zones for the entire nation. This data will be release in January 2006. However, FHWA Will further disaggregate the 114x114 region data to a county by county data before they load the data to the highway network and the truck data will not released late summer of 2006.

Figure 7-5: Estimated Annual Average Daily Truck Traffic in Georgia (1998)

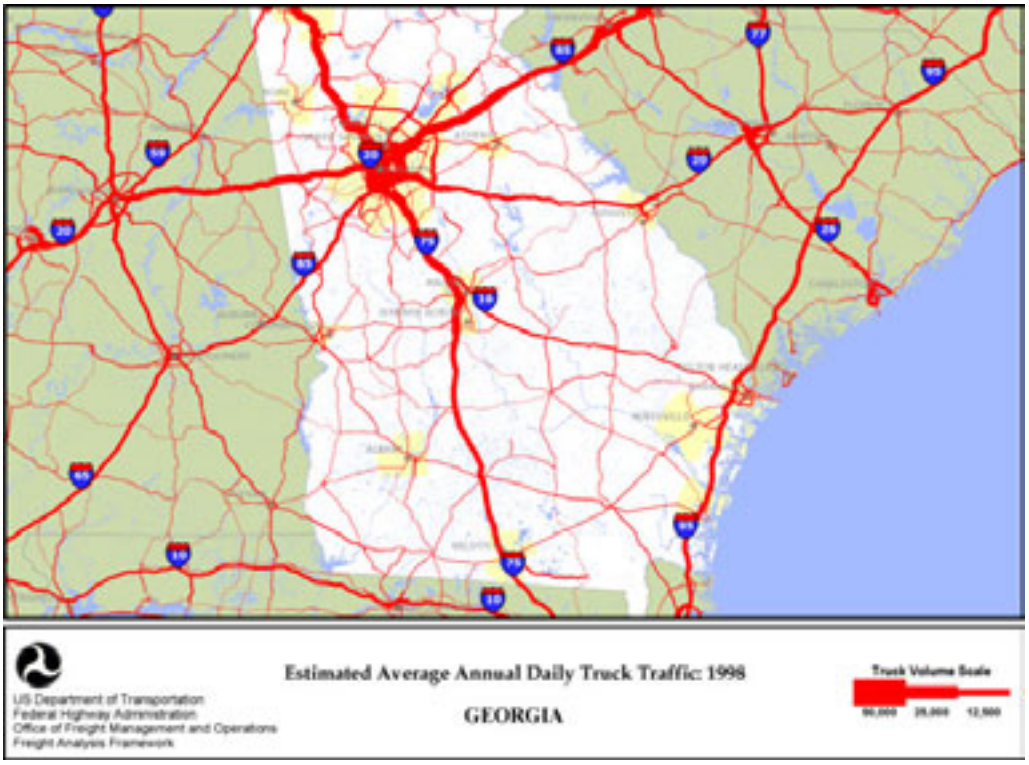
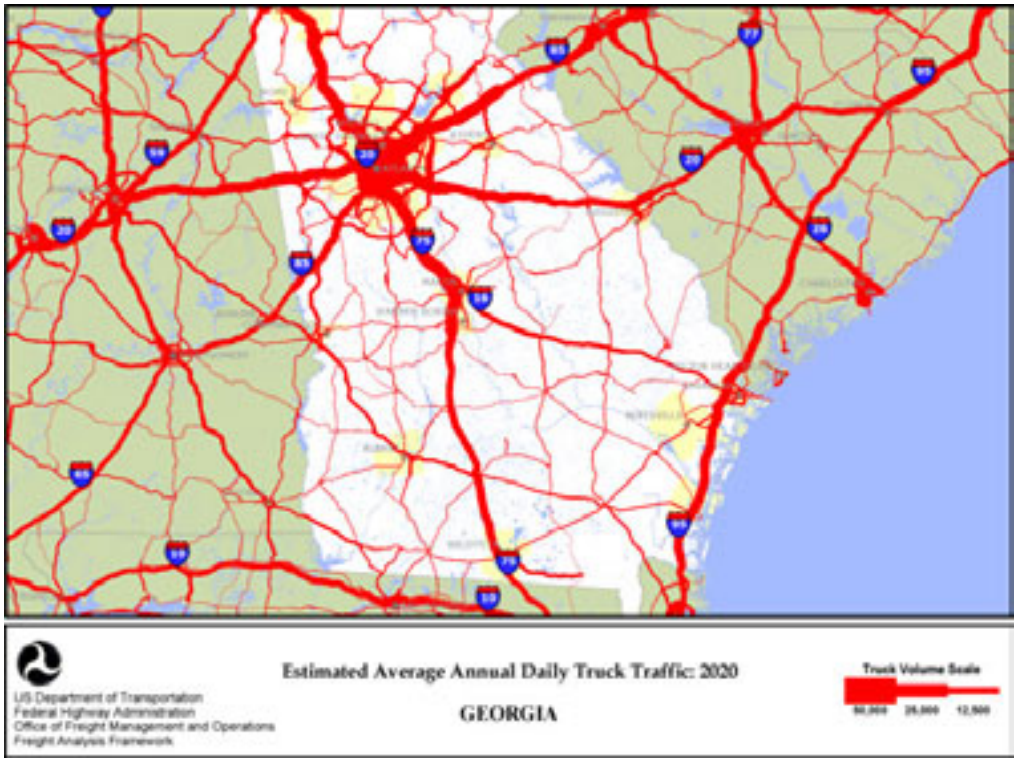


Figure 7-6: Estimated Annual Average Daily Truck Traffic in Georgia (2020)



Study of Hourly Truck Movement around Atlanta

The consultant Street Smarts conducted the following surveys for the Georgia Department of Transportation's study of Hourly Truck Movement around Atlanta.

Origin and Destination Survey: This involved surveying the truck drivers entering the Atlanta region at eight locations around the region. Two of the eight locations are on I-75: Catoosa County weigh station on I-75 Southbound in Ringgold – mile marker 343 and Monroe County weigh station on I-75 Northbound in Forsyth - mile marker 190. The data collected includes, origin and destination data, truck size, and configuration, type of commodity, carried, frequency of travel on various roadways, and use of in-vehicle technology.

Establishment Survey: This survey involved contacting a number of business' using trucks around the region to gather local data on the patterns of largely intra-regional truck deliveries using the Interstate highway system in the study area.

General findings from these Surveys are as follows:

- Over 85% of all truck trips surveyed have either an origin or destination in Georgia or in one of the neighboring states.
- Nearly half of all truck trips in the Atlanta region are through trips that originate and end in locations outside the region.
- About 60% of the truck trips made in the region occur multiple times during the week.
- About 14% of the truckers surveyed indicated that they "always" travel during the AM peak period while a slightly smaller group (11%) reported "always" traveling during the PM peak.
- The data from both origin-destination survey and establishment survey show there is widespread use of all parts of I-285 by truckers of all types. Generally, the areas avoided are located on the north side of the I-285 perimeter between I-75 and I-85.
- Survey findings indicate that reliable delivery time is a very strong factor used by truckers and establishments in making truck travel decisions.
- Most crashes involving trucks occur in Georgia with tractor-trailer configurations. Improper lane changing and following too closely are the factors in crashes involving trucks in the Atlanta Region (based on 1997 data).

Private Data Sources: TRANSEARCH

TRANSEARCH draws from a wide variety of data sources covering commodity volume and modal flow, including a proprietary motor carrier traffic sample, the Bureau of Transportation Statistics (BTS) Commodity Flow Survey (CFS), and the Surface Transportation Board (STB)'s Railroad Waybill Sample. The TRANSEARCH database contains freight movements by rail, water, air, and truck from manufacturing plants, truck movements of coal, and inland truck movements of imports. The data do not include shipments by pipeline, mail or small package shipments, and secondary truck shipments involving warehouses.

TRANSEARCH database contains information on freight movements moving into, out of, and through Atlanta; as well as the State of Georgia. They have used the Highway Routing Model to show which highway segments are used by trucks. This is an estimate

and is based on the model developed at the Oak Ridge TN National Laboratories. All of this is based on Freight Volumes by mode and commodity. Modes include: For-hire Truckload; Less-than-Truckload; Private Truck; Rail Intermodal; Rail Carload; Air; and Waterborne. Commodities are shown by STCC or SIC (or NAICS) Codes down to the 4-digit level of detail. There is no passenger vehicle information in TRANSEARCH. Origin/Destination detail can be displayed; as these are the basic elements to which the routing model is applied. Vehicle type (such as Dry Van, Refrigerated, Flatbed, Tanker, Hopper, etc.) information is available; and is based on the commodity type.

7.5 Summary

- Atlanta is the center of freight for the Southeast region of the United Sates. Most of the fright traffic is related to truck traffic.
- Fright movements are expected to grow faster than the regular traffic in the region.
- A review of the available federal, state, and regional data sources pertaining to freight transportation on Interstate highways shows there is a lack of relevant truck origin and destination data on I-75 and I-575 to sufficiently evaluate the demand for Truck Only lanes at this time.
- Commodity Flow Survey and Freight Analysis Framework can only serve as a basis for freight planning in the study area.
- There are large number of truck related injuries and fatalities on I-75 during 2002 to 2004. In 2004, there are 265 crashes per 1 million vehicle miles of travel on I-75 and 650 crashes on I-575. Tractor-trailers are involved in around 75 percent of the crashes on I-75 and 50 percent on I-575. Rear-end and Sideswipe collisions are significant in the truck related crashes.
- The average annual cost of truck related crashes in the I-75 corridor is $12 million and in the I-575 corridor is $1.65 million for the last three years. By providing Truck Only lanes, crashes between trucks and auto can be reduced and this will result in substantial savings in crash related cost.
- Considering the high number of fatalities and injuries on I-75 and I-575, increased congestion and anticipated future growth in the corridor, increased safety through separating auto and truck traffic may be one of the significant benefits derived from exclusive truck lanes in the corridor.
- To assess the volume of traffic that Truck Only lanes might carry, further data should be collected on truck volumes, and origin and destination in the corridor. Such efforts are ongoing, and should soon provide a clearer picture of truck movements in the I-75/575 corridor.

CHAPTER 8

SUMMARY OF FINDINGS

8.1 Existing Traffic Conditions and Trends in the I-75/575 Corridor

Congestion is a significant problem in the I-75 and I-575 corridors today, and will become more severe. By 2030, average daily traffic is expected to increase by 20-25 percent along the I-75 corridor and 83 percent along I-575, compared to a 12 percent increase in lanes miles. Region wide, the proportion of afternoon travel in severe congestion is forecast to increase from 25 percent to 34 percent over the planning horizon.

Future roadway Level of Service is expected to decrease along the majority of sections of the corridor. The travel time from Akers Mill Road to I-575 in the PM peak is expected to increase from 25 minutes to 33 minutes, compared to 16 minutes under free flow conditions, even with the improvements currently planned in ARC's Mobility 2030 long-range transportation plan. Very high volumes in the AM and PM peak periods will continue to result in peak spreading as commuters adjust their travel times to avoid the most congested hours of the day. As a result, more of the corridor will experience congestion over more hours of the day.

Specific factors contributing to the growing congestion problem include:

- Nationally, and within Georgia, people are driving more and traveling longer distances. Historically, vehicle miles of travel (VMT) are increasing at a greater rate than the population. But with congestion imposing an increasing cost of travel in the Atlanta region, this trend has leveled off and growth in VMT mirrors growth in population.
- The vast majority of commuters (74 percent) drive alone to work. This is understandable given the limited opportunities and incentives to use alternative modes of travel.
- The region has attempted to keep pace with the increase in demand for travel through heavy investment in new and upgraded highways and transit systems. For many reasons, including financial constraints, traffic conditions continue to deteriorate. Even ARC's aspiration plan, a theoretical plan that removes financial constraints, experiences an increase in congested travel. While congested conditions are expected to increase, it should be noted that without any transportation investments the percent of travel time in severe congestion is expected to increase by 116% verses 36% and 16% for ARC's Mobility 2030 and Aspirations Plan respectively.

- While the region has historically invested heavily in highways, there has not been a similar investment in travel alternatives to the private automobile. Only recently has the region begun to understand the need for a high quality transit system and initiatives such as travel demand management.

- The single, largest contributor to congestion in the Atlanta region, aside from the high growth rate, is the low-density land development pattern. Often characterized as sprawl, this type of growth results in more and longer automobile trips, with limited opportunity for transit use.

8.2 Traveler Preferences and Value of Time

An understanding of the value that travelers attach to travel time savings is essential to understanding the potential for managed lanes to relieve congestion and generate revenue. The Study accomplishes this objective through the use of a stated preference survey in which recent travelers in the corridor were contacted at random by telephone and presented with a series of hypothetical choices between reduced travel time and increased travel cost expressed as a toll. A total sample of 1500 subjects was contacted in the summer and fall of 2005. The travel behavior of these respondents was distributed among a range of trip types, classified as Home-Based Work, Non-Home Based, and Home Based-Other to understand differential value of time relative to activity. The sample was statistically scrutinized and confirmed to be valid to a 95% level of confidence.

Average values of time derived from the model ranged from $6.71/hour for off-peak hour Home Based Other (i.e. shopping, recreation) up to $12.84/hour for off-peak Non Home Based (i.e. trips undertaken during the work day on employer's business). Along with survey outputs that expressed the change in demand for access to the managed lanes as a result of changes in time savings and toll prices (demand elasticity), these values of time were converted to formulaic format for input into a regional transportation demand model in the next phase of the Study. A summary of recommended values of time for use in the travel demand model are illustrated in the table below.

Table 8-1: Recommended behavioral values ($/hour)

	Peak			**Non-peak**		
	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HB-School)	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HB-School)
Average value of time ($/hr)	9.15	10.96	8.71	8.75	12.84	6.71
Percentile values of time ($/hr)						
10th	4.98	2.92	2.84	1.40	1.12	1.64
20th	6.14	4.58	4.02	2.62	2.60	2.66

	Peak			Non-peak		
	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HB-School)	Home-Based Work (HBW)	Non-Home Based (NHB)	Home-Based Other/School (HBO/HB-School)
30th	7.14	6.38	5.16	4.12	4.76	3.78
40th	8.10	8.42	6.38	6.08	7.94	5.10
50th	9.14	10.96	7.78	8.74	12.84	6.74
60th	10.30	14.22	9.48	12.56	20.74	8.90
70th	11.72	18.82	11.72	18.52	34.62	12.00
80th	13.60	26.12	15.02	29.16	50.00	17.00
90th	16.74	41.14	21.18	50.00	50.00	27.56
Alternative-specific constant ($/trip)	0	0	0	0	0	0

8.3 Modeling Review and Strategy

Roadway tolling remains an exotic aspect of Georgia's transportation system. Currently, Georgia 400 between I-285 and Buckhead is the only segment of tolled roadway in the state. Because of the lack of tolling experience here, travel demand models used in the region to predict travel behavior and identify infrastructure needs must be adapted to account for the affect that variable tolling would have on traveler decision making. Variable tolling to manage roadway performance is unknown here, but has been implemented in other regions of the US for several years. To inform the adaptation of local models to incorporate managed lanes, the Study undertook a review of modeling approaches used in nine other jurisdictions, and identified strengths and weaknesses associated with each approach. This understanding was then applied to the Atlanta Regional model, as enhanced for the Northwest I-75/I-575 HOV/BRT program referenced above.

Taking into account Study schedule and scope limitations, the analysis indicated that an approach focused on traveler "willingness to pay" under a range of price and time circumstances as the best available approach to updating the Atlanta Regional Model. Briefly stated, this approach integrates estimates of traveler value of time with expectations for travel speed and time on the managed lane facility under analysis. For example, high values of time paired with inelastic demand for mobility would result in the highest propensity to "buy in" to the managed lane to experience reduced travel time under such an approach. This approach can be effectively integrated into the existing model framework, and produces outputs that are consistent with other measures of accuracy.

The willingness to pay approach selected for implementation for the following reasons:

- The results were stable across all price points and generally preserved the condition that HOV users would continue to utilize the managed lanes;
- The approach could be easily integrated into the current travel demand model structure;
- The value of time and willingness to pay data was readily available form the stated preference survey; and,
- The resulted under priced conditions produced meaningful and intuitive results from very low per mile toll rates to extremely high per mile toll rates.

8.4 Traffic and Toll Revenue Estimates

With a forecast methodology in place and a data set reflecting the stated preference of likely users acquired, the Study next introduced these inputs into the Regional Travel Demand Model, to extract outputs in the following areas: Maximum, Optimum, and Recommended Toll Rates, managed lane traffic volume and traffic share, and Annual Net Toll Revenues (inclusive of debt service and toll system construction and operation, but exclusive of roadway construction and maintenance).

The managed lane corridor is segmented into three tolled sections: I-75 from Akers Mill Road to I-575, I-75 from I-575 to Wade Green Road, and I-575 from I-75 to Sixes Road. Based on the assumption that average travel speeds of at least 45 miles per hour should be maintained in the managed lanes, and optimizing toll rates to achieve or exceed this mobility standard, the model delivered recommended tolls (in constant 2005 dollars) for each segment for three time frames: 2011, 2020, and 2030. Only the southern segment, on I-75 from Akers Mill to I-575 will be open in 2011.

In 2011, recommended tolls ranged from $.50 to $1.50 on the sole opened segment. In 2020, with all segments open, recommended tolls range from $.50 for northbound travel during the morning peak to $3.00 for travel from Akers Mill Road south to the I-75 / I-575 split during the morning rush hour. In the northbound direction during the evening rush hour HOV motorists consume all of the available capacity in the managed lanes. With no capacity to sell, SOV are prevented from using the managed lanes.

As a percentage of total traffic volume, travel in managed lanes becomes more significant over time. By 2030, segments of the managed lanes are expected to carry over 20% of total traffic volume during certain peak hours of operation (with these travelers maintaining an average speed of over 45 miles per hour!). However, if HOV occupancy rates hold at HOV 2+, HOV traffic will absorb available managed lane capacity during certain peak hours in the out years, excluding toll-paying SOV travelers from the facility in order to maintain travel speed.

Expected net revenue for the system starts off in negative territory, but soon breaks even, and eventually generates a substantial capital pool. Covering only the cost (including debt service) of converting programmed HOV lanes to managed lanes, the facility is forecast to generate an annual net loss of $807,000 in 2011. This value turns positive in 2014, and by 2050, cumulative net revenues are forecast to total $61,089,000.

Estimated annual gross toll revenue stream are illustrated in the table below.

Table 8-2: Annual Gross Toll Revenue (un-inflated dollars)

Year	Weekday Revenue By Period (1)				Total Weekday	Weekend Day (2)	Estimated Annual Revenue (3)	Cumulative Gross Revenue
	AM Peak	Midday	PM Peak	Night				
2011	$3,450	$2,020	$5,930	$140	$11,540	$5,770	$3,371,123	$3,371,123
2012	$3,800	$2,220	$6,640	$150	$12,810	$6,405	$3,742,121	$7,113,244
2013	$4,540	$2,700	$7,440	$190	$14,870	$7,435	$4,343,899	$11,457,143
2014	$5,600	$3,330	$8,330	$200	$17,460	$8,730	$5,100,503	$16,557,645
2015	$6,220	$3,700	$9,330	$220	$19,470	$9,735	$5,687,674	$22,245,319
2016	$8,140	$4,940	$3,530	$290	$16,900	$8,450	$4,936,913	$27,182,231
2017	$9,090	$5,480	$3,840	$310	$18,720	$9,360	$5,468,580	$32,650,811
2018	$12,740	$7,270	$4,920	$380	$25,310	$12,655	$7,393,684	$40,044,495
2019	$14,130	$8,070	$5,340	$410	$27,950	$13,975	$8,164,894	$48,209,389
2020	$16,000	$9,040	$5,820	$450	$31,310	$15,655	$9,146,434	$57,355,823
2021	$16,000	$9,184	$5,894	$452	$31,530	$15,765	$9,210,657	$66,566,480
2022	$16,000	$9,331	$5,968	$454	$31,753	$15,876	$9,275,828	$75,842,307
2023	$16,000	$9,480	$6,044	$456	$31,979	$15,990	$9,341,959	$85,184,266
2024	$16,000	$9,631	$6,120	$458	$32,209	$16,105	$9,409,066	$94,593,332
2025	$16,000	$9,784	$6,198	$460	$32,442	$16,221	$9,477,163	$104,070,494
2026	$16,000	$9,940	$6,276	$462	$32,679	$16,339	$9,546,264	$113,616,759
2027	$16,000	$10,099	$6,356	$464	$32,919	$16,459	$9,616,386	$123,233,144
2028	$16,000	$10,260	$6,436	$466	$33,162	$16,581	$9,687,543	$132,920,687
2029	$16,000	$10,424	$6,518	$468	$33,410	$16,705	$9,759,750	$142,680,438
2030	$16,000	$10,590	$6,600	$470	$33,660	$16,830	$9,832,928	$152,513,365

(1) 2005 Dollars

(2) Weekend day approximated to be 50 percent of weekday total revenue

(3) Annual revenue assume 250 weekdays and 115 weekend/holidays

8.5 Managed Lane Operations

The toll collection and system operations technologies of today and the future are sophisticated and rapidly evolving. Even mature systems like New Jersey's are keeping pace through retrofit. The I-75/575 corridor will require state of the art technology due to the magnitude of travel volume and complexity of operations expected there. While considerable innovation is anticipated before a managed lane could be open to service in 2011, a survey of the state-of-the-practice conducted for the Study revealed some key parameters upon which to base operational assumptions. Available technological approaches were evaluated based on the parameters, yielding a recommended approach. The analysis also estimates capital and operating costs, which are reflected in the financial pro-forma described above. Other features and relevant considerations for continued attention in the planning and implementation process were also identified and discussed.

Managed Lanes influence facility performance through the manipulation of pricing (through tolls), eligibility (of different types of vehicles), occupancy (within a class of vehicles), and access (to the managed facility). Permutation of these characteristics yield alternative approaches to facility management.

In the process of developing operational recommendations, the Study evaluated a range of schemes against evaluation parameters to identify the best currently available approach for managing the facility. The evaluation factors included Ease of Toll Collections, Ability to Dynamically Price, Ease of Enforcement, Cost of Implementation, Flexibility and Equity, Accounting Simplicity, Operations and Maintenance, Customer Relations and Public Understanding.

As a result of this evaluation, the Study recommends a system that employs an entry/exit system where managed lane users are tracked by point of entry and point of departure. All SOV and HOV users of the managed lanes would be equipped with a transponder and use the same access ramps (which are separate from general travel ramps). Tolls are collected in motion; there would be no staffed booths. Toll recognition equipment would be located on the ramps, with tolls levied at the exit point. The system would pre-register HOV users or employ onsite visual inspection by mobile enforcement officers to discriminate between vehicles on the basis of occupancy and enforce occupancy requirements, allowing HOV users to travel toll-free.

Collateral opportunities identifies in the review include smart card technology that would shift responsibility for financial transaction from the toll collection entity to a financial institution that issues the smart card. Smart Cards could also be employed in other uses, like transportation combinations that might include tolls, transit and parking, or unrelated convenience transactions.

Furthermore, preliminary estimates of system costs were prepared based on each concept plan. It should be noted that these cost are subject to considerable refinement during the detailed design phase. The figures below summarize anticipated capital and maintenance cost expenditures for each of the various subsystems. All costs are shown in current year (2005) dollars and subject to inflation.

Figure 8-1: Distribution of Toll Collection Costs by Function Opening Year (2011)

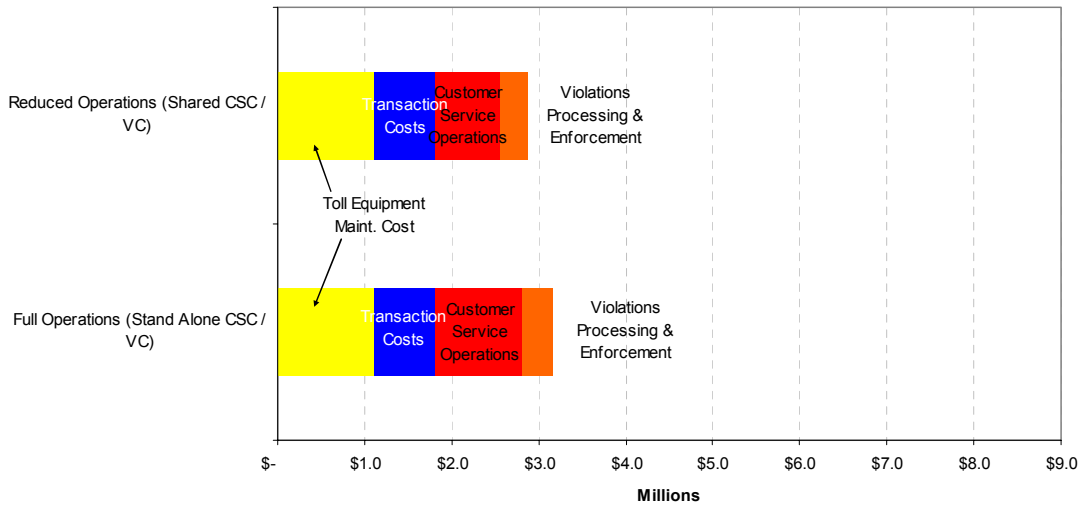


Figure 8-2: Distribution of Toll Collection Costs by Function at Build-out (2020)

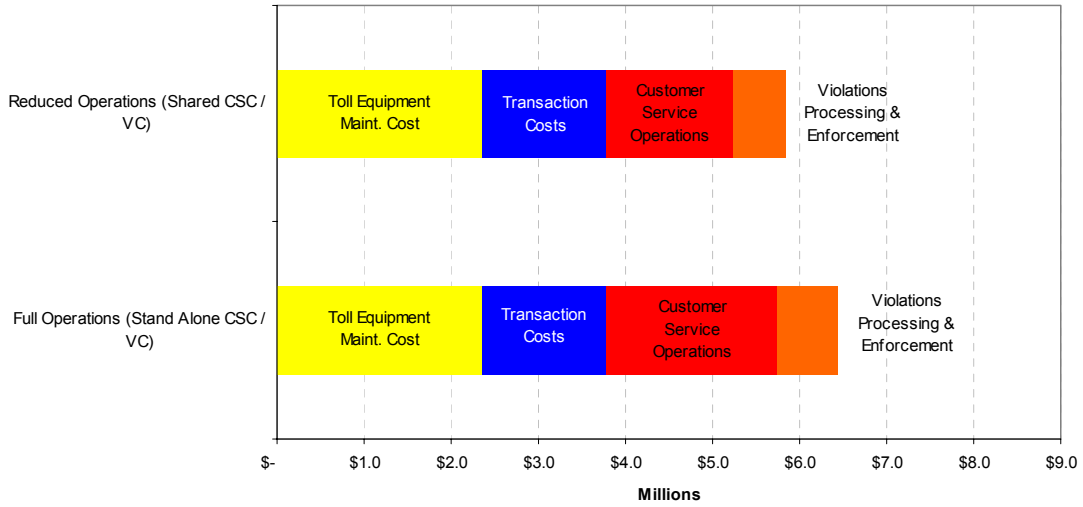
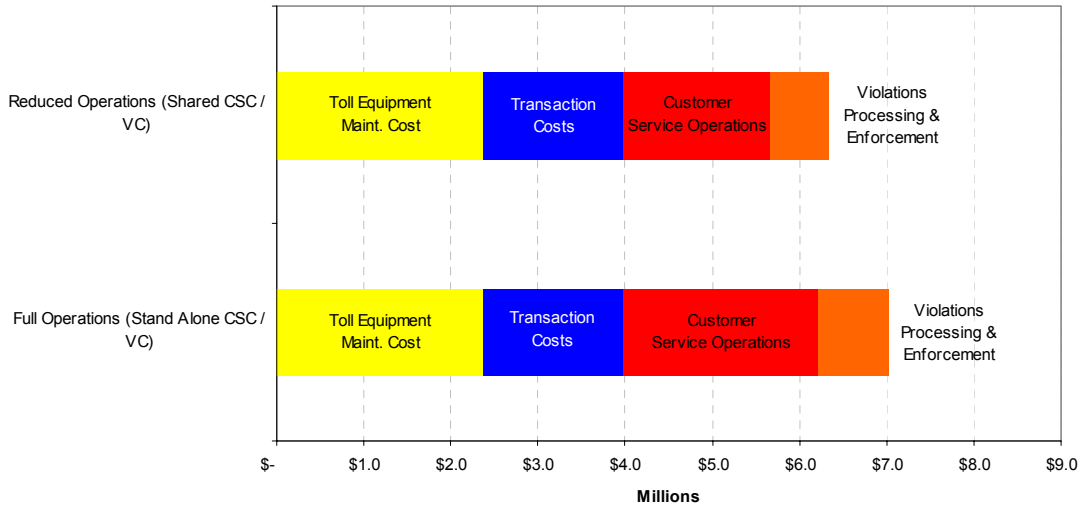


Figure 8-3: Distribution of Toll Collection Costs by Function Horizon Year (2030)



8.6 Understanding Truck-Only Lanes

Foreshadowing the more exhaustive evaluation of the feasibility of Truck-Only facilities within the corridor, the Study reviewed the availability of truck data relevant to the Study Corridor. Available data was thin, primarily consisting of crash data, regional studies, and qualitative information gleaned from other studies. Nevertheless, the available data provided no indication that this option was not appropriate for the corridor, and more exhaustive analysis is now under way.

APPENDIX 3-A
Interstate 75 Stated Preference Survey – Final Report

GEORGIA STATE ROAD AND TOLLWAY AUTHORITY

INTERSTATE 75
STATED PREFERENCE SURVEY

FINAL REPORT

November 2005

NuStats

3006 Bee Caves Rd., Suite A-300 ▪ Austin, Texas 78746
(512) 306-9065 ▪ fax (512) 306-9077 ▪ *www.nustats.com*

Contact: Chris Simek, *Project Manager*

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DOCUMENTATION OF METHODS

The following is technical documentation of the methods used to conduct the Interstate 75 Stated Preference (SP) Survey for the Georgia State Road and Tollway Authority (SRTA).

QUESTIONNAIRE

NuStats and Mark Bradley collaboratively designed the survey instrument with input from the State Road and Tollway Authority, the Georgia Department of Transportation and other members of the project team. Upon approval of the instrument it was programmed into a computer-assisted telephone interviewing (CATI) environment for dialing. The questionnaire contained 179 data items and four screener questions to confirm the eligibility of respondents for participation in the survey.

DATA COLLECTION

Survey specialists under contract to NuStats, conducted pilot data collection for the survey from 5:30 PM to 8 PM CST on July 14, 2005. All survey specialists attended a training session and were required to perform simulated interviews before beginning actual data collection activities. In addition, interviewers were continually monitored to ensure that the highest level of quality was maintained. The pilot was dialed in English only.

A total of 30 completed surveys were collected during the pilot data collection phase utilizing computer-assisted telephone interviewing (CATI) software. The use of CATI interviewing was essential to the research process to ensure that the right information was collected in the most efficient manner. The average length of each completed pilot survey was 14 minutes. Upon reviewing the pilot data and consulting with both interviewers and survey leads, a few minor revisions were made to the instrument to streamline data collection. Upon approval from the client, dialing for the full study began on July 15, with the pilot completes counting toward the ultimate goal of 1,500 completed surveys. The last of the contractually required completes was obtained on September 3, 2005. The final survey length was 12.9 minutes. It should be noted that the data collection was split equally (750-surveys each) between the summer (7/14/05 to 8/14/05) and autumn (8/15/05 to 9/3/05).

EDIT CHECKS

Prior to any data analysis, NuStats performed a comprehensive edit check for each completed interview. During this phase, each interview was required to pass a routine edit check program before it could be included in the final data set. Routine edit checks include such items as data range limitations, skip patterns, logic checks and coding of open end responses.

SURVEY POPULATION

The population of inference (or population under study) for the SRTA SP Survey consists of individuals 18 years of age or older, residing within the I-75/575 survey sampling areas (see Technical Sampling),who travel the target segment at least once per week. Eligible respondents also had at least one vehicle available for use by members of the household.

SAMPLE SIZES, TARGETS AND QUOTAS

A total of 1,500 valid interviews were required to meet project objectives. Of these, 750 were completed in summer 2005 and 750 were completed in autumn 2005. Quotas were established to ensure this equal seasonal distribution. Quotas were also established to obtain 70 percent of trips in the peak periods (AM peak is defined as 6 AM to 10 AM, and PM peak is defined as 3 PM to 7 PM) and 30 percent all other times including Saturday and Sunday.

At the onset of the survey, it was estimated that approximately 75% (1,125 interviews) would be conducted with drivers of single occupancy vehicles (SOV) who would be respondents for the SP questions on willingness to pay and potential use of priced facilities. Upon completion of the survey, it was observed that 73% of interviews were conducted with drivers of SOVs.

SAMPLING FRAME GENERATION

The sampling frame initially consisted of listed (known residential address) and unlisted (no known residential address) telephone numbers for households located in the I-75/575 sampling area (total of 150 census tracts - see technical sampling memorandum). Upon completion of summer data collection, it was noted that dialing productivity was not sufficient to maintain the project budget or schedule. As such, the summer data was analyzed and no statistically significant differences were noted between surveys captured with listed and unlisted sample. Furthermore, the productivity of the listed sample was significantly better than unlisted sample. As such, the project team decided to exclusively dial listed telephone numbers for the remainder of data collection, which included all of the autumn season.

The sample was ordered proportional to pre-defined census tract aggregations defined in the technical sampling memorandum. A total of 16,179 sample records were received for dialing in the SRTA SP survey, of which 12,092 (75%) had address information and 4,087 (25%) had no address information[1]. All sample was procured from Marketing Systems Group (MSG) based in Fort Washington, PA.

SAMPLE PREPARATION

The sample was prepared for administration by partitioning it into 51 subsamples (or replicates) of approximately 315 records each. A replicate is a systematically selected subsample of a sample that is geographically representative of the entire sample; the primary benefit of which is that the interviewers did not need to contact the entire sample in order to ensure proper representation. These replicates were released sequentially over the field period.

[1] Upon generating the unlisted sample, NuStats requested that MSG match the sample to their listed database and append address information for all matching records. As a result, the 75% of sample records with address information is a mixture of both listed and unlisted sample.

SURVEY RATES

Table 1 below provides a description of the final dispositions of the 12,692 sample pieces that were used during the I-75/575 SP survey. As indicted in the table, the final response rate was 47% and the final refusal rate was 15%.

TABLE 1: FINAL DISPOSITIONS

LABEL	COUNT	%
Answering Machine	2,065	16%
Busy	179	1%
Complete	1,501	12%
Disconnect	1,669	13%
Business/Government	509	4%
Language Barrier/Deaf	269	2%
Fax/Modem	686	5%
Caller ID	2	0%
Not Qualified	2,019	16%
Over Quota	21	0%
Specific Callback, Respondent	12	0%
General Callback, Household	222	2%
No Answer	873	7%
Partial Complete	2	0%
1st Refusal	1,226	10%
Hang Up	1,179	9%
Hard, Final Refusal	234	2%
Hard Refusal (Conversion Attempt)	24	0%
Total	**12,692**	**100%**
	ALL SAMPLE	
Sample Pieces Used	12,692	
Completed Surveys	1,501	12%
HHlds eligible for participation	1,761	
Ineligible sample	5,175	41%
Sample still working	5,756	
Ratio of good to bad sample	25.39%	
Expected eligible sample to come	1,461	
Official Response Rate	46.58%	
Refusal Rate	14.65%	
Ratio of CM to Eligible	85.24%	
Average Interview Length	12.90	Minutes

STATED PREFERENCE ANALYSIS

SRTA STATED PREFERENCE RESULTS

Stated preference questions were used to measure respondents' likelihood of using the HOT lanes as a function of the toll level and time savings. The questions were asked of 1,089 respondents whose reference trip was made as a SOV driver on I-75/575. The introduction and wording of the questions is shown below.

> Now assume you're making a future trip on I-75 just like the one that you just told me about. It's a trip on the same day, at the same time of day, for the same purpose, and you're under the same time pressures. You are traveling on the segment of I-75 between I-285 and I-575 and have the option of using the new carpool lane if you want to.
>
> **Order A**: If you were to use the general traffic lanes on this segment of I-75, your trip would take TT+[#] and be free. If you used the new carpool lane as a single driver you would pay [$] and your trip would take TT, saving [#] minutes. You could also choose to carpool with someone and use the lane for free. Now under these conditions, would you choose to:
>
> | | |
> |---|---|
> | Use the carpool lane, pay [$] and save [#] minutes | 1 |
> | Use the general lane for free | 2 |
> | Carpool with someone to use the carpool lane for free | 3 |
> | DK | 98 |
>
> **Order B**: If you were to use the carpool lane on this segment of I-75 as a single driver, you would pay [$] and your trip would take TT. If you were to use the general traffic lanes, your trip would take TT+[#], [#] minutes longer than in the toll lane, but it would be free. You could also choose to carpool with someone to use the carpool lane for free. Now under these conditions, would you choose to:
>
> | | |
> |---|---|
> | Use the general lane for free | 2 |
> | Use the carpool lane, pay [$] and save [#] minutes | 1 |
> | Carpool with someone to use the carpool lane for free | 3 |
> | DK | 98 |

SP METHOD A

Each person received 4 different scenarios of this type, each with a different amount of time savings (# = 5, 10, 15 or 20 minutes) and toll ($ = 50 cents, $1, $2, $3, $4, $5, $6 or $7). The value TT used for the tolled lane was based on the respondent's estimate of their travel time with no congestion. Nine different sets of 4 scenarios were used across the sample, with each respondent assigned 1 of the 9 sets at random. So, in total, 36 (9 x 4) different scenarios were used, each identifying a different time/cost tradeoff point.

To avoid bias due to ordering effects, the questions were asked in two different ways. Versions Order A and Order B above differ only in the order in which the toll and non-toll options are described to the respondent. Each respondent was randomly assigned one of the two orders for all SP questions.

In the cases where respondents chose option 3, Carpool, they were asked to imagine that it would not have been possible for them to carpool for that trip, and to choose from one of the two remaining options, 1 or 2.

SP METHOD B

Next, the same type question was asked again, but this time using the "price meter" approach. Each respondent was assigned a level of time savings (S = 5, 10 or 15 minutes) at random. Then a random toll price point was chosen (P = 50 cents, $1, $2, $3, $4, $5, $6 or $7) and the same question from above was asked (Order A or Order B). If the person said that they would pay the toll, a higher price point was chosen at random, and if they said they would not pay the toll, a lower price point was chosen at random, and the question was asked again at the new toll level. This procedure was continued until the "switching point" was identified – e.g. the respondent would be willing to pay a toll of $2, but not willing to pay the next higher level, $3.

Note that this method is designed to obtain the same type of information as from a "transfer price" question which would ask each respondent directly how much they would be willing to pay for the given time savings. There are, however, drawbacks to the transfer price approach, in that respondents tend to find it much more difficult to answer such a direct question than to provide simpler yes or no type answers to specific time and toll combinations. So, we designed Method B to approximate the type of information that would be obtained from a transfer price question, but using simple pairwise choices with EXACTLY the same questionnaire wording as used in Method A. So, to the respondent, the Method B questions were simply a continuation of the Method A questions, and thus not likely to be answered in any significantly different way, and thus not much more prone to policy bias than the Method A responses.

FIGURE 1: PERCENT WILLING TO PAY TOLL

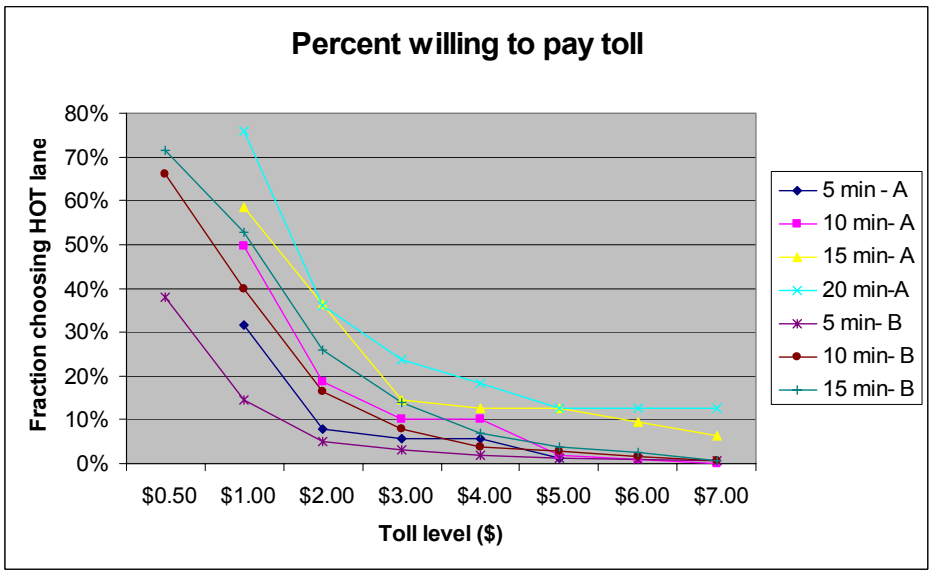


Figure 1 shows the percent of respondents who said they would pay the toll and use the HOT lane under each different level of time savings and toll. The Method A questions identify 22 different time/cost trading points, while the Method B questions represent 24 different time/cost trading points. Thus, both methods provide roughly the same amount of tradeoff information.

In Figure 1, there are 7 lines, 4 from Method A at 5, 10, 15 and 20-minute time savings, and 3 from Method B (the "price meter" approach) at 5, 10 and 15 minute time savings. The results appear to be consistent and reasonable. Some key findings are described below.

The two methods give consistent results. The lines for 5, 10 and 15 minutes for Method A track the corresponding lines from Method B quite well. The price meter (Method B) approach gives somewhat smoother curves and lower values.

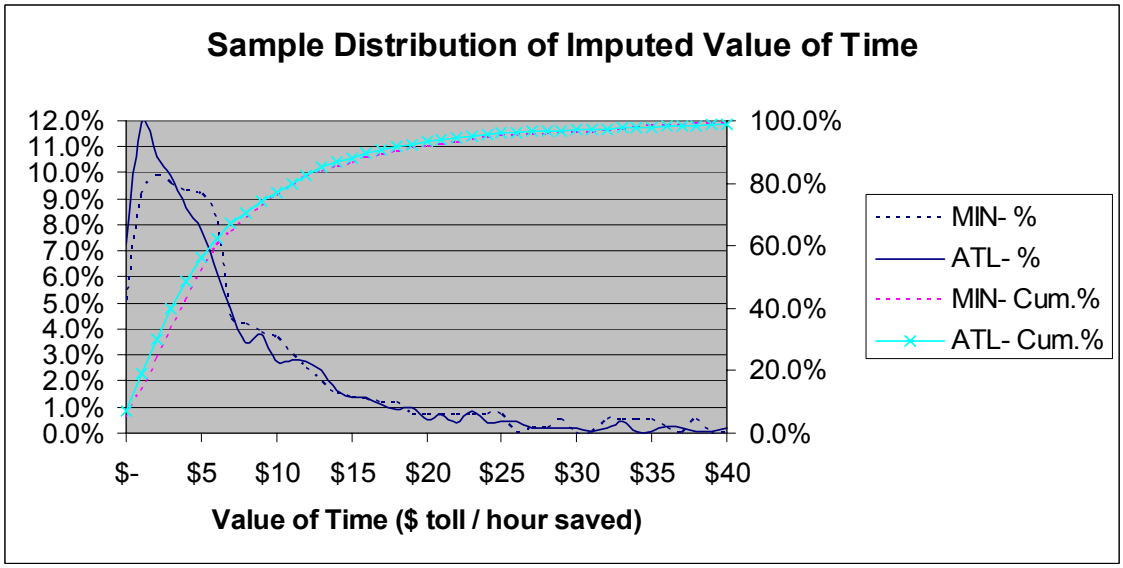
Even at a very low toll level (50 cents) not everyone is willing to pay it. Only about 40% would pay that much for a 5-minute savings, while about 65% would pay it to save 10 minutes and 75% would pay it to save 15 minutes.

Even at fairly high toll levels above $3, a small fraction would be willing to pay for any level of time savings. This result supports the typical finding that there is a wide distribution of willingness to pay in the population.

The analysis in Figure 1 excludes the choice to switch to carpool to use the HOT lane. Overall, about 6% of respondents said they would shift to carpool, with no clear effect of toll level or time savings on that choice. It is not possible to say how realistic this level of shift is, as many carpools tend to be opportunity-driven, depending on whether another person happens to have a very similar destination and departure time.

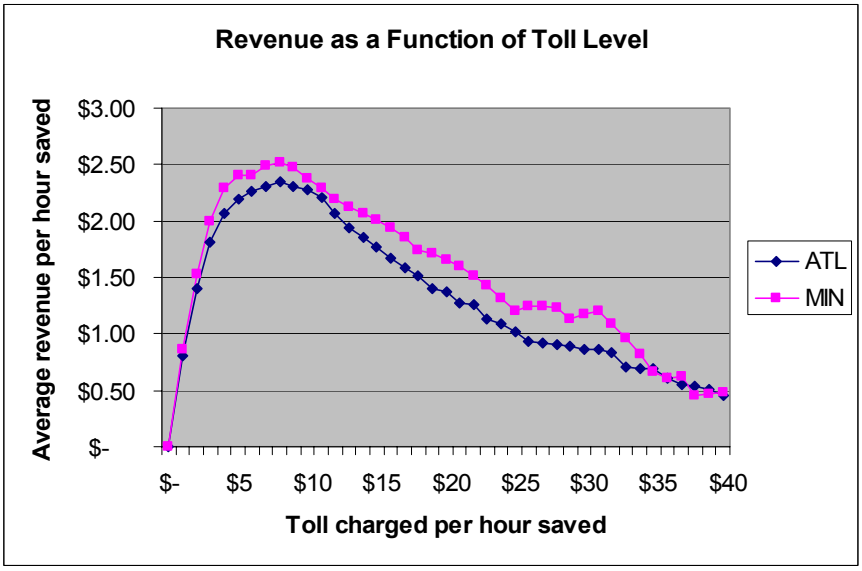
With the price meter approach (Method B), we can infer each respondent's value of time savings (VOT) within a fairly narrow range. The results of that analysis are plotted below, and compared to the distribution from a similar HOT lane survey carried out in Minneapolis (ATL vs. MIN). The distribution function is skewed to the left with a substantial tail to the right, resembling the log-normal distribution, which is typically found for VOT. The distribution has a mode of about $1/hour, a median of about $4.75/hour, and a mean value of about $7.50/hour, slightly lower than the distribution estimated in Minneapolis. The cumulative distribution reaches the 90% point at about $18/hour, meaning that there are 10% of respondents willing to pay more than 3 times the median amount. Less than 1% of respondents are "off the chart," willing to pay more than $40/hour.

FIGURE 2: DISTRIBUTION OF IMPUTED VALUE OF TIME



From the willingness to pay distribution above, we can obtain an estimate of the toll revenue at various toll levels, when the toll is expressed in terms of cost per time saved. The resulting curve below gives maximum revenue at a toll of about $7.50 per hour saved. This is the same result as was obtained for Minneapolis, although the revenue is slightly lower for the I-75. If the speed in the general lane were 30 mph, and the speed in the HOT lane were 60 mph, then traveling 1 mile would take 2 minutes in the general lane and 1 minute in the HOT lane, meaning the HOT lane provides a savings of 1 minute per mile. The revenue-maximizing toll would thus be $7.50/60, or 12.5 cents per mile. If, on the other hand, the speed in the general lane were 40 mph, then the HOT lane would only save 0.5 minutes per mile, so the revenue-maximizing toll would only be $7.50/120, or 6.25 cents/mile.

FIGURE 3: REVENUE AS A FUNCTION OF TOLL LEVEL



DETERMINANTS OF WILLINGNESS TO PAY

To help get an idea what factors cause such a wide distribution in willingness to pay, we analyzed the variation in the average willingness to pay across various market segmentations, using the individual-level values of willingness to pay from Method B. While these results are not very useful for predictive analysis, which is best done based on Logit analysis with the combined responses from both Methods A and B, this simple analysis is useful for understanding the market in terms of what factors have the most influence on willingness to pay, in addition to the standard factors that are usually distinguished in travel models (trip purpose and time of day). The results are explained on the following pages. First, some factors that do NOT appear to have a significant effect on willingness to pay include:

- Gender
- Household size
- Household car ownership
- Awareness of the plan to put carpool lanes on I-75
- Trip timing flexibility
- Direction of travel on I-75 (North or South)
- Day of week
- Opinion about charging tolls 24 hours a day

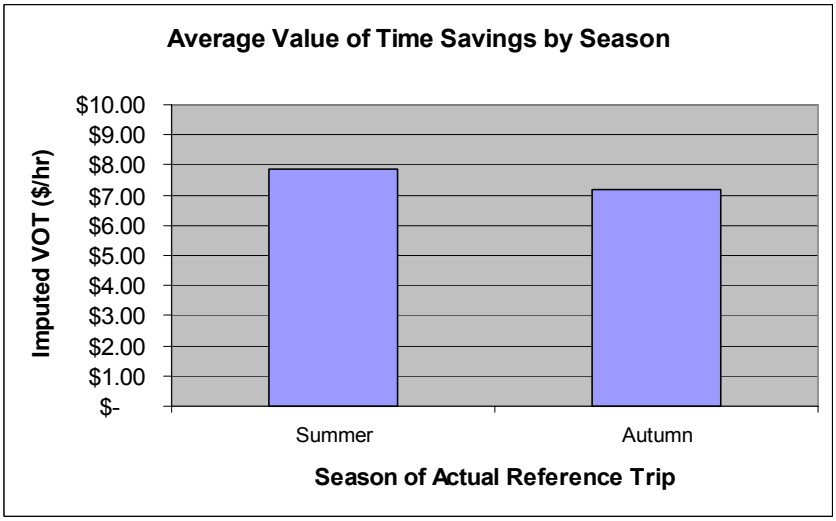
Season

Roughly half of the respondents were surveyed in the summer period of July 14-August 14, while the other half were surveyed during the autumn season of August 15-September 3. Although these two periods are adjoining, a significant difference was found in the willingness to pay, with the average VOT about 10% lower in the latter period ($7.15/hour versus $7.85/hour). This is why the overall average figures reported in this analysis are slightly lower than those reported in the interim analysis done on the summer data only.

Three possible reasons for the somewhat lower values for the autumn period are:

- Gasoline prices were rising sharply during the period of the survey, and hurricane Katrina disrupted the oil supply during the last week of August, so people may have become more sensitive to travel costs as a result.
- The people in the latter period reported marginally lower highway congestion levels for their actual trips relative to the earlier period—perhaps due to the fact that many children were back in school.
- The distribution of household incomes for the latter period sample is somewhat lower than in the sample from the earlier period. This is probably due to random sampling variation.

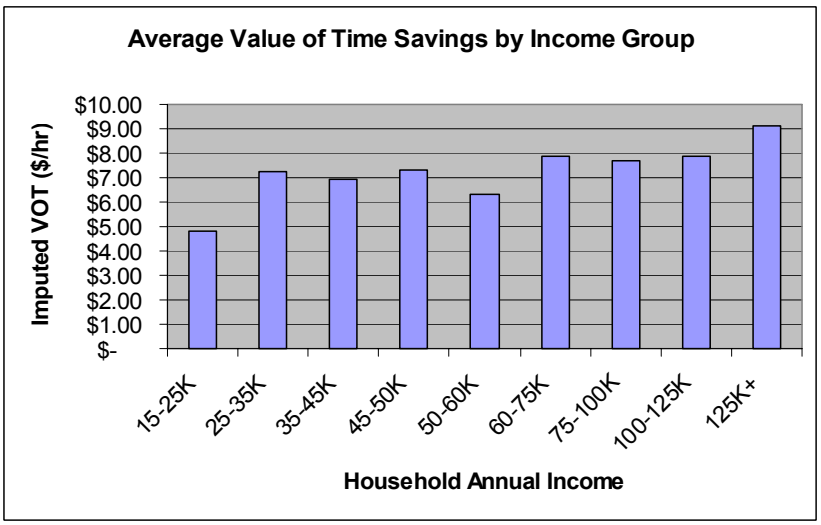
FIGURE 4: AVERAGE VALUE OF TIME SAVINGS BY SEASON



Income

As is typically found, willingness to pay is clearly related to income, but does not increase proportionally with income. This result indicates that other factors besides income also enter into the decision of whether or not to pay the toll.

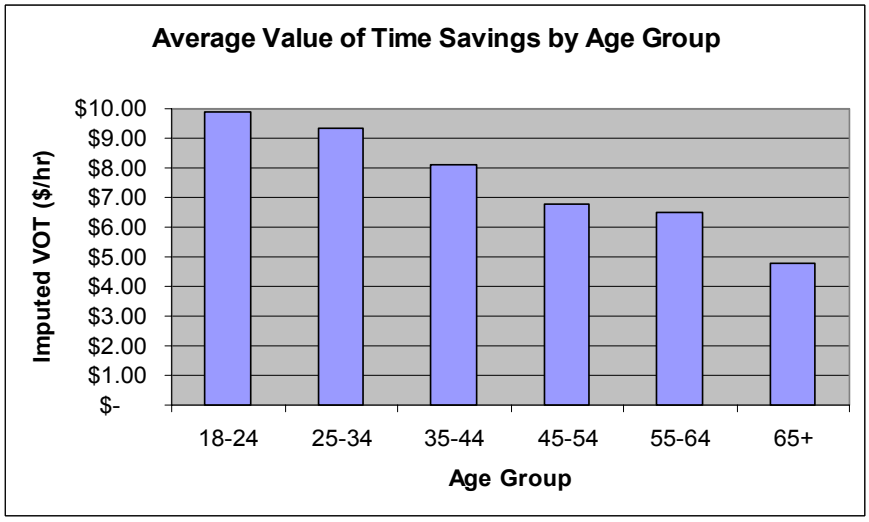
FIGURE 5: AVERAGE VALUE OF TIME SAVINGS BY INCOME GROUP



Age

Age is also important, with willingness to pay generally decreasing with age, particularly for individuals of retirement age. This probably indicates less hectic schedules once people pass a certain age. The reason for the high willingness to pay for those under 25 is not clear. These tend to be students, who may be reimbursed by their parents.

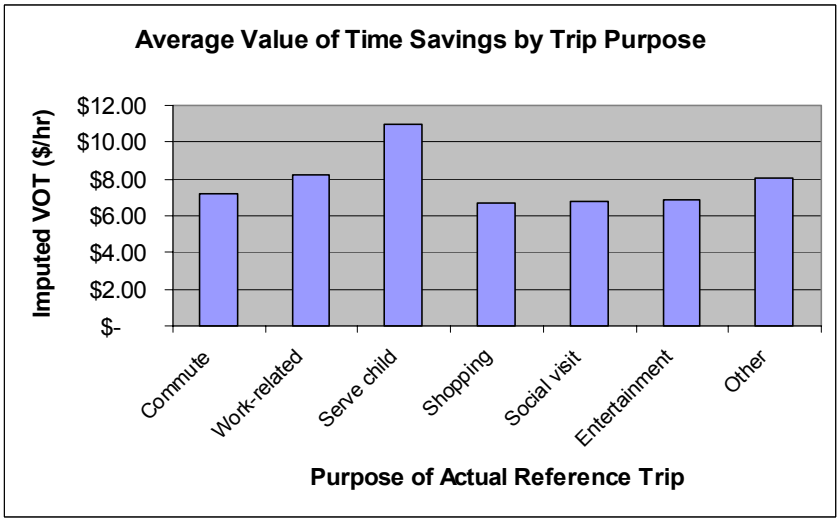
FIGURE 6: AVERAGE VALUE OF TIME SAVINGS BY AGE



Trip Purpose

Willingness to pay is lowest for shopping, social visit, and entertainment trips and highest for those picking up or dropping off children (only 7 respondents had this trip purpose, however). The average values for other purposes are near the overall average of $7.50/hr.

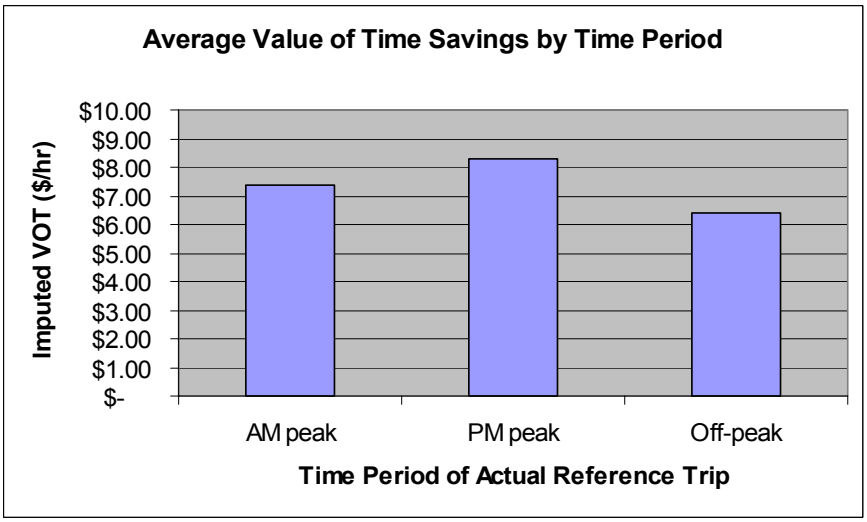
FIGURE 7: AVERAGE VALUE OF TIME SAVINGS BY TRIP PURPOSE



Time Period

The average value of time savings is highest for those making PM peak trips and lowest for those making off-peak trips. The variation is not as substantial as one might expect, because we offered the same levels of time savings to all respondents. In actual situations where much greater time savings are possible during the peak, the toll that people would be willing to pay would be correspondingly higher.

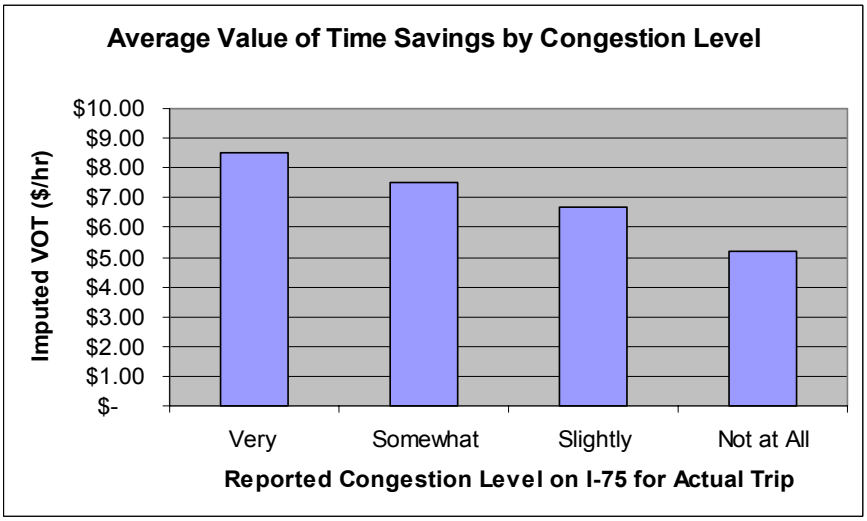
FIGURE 8: AVERAGE VALUE OF TIME SAVINGS BY TIME PERIOD



Actual Congestion Level

We do find quite large variation in willingness to pay according to the reported perceived congestion level for the actual trip. It is interesting that this variation is much larger than the peak/off-peak variation in the preceding chart. Two possible explanations for this are (a) there may be a good deal of congestion at off-peak times and congestion levels may be related to geography as well as time of day, and (b) those who are more time-sensitive and willing to pay higher tolls may also notice congestion levels more and have a lower threshold for what they perceive as "congested."

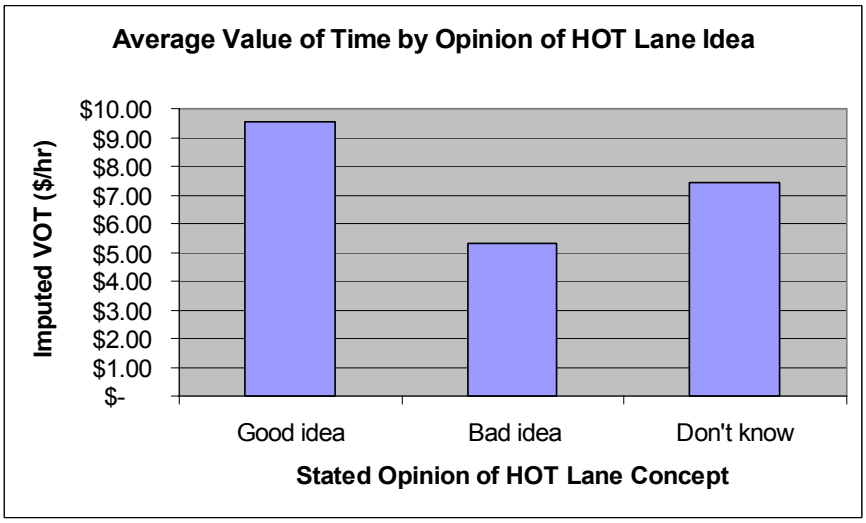
FIGURE 9: AVERAGE VALUE OF TIME SAVINGS BY CONGESTION LEVEL



Opinion of HOT lane project

It is interesting that the average willingness to pay for those who think the HOT lanes is a good idea is almost twice as high as for those who think it is a bad idea. This result is reasonable, since people who are willing to pay for faster travel will receive more benefit from the introduction of HOT lanes than those who are not (who would still receive some travel time benefit, but not as much).

FIGURE 10: AVERAGE VALUE OF TIME BY OPINION OF HOT LANE IDEA



Amount of Time Savings Offered

There were three different time savings levels used for the "price meter" SP questions. The graph below shows that the willingness to pay does not rise linearly with the amount of time savings. In other words, it appears that respondents are willing to spend marginally less for each additional minute saved. The average VOT for a savings of 5 minutes is $9.00/hour, meaning that the average person would spend 75 cents to save 5 minutes. The average VOT for a savings of 10 minutes is $7.50, meaning that the average person would spend $1.25 to save 10 minutes, or 50 cents for the second 5 minutes. The average VOT for a savings of 15 minutes is about $6.40, meaning that the average person would spend $1.60 to save 15 minutes, or 35 cents for the last 5 minutes.

FIGURE 11: AVERAGE VALUE OF TIME BY AMOUNT OF TIME SAVED

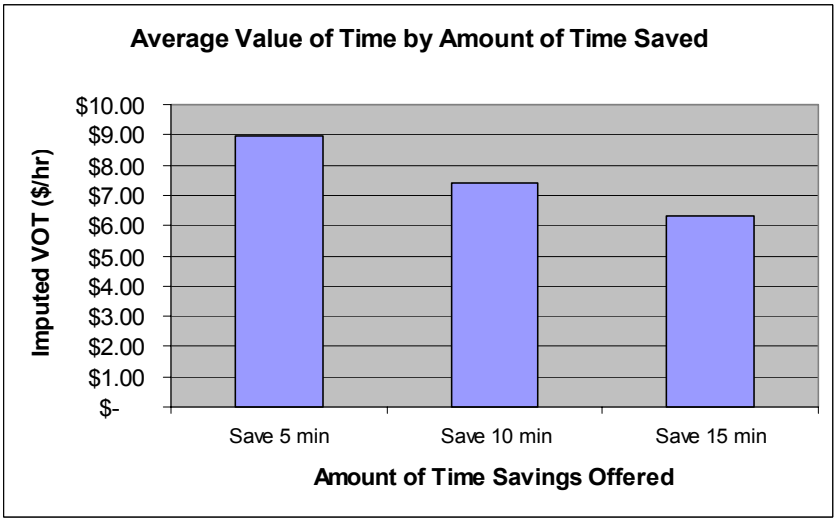


TABLE 2: VOT AND VALUE OF SAVINGS

TIME SAVINGS	VOT	VALUE OF SAVINGS	MARGINAL VOT FOR ADDED MINUTES
5 minutes	$9.00 / hr	$0.75 / 5 min	$0.75 / 5 min. = $9.00 / hr
10 minutes	$7.50 / hr	$1.25 / 10 min.	$0.50 / 5 min = $6.00 / hr
15 minutes	$6.40 / hr	$1.60 / 15 min.	$0.35 / 5 min = $4.20 / hr

REGRESSION MODEL

Finally, all of the variables listed above were included simultaneously in a regression analysis, regressing each respondent's imputed Value of Time savings from the "Price Meter" responses against a series of 0/1 dummy variables. Most of the effects discussed above remain significant even when analyzed in combination with the other determinants of VOT. Note, however, that the difference between the summer and autumn seasons is not significant when analyzed together with the other variables, suggesting that the difference found between the seasons is due mainly to differences in the composition of the two sub-samples—random and otherwise.

Also note that the R-squared value for the disaggregate regression model is about 0.06, meaning that about 94% of the variance in individual-level willingness to pay cannot be explained by the exogenous explanatory variables. This is a typical and important result, because it means that simply segmenting VOT by trip purpose, time of day, or other observed variables is not adequate to capture the order of magnitude of variance that actually occurs. Models that do not account for such wide variation will tend to overpredict toll lane usage at low toll levels, and underpredict usage at high toll levels.

TABLE 3: REGRESSION MODEL SUMMARY

VARIABLE	COEFFICIENT	T-STATISTIC
Constant	$ 6.92	7.52
Time savings of 5 minutes	+ $ 1.52	2.23
Time savings of 15 minutes	- $ 1.12	-1.67
Very congested	+ $ 1.23	2.04
Not at all congested	- $ 1.54	-1.49
AM peak trip	+ $ 0.29	0.35
PM peak trip	+ $ 1.21	1.48
Commute trip	- $ 1.86	-2.95
Shopping/social/entertainment trip	- $ 1.72	-1.72
Age under 35	+ $ 3.08	4.06
Age 35 to 44	+ $ 1.53	2.31
Age 65 and older	- $ 1.33	-0.98
Income $15-25K	- $ 1.81	-0.65
Income $25-60K	- $ 0.97	-1.34
Income over $125K	+ $ 1.66	2.38
Season = autumn	- $ 0.33	-0.60

R-squared = 0.061

APPENDIX A: SUMMARY OF SURVEY DATA

The following is a summary of the survey data. The following tables are based on processed and unweighted data.

TABLE 4: DATA COLLECTION PERIOD

CHOICE	CODE	FREQUENCY	PERCENT
Summer	1	750	50.0
Fall	2	751	50.0
Total	–	**1,501**	**100.0**

TABLE 5: HOW DO YOU USUALLY TRAVEL ON I-75?

CHOICE	CODE	FREQUENCY	PERCENT
Drive alone	1	1,182	78.7
Drive with other passengers	2	266	17.7
Ride as a passenger in a personal vehicle	3	44	2.9
Ride as a passenger in a vanpool	4	3	0.2
Ride as a passenger in a bus	5	6	0.4
Total	–	**1,501**	**100.0**

TABLE 6: HOUSEHOLD VEHICLES

CHOICE	CODE	FREQUENCY	PERCENT
Zero	0	0	0.0
One	1	216	14.4
Two	2	788	52.5
Three	3	312	20.8
Four or More	4	185	12.3
Total	–	**1,501**	**100.0**

TABLE 7: HOUSEHOLD SIZE

CHOICE	CODE	FREQUENCY	PERCENT
One	1	194	12.9
Two	2	542	36.1
Three	3	288	19.2
Four or More	4	477	31.8
Total	–	**1,501**	**100.0**

TABLE 8: PERCEIVED CONGESTION IN ATLANTA

CHOICE	CODE	FREQUENCY	PERCENT
Major problem	1	1,093	72.8
Moderate problem	2	298	19.9
Minor problem	3	69	4.6
No problem at all	4	37	2.5
Don't Know	8	4	0.3
Total	–	**1,501**	**100.0**

TABLE 9: AWARENESS OF MANAGED LANE CONSTRUCTION ON I-75

CHOICE	CODE	FREQUENCY	PERCENT
Yes	1	679	45.2
No	2	822	54.8
Total	–	**1,501**	**100.0**

TABLE 10: WHAT HAVE YOU HEARD REGARDING CONSTRUCTION OF I-75 MANAGED LANES?

CHOICE	CODE	FREQUENCY	PERCENT
Toll road/lane was going to be built	2	148	21.8
HOV lane was going to be built	3	286	42.1
Committee was considering a change	4	107	15.8
Read information about a toll road/lane	5	72	10.6
Decision to build toll road/lane has been made	6	50	7.4
Other	1	16	2.4
Total	–	**679**	**100.0**

TABLE 11: THOUGHTS ON MANAGED (HOT) LANES

CHOICE	CODE	FREQUENCY	PERCENT
Good Idea	1	698	46.5
Bad Idea	2	706	47.0
Don't Know	8	97	6.5
Total	–	**1,501**	**100.0**

TABLE 12: WHY DO YOU FEEL THIS WAY (REGARDING HOT LANES)?

CHOICE	CODE	FREQUENCY	PERCENT
Defeats the purpose	2	199	14.2
Only people in carpool lanes should be rewarded	3	78	5.6
Don't think it's fair	4	60	4.3
Will not help because it will be the same amount of cars	5	173	12.3
Will help reduce the flow of traffic	6	216	15.4
Gives people a better option to shorten trip	7	372	26.5
The state can raise more money	8	88	6.3
Oppose tolls/already taxed/no direct answer	9	98	7.0
Other	1	120	8.5
Total	–	**1,404**	**100.0**

TABLE 13: THOUGHTS ON VARIABLE PRICING

CHOICE	CODE	FREQUENCY	PERCENT
Good Idea	1	463	30.8
Bad Idea	2	914	60.9
Don't Know	8	124	8.3
Total	–	**1,501**	**100.0**

TABLE 14: WHY DO YOU FEEL THIS WAY (REGARDING VARIABLE PRICING)?

CHOICE	CODE	FREQUENCY	PERCENT
Tolls should be a flat fee/need to anticipate cost	2	485	35.2
Should not charge too much when traffic is light	3	88	6.4
May create more traffic on those lanes	4	82	6.0
Will help bring in more money	5	37	2.7
Gives a good option to either carpool or pay toll	6	168	12.2
Can help reduce the flow of traffic	7	101	7.3
Oppose tolls/already taxed/no direct answer	9	97	7.0
Other	1	319	23.2
Total	–	**1,377**	**100.0**

TABLE 15: THOUGHTS ON HOURS OF OPERATION

CHOICE	CODE	FREQUENCY	PERCENT
Good Idea	1	850	56.6
Bad Idea	2	546	36.4
Don't Know	8	105	7.0
Total	–	**1,501**	**100.0**

TABLE 16: WHY DO YOU FEEL THIS WAY (REGARDING HOURS OF OPERATION)?

CHOICE	CODE	FREQUENCY	PERCENT
Only needs to be at certain hours of the day	2	254	18.2
Could cause lane to be congested	3	47	3.4
More efficient that way/help with congestion	4	293	21.0
Good option to have/flexibility	5	466	33.4
Oppose tolls/already taxed/no direct answer	9	94	6.7
Other	1	242	17.3
Total	–	**1,396**	**100.0**

TABLE 17: INFLUENCES REGARDING USE OF MANAGED LANES

CHOICE	CODE	FREQUENCY	PERCENT
Reduce your overall travel time	1	621	41.4
Reduce the amount of time you spend in heavy traffic	2	383	25.5
Increase the predictability of your arrival time	3	231	15.4
Increase personal safety while driving in traffic	4	64	4.3
Price of the toll	5	43	2.9
Some other reason? Specify	7	159	10.6
Total	–	**1,501**	**100.0**

TABLE 18: DAY OF REFERENCE TRIP

CHOICE	CODE	FREQUENCY	PERCENT
Monday	1	206	13.7
Tuesday	2	232	15.5
Wednesday	3	262	17.5
Thursday	4	280	18.7
Friday	5	362	24.1
Saturday	6	94	6.3
Sunday	7	65	4.3
Total	–	**1,501**	**100.0**

TABLE 19: TIME OF DAY OF REFERENCE TRIP

CHOICE	CODE	FREQUENCY	PERCENT
AM Peak (6-10)	1	548	36.5
PM Peak (3-7)	2	540	36.0
Non-Peak	3	413	27.5
Total	–	**1,501**	**100.0**

TABLE 20: DID YOU LEAVE AT THIS PARTICULAR TIME TO AVOID TRAFFIC CONGESTION?

CHOICE	CODE	FREQUENCY	PERCENT
Yes	1	546	36.4
No	2	953	63.5
Don't Know	8	2	0.1
Total	–	**1,501**	**100.0**

TABLE 21: WHAT TIME WOULD YOU HAVE PREFERRED TO LEAVE IF NO TRAFFIC CONGESTION?

CHOICE	FREQUENCY	PERCENT
0300-0359	2	0.4
0400-0459	2	0.4
0500-0559	6	1.1
0600-0659	40	7.6
0700-0759	124	23.5
0800-0859	110	20.9
0900-0959	53	10.1
1000-1059	10	1.9
1100-1159	5	0.9
1200-1259	5	0.9
1300-1359	8	1.5
1400-1459	11	2.1
1500-1559	19	3.6
1600-1659	50	9.5
1700-1759	60	11.4
1800-1859	16	3.0
1900-1959	2	0.4
2000-2059	2	0.4
2100-2159	1	0.2
2200-2259	1	0.2
Total	**527**	**100.0**

TABLE 22: NORTH OR SOUTHBOUND TRAVEL

CHOICE	CODE	FREQUENCY	PERCENT
North	1	639	42.6
South	2	862	57.4
Total	–	**1,501**	**100.0**

TABLE 23: TRIP PURPOSE

CHOICE	CODE	FREQUENCY	PERCENT
Commute to or from work or school	1	650	43.3
Work-related	2	315	21.0
Drop off/pick up school age child	3	22	1.5
Shop	4	57	3.8
Visit friends or family	5	93	6.2
Recreational or entertainment activity	6	138	9.2
Something else	7	226	15.1
Total	–	**1,501**	**100.0**

TABLE 24: TIME RESPONDENT HAD TO BE AT DESTINATION

CHOICE	CODE	FREQUENCY	PERCENT
Specific time plus or minus 10 minutes	1	396	40.1
Specific time plus or minus 30 minutes	2	110	11.1
Had more flexibility in the arrival time than that	3	481	48.7
Total	–	**987**	**100.0**

TABLE 25: TRIP START

CHOICE	CODE	FREQUENCY	PERCENT
Home	1	923	61.5
Work	2	376	25.0
Other, Specify Place Name	7	202	13.5
Total	–	**1,501**	**100.0**

TABLE 26: TRIP END

CHOICE	CODE	FREQUENCY	PERCENT
Home	1	416	27.7
Work	2	404	26.9
Other, Specify Place Name	7	681	45.4
Total	–	**1,501**	**100.0**

TABLE 27: ARRIVAL TIME AT END LOCATION

CHOICE	CODE	FREQUENCY	PERCENT
AM Peak (7-10)	1	421	28.0
PM Peak (3-7)	2	572	38.1
Non-Peak	3	508	33.8
Total	–	**1,501**	**100.0**

TABLE 28: MODE OF TRAVEL

CHOICE	CODE	FREQUENCY	PERCENT
Driving alone	1	1,089	72.6
Driving with other passengers	2	355	23.7
Riding as a passenger in a personal vehicle	3	51	3.4
Riding as a passenger in a vanpool	4	2	0.1
Riding as a passenger in a bus	5	4	0.3
Total	–	**1,501**	**100.0**

TABLE 29: REFERENCE TRIP MODE

CHOICE	CODE	FREQUENCY	PERCENT
SOV	1	1,089	72.6
HOV	2	406	27.0
Vanpool	3	2	0.1
Transit	4	4	0.3
Total	–	**1,501**	**100.0**

TABLE 30: NUMBER OF ADULTS ON TRIP

CHOICE	CODE	FREQUENCY	PERCENT
One	1	71	17.5
Two	2	274	67.5
Three	3	40	9.9
Four	4	16	3.9
Five	5	3	0.7
Six	6	1	0.2
Seven	7	0	0
Eight	8	1	0.2
Total	–	**406**	**100.0**

TABLE 31: NUMBER OF CHILDREN ON TRIP

CHOICE	CODE	FREQUENCY	PERCENT
None	0	287	70.7
One	1	60	14.8
Two	2	38	9.4
Three	3	17	4.2
Four	4	3	0.7
Five	5	0	0
Six	6	1	0.2
Total	–	**406**	**100.0**

TABLE 32: TOTAL OCCUPANTS

CHOICE	CODE	FREQUENCY	PERCENT
One	1	6	1.5
Two	2	264	65.0
Three	3	71	17.5
Four	4	46	11.3
Five	5	13	3.2
Six	6	4	1.0
Seven	7	0	0
Eight	8	1	0.2
Nine	9	1	0.2
Total	–	**406**	**100.0**

TABLE 33: WAS RESPONDENT DELAYED BY CONGESTION

CHOICE	CODE	FREQUENCY	PERCENT
Yes	1	877	58.4
No	2	624	41.6
Total	–	**1,501**	**100.0**

TABLE 34: TRIP TIME IF NOT DELAYED BY CONGESTION (MINUTES)

CHOICE	FREQUENCY	PERCENT
0-5	2	0.2
6-10	17	1.9
11-15	61	6.9
16-20	105	11.8
21-25	89	10.0
26-30	185	20.9

Choice	Frequency	Percent
31-35	75	8.5
36-40	102	11.5
41-45	114	12.9
46-50	24	2.7
51-55	3	0.3
56-60	49	5.5
60+	61	6.9
Total	**887**	**100.0**

Table 35: Did Respondent Make Stops on Trip

Choice	Code	Frequency	Percent
Yes	1	199	13.3
No	2	1,302	86.7
Total	–	**1,501**	**100.0**

Table 36: Type of Stop Made

Choice	Code	Frequency	Percent
Pick up/ drop off kids at daycare	1	10	5.0
Pick up / drop off other people	2	13	6.5
Change your mode of travel, like catch of bus	3	1	0.5
Take care of personal business, like shopping	4	147	73.9
Work-related activity	5	9	4.5
Multiple stops for different purposes	6	19	9.5
Total	–	**199**	**100.0**

Table 37: Number of Times Late to Pick Up Child at Daycare

Choice	Code	Frequency	Percent
None	1	7	70.0
1 - 5	2	1	10.0
6 - 9	3	0	0.0
10 or more times	4	2	20.0
Total	–	**10**	**100.0**

TABLE 38: SATISFACTION WITH THE OVERALL QUALITY OF TRAVEL ON I-75 BETWEEN I-285 AND I-575

CHOICE	CODE	FREQUENCY	PERCENT
Very satisfied	1	359	23.9
Slightly satisfied	2	450	30.0
Slightly unsatisfied	3	320	21.3
Very unsatisfied	4	366	24.4
Don't Know	8	6	0.4
Total	–	**1,501**	**100.0**

TABLE 39: LEVEL OF CONGESTION ON THIS SEGMENT OF I-75

CHOICE	CODE	FREQUENCY	PERCENT
Very congested	1	531	35.4
Somewhat congested	2	493	32.8
Slightly congested	3	310	20.7
Or not congested at all	4	167	11.1
Total	–	**1,501**	**100.0**

TABLE 40: EMPLOYMENT

CHOICE	CODE	FREQUENCY	PERCENT
Self-employed	1	259	17.3
Employed full or part time	2	999	66.6
Student full or part time	3	37	2.5
Retired	4	129	8.6
Something else	7	77	5.1
Total	–	**1,501**	**100.0**

TABLE 41: EDUCATION

CHOICE	CODE	FREQUENCY	PERCENT
Grade School	1	14	0.9
GED or High School Graduate	2	196	13.1
Some college or vocational education	3	342	22.8
College Graduate	4	677	45.1
Graduate Degree	5	269	17.9
Refused	9	3	0.2
Total	–	**1,501**	**100.0**

TABLE 42: ETHNICITY

CHOICE	CODE	FREQUENCY	PERCENT
White or Caucasian	1	1,265	84.3
Hispanic or Latino	2	34	2.3
African-American	3	124	8.3
Asian-American	4	21	1.4
Other	7	37	2.5
Refused	9	20	1.3
Total	–	**1,501**	**100.0**

TABLE 43: AGE

CHOICE	CODE	FREQUENCY	PERCENT
18 - 24	1	60	4.0
25 - 34	2	255	17.0
35 - 44	3	411	27.4
45 -54	4	385	25.6
55 - 64	5	261	17.4
65 or older	6	115	7.7
Refused	9	14	0.9
Total	–	**1,501**	**100.0**

TABLE 44: HOUSEHOLD INCOME

CHOICE	CODE	FREQUENCY	PERCENT
$15,000 or less	1	17	1.1
$15,000 to $24,999	2	27	1.8
$25,000 to $34,999	3	51	3.4
$35,000 to $44,999	4	59	3.9
$45,000 to $49,999	5	49	3.3
$50,000 to $59,999	6	154	10.3
$60,000 to $74,999	7	175	11.7
$75,000 to $99,999	8	302	20.1
$100,000 to $124,999	9	177	11.8
Above $125,000	10	312	20.8
Refused	99	178	11.9
Total	–	**1,501**	**100.0**

TABLE 45: FOLLOW UP RESPONDENT

CHOICE	CODE	FREQUENCY	PERCENT
Yes	1	1,268	84.5
No	2	233	15.5
Total	–	**1,501**	**100.0**

TABLE 46: PREFERRED MODE FOR FOLLOW UP

CHOICE	CODE	FREQUENCY	PERCENT
Telephone	1	720	56.8
Mail	2	190	15.0
Email	3	358	28.2
Total	–	**1,268**	**100.0**

TABLE 47: GENDER

CHOICE	CODE	FREQUENCY	PERCENT
Male	1	841	56.0
Female	2	660	44.0
Total	–	**1,501**	**100.0**

TABLE 48: COUNTY

CHOICE	FIPS CODE	FREQUENCY	PERCENT
Bartow	13015	26	1.7
Cherokee	13057	851	56.7
Cobb	13067	593	39.5
Fulton	13121	15	1.0
Gordon	13129	1	0.1
Paulding	13223	15	1.0
Total	–	**1,501**	**100.0**

APPENDIX 3-B
Technical Memorandum on Sample Design

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TECHNICAL MEMORANDUM ON SAMPLE DESIGN

This memorandum describes the sample design for the I-75 Stated Preference (SP) Survey. The design includes identifying the population of inference, documentation of tasks performed to process the sample, methodology related to sampling tasks during field production, and expected distribution.

PROJECT OBJECTIVES

State Road and Tollway Authority along with its planning partners, the Georgia Department of Transportation (GDOT) and the Georgia Regional Transportation Authority (GRTA), are investigation the feasibility of high occupancy toll (HOT) lane option as a congestion management tool within high occupancy vehicle lanes currently in design. The subject of this analysis is the segment of I-75 from Akers Mill Road to Wade Green Road (hereafter, referred to as the "target segment of I-75"). The key objective of the I-75/575 Sated Preference (SP) survey is to test willingness to pay for saved travel time associated with use of the potential HOT lanes among drivers of single occupancy vehicles. The SP survey will also assess potential demand for the new facilities, as well as ascertain acceptance of value pricing concepts.

POPULATION OF INFERENCE

The population of inference (or population under study) consists of those individuals 18 years of age or older, residing within the I-75 survey sampling areas (see Figure 1 below), who travel the target segment at least three times per week (IS THIS BY DIRECTION OR TRIP). Eligible respondents will have at least one vehicle available for use by members of the household.

FIGURE 1: I-75 SURVEY SAMPLING AREAS AND TRAVEL SHED

Sampling Area (yellow), the ARC model travel shed (blue), and the target I-75 section (red)

PROPOSED SAMPLE SIZE

A total of 1,500 valid interviews will be required to meet project objectives. Of these, 1300 will be completed in summer 2005 and 200 will be completed in fall 2005 (to validate summer results). Of these interviews, we expect approximately 75% (1125 interviews) will be conducted with drivers of single occupancy vehicles (SOV) who will be respondents for the SP questions on willingness to pay and potential use. This sample size will satisfy statistical requirements and provide meaningful results that can be employed in the traffic and toll revenue analysis (see table 1 for proposed sample sizes by season).

Table 1: Target Sample Sizes, Summer and Fall

Season	Total Sample	SOV Sample
Summer 2005	1,300	1,125
Fall 2005	200	150
Total	1,500	1,275

SAMPLING OBJECTIVES

The sample design will incorporate two explicit objectives. The first objective is to profile trips based on set peak and non-peak proportions. Desired proportions were to obtain 70 percent of trips in the peak periods and 30 percent in all other times including Saturday and Sunday (see Table 2 below). AM peak is defined as 6am to 10am, and PM peak is defined as 3pm to 7pm.

Table 2: Proposed Distribution of Sample by Time of Day

Time of Day	Total Sample	% of Total Sample
AM Peak	525	35%
PM Peak	525	35%
Non-Peak	450	30%
Total	1,500	100%

The second objective is to ensure that dialing productivity will be as efficient as possible given the random nature of travel incidence along I-75. This objective will be achieved by targeting census tracts in which households have the greatest propensity to drive the target segment of I-75.

ACHIEVING SAMPLING EFFICIENCY

Sampling efficiency will be achieved by identifying the census tracts within the I-75 travel shed that contain households with the greatest propensity to travel the target segment of I-75. The process used to identify these census tracts consisted first of defining the initial sampling area through a "select link" analysis that identified the density of trip origins by TAZ estimated to travel through the target segment of I-75. Demand trends from the results of that analysis were then extrapolated into the counties not modeled by the ARC model. The resulting sampling area is shown in yellow in Figure 1 (page 1) and identifies all tracts within the region that have a *strong likelihood* of containing respondents that make regular trips on the target segment of I-75.

Table 3 presents total households (HH) for the census tracts by county that comprise the sampling area (N=678,622), the total households (HH) in the target census tracts (N=378,235), the percent of total households in target census tracts (N=378,235), and the households in targeted census tracts as a percent of the total households in the counties (N=678,622). So, total households in our sampling area represent 56% of the households in the seven counties.

Table 3: Total Households in Sampling Area Counties and Target Census Tracts

County	Total HHs in County	Total HHs in Targeted Tracts	Distribution of Sample Population by County	HHs in Targeted Tracts as % of Total HHs in County
Cobb	227,487	223,286	59%	98%
Cherokee	49,495	49,495	13%	100%
Fulton	321,242	46,785	12%	15%
Paulding	28,089	25,593	7%	91%
Bartow	27,176	27,176	7%	100%
Pickens	8,960	3,859	1%	43%
Gordon	16,173	2,041	1%	13%
Total	678,622	378,235	100%	56%

Source: 2000 Census.

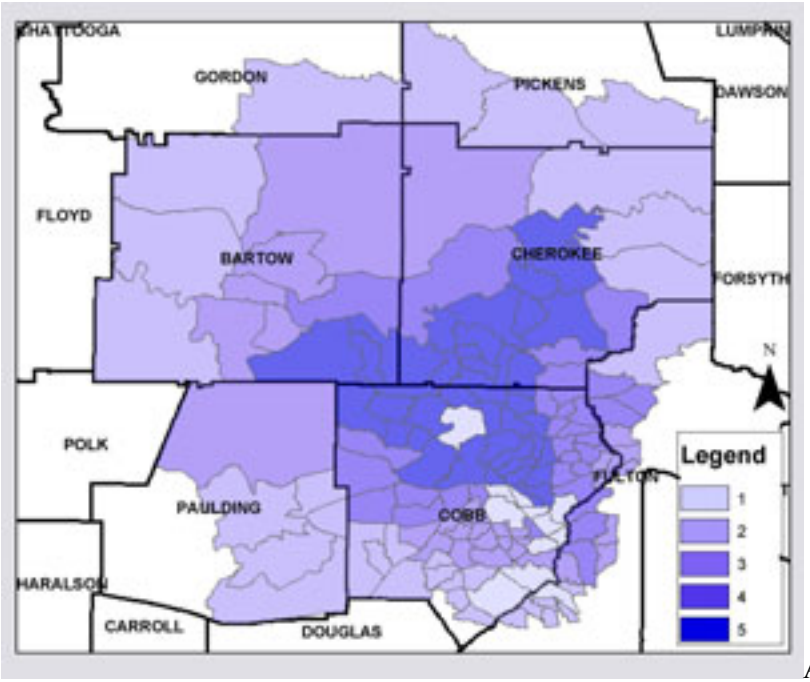
Note: these number need further explanation, especially since Bartow and Cherokee are 100% - not intuitive from my perspective.

The sampling area was further refined by identifying those census tracts with the *highest likelihood* of finding participants that regularly drive the target section of I-75. This was accomplished by evaluating the forecasted trip origins using population density and land use, then selecting those tracts based on the highest trip to population densities within residential land uses. This step helped to eliminate the large commercial shopping areas and Dobbins Air Force Base (AFB) that are large trip attractors, but do not have large residential areas.

The result was the creation of an index that classifies tracts based on trips likely to be made on the targeted section of I-75.

Figure 2 (next page) identifies the tracts that comprise the sampling area by their trip densities. Darker blue tracts represent tracts (1) with the heaviest trip densities and (2) most likely to produce an eligible respondent. Lighter blue tracts are included in the sampling area but have a lower likelihood of a match. The lightest blue tracts are ones with large nonresidential land uses (Dobbins AFB, Town Center, etc.).

FIGURE 2: TRIP DENSITIES ASSOCIATED WITH TARGETED TRACTS



Add Area 1 etc. to the ledend

Table 4 provides information on total households comprising the five areas organized by trip density level. These areas are not coterminous with county boundaries. The lowest trip densities (lightest blue or Area 1) include 12 census tracts that are all located in Cobb County. Highest trip densities (dark blue or Area 5) include 43 census tracts that span three counties (Bartow, Cherokee, and Cobb).

Table 4: Survey Target Area Details by Trip Density Areas – delete % of total tracks column

Trip Density Level	No. of Tracts	% of Total Tracts	Total HHs	% of Total HHs
Area 1	12	8%	37,692	10%
Area 2	32	21%	74,975	20%
Area 3	31	21%	80,699	21%

Area 4	32	21%	75,594	20%
Area 5	43	29%	109,275	29%
Total	150	100%	378,235	100%

Note: The data used in these analyses included the ARC travel demand model and US Census data at the TAZ and census tract level.

We propose to sample the households within the sampling area (yellow area in Figure 1) based on the proportional distribution of households within the trip density level area. Table 5 (next page) presents the expected number of completed interviews by area. Based on our estimates, Area 5 (with the highest trip densities) would have the highest number of completed interviews (435 of the 1500). Area 1 with the lowest trip densities would also have the lowest number of completed interviews (150 of the 1500).

Table 5: Expected Distribution of Sample by Trip Density Area

Trip Density Level	Total HHs	% of Total HHs	Expected Valid Interviews
Area 1	37,692	10%	150
Area 2	74,975	20%	300
Area 3	80,699	21%	315
Area 4	75,594	20%	300
Area 5	109,275	29%	435
Total	378,235	100%	1,500

SAMPLING FRAME

The sampling frame will consist of listed (known residential address) and unlisted (no known residential address) telephone numbers for households located in the I-75 sampling area (total of 150 census tracts presented in shades of blue in Figure 1). Sample will be procured from Marketing Systems Group (MSG) based in Fort Washington, PA, with the proportional distribution indicated in Table 5 above.

SAMPLE PROCESSING

NuStats will provide MSG with specifications for generating the telephone sample. These specifications will include (1) expectations about the eligibility rate for participation in the survey[1], and (2) expectations about the survey response rate[2]. For this survey, we estimate that with geographic efficiency 60 percent of the individuals we contact will be eligible to

[1] Eligible respondents will need to be 18 years of age or older, use the target segment of I-75 at least three times per week, and have at least one vehicle available for use to household members.
[2] Response rate is defined as the percent of eligible respondents who actually complete an interview.

participate in the interview, and that we will achieve a response rate of 65 percent. Given these parameters, we estimate that approximately 12,500 numbers will be needed to capture the necessary number of completes.

Sample processing by MSG will be done in the following manner. Based on the areas provided by NuStats, geo-demographers will map these areas to known residential telephone exchanges. In the case where exchanges overlap between specified areas[3], exchanges will be attached to those areas that contain a higher proportion of households. Actual telephone numbers will be randomly generated by deriving unique blocks based on area code, exchange, and the 4th and 5th digits of known telephone number, (e.g. 616-555-12). The last two digits will be randomly generated and each number will be purged against known business listings and in some cases numbers will be pre-dialed to purge non-working numbers. Numbers will also be matched against known residential listings to append names and addresses for the purpose of mailing advance letters. This process will continue until the specified amount of listed and unlisted numbers is generated for each area.

An initial sample order will be placed of about one-fourth the total amount required (3,125 records) to ascertain the most efficient geographies in terms of eligibility rates. Findings from the fielding of this initial sample will be used to determine future orders. Both listed and unlisted sample will be ordered based on the proportions that exist in the population.

EXPECTED SAMPLE COMPOSITION

Sample will be drawn from the 150 census tracts that comprise the sample area. The tables below provide population parameters for the households that comprise this total area. It is important to note that our survey sample will differ from all households in the survey area in a couple ways that will impact the demographic distributions of our survey sample. First, our sampling frame will not cover non-telephone or cell phone-only households. Second, eligible respondents will be screened on whether they use the target segment of I-75 at least three times per week. Third, zero car households will not be included in our sample. Given these caveats, the demographic distributions below represent the demographic characteristics of our survey area households.

TABLE 6: 2000 CENSUS GENDER DISTRIBUTION

Gender	Total
Male	50%
Female	50%
Total	100%

TABLE 7: 2000 CENSUS AGE DISTRIBUTION

Age	Total
18-21	6%
22-29-	17%
30-39	25%

[3] This was common since our areas are highly contiguous.

40-49	22%
50-64	19%
65+	10%
Total	100%

TABLE 8: 2000 CENSUS RACE / ETHNICITY [4]

Race / Ethnicity	Total
Asian American	2%
Black / African American	15%
Caucasian	80%
Other	3%
Total	100%

For population 18 and older

[4] It is estimate that Hispanics account for about 6% of all ethnicities in the survey area. However, including them in Table 8 would result in double counting of individuals, due to the way the US Census records individuals of multiple races and Hispanics at the tract level.

APPENDIX 3-C
Survey Instrument

I 75 SP SURVEY INSTRUMENT

Note: This questionnaire has been constructed using the following convention – text presented in upper and lower case is read by the interviewer; text in ALL CAPS is not.

Hello, my name is _____. I'm calling on behalf of the State Road and Tollway Authority. We're conducting a survey on congestion and avoiding congestion in the Atlanta region, and would like to include your opinions. It will take only a few minutes of your time. This is not a sales call. Are you 18 years of age or older and live in the household I am calling?

IF NO: May I speak with a resident of the household 18 years of age or older?

If NEW R: REPEAT INTRO.

SCREENING QUESTIONS

S1. We're interested in talking with people who are regular users of I-75. Do you or does anyone in your household use the segment of I-75 between I-285 and I-575 at least once per week? IF NEEDED: THAT IS BETWEEN EXIT 259 (I-285) AND EXIT 268 (I-575).

CONTINUE---YES R DOES	1
REPEAT INTRO<--------YES OTHER HH ADULT DOES	2
TERMINATE <----------NO ONE IN HH DOES	2

S2. How do you usually travel on I-75? Do you usually…

Drive alone	1
Drive with other passengers	2
Ride as a passenger in a personal vehicle	3
Ride as a passenger in a van pool	4
Ride as a passenger in a bus	5

S3. And, how many vehicles (in working condition) are available in your household?

TERMINATE<---------ZERO	1
ONE	2
TWO	3
THREE	4
FOUR OR MORE	5

S4. How many people, including yourself, currently live in your household?

ONE	1
TWO	2
THREE	3
FOUR OR MORE	4

GENERAL OPINION

1. Next, for your current travel patterns and needs is congestion in Atlanta a ……

A major problem	1
A moderate problem	2
A minor problem, or	3
No problem at all	4
DON'T KNOW	98

I-75 PROJECT SPECIFIC OPINIONS

2. Now I'm going to ask some questions about a new transportation project in Northwest Atlanta. Are you aware of plans to build new carpool lanes on I-75 between I-285 and I-575?

YES	1
NO	2

3. IF YES: What have you heard? [OPEN END][1]

[DELIVER TO ALL RESPONDENTS:] As a way to relieve congestion, the Georgia Department of Transportation plans to build new carpool lanes on I-75 between I-285 (at exit 259) and I-575 (at exit 268). In conjunction with these new carpool lanes, the State Road and Tollway Authority is considering allowing drivers of single occupancy vehicles to use carpool lanes on payment of a fee. The fees are collected electronically w/o toll booths and at highway speeds via on-vehicle transponders."

4. What do you think of allowing drivers of single occupancy vehicles to use the new carpool lanes by paying a toll? Is it a …

Good idea, or	1
A bad idea?	2
DON'T KNOW	98

5. Why do you feel this way? [OPEN END]
6. It will be important to keep traffic in the carpool lane free-flowing. To accomplish this, the toll that drivers of single occupancy vehicles will pay will not be a set price. Tolls would be adjusted continuously so as to limit total vehicle flow on carpool lanes and guarantee free flow and high speeds. Do you think this is a…

Good idea, or	1
A bad idea?	2
DON'T KNOW	98

7. Why do you feel this way? [OPEN END]
8. Under this potential new toll lane program, drivers of single occupancy vehicles who opt to pay a toll, as well as carpoolers and bus riders, could drive in the carpool lane at any

[1] NOTE: We will build response categories for open end questions in this section as the survey progresses, starting with pilot interviews.

time of day. In other words, the potential new toll lane program would operate 24 hours a day. Is this a …

Good idea, or	1
A bad idea?	2
DON'T KNOW	98

9. Why do you feel this way? [OPEN END]
10. DELETE
11. Please think about the times and circumstances when you most typically drive alone on this segment. If you were to decide to pay the toll to access the toll lanes, what is the one reason that would most often influence your decision to use the tolled lane?"

To reduce your overall travel time	1
To reduce the amount of time you spend in heavy traffic	2
To increase the predictability of your arrival time,	3
To increase personal safety while driving in traffic	4
Or some other reason? SPECIFY	5

REFERENCE TRIP DETAILS (FOR SP QUESTIONS)

Now I need to record some information about your most recent travel on I-75 between I-285 (at exit 259) and I-575 (at exit 268). It is important that you think about at trip in which you traveled on I-75 between I-285 and I-575 for more than one or two miles.

12. What day of the week was it? [QUOTAS INDICATED IN SAMPLING PLAN]

MONDAY	1
TUESDAY	2
WEDNESDAY	3
THURSDAY	4
FRIDAY	5
NON-PEAK<-----SATURDAY	6
NON-PEAK<-----SUNDAY	7

13. What time did you start this trip? [military time]? TO MEET QUOTAS: BE READY TO ASK FOR ANOTHER REFERENCE TRIP.

COMPUTE TIME PERIOD VARIABLE:

6am to 10am =1

10am to 3pm =2

3pm to 7pm =3

7pm to 6am =4

COMPUTE PEAK/ NON-PEAK VARIABLE

Peak (weekday 6am to 10am) = 1 (quota= 35%)

Peak (weekday 3pm to 7pm) = 2 (quota – 35%)
Non-Peak (all else) = 3 (quota = 30%)

14. Did you leave at this particular time to avoid traffic congestion?

YES	1
SKIP TO Q.16<----NO	2
SKIP TO Q.16<----DK	98

15. IF YES: What time would you have preferred to leave if there was no traffic congestion? [military time]

16. Were you traveling to the north or to the south?

NORTH	1
SOUTH	2

17. What would you say the main purpose of this trip was?

COMMUTE TO OR FROM WORK OR SCHOOL	1
WORK-RELATED	2
DROP OFF/ PICK UP SCHOOL AGE CHILD	3
SKIP TO Q.19<----SHOP	4
SKIP TO Q.19<----VISIT FRIENDS OR FAMILY	5
SKIP TO Q.19<----RECREATIONAL OR ENTERTAINMENT ACTIVITY	6
SKIP TO Q.19<----OR SOMETHING ELSE (DO NOT SPECIFY)?	7

18. IF PURPOSES 1-3 IN Q17: Would you say you had to be at your destination…

at a specific time plus or minus 10 minutes	1
plus or minus 30 minutes	2
Or did you have more flexibility in the arrival time than that?	3

19. Where did you start this trip? Was it home, work or someplace else?

HOME	1
WORK	2
SOME PLACE ELSE: SPECIFY PLACE NAME (EG: STORE, SCHOOL)	3

20. COLLECT ZIP CODE. IF NOT KNOWN, COLLECT CITY.

21. Where did you end this trip? Was it home, work or someplace else? CAN'T BE A LOOP TRIP

HOME	1
WORK	2

SOME PLACE ELSE: SPECIFY PLACE NAME (EG: STORE, SCHOOL) 3

22. COLLECT ZIP CODE. IF NOT KNOWN, COLLECT CITY.

23. What time did you arrive at this end location? [military time]

COMPUTE NEW VARIABLE, TRAVEL TIME = Q23– Q16 [# minutes]

24. This means that your trip took about [TRAVEL TIME] minutes from start to end. Is this about right?

YES	1
IF NECESSARY COLLECT NEW START / END TIMES<-----NO	2

25. How did you travel? Were you…

Driving alone	1
Driving with other passengers	2
Riding as a passenger in a personal vehicle	3
Riding as a passenger in a van pool	4
Riding as a passenger in a bus	5

COMPUTE NEW VARIABLE: REFERENCE TRIP MODE

SOV (Driving alone) = 1

HOV (Driving with other passengers, riding as passenger in personal vehicle) = 2

VAN POOL = 3

TRANSIT =4

26. IF HOV: How many adults, 18 or older, were in the vehicle on this trip? CLARIFY: INCLUDING YOURSELF.

27. IF HOV: How many children (under 18) traveled with you?

COMPUTE NEW VARIABLE: TOTAL OCCUPANTS

28. Were you delayed by congestion on this trip from [START TO END LOCATION]?

YES	1
Skip to Q.30<----NO	2

29. IF YES: Your trip took about [TRAVEL TIME] minutes door-to-door. If you had not been delayed by congestion, about how long do you think this trip would have taken?___ # minutes

30. Did you make any stops between [START AND END LOCATION]?

YES	1
SKIP TO Q.32<----NO	2

31. IF YES: Which of the following best describes the types of stops you took? Was it to:

Pick up/ drop off kids at daycare	1
Pick up / drop off other people	2
Chance your mode of travel, like catch of bus	3
Take care of personal business, like shopping	4
Do a work-related activity	5
Or, did you make multiple stops for different purposes?	6

31A: IF Q31=1: About how many times did you arrive late to pick up your kids at daycare last month?

None	1
1-5	2
5-9	3
More than 10	4

32. Based on this trip, how satisfied were you with the overall quality of travel conditions on I-75 between I-285 and I-575?

Very satisfied	1
Slightly satisfied	2
Slightly unsatisfied	3
Very unsatisfied	4
DK	98

33. How would you describe the level of congestion on this segment of I-75 at the time of your trip? Would you say the road was…

Very congested	1
Somewhat congested	2
Slightly congested	3
Or not congested at all?	4

SP MODULE ONLY -- ASKED OF SOV ONLY Q25

Now assume you're making a future trip on I-75 just like the one that you just told me about. It's a trip on the same day, at the same time of day, for the same purpose, and you're under the same time pressures. You are traveling on the segment of I-75 between I-285 and I-575 and have the option of using the new carpool lane if you want to.

Note: Parameters for these questions are based upon the actual travel time (if the respondent was NOT delayed by congestion on their trip) or the respondent's projected travel time (their estimate of how long it would have taken given no congestion). This value is represented by a new variable, TOLLTIME.

WE WILL RANDOMLY ASSIGN [$] AND [#] IN SP SETS.
$= .25, .50, $1, $2, $3, $4, $5, $6, $7, AND $8

TIME SAVINGS = 5, 10, 15, AND 20 MINUTES, WITH 20 MINUTES OCCCURRING LESS OFTEN.
There are two sets of stated preference questions – one random half is presented with SP SET A; the other random half is presented with SP SET B. Also in order to minimize order effects, the response options are rotated at random (i.e. sometimes the "carpool lane" response is first, sometimes second, sometimes third, and vice versa).

SP SET A: If you were to use the general traffic lanes on this segment of I-75, your trip would take TOLLTIME+[#] and be free. If you used the new carpool lane as a single driver you would pay [$] and your trip would take TOLLTIME, saving [#] minutes. You could also choose to carpool with someone and use the lane for free. Now under these conditions, would you choose to: [ROTATE]

Use the carpool lane, pay [$] and save [#] minutes	1
Use the general lane for free	2
Carpool with someone to use the carpool lane for free	3
DK	98

SP SET B: If you were to use the carpool lane on this segment of I-75 as a single driver, you would pay [$] and your trip would take TOLLTIME. If you were to use the general traffic lanes, your trip would take TOLLTIME+[#], [#] minutes longer than in the toll lane, but it would be free. You could also choose to carpool with someone to use the carpool lane for free. Now under these conditions, would you choose to: [ROTATE]

Use the carpool lane, pay [$] and save [#] minutes	1
Use the general lane for free	2
Carpool with someone to use the carpool lane for free	3
DK	98

FIRST TIME CARPOOL IS SELECTED, ASK SP C and SP D:

SP C: With whom would you carpool to make this trip?	FAMILY MEMBER	1
	NON-FAMILY MEMBER	2
	RE-ASK SP QUESTION; ELIMINATE CARPOOL OPTION<-----DK	98

SP D: Is this really a realistic option for this particular trip?	YES	1
	RE-ASK SP QUESTION; ELIMINATE CARPOOL OPTION<-----NO	2

A second set of questions in the stated preference module present a randomly selected time savings parameter – 5, 10, or 15 minutes. Price points are presented to the respondent iteratively until it is determined they would not pay to travel in the carpool lane (regardless of price) or they would pay if the toll was [highest cost tested]. For example:

Assume the initial price point is $2 (time savings of some random amount, assume 10 minutes). The respondent states they would pay it, so the highest the respondent would pay (at this point) is $2. A random price point higher than this value is selected for the next question determining whether the respondent would pay that amount, given the time savings. Assume the next price point is $6, and the respondent would not pay that amount; the next price point would be $5, next $4. Let's assume the respondent would pay $4; at this point the questions would end, since there is no space between $4 (which they would pay) and $5 (which they would not pay).

SP F: Now imagine a different scenario. As a single driver, if you were to pay to use the carpool lane on I-75, you would pay [$] and you would save [#] minutes. Under these conditions what would you do?

Use the carpool lane, pay [$] and save [#] minutes	1
Use the general lane for free	2
Carpool with someone to use the carpool lane for free	3
DK	98

DEMOGRAPHICS MODULE

To make sure this survey represents the greater Atlanta area, I need to ask some questions about you.

D1. Currently, are you…[multiple responses]

Self-employed	1
Employed full or part time	2
A Student full or part time	3
Retired	4
Or something else?	5

D2. What is the highest level of education you have attained?

GRADE SCHOOL	1
GED OR HIGH SCHOOL GRADUATE	2
SOME COLLEGE OR VOCATIONAL EDUCATION	3
COLLEGE GRADUATE	4
GRADUATE DEGREE	5
RF	99

D3. Most people classify themselves as being White, or Caucasian, Hispanic or Latino, African-American, or Asian American? What do you consider yourself?

WHITE OR CAUCASIAN	1
HISPANIC OR LATINO	2
AFRICAN-AMERICAN	3
ASIAN-AMERICAN	4
OTHER	5
RF	99

D4. What is your age?

18 - 24	1
25 - 34	2
35 - 44	3
45 -54	4
55 - 64	5
65 OR OLDER	6
RF	99

D5. What is the total annual income for your household, when you consider the income of all employed individuals? Is it above or below $50,000?

BELOW $50,000 READ	
$15,000 or less	1
$15,000 to $24,999	2
$25,000 to $34,999	3
$35,000 to $44,999	4
$45,000 to $49,999	5
$50,000 AND ABOVE READ	
$50,000 to $59,999	6
$60,000 to $74,999	7
$75,000 to $99,999	8
$100,000 to $124,999	9
or Above $125,000	10
RF	99

D6. What is your home zip code? IF NOT PROVIDED IN Q22 OR 24. [IF NEEDED: THIS IS TO MAKE SURE THAT OUR SURVEY REPRESENTS PEOPLE WHO LIVE THROUGHOUT THE GREATER ATLANTA AREA.]

RF	99

D7. Would you be willing to help us in upcoming studies of opinions and experiences with transportation in Atlanta?

YES	1
SKIP TO QD9<-----NO	2

D8 IF YES: Which of the following would be the best way to contact you regarding these follow-up research studies?

Telephone: IF YES: confirm number:	1
Mail: IF YES: specify mailing address	2
Email: IF YES: specify email address	3

D9. RECORD GENDER.

MALE	1
FEMALE	2

Thank you very much for your time. Have a good day evening.

APPENDIX 5-A
Managed lane Operational Summaries

2011 A.M. PEAK PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Corridor Average Delay (min)		Average System Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane		
I-75 From Akers Mill Road to Banberry Road	***Baseline***	***27,990***	***1,329***	***0***	***1,329***	***29,318***	***8.3***	***5.3***	***39.8***	***58.1***	***0.69***	***0.10***	***2.7***	***0.0***	***2.6***	***0***
	5 Cents/mile	26,673	1,289	1,925	3,214	29,888	7.8	5.9	42.3	56.5	0.66	0.25	2.2	0.2	2.0	540
	10 Cents/mile	27,379	1,333	989	2,322	29,700	8.1	5.8	41.0	57.5	0.68	0.18	2.5	0.1	2.3	550
	15 Cents/mile	27,631	1,344	591	1,936	29,567	8.2	5.8	40.5	57.8	0.69	0.15	2.6	0.1	2.4	490
	20 Cents/mile	27,711	1,348	360	1,708	29,419	8.2	5.8	40.3	57.9	0.69	0.13	2.6	0.0	2.4	400
	25 Cents/mile	27,837	1,350	269	1,619	29,456	8.3	5.8	40.1	57.9	0.69	0.13	2.7	0.0	2.5	370
	30 Cents/mile	27,878	1,356	198	1,553	29,432	8.3	5.8	40.0	57.9	0.69	0.12	2.7	0.0	2.5	330
I-75 From Banberry Road to I-575 Split	***Baseline***	***24,984***	***0***	***0***	***0***	***24,984***	***7.2***	***N/A***	***41.2***	***N/A***	***0.69***	***N/A***	***2.3***	***N/A***	***2.4***	***0***
	5 Cents/mile	25,117	0	0	0	25,117	7.3	N/A	40.9	N/A	0.70	N/A	2.4	N/A	2.4	0
	10 Cents/mile	25,065	0	0	0	25,065	7.2	N/A	41.0	N/A	0.69	N/A	2.4	N/A	2.4	0
	15 Cents/mile	25,015	0	0	0	25,015	7.2	N/A	41.1	N/A	0.69	N/A	2.4	N/A	2.4	0
	20 Cents/mile	24,995	0	0	0	24,995	7.2	N/A	41.1	N/A	0.69	N/A	2.3	N/A	2.4	0
	25 Cents/mile	25,013	0	0	0	25,013	7.2	N/A	41.1	N/A	0.69	N/A	2.4	N/A	2.4	0
	30 Cents/mile	25,002	0	0	0	25,002	7.2	N/A	41.1	N/A	0.69	N/A	2.4	N/A	2.4	0

2011 A.M. PEAK PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Corridor Average Delay (min)		Average System Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane		
I-75 From Akers Mill Road to Banberry Road	***Baseline***	***34,416***	***4,205***	***0***	***4,205***	***38,621***	***13.0***	***6.2***	***26.4***	***54.6***	***0.90***	***0.32***	***7.3***	***0.4***	***6.9***	***0***
	10 Cents/mile	32,533	3,529	4,444	7,972	40,505	11.5	8.3	29.6	44.9	0.85	0.61	5.8	2.5	5.5	2,480
	15 Cents/mile	32,854	3,772	3,477	7,250	40,103	11.8	7.8	29.0	47.4	0.86	0.56	6.0	2.1	5.6	2,910
	20 Cents/mile	33,272	3,903	2,817	6,720	39,992	12.1	7.4	28.3	48.9	0.87	0.52	6.3	1.7	5.8	3,140
	30 Cents/mile	33,877	4,071	1,748	5,820	39,697	12.6	6.8	27.3	51.2	0.89	0.45	6.8	1.0	6.3	2,930
	35 Cents/mile	33,871	4,091	1,456	5,546	39,417	12.5	6.6	27.3	51.8	0.89	0.43	6.8	0.9	6.3	2,840
	40 Cents/mile	34,156	4,126	1,208	5,333	39,489	12.8	6.5	26.8	52.3	0.89	0.41	7.0	0.8	6.5	2,690
I-75 From Banberry Road to I-575 Split	***Baseline***	***32,234***	***0***	***0***	***0***	***32,234***	***12.2***	***N/A***	***27.1***	***N/A***	***0.91***	***N/A***	***7.0***	***N/A***	***7.1***	***0***
	10 Cents/mile	32,548	0	0	0	32,548	12.6	N/A	26.5	N/A	0.92	N/A	7.3	N/A	7.5	0
	15 Cents/mile	32,586	0	0	0	32,586	12.6	N/A	26.4	N/A	0.92	N/A	7.3	N/A	7.5	0
	20 Cents/mile	32,612	0	0	0	32,612	12.7	N/A	26.4	N/A	0.92	N/A	7.4	N/A	7.5	0
	30 Cents/mile	27,530	1,340	750	2,090	32,392	12.4	N/A	26.8	N/A	0.91	N/A	7.2	N/A	7.3	0
	35 Cents/mile	33,286	3,799	2,666	6,465	32,430	12.5	N/A	26.7	N/A	0.91	N/A	7.2	N/A	7.3	0
	40 Cents/mile	32,495	0	0	0	32,495	12.5	N/A	26.6	N/A	0.92	N/A	7.2	N/A	7.4	0

2011 P.M. PEAK PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Corridor Average Delay (min)		Average System Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane		
I-75 From Akers Mill Road to Banberry Road	***Baseline***	***40,680***	***6,015***	***0***	***6,015***	***46,695***	***16.2***	***5.9***	***20.4***	***51.7***	***1.00***	***0.45***	***10.7***	***0.7***	***9.4***	***0***
	10 Cents/mile	37,746	4,434	5,178	9,612	47,359	13.1	10.0	25.3	37.4	0.93	0.74	7.5	4.3	7.0	2,880
	15 Cents/mile	38,495	4,873	4,267	9,140	47,635	13.8	9.4	24.0	39.6	0.95	0.70	8.2	3.7	7.5	3,560
	20 Cents/mile	38,399	5,172	3,617	8,789	47,188	13.7	9.1	24.1	41.2	0.94	0.68	8.2	3.4	7.4	4,030
	30 Cents/mile	38,801	5,500	2,559	8,059	46,860	14.1	8.4	23.4	44.4	0.96	0.62	8.5	2.7	7.6	4,280
	40 Cents/mile	39,776	5,620	1,898	7,517	47,293	15.1	8.0	21.9	46.4	0.98	0.58	9.5	2.3	8.5	4,230
	50 Cents/mile	40,036	5,736	1,471	7,208	47,244	15.4	7.9	21.5	47.3	0.98	0.56	9.8	2.2	8.7	4,100
I-75 From Banberry Road to I-575 Split	***Baseline***	***39,115***	***0***	***0***	***0***	***39,115***	***20.3***	***N/A***	***16.4***	***N/A***	***1.08***	***N/A***	***15.4***	***N/A***	***15.7***	***0***
	10 Cents/mile	38,461	0	0	0	38,461	18.9	N/A	17.4	N/A	1.06	N/A	14.0	N/A	14.3	0
	15 Cents/mile	39,236	0	0	0	39,236	20.7	N/A	16.2	N/A	1.09	N/A	15.9	N/A	16.1	0
	20 Cents/mile	38,402	0	0	0	38,402	18.8	N/A	17.5	N/A	1.06	N/A	14.0	N/A	14.2	0
	30 Cents/mile	38,639	0	0	0	38,639	19.2	N/A	17.1	N/A	1.07	N/A	14.4	N/A	14.6	0
	40 Cents/mile	39,235	0	0	0	39,235	20.6	N/A	16.2	N/A	1.09	N/A	15.8	N/A	16.0	0
	50 Cents/mile	39,156	0	0	0	39,156	20.4	N/A	16.3	N/A	1.08	N/A	15.5	N/A	15.8	0

2011 P.M. PEAK PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Corridor Average Delay (min)		Average System Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane		
I-75 From Akers Mill Road to Banberry Road	***Baseline***	***32,016***	***4,053***	***0***	***4,053***	***36,069***	***11.2***	***6.2***	***30.3***	***54.8***	***0.84***	***0.31***	***5.5***	***0.4***	***5.1***	***0***
	5 Cents/mile	30,016	3,083	4,020	7,104	37,120	10.1	7.9	33.6	47.5	0.78	0.55	4.3	2.1	4.2	1,120
	10 Cents/mile	30,238	3,585	2,739	6,324	36,562	10.2	7.5	33.3	49.6	0.79	0.49	4.4	1.7	4.2	1,530
	15 Cents/mile	30,770	3,766	1,972	5,738	36,508	10.5	7.0	32.4	51.0	0.80	0.44	4.7	1.2	4.4	1,650
	20 Cents/mile	30,924	3,862	1,490	5,351	36,275	10.6	6.7	32.1	52.0	0.81	0.41	4.8	0.9	4.5	1,660
	30 Cents/mile	31,246	3,941	923	4,865	36,110	10.7	6.5	31.6	53.0	0.82	0.38	5.0	0.7	4.6	1,550
	40 Cents/mile	31,476	3,979	591	4,570	36,047	10.9	6.3	31.2	53.7	0.82	0.35	5.1	0.6	4.8	1,320
I-75 From Banberry Road to I-575 Split	***Baseline***	***29,028***	***0***	***0***	***0***	***29,028***	***9.9***	***N/A***	***32.9***	***N/A***	***0.82***	***N/A***	***4.6***	***N/A***	***4.7***	***0***
	5 Cents/mile	29,091	0	0	0	29,091	10.0	N/A	32.8	N/A	0.82	N/A	4.7	N/A	4.7	0
	10 Cents/mile	29,011	0	0	0	29,011	9.9	N/A	32.9	N/A	0.82	N/A	4.6	N/A	4.7	0
	15 Cents/mile	38,437	5,052	3,877	8,929	28,966	9.9	N/A	33.0	N/A	0.82	N/A	4.6	N/A	4.7	0
	20 Cents/mile	#VALUE!	#VALUE!	#VALUE!	#VALUE!	28,835	9.8	N/A	33.3	N/A	0.81	N/A	4.5	N/A	4.6	0
	30 Cents/mile	28,854	0	0	0	28,854	9.8	N/A	33.2	N/A	0.81	N/A	4.5	N/A	4.6	0
	40 Cents/mile	28,875	0	0	0	28,875	9.8	N/A	33.2	N/A	0.81	N/A	4.5	N/A	4.6	0

2011 MIDDAY PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average System Delay (min/vehicle)	5-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 From Akers Mill Road to Banberry Road	***Baseline***	***38,000***	***3,516***	***0***	***3,516***	***41,516***	***9.1***	***5.3***	***36.4***	***57.3***	***0.75***	***0.21***	***207,943***	***17,891***	***225,834***	***5,782***	***313***	***6,095***	***3.5***	***0.1***	***3.3***	***0***
	2 Cents/mile	35,535	2,782	4,471	7,253	42,788	8.3	6.7	39.9	51.2	0.69	0.45	194,465	40,405	234,870	4,972	819	5,791	2.7	1.0	2.5	500
	5 Cents/mile	36,167	3,150	3,063	6,213	42,380	8.5	6.4	39.0	53.0	0.71	0.38	197,915	34,605	232,520	5,165	668	5,834	2.9	0.7	2.7	850
	10 Cents/mile	36,997	3,336	1,706	5,042	42,039	8.7	6.1	37.8	54.9	0.73	0.31	202,467	28,081	230,548	5,434	518	5,952	3.1	0.4	2.9	950
	15 Cents/mile	37,355	3,463	1,069	4,532	41,887	8.9	6.0	37.3	55.7	0.73	0.28	204,428	25,249	229,676	5,556	458	6,013	3.3	0.3	3.0	890
I-75 From Banberry Road to I-575 Split	***Baseline***	***35,722***	***0***	***0***	***0***	***35,722***	***8.6***	***N/A***	***34.6***	***N/A***	***0.79***	***N/A***	***174,237***	***N/A***	***174,237***	***5,179***	***N/A***	***5,179***	***3.8***	***N/A***	***3.8***	***0***
	2 Cents/mile	36,102	0	0	0	36,102	8.8	N/A	34.0	N/A	0.80	N/A	176,087	0	176,087	5,326	0	5,326	3.9	N/A	4.0	0
	5 Cents/mile	35,987	0	0	0	35,987	8.7	N/A	34.2	N/A	0.80	N/A	175,526	0	175,526	5,278	0	5,278	3.9	N/A	3.9	0
	10 Cents/mile	35,944	0	0	0	35,944	8.7	N/A	34.3	N/A	0.80	N/A	175,327	0	175,327	5,261	0	5,261	3.9	N/A	3.9	0
	15 Cents/mile	35,818	0	0	0	35,818	8.7	N/A	34.4	N/A	0.79	N/A	174,700	0	174,700	5,218	0	5,218	3.8	N/A	3.9	0

2011 MIDDAY PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average System Delay (min/vehicle)	5-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 From Akers Mill Road to Banberry Road	***Baseline***	***37,338***	***4,176***	***0***	***4,176***	***41,515***	***10.0***	***6.0***	***33.9***	***56.1***	***0.78***	***0.26***	***207,157***	***23,298***	***230,455***	***6,360***	***420***	***6,779***	***4.2***	***0.2***	***4.1***	***0***
	2 Cents/mile	35,026	3,078	4,937	8,015	43,041	9.2	7.2	37.1	49.7	0.73	0.49	194,341	44,680	239,021	5,513	968	6,481	3.4	1.4	3.3	550
	5 Cents/mile	35,394	3,634	3,595	7,229	42,623	9.3	6.8	36.6	51.2	0.74	0.45	196,368	40,338	236,706	5,636	832	6,467	3.5	1.1	3.4	1,000
	10 Cents/mile	36,096	3,983	2,103	6,085	42,182	9.5	6.4	35.6	53.1	0.75	0.38	200,283	33,934	234,217	5,881	658	6,538	3.8	0.7	3.6	1,170
	15 Cents/mile	36,504	4,040	1,406	5,446	41,950	9.7	6.2	35.1	54.2	0.76	0.34	202,544	30,382	232,925	6,029	573	6,602	3.9	0.5	3.7	1,180
I-75 From Banberry Road to I-575 Split	***Baseline***	***34,174***	***0***	***0***	***0***	***34,174***	***9.1***	***N/A***	***36.0***	***N/A***	***0.77***	***N/A***	***181,867***	***N/A***	***181,867***	***5,213***	***N/A***	***5,213***	***3.8***	***N/A***	***3.9***	***0***
	2 Cents/mile	35,082	0	0	0	35,082	9.4	N/A	34.6	N/A	0.79	N/A	186,697	0	186,697	5,550	0	5,550	4.1	N/A	4.2	0
	5 Cents/mile	34,979	0	0	0	34,979	9.4	N/A	34.8	N/A	0.79	N/A	186,144	0	186,144	5,506	0	5,506	4.1	N/A	4.2	0
	10 Cents/mile	33,985	0	0	0	33,985	9.0	N/A	36.3	N/A	0.77	N/A	180,861	0	180,861	5,153	0	5,153	3.7	N/A	3.8	0
	15 Cents/mile	34,005	0	0	0	34,005	9.0	N/A	36.2	N/A	0.77	N/A	180,972	0	180,972	5,166	0	5,166	3.7	N/A	3.8	0

2011 NIGHT PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average System Delay (min/vehicle)	11-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 From	***Baseline***	***35,778***	***963***	***0***	***963***	***36,741***	***5.9***	***5.2***	***55.3***	***58.3***	***0.32***	***0.03***	***195,797***	***4,900***	***200,697***	***3,536***	***84***	***3,620***	***0.3***	***0.0***	***0.3***	***0***
Akers Mill	2 Cents/mile	35,332	954	542	1,496	36,827	5.9	5.7	55.4	58.2	0.32	0.04	193,350	8,342	201,692	3,486	143	3,629	0.3	0.0	0.3	60
Road to	5 Cents/mile	35,620	934	256	1,190	36,810	5.9	5.7	55.4	58.2	0.32	0.03	194,935	6,615	201,550	3,518	114	3,632	0.3	0.0	0.3	70
Banberry	10 Cents/mile	35,763	894	151	1,046	36,809	5.9	5.7	55.3	58.3	0.32	0.03	195,718	5,826	201,544	3,534	100	3,634	0.3	0.0	0.3	80
I-75 From	***Baseline***	***31,725***	***0***	***0***	***0***	***31,725***	***5.2***	***N/A***	***56.8***	***N/A***	***0.32***	***N/A***	***154,735***	***N/A***	***154,735***	***2,734***	***N/A***	***2,734***	***0.3***	***N/A***	***0.3***	***0***
Banberry	2 Cents/mile	31,822	0	0	0	31,822	5.2	N/A	56.7	N/A	0.32	N/A	155,203	0	155,203	2,744	0	2,744	0.3	N/A	0.3	0
Road to I-	5 Cents/mile	31,804	0	0	0	31,804	5.2	N/A	56.8	N/A	0.32	N/A	155,122	0	155,122	2,742	0	2,742	0.3	N/A	0.3	0
575 Split	10 Cents/mile	31,793	0	0	0	31,793	5.2	N/A	56.8	N/A	0.32	N/A	155,074	0	155,074	2,741	0	2,741	0.3	N/A	0.3	0

2011 NIGHT PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average System Delay (min/vehicle)	11-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 From	***Baseline***	***31,575***	***744***	***0***	***744***	***32,319***	***6.0***	***5.7***	***55.1***	***58.3***	***0.30***	***0.02***	***175,189***	***4,163***	***179,352***	***3,188***	***71***	***3,259***	***0.3***	***0.0***	***0.3***	***0***
Akers Mill	2 Cents/mile	30,908	734	699	1,433	32,341	6.0	5.8	55.3	58.2	0.29	0.04	171,472	7,992	179,464	3,112	137	3,249	0.3	0.0	0.3	80
Road to	5 Cents/mile	31,452	724	222	946	32,398	6.0	5.7	55.2	58.3	0.30	0.03	174,514	5,280	179,793	3,174	91	3,265	0.3	0.0	0.3	60
Banberry	10 Cents/mile	31,605	701	126	827	32,432	6.0	5.7	55.1	58.3	0.30	0.02	175,352	4,608	179,960	3,191	79	3,270	0.3	0.0	0.3	70
I-75 From	***Baseline***	***27,401***	***0***	***0***	***0***	***27,401***	***5.5***	***N/A***	***57.8***	***N/A***	***0.28***	***N/A***	***145,818***	***N/A***	***145,818***	***2,528***	***N/A***	***2,528***	***0.2***	***N/A***	***0.2***	***0***
Banberry	2 Cents/mile	27,454	0	0	0	27,454	5.5	N/A	57.8	N/A	0.28	N/A	146,104	0	146,104	2,534	0	2,534	0.2	N/A	0.2	0
Road to I-	5 Cents/mile	27,451	0	0	0	27,451	5.5	N/A	57.8	N/A	0.28	N/A	146,095	0	146,095	2,534	0	2,534	0.2	N/A	0.2	0
575 Split	10 Cents/mile	27,481	0	0	0	27,481	5.5	N/A	57.8	N/A	0.28	N/A	146,233	0	146,233	2,537	0	2,537	0.2	N/A	0.2	0

2020 A.M. PEAK PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***28,415***	***2,639***	***0***	***2,639***	***31,054***	***16.4***	***10.2***	***36.6***	***57.7***	***0.75***	***0.20***	***280,114***	***25,917***	***306,031***	***7,702***	***457***	***8,159***	***6.4***	***0.2***	***5.8***	***0***
	5 Cents/mile	27,084	2,493	3,055	5,548	32,633	15.3	11.2	39.1	53.0	0.71	0.41	267,005	54,418	321,423	6,898	1,050	7,948	5.3	1.2	4.6	1,500
	8 Cents/mile	27,511	2,544	2,122	4,666	32,176	15.6	10.8	38.3	54.8	0.72	0.34	271,190	45,783	316,973	7,153	853	8,007	5.6	0.8	4.9	1,670
	10 Cents/mile	27,110	2,552	1,668	4,220	31,330	15.3	10.6	39.0	55.7	0.71	0.31	267,242	41,397	308,639	6,905	760	7,665	5.3	0.6	4.7	1,640
	15 Cents/mile	27,573	2,591	1,019	3,610	31,183	15.7	10.4	38.2	56.6	0.72	0.27	271,806	35,408	307,214	7,167	638	7,805	5.7	0.4	5.0	1,500
	20 Cents/mile	27,915	2,606	678	3,285	31,200	15.9	10.4	37.5	57.0	0.73	0.24	275,188	32,251	307,439	7,383	577	7,960	5.9	0.4	5.3	1,330
	30 Cents/mile	28,143	2,605	346	2,951	31,094	16.1	10.3	37.1	57.4	0.74	0.22	277,434	28,944	306,378	7,522	514	8,036	6.1	0.3	5.5	1,020
I-75 from I-575 Split to Wade Green Road	***Baseline***	***15,747***	***732***	***0***	***732***	***16,479***	***6.6***	***4.1***	***37.4***	***59.5***	***0.74***	***0.11***	***63,649***	***2,944***	***66,593***	***1,723***	***50***	***1,773***	***2.5***	***0.0***	***2.4***	***0***
	5 Cents/mile	14,526	659	2,108	2,768	17,294	5.9	4.5	41.3	54.2	0.47	0.40	58,727	11,162	69,890	1,439	208	1,647	1.8	0.4	1.6	430
	8 Cents/mile	14,909	688	1,460	2,148	17,057	6.1	4.3	40.1	56.5	0.48	0.31	60,264	8,668	68,932	1,522	155	1,677	2.0	0.2	1.8	470
	10 Cents/mile	15,061	693	1,156	1,849	16,910	6.2	4.2	39.6	57.5	0.49	0.27	60,879	7,466	68,346	1,558	131	1,688	2.1	0.2	1.9	470
	15 Cents/mile	15,292	703	717	1,421	16,713	6.3	4.1	38.8	58.6	0.49	0.21	61,826	5,727	67,553	1,612	99	1,711	2.2	0.1	2.1	430
	20 Cents/mile	15,453	713	483	1,196	16,649	6.4	4.1	38.3	59.1	0.50	0.17	62,471	4,818	67,289	1,651	82	1,733	2.3	0.1	2.2	390
	30 Cents/mile	15,580	713	244	956	16,536	6.5	4.1	37.9	59.4	0.50	0.14	62,975	3,879	66,854	1,683	66	1,748	2.4	0.0	2.3	300
I-575 from I-75 Split to Sixes Road	***Baseline***	***11,943***	***693***	***0***	***693***	***12,635***	***12.9***	***10.5***	***49.8***	***60.9***	***0.56***	***0.10***	***127,231***	***7,383***	***134,614***	***2,571***	***122***	***2,692***	***2.4***	***0.1***	***2.3***	***0***
	5 Cents/mile	11,572	663	603	1,267	12,838	12.7	10.6	50.6	60.6	0.54	0.18	123,284	13,536	136,820	2,452	224	2,676	2.2	0.1	2.0	320
	8 Cents/mile	11,708	658	366	1,025	12,733	12.7	10.6	50.3	60.7	0.55	0.15	124,722	10,942	135,664	2,496	181	2,676	2.3	0.1	2.2	310
	10 Cents/mile	11,817	654	277	931	12,748	12.8	10.6	50.1	60.7	0.55	0.13	125,903	9,936	135,839	2,530	164	2,694	2.3	0.1	2.2	300
	15 Cents/mile	11,906	670	150	820	12,726	12.9	10.5	49.9	60.8	0.56	0.12	126,837	8,783	135,621	2,559	145	2,704	2.4	0.1	2.3	240
	20 Cents/mile	11,919	675	99	774	12,693	12.9	10.5	49.8	60.8	0.56	0.11	126,991	8,250	135,241	2,565	136	2,701	2.4	0.1	2.3	210
	30 Cents/mile	11,986	670	53	723	12,709	12.9	10.5	49.7	60.8	0.56	0.10	127,703	7,757	135,460	2,586	128	2,714	2.4	0.1	2.4	170

2020 A.M. PEAK PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***33,690***	***6,463***	***0***	***6,463***	***40,153***	***25.5***	***11.5***	***24.4***	***51.3***	***0.94***	***0.48***	***332,137***	***63,391***	***395,529***	***14,656***	***1,249***	***15,905***	***15.4***	***1.5***	***13.7***	***0***
	10 Cents/mile	32,845	5,266	5,178	10,444	43,289	23.7	16.9	25.8	35.3	0.92	0.77	323,800	102,437	426,236	13,236	2,964	16,200	13.7	7.0	12.4	5,080
	15 Cents/mile	33,034	5,565	4,342	9,908	42,942	24.1	15.8	25.5	37.8	0.92	0.73	325,672	97,171	422,843	13,547	2,620	16,168	14.0	5.8	12.6	6,390
	20 Cents/mile	33,347	5,771	3,595	9,367	42,713	24.8	14.7	25.0	40.5	0.93	0.69	328,767	91,859	420,626	14,135	2,313	16,448	14.8	4.8	13.1	7,050
	30 Cents/mile	33,250	6,060	2,547	8,607	41,857	24.6	13.5	25.2	44.1	0.93	0.63	327,805	84,404	412,208	14,004	1,951	15,955	14.6	3.5	12.9	7,490
	40 Cents/mile	33,476	6,220	1,769	7,989	41,465	25.0	12.8	24.7	46.5	0.93	0.59	330,029	78,356	408,384	14,260	1,711	15,970	15.0	2.8	13.1	6,940
	50 Cents/mile	33,948	6,302	1,290	7,592	41,540	26.0	12.3	23.9	48.1	0.95	0.56	334,691	74,507	409,198	15,007	1,571	16,578	15.9	2.4	13.9	6,330
I-75 from I-575 Split to Wade Green Road	***Baseline***	***19,854***	***2,307***	***0***	***2,307***	***22,162***	***9.4***	***4.4***	***26.4***	***55.8***	***0.92***	***0.34***	***80,075***	***9,308***	***89,383***	***3,123***	***170***	***3,294***	***5.4***	***0.3***	***4.9***	***0***
	10 Cents/mile	19,086	1,782	2,948	4,731	23,817	8.6	6.1	28.7	41.0	0.88	0.69	76,981	19,096	96,077	2,739	490	3,229	4.5	2.0	4.1	1,190
	15 Cents/mile	19,231	1,932	2,437	4,370	23,600	8.7	5.7	28.3	43.7	0.89	0.64	77,564	17,641	95,205	2,802	425	3,227	4.7	1.7	4.2	1,480
	20 Cents/mile	19,471	2,066	2,014	4,081	23,551	8.9	5.4	27.6	46.0	0.90	0.60	78,534	16,465	94,999	2,912	373	3,284	4.9	1.3	4.3	1,630
	30 Cents/mile	19,588	2,147	1,432	3,579	23,168	9.1	5.0	27.2	49.5	0.90	0.52	78,995	14,450	93,445	2,970	302	3,273	5.0	0.9	4.4	1,730
	40 Cents/mile	19,444	2,222	993	3,215	22,659	9.0	4.7	27.6	51.8	0.90	0.47	78,417	12,996	91,413	2,928	258	3,185	4.9	0.7	4.4	1,600
	50 Cents/mile	19,721	2,297	728	3,025	22,746	9.2	4.6	26.8	52.8	0.91	0.44	79,545	12,217	91,762	3,067	237	3,303	5.2	0.6	4.7	1,470
I-575 from I-75 Split to Sixes Road	***Baseline***	***19,981***	***3,217***	***0***	***3,217***	***23,198***	***26.9***	***12.0***	***25.5***	***53.7***	***0.94***	***0.46***	***220,424***	***34,429***	***254,853***	***9,103***	***647***	***9,750***	***16.1***	***1.5***	***14.4***	***0***
	10 Cents/mile	18,939	2,422	2,817	5,238	24,177	23.7	17.1	28.7	38.1	0.89	0.74	208,912	56,048	264,960	7,605	1,506	9,111	12.9	6.6	11.8	3,010
	15 Cents/mile	19,086	2,598	2,379	4,977	24,062	24.1	16.0	28.3	40.6	0.89	0.71	210,551	53,277	263,828	7,789	1,344	9,133	13.3	5.5	12.0	3,820
	20 Cents/mile	19,237	2,766	1,990	4,756	23,993	24.6	15.2	27.8	42.8	0.90	0.67	212,219	50,915	263,134	7,995	1,221	9,217	13.7	4.7	12.3	4,260
	30 Cents/mile	19,460	2,952	1,413	4,364	23,824	25.1	14.1	27.1	46.1	0.91	0.62	214,659	46,712	261,371	8,263	1,036	9,299	14.3	3.6	12.6	4,530
	40 Cents/mile	19,529	3,044	1,008	4,052	23,581	25.4	13.3	26.9	48.6	0.91	0.57	215,444	43,309	258,753	8,408	906	9,314	14.6	2.8	12.9	4,310
	50 Cents/mile	19,677	3,103	733	3,836	23,513	25.9	12.8	26.5	50.2	0.92	0.54	217,044	41,023	258,067	8,626	827	9,453	15.0	2.3	13.3	3,920

2020 P.M. PEAK PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***38,981***	***9,435***	***0***	***9,435***	***48,416***	***32.9***	***15.1***	***19.3***	***40.0***	***1.02***	***0.69***	***384,270***	***92,567***	***476,837***	***21,295***	***2,413***	***23,708***	***22.9***	***5.1***	***19.4***	***0***
	10 Cents/mile	37,542	6,942	6,030	12,972	50,514	28.5	25.6	21.7	23.7	0.99	0.95	370,101	127,281	497,382	17,722	5,565	23,287	18.5	15.5	17.7	5,920
	15 Cents/mile	38,420	7,472	4,808	12,280	50,700	30.5	22.4	20.5	26.9	1.00	0.90	378,732	120,525	499,257	19,631	4,619	24,250	20.5	12.4	18.7	7,080
	20 Cents/mile	38,749	7,798	4,262	12,060	50,809	31.8	21.6	20.0	27.9	1.01	0.89	381,968	118,296	500,264	20,684	4,374	25,057	21.8	11.6	19.6	8,360
	30 Cents/mile	38,120	8,322	3,398	11,719	49,839	30.4	20.5	20.7	29.4	1.00	0.86	375,771	114,979	490,750	19,235	4,045	23,280	20.4	10.5	18.0	10,000
	40 Cents/mile	38,287	8,582	2,689	11,272	49,559	30.8	19.2	20.4	31.4	1.00	0.83	377,434	110,601	488,035	19,587	3,651	23,237	20.8	9.2	18.1	10,560
	50 Cents/mile	39,099	8,910	2,117	11,027	50,126	33.4	18.6	19.3	32.5	1.02	0.81	385,438	108,243	493,681	21,957	3,463	25,420	23.4	8.6	20.4	10,390
	60 Cents/mile	38,437	8,921	1,735	10,656	49,093	31.3	17.7	20.2	34.2	1.01	0.78	378,909	104,574	483,483	19,981	3,178	23,158	21.3	7.7	18.3	10,210
I-75 from I-575 Split to Wade Green Road	***Baseline***	***21,260***	***3,123***	***0***	***3,123***	***24,383***	***12.5***	***4.8***	***21.1***	***51.3***	***1.00***	***0.46***	***85,942***	***12,607***	***98,549***	***4,474***	***263***	***4,737***	***8.4***	***0.8***	***7.6***	***0***
	10 Cents/mile	19,765	2,209	3,594	5,802	25,567	10.0	8.9	25.5	30.9	0.63	0.85	79,895	23,419	103,314	3,343	898	4,241	6.0	4.8	5.9	1,450
	15 Cents/mile	20,159	2,388	2,917	5,305	25,464	10.6	7.5	24.3	35.7	0.65	0.78	81,481	21,432	102,913	3,615	698	4,313	6.6	3.4	6.1	1,770
	20 Cents/mile	20,411	2,537	2,546	5,082	25,493	11.0	7.1	23.6	37.7	0.66	0.74	82,504	20,541	103,045	3,795	637	4,433	6.9	3.0	6.3	2,060
	30 Cents/mile	20,421	2,743	1,965	4,707	25,129	11.0	6.6	23.6	40.3	0.65	0.69	82,548	19,017	101,565	3,778	552	4,331	6.9	2.5	6.3	2,380
	40 Cents/mile	20,573	2,897	1,536	4,433	25,006	11.3	6.1	23.1	42.3	0.66	0.65	83,160	17,907	101,067	3,924	482	4,406	7.2	2.1	6.5	2,480
	50 Cents/mile	20,673	2,982	1,207	4,189	24,862	11.4	5.9	22.8	43.7	0.66	0.61	83,572	16,924	100,496	3,968	444	4,412	7.3	1.9	6.6	2,440
	60 Cents/mile	20,712	2,983	968	3,951	24,663	11.5	5.6	22.7	45.3	0.66	0.58	83,718	15,968	99,686	4,005	397	4,401	7.4	1.6	6.6	2,350
I-575 from I-75 Split to Sixes Road	***Baseline***	***21,383***	***4,597***	***0***	***4,597***	***25,980***	***32.8***	***15.0***	***21.3***	***43.7***	***1.00***	***0.65***	***227,801***	***49,050***	***276,851***	***12,071***	***1,171***	***13,243***	***22.3***	***4.5***	***20.1***	***0***
	10 Cents/mile	20,414	2,831	3,954	6,785	27,200	28.1	28.2	24.3	23.9	0.95	0.96	217,480	72,432	289,913	9,830	3,240	13,069	17.6	17.7	18.4	4,220
	15 Cents/mile	21,187	3,233	3,096	6,329	27,516	31.6	23.5	22.0	28.1	0.99	0.90	225,719	67,584	293,303	11,474	2,513	13,987	21.1	13.0	20.0	4,960
	20 Cents/mile	21,285	3,446	2,747	6,192	27,478	32.0	22.5	21.6	29.3	1.00	0.88	226,774	66,125	292,900	11,693	2,358	14,052	21.6	12.0	20.2	5,870
	30 Cents/mile	21,071	3,738	2,280	6,019	27,090	30.9	21.4	22.3	30.9	0.99	0.85	224,476	64,256	288,732	11,168	2,178	13,347	20.5	10.9	19.1	7,300
	40 Cents/mile	21,289	3,953	1,838	5,790	27,079	32.0	20.0	21.6	33.1	1.00	0.82	226,803	61,797	288,600	11,658	1,961	13,619	21.5	9.5	19.7	7,850
	50 Cents/mile	21,639	4,127	1,442	5,569	27,208	33.9	18.8	20.6	35.1	1.01	0.79	230,518	59,426	289,944	12,559	1,772	14,330	23.4	8.3	21.1	7,700
	60 Cents/mile	21,142	4,179	1,206	5,385	26,527	31.3	17.9	22.1	36.8	0.99	0.76	225,243	57,533	282,776	11,355	1,645	13,000	20.8	7.5	18.9	7,730

2020 P.M. PEAK PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor	4-Hour Revenue
		GP Total	HOT Lane	HOT Lane	HOT Lane	Total	GP Lane	HOV/HOT	GP Lane	HOV/HOT	GP Lane	HOV/HOT	GP Lane	HOV/HOT	Total	GP Lane	HOV/HOT	Total	GP Lane	HOV/HOT	Corridor	Revenue
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***31,637***	***5,952***	***0***	***5,952***	***37,589***	***21.9***	***11.5***	***27.8***	***51.8***	***0.89***	***0.44***	***311,917***	***58,389***	***370,306***	***11,679***	***1,178***	***12,857***	***11.9***	***1.5***	***10.5***	***0***
	5 Cents/mile	30,395	4,885	4,764	9,649	40,044	20.2	15.7	30.0	39.3	0.85	0.71	299,659	94,670	394,329	10,323	2,590	12,913	10.1	5.7	9.3	2,340
	10 Cents/mile	30,731	5,370	3,373	8,743	39,474	20.7	14.3	29.4	42.8	0.86	0.64	302,972	85,778	388,751	10,733	2,155	12,888	10.6	4.3	9.6	3,310
	15 Cents/mile	30,740	5,729	2,398	8,127	38,867	20.5	13.5	29.5	45.2	0.86	0.60	303,051	79,701	382,752	10,689	1,885	12,574	10.5	3.5	9.4	3,530
	20 Cents/mile	30,798	5,835	1,842	7,677	38,475	20.7	13.0	29.4	46.7	0.86	0.57	303,623	75,306	378,928	10,774	1,718	12,492	10.6	3.0	9.4	3,610
	30 Cents/mile	31,516	5,829	1,158	6,987	38,502	21.8	12.3	28.0	49.0	0.88	0.52	310,703	68,563	379,266	11,517	1,481	12,998	11.7	2.3	10.2	3,410
	40 Cents/mile	31,270	5,983	730	6,713	37,983	21.3	12.1	28.6	49.8	0.87	0.50	308,275	65,838	374,113	11,250	1,395	12,645	11.2	2.1	9.9	2,860
	50 Cents/mile	31,711	5,902	522	6,424	38,134	22.1	11.8	27.6	50.6	0.89	0.47	312,631	62,996	375,627	11,745	1,308	13,053	12.0	1.9	10.5	2,560
I-75 from I-575 Split to Wade Green Road	***Baseline***	***18,049***	***1,793***	***0***	***1,793***	***19,842***	***7.7***	***4.2***	***31.7***	***57.5***	***0.83***	***0.26***	***72,790***	***7,248***	***80,039***	***2,323***	***129***	***2,452***	***3.7***	***0.2***	***3.4***	***0***
	5 Cents/mile	16,395	1,335	2,966	4,301	20,696	6.7	5.6	36.6	44.5	0.76	0.63	66,125	17,370	83,496	1,828	405	2,233	2.6	1.5	2.4	600
	10 Cents/mile	16,893	1,550	2,085	3,635	20,528	7.0	5.0	35.0	49.3	0.78	0.53	68,140	14,681	82,820	1,965	307	2,271	2.9	0.9	2.6	840
	15 Cents/mile	17,184	1,715	1,491	3,206	20,390	7.1	4.7	34.2	51.8	0.79	0.47	69,313	12,956	82,269	2,050	257	2,307	3.1	0.7	2.8	900
	20 Cents/mile	17,430	1,755	1,137	2,892	20,322	7.3	4.6	33.5	53.3	0.80	0.42	70,291	11,682	81,973	2,125	225	2,349	3.3	0.5	2.9	920
	30 Cents/mile	17,640	1,785	713	2,498	20,138	7.4	4.4	32.9	55.1	0.81	0.37	71,140	10,084	81,224	2,187	187	2,375	3.4	0.4	3.0	860
	40 Cents/mile	17,863	1,830	443	2,273	20,137	7.6	4.4	32.2	55.9	0.82	0.33	72,040	9,178	81,218	2,261	168	2,429	3.6	0.3	3.2	720
	50 Cents/mile	17,850	1,809	314	2,123	19,973	7.6	4.3	32.3	56.5	0.82	0.31	71,991	8,577	80,567	2,254	155	2,410	3.5	0.3	3.2	630
I-575 from I-75 Split to Sixes Road	***Baseline***	***16,281***	***2,053***	***0***	***2,053***	***18,334***	***18.3***	***11.0***	***36.7***	***58.3***	***0.76***	***0.29***	***179,595***	***21,935***	***201,530***	***5,001***	***378***	***5,379***	***7.4***	***0.5***	***6.8***	***0***
	5 Cents/mile	15,210	1,847	2,003	3,850	19,060	16.7	12.7	40.1	50.6	0.71	0.55	167,763	41,169	208,932	4,263	817	5,081	5.8	2.2	5.2	1,070
	10 Cents/mile	15,611	1,941	1,285	3,226	18,836	17.2	11.9	38.8	53.9	0.73	0.46	172,200	34,507	206,707	4,522	643	5,165	6.4	1.4	5.7	1,370
	15 Cents/mile	15,711	2,036	865	2,901	18,612	17.4	11.6	38.5	55.2	0.74	0.41	173,297	31,046	204,342	4,590	564	5,154	6.5	1.1	5.8	1,390
	20 Cents/mile	15,884	2,053	617	2,671	18,555	17.7	11.4	38.0	56.2	0.74	0.38	175,220	28,541	203,761	4,711	510	5,220	6.8	0.9	6.1	1,320
	30 Cents/mile	16,121	2,001	353	2,354	18,475	18.0	11.2	37.2	57.3	0.76	0.33	177,849	25,161	203,010	4,882	441	5,323	7.2	0.7	6.5	1,130
	40 Cents/mile	16,131	2,070	219	2,289	18,420	18.0	11.2	37.2	57.5	0.76	0.32	177,941	24,454	202,395	4,890	427	5,316	7.2	0.7	6.5	930
	50 Cents/mile	16,192	2,029	159	2,188	18,380	18.1	11.1	37.0	57.8	0.76	0.31	178,630	23,347	201,978	4,935	405	5,340	7.3	0.6	6.6	850

2020 MIDDAY PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	5-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***38,003***	***6,629***	***0***	***6,629***	***44,633***	***17.8***	***11.1***	***33.5***	***53.5***	***0.80***	***0.39***	***374,635***	***65,056***	***439,691***	***11,268***	***1,249***	***12,516***	***7.8***	***1.1***	***6.8***	***0***
	2 Cents/mile	35,923	5,195	6,223	11,418	47,341	16.5	14.5	36.3	41.6	0.75	0.67	354,102	112,039	466,141	9,840	2,781	12,620	6.5	4.4	6.0	1,220
	5 Cents/mile	36,652	5,812	4,519	10,332	46,984	16.9	13.3	35.3	45.0	0.77	0.61	361,301	101,402	462,703	10,324	2,329	12,653	6.9	3.3	6.2	2,220
	10 Cents/mile	37,286	6,066	2,786	8,852	46,138	17.3	12.1	34.7	49.1	0.78	0.52	367,563	86,852	454,415	10,803	1,823	12,626	7.3	2.1	6.4	2,730
	15 Cents/mile	37,665	6,196	1,886	8,083	45,748	17.5	11.7	34.1	50.8	0.79	0.48	371,293	79,296	450,589	11,064	1,607	12,670	7.5	1.7	6.6	2,780
	20 Cents/mile	37,888	6,235	1,331	7,565	45,453	17.7	11.5	33.8	51.9	0.79	0.45	373,500	74,265	447,766	11,231	1,470	12,701	7.7	1.4	6.8	2,610
	30 Cents/mile	38,168	6,278	732	7,010	45,178	17.9	11.2	33.5	52.9	0.80	0.41	376,254	68,791	445,045	11,440	1,333	12,773	7.9	1.2	7.0	2,150
I-75 from I-575 Split to Wade Green Road	***Baseline***	***21,194***	***2,020***	***0***	***2,020***	***23,214***	***7.3***	***4.2***	***33.8***	***57.8***	***0.80***	***0.24***	***85,671***	***8,159***	***93,830***	***2,592***	***144***	***2,736***	***3.2***	***0.2***	***3.0***	***0***
	2 Cents/mile	19,334	1,462	4,201	5,662	24,997	6.4	5.8	38.3	42.8	0.50	0.66	78,169	22,862	101,031	2,074	555	2,630	2.3	1.7	2.2	340
	5 Cents/mile	19,916	1,646	3,156	4,802	24,718	6.7	5.1	36.9	48.1	0.51	0.56	80,497	19,419	99,916	2,221	414	2,635	2.6	1.0	2.3	640
	10 Cents/mile	20,338	1,771	1,921	3,692	24,030	6.9	4.6	35.8	53.2	0.52	0.43	82,217	14,895	97,111	2,342	285	2,626	2.8	0.5	2.5	780
	15 Cents/mile	20,553	1,850	1,314	3,164	23,718	7.0	4.4	35.3	55.0	0.53	0.37	83,078	12,770	95,848	2,401	236	2,638	2.9	0.4	2.6	800
	20 Cents/mile	20,732	1,920	936	2,856	23,588	7.1	4.4	34.9	55.9	0.53	0.34	83,797	11,543	95,341	2,453	211	2,663	3.0	0.3	2.7	760
	30 Cents/mile	20,922	1,885	518	2,403	23,325	7.2	4.2	34.4	57.2	0.54	0.28	84,567	9,711	94,278	2,508	173	2,680	3.1	0.2	2.8	630
I-575 from I-75 Split to Sixes Road	***Baseline***	***18,045***	***2,261***	***0***	***2,261***	***20,306***	***15.1***	***10.8***	***42.6***	***59.1***	***0.68***	***0.26***	***192,262***	***24,118***	***216,380***	***4,590***	***409***	***5,000***	***4.7***	***0.4***	***4.3***	***0***
	2 Cents/mile	16,635	1,866	2,631	4,497	21,132	14.0	12.4	46.1	51.9	0.62	0.51	177,228	48,031	225,258	3,901	930	4,831	3.5	1.9	3.3	560
	5 Cents/mile	17,171	2,075	1,736	3,810	20,981	14.4	11.8	44.8	54.6	0.64	0.43	182,930	40,688	223,618	4,150	748	4,898	3.9	1.3	3.5	930
	10 Cents/mile	17,634	2,082	1,034	3,116	20,750	14.8	11.3	43.6	56.8	0.66	0.35	187,877	33,237	221,114	4,380	588	4,967	4.3	0.8	3.9	1,100
	15 Cents/mile	17,846	2,094	652	2,746	20,592	15.0	11.1	43.1	57.8	0.67	0.31	190,108	29,320	219,428	4,487	509	4,996	4.5	0.6	4.1	1,040
	20 Cents/mile	17,915	2,092	434	2,527	20,442	15.0	11.0	43.0	58.4	0.67	0.29	190,864	27,027	217,891	4,523	464	4,987	4.6	0.5	4.2	930
	30 Cents/mile	18,514	2,366	258	2,624	21,138	16.2	11.1	41.3	58.1	0.69	0.30	204,215	28,082	232,298	5,020	485	5,505	5.3	0.5	4.8	830

2020 MIDDAY PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor Travel Delay (min/vehicle)	5-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***36,723***	***6,905***	***0***	***6,905***	***43,628***	***19.0***	***11.1***	***31.8***	***53.2***	***0.82***	***0.41***	***362,043***	***67,711***	***429,753***	***11,759***	***1,308***	***13,066***	***8.9***	***1.2***	***7.9***	***0***
	2 Cents/mile	35,340	5,278	6,249	11,527	46,867	17.8	14.6	33.9	41.3	0.79	0.68	348,424	113,015	461,439	10,630	2,842	13,471	7.7	4.6	7.2	1,230
	5 Cents/mile	35,565	6,005	4,838	10,844	46,409	18.0	13.9	33.5	43.4	0.79	0.64	350,616	106,391	457,008	10,783	2,566	13,348	7.9	3.9	7.2	2,370
	10 Cents/mile	36,393	6,334	3,232	9,566	45,959	18.6	12.7	32.4	47.2	0.81	0.56	358,766	93,822	452,588	11,438	2,076	13,514	8.5	2.8	7.6	3,170
	15 Cents/mile	36,554	6,473	2,223	8,697	45,251	18.7	12.1	32.2	49.4	0.82	0.51	360,373	85,294	445,667	11,561	1,793	13,354	8.6	2.1	7.7	3,270
	20 Cents/mile	36,794	6,546	1,588	8,134	44,928	18.9	11.8	31.8	50.7	0.82	0.48	362,753	79,808	442,562	11,766	1,632	13,398	8.9	1.8	7.9	3,110
	30 Cents/mile	37,168	6,600	909	7,509	44,677	19.2	11.4	31.3	52.0	0.83	0.44	366,444	73,670	440,114	12,103	1,461	13,564	9.2	1.5	8.2	2,670
I-75 from I-575 Split to Wade Green Road	***Baseline***	***21,815***	***2,136***	***0***	***2,136***	***23,951***	***7.3***	***4.2***	***33.4***	***57.7***	***0.81***	***0.25***	***87,981***	***8,620***	***96,601***	***2,660***	***152***	***2,812***	***3.3***	***0.2***	***3.0***	***0***
	2 Cents/mile	19,586	1,432	4,169	5,601	25,188	6.3	5.7	38.8	43.4	0.72	0.65	78,990	22,620	101,610	2,053	531	2,584	2.3	1.6	2.1	340
	5 Cents/mile	20,019	1,662	3,289	4,952	24,971	6.5	5.1	37.7	47.5	0.74	0.58	80,729	20,010	100,739	2,159	428	2,587	2.4	1.1	2.2	660
	10 Cents/mile	20,663	1,927	2,161	4,088	24,751	6.7	4.7	36.1	51.7	0.76	0.48	83,326	16,487	99,813	2,327	325	2,651	2.7	0.7	2.4	870
	15 Cents/mile	21,040	1,977	1,479	3,456	24,495	6.9	4.5	35.2	54.1	0.78	0.41	84,849	13,968	98,817	2,432	262	2,695	2.9	0.4	2.6	900
	20 Cents/mile	21,248	1,997	1,061	3,058	24,306	7.0	4.4	34.7	55.3	0.78	0.36	85,703	12,361	98,063	2,492	227	2,719	3.0	0.3	2.7	860
	30 Cents/mile	21,527	2,022	613	2,635	24,162	7.2	4.3	34.1	56.6	0.79	0.31	86,818	10,650	97,467	2,573	191	2,764	3.1	0.2	2.8	740
I-575 from I-75 Split to Sixes Road	***Baseline***	***18,535***	***2,483***	***0***	***2,483***	***21,018***	***16.2***	***11.0***	***41.3***	***58.5***	***0.69***	***0.28***	***204,446***	***26,559***	***231,005***	***5,031***	***455***	***5,486***	***5.3***	***0.5***	***4.9***	***0***
	2 Cents/mile	17,331	2,030	2,662	4,692	22,023	15.1	12.6	44.3	51.1	0.65	0.53	191,197	50,169	241,366	4,379	985	5,364	4.2	2.1	3.8	570
	5 Cents/mile	17,649	2,279	1,828	4,106	21,755	15.3	12.0	43.5	53.6	0.66	0.47	194,687	43,917	238,604	4,539	823	5,362	4.5	1.5	4.0	980
	10 Cents/mile	18,031	2,263	1,135	3,398	21,429	15.7	11.5	42.6	56.0	0.68	0.39	198,898	36,304	235,202	4,745	650	5,395	4.8	1.0	4.3	1,210
	15 Cents/mile	18,255	2,312	727	3,039	21,293	15.9	11.3	42.0	57.0	0.68	0.34	201,383	32,475	233,858	4,871	571	5,442	5.0	0.8	4.5	1,170
	20 Cents/mile	18,393	2,346	496	2,841	21,234	16.0	11.2	41.6	57.5	0.69	0.32	202,883	30,385	233,268	4,950	530	5,480	5.2	0.7	4.7	1,060
	30 Cents/mile	18,514	2,366	258	2,624	21,138	16.2	11.1	41.3	58.1	0.69	0.30	204,215	28,082	232,298	5,020	485	5,505	5.3	0.5	4.8	830

2020 NIGHT PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	11-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***38,928***	***2,307***	***0***	***2,307***	***41,235***	***10.9***	***10.0***	***54.5***	***58.7***	***0.37***	***0.06***	***383,745***	***22,614***	***406,359***	***7,062***	***388***	***7,450***	***0.9***	***0.0***	***0.8***	***0***
	2 Cents/mile	38,179	2,266	825	3,091	41,270	10.8	10.0	54.7	58.6	0.36	0.08	376,358	30,330	406,688	6,904	520	7,424	0.8	0.0	0.8	160
	5 Cents/mile	38,794	2,246	251	2,498	41,292	10.9	10.0	54.6	58.7	0.37	0.07	382,436	24,539	406,975	7,034	421	7,455	0.9	0.0	0.8	120
	10 Cents/mile	39,014	2,219	112	2,332	41,346	10.9	10.0	54.5	58.7	0.37	0.06	384,595	22,888	407,483	7,081	392	7,474	0.9	0.0	0.8	110
	15 Cents/mile	39,126	2,182	89	2,271	41,398	10.9	10.0	54.5	58.7	0.37	0.06	385,706	22,316	408,023	7,106	383	7,488	0.9	0.0	0.8	130
I-75 from I-575 Split to Wade Green Road	***Baseline***	***21,186***	***909***	***0***	***909***	***22,095***	***4.4***	***4.1***	***55.0***	***59.7***	***0.36***	***0.05***	***85,645***	***3,666***	***89,311***	***1,560***	***62***	***1,622***	***0.3***	***0.0***	***0.3***	***0***
	2 Cents/mile	20,643	904	647	1,551	22,194	4.4	4.1	55.2	59.6	0.24	0.08	83,450	6,258	89,708	1,514	105	1,620	0.3	0.0	0.3	50
	5 Cents/mile	21,065	894	215	1,109	22,175	4.4	4.1	55.0	59.6	0.24	0.06	85,156	4,490	89,646	1,550	75	1,626	0.3	0.0	0.3	40
	10 Cents/mile	21,196	889	93	982	22,177	4.4	4.1	55.0	59.6	0.24	0.05	85,684	3,982	89,666	1,561	67	1,628	0.3	0.0	0.3	40
	15 Cents/mile	21,256	884	79	962	22,218	4.4	4.1	54.9	59.7	0.25	0.05	85,915	3,862	89,777	1,566	65	1,631	0.3	0.0	0.3	50
I-575 from I-75 Split to Sixes Road	***Baseline***	***16,193***	***618***	***0***	***618***	***16,812***	***10.9***	***10.5***	***58.6***	***61.1***	***0.28***	***0.03***	***172,527***	***6,604***	***179,131***	***2,944***	***108***	***3,053***	***0.4***	***0.0***	***0.4***	***0***
	2 Cents/mile	16,036	607	182	789	16,825	10.9	10.5	58.7	61.0	0.27	0.04	170,840	8,429	179,268	2,912	138	3,050	0.4	0.0	0.4	40
	5 Cents/mile	16,173	602	41	643	16,815	10.9	10.5	58.7	61.1	0.28	0.03	172,309	6,894	179,202	2,940	113	3,053	0.4	0.0	0.4	20
	10 Cents/mile	16,209	592	20	612	16,821	10.9	10.5	58.6	61.1	0.28	0.03	172,688	6,504	179,192	2,947	107	3,054	0.4	0.0	0.4	20
	15 Cents/mile	16,224	577	18	595	16,819	10.9	10.5	58.6	61.1	0.28	0.03	172,855	6,338	179,192	2,950	104	3,054	0.4	0.0	0.4	30

2020 NIGHT PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor Travel Delay (min/vehicle)	11-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***34,115***	***1,782***	***0***	***1,782***	***35,898***	***10.8***	***10.0***	***54.8***	***58.9***	***0.3***	***0.0***	***336,331***	***17,483***	***353,815***	***6,149***	***299***	***6,448***	***0.8***	***0.0***	***0.7***	***0***
	2 Cents/mile	33,568	1,767	650	2,418	35,986	10.8	10.0	55.0	58.9	0.3	0.1	330,940	23,695	354,635	6,036	405	6,441	0.7	0.0	0.7	130
	5 Cents/mile	34,021	1,756	230	1,986	36,007	10.8	10.0	54.8	58.9	0.3	0.1	335,402	19,474	354,876	6,130	333	6,463	0.7	0.0	0.7	110
	10 Cents/mile	34,235	1,735	113	1,848	36,083	10.8	10.0	54.8	58.9	0.3	0.0	337,511	18,119	355,630	6,175	310	6,485	0.8	0.0	0.7	110
	15 Cents/mile	34,369	1,711	89	1,799	36,169	10.8	10.0	54.8	58.9	0.4	0.0	338,843	17,662	356,505	6,203	302	6,506	0.8	0.0	0.7	130
I-75 from I-575 Split to Wade Green Road	***Baseline***	***19,699***	***609***	***0***	***609***	***20,307***	***4.3***	***4.1***	***56.4***	***59.7***	***0.3***	***0.0***	***79,451***	***2,464***	***81,915***	***1,410***	***41***	***1,451***	***0.3***	***0.0***	***0.3***	***0***
	2 Cents/mile	19,241	609	526	1,134	20,376	4.3	4.1	56.6	59.6	0.3	0.1	77,605	4,577	82,182	1,373	77	1,449	0.3	0.0	0.2	40
	5 Cents/mile	19,570	604	180	784	20,354	4.3	4.1	56.4	59.7	0.3	0.0	78,926	3,161	82,086	1,399	53	1,452	0.3	0.0	0.3	40
	10 Cents/mile	19,668	594	83	677	20,344	4.3	4.1	56.4	59.7	0.3	0.0	79,318	2,744	82,062	1,407	46	1,453	0.3	0.0	0.3	30
	15 Cents/mile	19,696	589	69	658	20,353	4.3	4.1	56.4	59.7	0.3	0.0	79,433	2,650	82,083	1,410	44	1,454	0.3	0.0	0.3	40
I-575 from I-75 Split to Sixes Road	***Baseline***	***13,642***	***503***	***0***	***503***	***14,145***	***11.1***	***10.5***	***59.6***	***61.1***	***0.2***	***0.0***	***150,469***	***5,380***	***155,849***	***2,529***	***88***	***2,617***	***0.3***	***0.0***	***0.3***	***0***
	2 Cents/mile	13,516	499	135	634	14,149	11.1	10.5	59.6	61.0	0.2	0.0	149,080	6,749	155,829	2,504	111	2,615	0.3	0.0	0.3	30
	5 Cents/mile	13,616	498	31	530	14,146	11.1	10.5	59.6	61.1	0.2	0.0	150,183	5,690	155,873	2,524	93	2,617	0.3	0.0	0.3	20
	10 Cents/mile	13,635	496	23	519	14,155	11.1	10.5	59.6	61.1	0.2	0.0	150,401	5,499	155,900	2,528	90	2,618	0.3	0.0	0.3	20
	15 Cents/mile	13,642	492	13	505	14,148	11.1	10.5	59.6	61.1	0.2	0.0	150,491	5,436	155,926	2,530	89	2,619	0.3	0.0	0.3	20

2030 A.M. PEAK PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***29,484***	***3,088***	***0***	***3,088***	***32,572***	***17.2***	***10.3***	***34.9***	***57.2***	***0.78***	***0.23***	***290,641***	***30,299***	***320,940***	***8,422***	***540***	***8,962***	***7.2***	***0.3***	***6.5***	***0***
	5 Cents/mile	27,597	2,860	3,346	6,206	33,803	15.6	11.5	38.2	51.6	0.72	0.46	272,051	60,911	332,962	7,192	1,210	8,402	5.6	1.5	4.9	1,640
	8 Cents/mile	28,276	2,952	2,365	5,317	33,594	16.2	11.1	37.0	53.5	0.74	0.39	278,742	52,175	330,918	7,619	997	8,616	6.2	1.1	5.4	1,860
	10 Cents/mile	28,453	2,997	1,929	4,926	33,380	16.3	10.9	36.7	54.3	0.75	0.36	280,482	48,310	328,792	7,733	908	8,641	6.3	0.9	5.5	1,890
	15 Cents/mile	28,627	3,021	1,189	4,210	32,837	16.4	10.6	36.4	55.7	0.75	0.31	282,223	41,298	323,521	7,824	757	8,580	6.4	0.6	5.7	1,750
	20 Cents/mile	28,928	3,040	803	3,843	32,771	16.7	10.5	35.9	56.3	0.76	0.28	285,155	37,691	322,847	8,011	683	8,694	6.7	0.5	5.9	1,580
	30 Cents/mile	29,303	3,054	422	3,476	32,779	17.0	10.4	35.2	56.8	0.77	0.26	288,872	34,110	322,982	8,273	613	8,885	7.0	0.4	6.3	1,240
I-75 from I-575 Split to Wade Green Road	***Baseline***	***16,187***	***881***	***0***	***881***	***17,069***	***6.8***	***4.1***	***36.1***	***59.4***	***0.76***	***0.13***	***65,432***	***3,569***	***69,001***	***1,839***	***61***	***1,900***	***2.7***	***0.0***	***2.6***	***0***
	5 Cents/mile	14,845	759	2,294	3,052	17,897	6.1	4.6	40.3	52.9	0.48	0.45	60,005	12,320	72,324	1,509	236	1,745	2.0	0.5	1.8	460
	8 Cents/mile	15,231	818	1,615	2,433	17,664	6.3	4.4	39.0	55.4	0.49	0.36	61,555	9,843	71,398	1,596	180	1,776	2.2	0.3	1.9	520
	10 Cents/mile	15,397	837	1,336	2,173	17,570	6.4	4.3	38.5	56.4	0.50	0.32	62,237	8,798	71,035	1,636	158	1,794	2.3	0.3	2.0	540
	15 Cents/mile	15,665	843	837	1,680	17,345	6.5	4.2	37.7	58.0	0.50	0.25	63,329	6,792	70,120	1,704	118	1,823	2.4	0.1	2.2	510
	20 Cents/mile	15,862	858	568	1,425	17,287	6.6	4.1	37.0	58.5	0.51	0.21	64,129	5,759	69,888	1,754	99	1,853	2.5	0.1	2.3	460
	30 Cents/mile	16,004	872	299	1,171	17,175	6.7	4.1	36.6	59.1	0.52	0.17	64,690	4,720	69,410	1,790	81	1,871	2.6	0.1	2.4	360
I-575 from I-75 Split to Sixes Road	***Baseline***	***12,957***	***948***	***0***	***948***	***13,905***	***13.7***	***10.6***	***47.0***	***60.7***	***0.61***	***0.13***	***138,033***	***10,124***	***148,156***	***2,972***	***167***	***3,139***	***3.2***	***0.1***	***3.1***	***0***
	5 Cents/mile	12,526	874	824	1,698	14,224	13.3	10.8	48.3	59.5	0.59	0.24	133,453	18,105	151,558	2,789	304	3,093	2.8	0.3	2.6	440
	8 Cents/mile	12,670	897	523	1,420	14,090	13.4	10.6	47.8	60.4	0.59	0.20	134,977	15,150	150,127	2,851	251	3,102	3.0	0.1	2.8	450
	10 Cents/mile	12,747	911	403	1,313	14,060	13.5	10.6	47.6	60.6	0.60	0.19	135,808	14,064	149,872	2,884	232	3,117	3.0	0.1	2.8	430
	15 Cents/mile	12,861	923	235	1,158	14,019	13.6	10.6	47.3	60.7	0.60	0.16	137,020	12,322	149,342	2,929	203	3,132	3.1	0.1	3.0	380
	20 Cents/mile	12,909	925	148	1,072	13,981	13.6	10.6	47.1	60.7	0.60	0.15	137,522	11,450	148,972	2,949	189	3,138	3.2	0.1	3.0	320
	30 Cents/mile	12,885	938	80	1,018	13,904	13.6	10.6	47.2	60.7	0.60	0.14	137,274	10,891	148,165	2,942	180	3,121	3.1	0.1	3.0	260

2030 A.M. PEAK PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor Travel Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***33,467***	***6,478***	***0***	***6,478***	***39,946***	***25.1***	***11.5***	***24.8***	***51.3***	***0.93***	***0.48***	***329,948***	***63,530***	***393,477***	***14,327***	***1,249***	***15,577***	***15.0***	***1.5***	***13.4***	***0***
	10 Cents/mile	32,329	5,407	4,792	10,199	42,527	22.8	16.4	26.8	36.4	0.90	0.75	318,726	100,012	418,738	12,542	2,793	15,336	12.8	6.4	11.6	4,700
	15 Cents/mile	32,343	5,669	3,960	9,629	41,972	22.8	15.2	26.7	39.2	0.90	0.71	318,850	94,396	413,246	12,537	2,450	14,987	12.8	5.2	11.4	5,830
	20 Cents/mile	32,213	5,871	3,243	9,114	41,327	22.5	14.3	27.0	41.7	0.90	0.67	317,583	89,339	406,922	12,311	2,176	14,487	12.5	4.3	11.0	6,360
	30 Cents/mile	32,869	6,169	2,167	8,336	41,205	23.8	13.1	25.7	45.3	0.92	0.61	324,058	81,759	405,817	13,271	1,828	15,099	13.8	3.1	12.0	6,380
	40 Cents/mile	32,879	6,268	1,479	7,748	40,627	24.0	12.4	25.8	47.6	0.92	0.57	324,147	76,001	400,149	13,457	1,614	15,071	13.9	2.5	12.2	5,800
	50 Cents/mile	33,227	6,360	1,036	7,396	40,623	24.6	12.1	25.2	48.8	0.93	0.54	327,558	72,562	400,120	13,940	1,502	15,442	14.5	2.1	12.8	5,080
I-75 from I-575 Split to Wade Green Road	***Baseline***	***20,432***	***2,414***	***0***	***2,414***	***22,846***	***10.1***	***4.4***	***24.7***	***55.5***	***0.94***	***0.35***	***82,400***	***9,731***	***92,132***	***3,453***	***178***	***3,631***	***6.0***	***0.3***	***5.5***	***0***
	10 Cents/mile	19,083	1,831	2,958	4,789	23,872	8.6	6.2	28.7	40.4	0.88	0.70	76,957	19,350	96,306	2,744	503	3,247	4.6	2.1	4.1	1,190
	15 Cents/mile	19,358	1,976	2,437	4,412	23,771	8.9	5.7	27.8	43.5	0.89	0.64	78,075	17,826	95,900	2,870	428	3,298	4.8	1.7	4.3	1,480
	20 Cents/mile	19,512	2,101	1,984	4,084	23,597	9.0	5.4	27.4	46.0	0.90	0.60	78,700	16,501	95,201	2,949	374	3,323	5.0	1.3	4.4	1,600
	30 Cents/mile	19,913	2,290	1,356	3,646	23,559	9.4	5.0	26.2	49.2	0.92	0.53	80,316	14,714	95,030	3,147	308	3,455	5.4	0.9	4.8	1,640
	40 Cents/mile	19,676	2,315	922	3,237	22,913	9.3	4.7	26.9	51.8	0.90	0.47	79,365	13,084	92,449	3,076	258	3,334	5.2	0.7	4.7	1,490
	50 Cents/mile	20,181	2,306	638	2,943	23,125	9.8	4.6	25.5	53.2	0.93	0.43	81,390	11,887	93,277	3,302	228	3,530	5.7	0.5	5.1	1,290
I-575 from I-75 Split to Sixes Road	***Baseline***	***20,224***	***3,771***	***0***	***3,771***	***23,995***	***28.5***	***12.7***	***24.8***	***50.7***	***0.95***	***0.53***	***223,081***	***40,334***	***263,415***	***9,880***	***805***	***10,685***	***17.7***	***2.2***	***15.9***	***0***
	10 Cents/mile	19,552	2,764	2,789	5,553	25,105	25.8	18.5	26.8	35.2	0.91	0.79	215,671	59,366	275,037	8,570	1,733	10,303	14.9	8.0	13.9	2,980
	15 Cents/mile	19,572	2,985	2,329	5,313	24,885	25.9	17.4	26.8	37.4	0.92	0.75	215,901	56,832	272,732	8,615	1,565	10,179	15.0	6.9	13.8	3,740
	20 Cents/mile	19,735	3,149	1,978	5,127	24,862	26.5	16.6	26.3	39.1	0.92	0.73	217,715	54,843	272,558	8,897	1,442	10,339	15.6	6.1	14.2	4,230
	30 Cents/mile	19,831	3,366	1,417	4,783	24,614	26.9	15.3	26.0	42.5	0.93	0.68	218,748	51,135	269,884	9,096	1,239	10,335	16.0	4.8	14.4	4,550
	40 Cents/mile	19,816	3,503	1,031	4,534	24,350	26.9	14.5	26.0	44.7	0.93	0.64	218,590	48,482	267,072	9,091	1,113	10,204	16.0	4.0	14.4	4,410
	50 Cents/mile	20,109	3,583	771	4,354	24,463	27.9	14.0	25.1	46.2	0.94	0.62	221,819	46,529	268,348	9,601	1,031	10,632	17.1	3.5	15.3	4,120

2030 P.M. PEAK PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	4-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***39,095***	***10,070***	***0***	***10,070***	***49,165***	***32.7***	***16.4***	***19.2***	***36.9***	***1.02***	***0.74***	***385,386***	***98,816***	***484,201***	***21,300***	***2,798***	***24,098***	***22.7***	***6.4***	***19.4***	***0***
	10 Cents/mile	38,127	7,345	5,270	12,614	50,741	30.2	23.7	20.8	25.4	1.00	0.93	375,852	123,793	499,645	19,269	5,025	24,294	20.2	13.7	18.7	5,170
	15 Cents/mile	38,262	7,968	4,461	12,429	50,692	30.5	22.9	20.6	26.2	1.00	0.91	377,184	121,983	499,167	19,533	4,782	24,315	20.5	12.9	18.8	6,570
	20 Cents/mile	38,358	8,351	3,951	12,301	50,659	30.6	22.5	20.3	26.8	1.01	0.90	378,132	120,679	498,811	19,472	4,640	24,112	20.6	12.5	18.6	7,750
	30 Cents/mile	38,533	8,861	3,024	11,886	50,419	31.4	21.0	20.2	28.7	1.01	0.87	379,859	116,653	496,512	20,231	4,205	24,435	21.4	11.0	19.1	8,900
	40 Cents/mile	38,364	9,076	2,453	11,530	49,893	31.0	20.0	20.4	30.3	1.00	0.85	378,181	113,116	491,297	19,862	3,872	23,734	21.0	10.0	18.5	9,630
	50 Cents/mile	38,596	9,287	1,959	11,246	49,842	31.5	19.2	20.0	31.5	1.01	0.83	380,477	110,391	490,869	20,347	3,634	23,980	21.5	9.2	18.9	9,610
	60 Cents/mile	38,878	9,429	1,577	11,005	49,883	32.1	18.5	19.5	32.6	1.02	0.81	383,262	107,981	491,243	20,613	3,437	24,050	22.1	8.5	18.9	9,280
I-75 from I-575 Split to Wade Green Road	***Baseline***	***21,387***	***3,529***	***0***	***3,529***	***24,916***	***12.8***	***5.1***	***20.7***	***48.6***	***1.00***	***0.52***	***86,453***	***14,248***	***100,701***	***4,618***	***316***	***4,934***	***8.7***	***1.1***	***7.8***	***0***
	10 Cents/mile	20,439	2,434	3,453	5,887	26,325	11.1	9.0	23.5	30.0	0.65	0.86	82,617	23,786	106,403	3,820	923	4,743	7.0	5.0	6.7	1,400
	15 Cents/mile	20,662	2,642	2,912	5,555	26,217	11.5	8.1	22.8	33.3	0.66	0.81	83,510	22,433	105,942	4,010	794	4,803	7.4	4.1	6.9	1,770
	20 Cents/mile	20,647	2,791	2,590	5,381	26,027	11.4	7.8	22.9	35.0	0.66	0.79	83,458	21,737	105,194	3,966	738	4,703	7.3	3.7	6.8	2,090
	30 Cents/mile	20,918	3,025	1,958	4,984	25,901	11.9	7.0	22.1	38.3	0.67	0.73	84,564	20,132	104,696	4,215	624	4,838	7.9	3.0	7.1	2,370
	40 Cents/mile	20,953	3,155	1,555	4,710	25,663	12.0	6.5	22.0	40.4	0.67	0.69	84,702	19,025	103,727	4,238	542	4,779	7.9	2.4	7.1	2,510
	50 Cents/mile	21,070	3,239	1,231	4,471	25,541	12.2	6.2	21.6	42.0	0.67	0.66	85,169	18,059	103,228	4,327	492	4,819	8.1	2.2	7.2	2,490
	60 Cents/mile	21,242	3,284	987	4,272	25,514	12.5	5.9	21.1	43.4	0.68	0.63	85,861	17,256	103,117	4,491	448	4,939	8.5	1.9	7.5	2,390
I-575 from I-75 Split to Sixes Road	***Baseline***	***22,495***	***5,445***	***0***	***5,445***	***27,940***	***39.5***	***18.1***	***18.4***	***36.2***	***1.05***	***0.77***	***239,633***	***58,121***	***297,754***	***15,379***	***1,674***	***17,053***	***29.0***	***7.6***	***26.2***	***0***
	10 Cents/mile	22,020	2,918	3,876	6,794	28,814	36.8	27.9	19.7	23.7	1.03	0.96	234,585	72,559	307,144	14,059	3,207	17,266	26.3	17.5	25.5	4,140
	15 Cents/mile	21,947	3,758	3,047	6,805	28,752	36.3	27.9	19.8	23.7	1.03	0.97	233,818	72,629	306,447	13,787	3,209	16,996	25.8	17.5	25.0	4,880
	20 Cents/mile	21,721	4,034	2,714	6,749	28,470	35.0	27.3	20.4	24.2	1.02	0.96	231,420	72,009	303,429	13,167	3,118	16,285	24.6	16.9	23.9	5,800
	30 Cents/mile	22,074	4,332	2,211	6,543	28,617	37.0	25.3	19.5	26.1	1.03	0.93	235,158	69,831	304,989	14,152	2,801	16,953	26.6	14.8	25.1	7,080
	40 Cents/mile	22,011	4,549	1,858	6,407	28,418	36.6	24.2	19.7	27.3	1.03	0.91	234,489	68,428	302,917	13,964	2,621	16,585	26.2	13.7	24.6	7,940
	50 Cents/mile	22,170	4,716	1,538	6,254	28,425	37.4	23.0	19.2	28.7	1.04	0.89	236,187	66,774	302,961	14,350	2,433	16,783	26.9	12.5	25.0	8,210
	60 Cents/mile	22,133	4,837	1,289	6,126	28,259	37.3	22.1	19.4	29.9	1.04	0.87	235,794	65,409	301,204	14,300	2,289	16,588	26.8	11.6	24.8	8,260

2030 P.M. PEAK PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor	4-Hour Revenue
		GP Total	***HOT***	***HOT***	***HOT***	***Total***	***GP Lane***	***HOV/HOT***	***GP Lane***	***HOV/HOT***	***GP Lane***	***HOV/HOT***	***GP Lane***	***HOV/HOT***	***Total***	***GP Lane***	***HOV/HOT***	***Total***	***GP Lane***	***HOV/HOT***	Corridor	Revenue
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***32,638***	***6,953***	***0***	***6,953***	***39,591***	***23.4***	***12.2***	***26.1***	***49.1***	***0.91***	***0.51***	***321,772***	***68,220***	***389,992***	***12,893***	***1,467***	***14,360***	***13.4***	***2.3***	***11.7***	***0***
	5 Cents/mile	31,099	5,491	4,728	10,219	41,318	21.1	16.8	28.8	36.5	0.87	0.75	306,582	100,274	406,857	11,101	2,927	14,028	11.1	6.8	10.3	2,320
	10 Cents/mile	31,622	6,109	3,484	9,593	41,215	21.8	15.6	27.8	39.6	0.89	0.71	311,746	94,096	405,842	11,623	2,565	14,188	11.8	5.6	10.6	3,420
	15 Cents/mile	31,670	6,473	2,591	9,064	40,733	21.8	14.7	27.8	41.7	0.89	0.67	312,215	88,914	401,129	11,675	2,292	13,967	11.8	4.7	10.5	3,810
	20 Cents/mile	31,821	6,622	2,041	8,663	40,484	22.1	14.2	27.5	43.2	0.89	0.64	313,723	84,948	398,671	11,872	2,112	13,984	12.1	4.2	10.7	4,000
	30 Cents/mile	32,099	6,742	1,314	8,056	40,155	22.5	13.4	27.0	45.5	0.90	0.59	316,470	79,008	395,478	12,205	1,856	14,061	12.5	3.4	11.0	3,870
	40 Cents/mile	32,285	6,848	866	7,715	40,000	22.8	13.0	26.7	46.7	0.90	0.57	318,289	75,656	393,945	12,427	1,732	14,158	12.7	3.0	11.2	3,400
	50 Cents/mile	32,518	6,854	601	7,455	39,973	23.3	12.7	26.3	47.5	0.91	0.55	320,595	73,133	393,728	12,785	1,637	14,422	13.2	2.8	11.6	2,950
I-75 from I-575 Split to Wade Green Road	***Baseline***	***18,764***	***2,178***	***0***	***2,178***	***20,942***	***8.3***	***4.3***	***29.7***	***56.3***	***0.87***	***0.32***	***75,675***	***8,784***	***84,459***	***2,587***	***160***	***2,747***	***4.2***	***0.3***	***3.8***	***0***
	5 Cents/mile	17,183	1,525	3,046	4,570	21,753	7.1	5.9	34.2	42.4	0.79	0.67	69,310	18,455	87,764	2,047	455	2,502	3.1	1.8	2.9	610
	10 Cents/mile	17,597	1,794	2,225	4,019	21,616	7.4	5.3	33.0	46.4	0.81	0.59	70,968	16,222	87,190	2,173	366	2,539	3.4	1.3	3.0	900
	15 Cents/mile	17,906	1,941	1,666	3,607	21,513	7.6	5.0	32.1	49.1	0.82	0.53	72,224	14,566	86,790	2,274	309	2,583	3.6	1.0	3.2	1,010
	20 Cents/mile	18,116	2,025	1,301	3,326	21,442	7.8	4.8	31.5	51.0	0.83	0.49	73,073	13,435	86,507	2,347	272	2,619	3.7	0.8	3.3	1,050
	30 Cents/mile	18,341	2,085	843	2,927	21,268	7.9	4.6	30.9	53.1	0.84	0.43	73,969	11,806	85,775	2,424	229	2,653	3.9	0.5	3.5	1,020
	40 Cents/mile	18,493	2,134	558	2,692	21,185	8.0	4.5	30.4	54.2	0.85	0.40	74,592	10,875	85,467	2,484	206	2,690	4.0	0.4	3.6	900
	50 Cents/mile	18,611	2,134	383	2,517	21,128	8.1	4.4	30.1	55.0	0.86	0.37	75,056	10,168	85,224	2,525	190	2,714	4.1	0.4	3.7	770
I-575 from I-75 Split to Sixes Road	***Baseline***	***17,582***	***2,803***	***0***	***2,803***	***20,385***	***20.6***	***11.6***	***32.8***	***55.6***	***0.82***	***0.40***	***193,948***	***29,969***	***223,917***	***6,115***	***541***	***6,656***	***9.7***	***1.1***	***8.8***	***0***
	5 Cents/mile	16,498	2,394	2,154	4,547	21,046	18.6	14.4	36.1	44.8	0.77	0.64	181,986	48,622	230,608	5,176	1,093	6,269	7.8	3.9	7.1	1,150
	10 Cents/mile	16,744	2,605	1,526	4,130	20,874	19.0	13.3	35.3	48.5	0.78	0.59	184,675	44,175	228,850	5,368	915	6,283	8.2	2.7	7.3	1,630
	15 Cents/mile	16,936	2,675	1,109	3,784	20,720	19.4	12.6	34.7	50.9	0.79	0.54	186,823	40,466	227,289	5,527	797	6,324	8.5	2.1	7.5	1,780
	20 Cents/mile	17,085	2,705	833	3,538	20,623	19.6	12.3	34.3	52.3	0.80	0.50	188,464	37,855	226,319	5,653	726	6,379	8.8	1.8	7.8	1,780
	30 Cents/mile	17,259	2,733	501	3,233	20,492	20.0	11.9	33.8	53.8	0.81	0.46	190,382	34,576	224,958	5,810	644	6,454	9.1	1.4	8.1	1,610
	40 Cents/mile	17,390	2,751	320	3,071	20,461	20.2	11.8	33.4	54.5	0.81	0.44	191,828	32,894	224,721	5,932	605	6,537	9.4	1.3	8.4	1,370
	50 Cents/mile	17,449	2,769	222	2,991	20,441	20.3	11.7	33.2	54.9	0.82	0.42	192,484	31,968	224,452	5,983	584	6,567	9.5	1.2	8.5	1,190

2030 MIDDAY PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	5-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***39,836***	***8,020***	***0***	***8,020***	***47,856***	***19.3***	***11.7***	***31.1***	***50.8***	***0.83***	***0.47***	***392,699***	***78,714***	***471,413***	***12,814***	***1,603***	***14,417***	***9.3***	***1.7***	***8.1***	***0***
	2 Cents/mile	38,359	5,827	5,566	11,393	49,751	18.1	14.4	33.1	41.6	0.80	0.67	378,134	111,757	489,891	11,598	2,749	14,346	8.1	4.4	7.3	1,090
	5 Cents/mile	38,620	6,703	4,222	10,925	49,545	18.3	13.9	32.8	43.3	0.81	0.64	380,715	107,223	487,938	11,827	2,556	14,383	8.3	3.9	7.4	2,070
	10 Cents/mile	39,191	7,388	2,924	10,313	49,504	19	13	32	45	1	1	386,348	101,160	487,508	12,268	2,327	14,595	9	3	8	2,870
	15 Cents/mile	39,077	7,683	2,073	9,756	48,833	18.7	12.9	32.0	46.7	0.82	0.58	385,237	95,733	480,970	12,109	2,135	14,244	8.7	2.9	7.5	3,050
	20 Cents/mile	39,194	7,805	1,495	9,300	48,495	18.9	12.5	31.8	47.9	0.82	0.55	386,378	91,219	477,597	12,264	1,982	14,246	8.9	2.5	7.6	2,930
	30 Cents/mile	39,351	7,938	854	8,792	48,143	18.9	12.2	31.7	49.1	0.83	0.52	387,930	86,283	474,213	12,384	1,824	14,208	8.9	2.2	7.7	2,510
I-75 from I-575 Split to Wade Green Road	***Baseline***	***22,062***	***2,483***	***0***	***2,483***	***24,546***	***7.8***	***4.3***	***31.7***	***56.8***	***0.83***	***0.29***	***89,175***	***10,039***	***99,214***	***2,878***	***181***	***3,059***	***3.7***	***0.2***	***3.4***	***0***
	2 Cents/mile	20,414	1,641	3,781	5,423	25,837	6.9	5.6	35.7	44.3	0.53	0.63	82,520	21,925	104,445	2,356	511	2,867	2.8	1.5	2.6	310
	5 Cents/mile	20,686	1,926	3,000	4,926	25,613	7.0	5.2	35.0	47.3	0.53	0.58	83,622	19,919	103,541	2,435	435	2,870	3.0	1.2	2.6	610
	10 Cents/mile	21,061	2,230	2,110	4,340	25,401	7.2	4.9	34.1	50.3	0.54	0.51	85,131	17,515	102,645	2,550	360	2,909	3.2	0.8	2.8	850
	15 Cents/mile	21,299	2,329	1,483	3,813	25,111	7.4	4.7	33.5	52.5	0.55	0.45	86,095	15,414	101,509	2,623	302	2,925	3.3	0.6	2.9	900
	20 Cents/mile	21,445	2,414	1,080	3,495	24,939	7.4	4.5	33.2	53.7	0.55	0.41	86,696	14,122	100,817	2,670	270	2,940	3.4	0.5	3.0	870
	30 Cents/mile	21,769	2,454	632	3,086	24,855	7.6	4.4	32.4	55.2	0.56	0.36	88,000	12,459	100,459	2,777	232	3,009	3.5	0.4	3.2	770
I-575 from I-75 Split to Sixes Road	***Baseline***	***19,800***	***3,228***	***0***	***3,228***	***23,028***	***17.0***	***11.4***	***38.2***	***56.5***	***0.74***	***0.37***	***210,924***	***34,483***	***245,407***	***5,664***	***613***	***6,277***	***6.5***	***0.9***	***5.9***	***0***
	2 Cents/mile	18,532	2,582	2,862	5,444	23,976	15.6	13.8	41.4	46.6	0.69	0.62	197,448	58,160	255,608	4,875	1,256	6,130	5.2	3.3	4.9	610
	5 Cents/mile	18,892	2,910	2,033	4,943	23,835	16.0	12.9	40.5	49.8	0.71	0.56	201,280	52,826	254,106	5,085	1,064	6,149	5.5	2.4	5.0	1,090
	10 Cents/mile	19,090	3,078	1,319	4,397	23,487	16.2	12.3	40.0	52.4	0.71	0.50	203,380	46,966	250,346	5,206	900	6,106	5.7	1.8	5.1	1,410
	15 Cents/mile	19,376	3,126	900	4,026	23,402	16.5	11.9	39.3	53.9	0.73	0.46	206,417	42,949	249,366	5,384	799	6,184	6.0	1.4	5.4	1,440
	20 Cents/mile	19,459	3,150	630	3,780	23,239	16.6	11.7	39.1	54.7	0.73	0.43	207,306	40,344	247,650	5,436	739	6,175	6.1	1.2	5.5	1,340
	30 Cents/mile	19,584	3,217	341	3,558	23,142	16.7	11.6	38.8	55.5	0.73	0.40	208,615	37,948	246,563	5,517	686	6,203	6.2	1.1	5.6	1,090

2030 MIDDAY PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor Travel Delay (min/vehicle)	5-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***37,966***	***8,336***	***0***	***8,336***	***46,302***	***20.0***	***11.9***	***30.1***	***50.2***	***0.85***	***0.49***	***374,305***	***81,755***	***456,061***	***12,856***	***1,692***	***14,548***	***10.0***	***1.9***	***8.8***	***0***
	2 Cents/mile	35,692	6,042	6,799	12,841	48,534	18.2	16.7	33.2	36.2	0.80	0.76	351,888	125,938	477,826	10,963	3,635	14,598	8.2	6.8	8.0	1,330
	5 Cents/mile	36,309	6,929	4,639	11,568	47,877	18.7	14.7	32.5	41.1	0.81	0.68	357,973	113,496	471,469	11,504	2,888	14,392	8.6	4.7	8.0	2,280
	10 Cents/mile	36,704	7,720	3,150	10,870	47,574	19.1	14.0	31.9	43.3	0.82	0.64	361,866	106,592	468,458	11,851	2,586	14,437	9.0	4.0	8.2	3,090
	15 Cents/mile	37,107	7,956	2,217	10,173	47,279	19.4	13.3	31.3	45.4	0.83	0.60	365,821	99,780	465,601	12,194	2,302	14,496	9.4	3.3	8.4	3,260
	20 Cents/mile	37,242	8,065	1,645	9,710	46,951	19.5	12.9	31.2	46.7	0.83	0.57	367,152	95,252	462,403	12,296	2,130	14,426	9.4	2.9	8.4	3,230
	30 Cents/mile	37,572	8,205	952	9,157	46,730	19.7	12.4	30.8	48.2	0.84	0.54	370,413	89,834	460,247	12,546	1,946	14,492	9.6	2.5	8.6	2,800
I-75 from I-575 Split to Wade Green Road	***Baseline***	***22,276***	***2,562***	***0***	***2,562***	***24,837***	***7.5***	***4.3***	***32.3***	***56.8***	***0.82***	***0.30***	***89,848***	***10,360***	***100,208***	***2,806***	***187***	***2,993***	***3.5***	***0.2***	***3.2***	***0***
	2 Cents/mile	19,841	1,682	4,393	6,075	25,916	6.4	6.2	38.2	39.6	0.73	0.71	80,019	24,555	104,574	2,116	636	2,751	2.4	2.2	2.3	350
	5 Cents/mile	20,545	1,971	3,240	5,211	25,756	6.7	5.4	36.4	45.8	0.76	0.61	82,859	21,030	103,890	2,297	470	2,767	2.7	1.3	2.4	650
	10 Cents/mile	21,021	2,367	2,180	4,547	25,568	6.9	5.0	35.3	49.3	0.78	0.53	84,773	18,373	103,146	2,429	384	2,813	2.9	0.9	2.6	880
	15 Cents/mile	21,389	2,452	1,533	3,986	25,374	7.1	4.7	34.4	52.0	0.79	0.47	86,251	16,080	102,331	2,534	317	2,851	3.1	0.6	2.7	930
	20 Cents/mile	21,543	2,487	1,130	3,618	25,160	7.2	4.6	34.0	53.4	0.79	0.42	86,882	14,614	101,496	2,579	280	2,859	3.1	0.5	2.8	910
	30 Cents/mile	21,883	2,512	652	3,164	25,047	7.3	4.4	33.2	54.9	0.81	0.37	88,256	12,769	101,025	2,681	238	2,919	3.3	0.4	3.0	790
I-575 from I-75 Split to Sixes Road	***Baseline***	***20,324***	***3,540***	***0***	***3,540***	***23,864***	***18.2***	***11.6***	***36.8***	***55.5***	***0.76***	***0.40***	***224,193***	***37,891***	***262,084***	***6,224***	***685***	***6,908***	***7.4***	***1.1***	***6.6***	***0***
	2 Cents/mile	18,859	2,777	3,091	5,868	24,726	16.5	14.9	40.5	43.3	0.71	0.67	208,032	62,707	270,739	5,234	1,456	6,690	5.7	4.4	5.5	660
	5 Cents/mile	19,349	3,116	2,118	5,234	24,583	17.1	13.4	39.2	48.2	0.72	0.59	213,450	55,966	269,416	5,541	1,168	6,709	6.2	2.9	5.6	1,130
	10 Cents/mile	19,640	3,326	1,392	4,718	24,359	17.4	12.6	38.5	51.0	0.74	0.54	216,653	50,474	267,127	5,737	993	6,730	6.5	2.1	5.8	1,490
	15 Cents/mile	19,801	3,402	952	4,354	24,155	17.6	12.2	38.1	52.6	0.74	0.49	218,428	46,518	264,946	5,849	887	6,735	6.7	1.7	5.9	1,530
	20 Cents/mile	19,941	3,450	678	4,128	24,069	17.7	12.0	37.8	53.5	0.75	0.47	219,967	44,195	264,162	5,947	828	6,775	6.9	1.5	6.1	1,450
	30 Cents/mile	20,117	3,512	369	3,881	23,998	18.0	11.8	37.3	54.4	0.75	0.44	221,920	41,524	263,444	6,076	766	6,842	7.1	1.3	6.3	1,180

2030 NIGHT PERIOD NORTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time (min)		Average Travel Speed Weighted by Distance (mph)		Average VC Ratio Weighted by Distance		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average Delay (min)		Average Corridor Travel Delay (min/vehicle)	11-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***39,790***	***2,538***	***0***	***2,538***	***42,328***	***10.9***	***10.0***	***54.3***	***58.7***	***0.38***	***0.07***	***392,251***	***24,884***	***417,136***	***7,247***	***426***	***7,673***	***1***	***0***	***1***	***0***
	2 Cents/mile	39,019	2,508	817	3,324	42,343	10.9	10.1	54.5	58.6	0.37	0.09	384,646	32,630	417,276	7,081	560	7,641	1	0	1	160
	5 Cents/mile	39,624	2,493	248	2,742	42,366	10.9	10.0	54.4	58.7	0.38	0.07	390,612	26,901	417,512	7,211	461	7,672	1	0	1	120
	10 Cents/mile	39,832	2,468	112	2,581	42,413	10.9	10.0	54.3	58.7	0.38	0.07	392,656	25,312	417,968	7,256	434	7,690	1	0	1	110
	15 Cents/mile	39,932	2,441	87	2,528	42,460	10.9	10.0	54.3	58.7	0.38	0.07	393,636	24,802	418,438	7,278	425	7,703	1	0	1	130
I-75 from I-575 Split to Wade Green Road	***Baseline***	***21,599***	***979***	***0***	***979***	***22,578***	***4.4***	***4.1***	***54.8***	***59.6***	***0.37***	***0.05***	***87,306***	***3,953***	***91,259***	***1,596***	***67***	***1,662***	***0***	***0***	***0***	***0***
	2 Cents/mile	21,042	969	638	1,608	22,649	4.4	4.1	55.0	59.5	0.24	0.09	85,056	6,512	91,568	1,548	110	1,657	0	0	0	50
	5 Cents/mile	21,453	969	206	1,175	22,628	4.4	4.1	54.9	59.6	0.25	0.06	86,726	4,745	91,470	1,583	80	1,663	0	0	0	40
	10 Cents/mile	21,572	964	93	1,057	22,628	4.4	4.1	54.8	59.6	0.25	0.06	87,194	4,271	91,465	1,593	72	1,665	0	0	0	40
	15 Cents/mile	21,608	959	74	1,033	22,641	4.4	4.1	54.8	59.6	0.25	0.05	87,344	4,165	91,508	1,596	70	1,667	0	0	0	40
I-575 from I-75 Split to Sixes Road	***Baseline***	***18,029***	***799***	***0***	***799***	***18,828***	***11.1***	***10.5***	***57.9***	***61.0***	***0.31***	***0.04***	***192,088***	***8,542***	***200,629***	***3,320***	***140***	***3,460***	***1***	***0***	***1***	***0***
	2 Cents/mile	17,842	793	209	1,002	18,844	11.0	10.5	58.0	61.0	0.30	0.05	190,062	10,708	200,770	3,280	176	3,456	1	0	1	40
	5 Cents/mile	18,001	787	51	838	18,839	11.1	10.5	57.9	61.0	0.31	0.04	191,778	8,959	200,737	3,314	147	3,461	1	0	1	30
	10 Cents/mile	18,047	773	20	792	18,839	11.1	10.5	57.9	61.0	0.31	0.04	192,283	8,492	200,775	3,323	139	3,463	1	0	1	20
	15 Cents/mile	18,070	763	18	780	18,851	11.1	10.5	57.9	61.0	0.31	0.04	192,516	8,325	200,841	3,328	137	3,465	1	0	1	30

2030 NIGHT PERIOD SOUTHBOUND

Corridor	Scenario	Average Volume Weighted by Distance					Corridor Travel Time		Average Travel		Average VC Ratio		Vehicle Miles Traveled (Miles)			Vehicle Hours Traveled (Hours)			Corridor Average		Average Corridor Travel Delay (min/vehicle)	11-Hour Revenue ($)
		GP Total	HOT Lane HOV Volume	HOT Lane SOV Toll Volume	HOT Lane Total	Total Throughput	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane	Total	GP Lane	HOV/HOT Lane		
I-75 from Akers Mill Road to I-575 Split	***Baseline***	***35,502***	***2,083***	***0***	***2,083***	***37,584***	***10.9***	***10.0***	***54.5***	***58.9***	***0.36***	***0.06***	***349,989***	***20,408***	***370,396***	***6,441***	***349***	***6,790***	***0.8***	***0.0***	***0.8***	***0***
	2 Cents/mile	34,889	2,070	692	2,763	37,651	10.8	10.0	54.6	58.9	0.36	0.07	343,952	27,082	371,033	6,312	463	6,775	0.8	0.0	0.8	140
	5 Cents/mile	35,363	2,057	237	2,293	37,656	10.9	10.0	54.5	58.9	0.36	0.06	348,638	22,516	371,154	6,412	385	6,797	0.8	0.0	0.8	120
	10 Cents/mile	35,560	2,041	113	2,153	37,714	10.9	10.0	54.4	58.9	0.36	0.06	350,576	21,134	371,711	6,454	361	6,816	0.8	0.0	0.8	110
	15 Cents/mile	35,670	2,023	89	2,112	37,782	10.9	10.0	54.4	58.9	0.36	0.06	351,663	20,706	372,369	6,478	354	6,832	0.8	0.0	0.8	130
I-75 from I-575 Split to Wade Green Road	***Baseline***	***19,947***	***669***	***0***	***669***	***20,616***	***4.3***	***4.1***	***56.3***	***59.7***	***0.34***	***0.04***	***80,452***	***2,701***	***83,153***	***1,430***	***45***	***1,476***	***0.3***	***0.0***	***0.3***	***0***
	2 Cents/mile	19,475	664	537	1,201	20,677	4.3	4.1	56.5	59.6	0.33	0.06	78,549	4,852	83,402	1,392	81	1,473	0.3	0.0	0.2	40
	5 Cents/mile	19,816	659	171	830	20,646	4.3	4.1	56.3	59.7	0.33	0.04	79,916	3,379	83,295	1,419	57	1,476	0.3	0.0	0.3	30
	10 Cents/mile	19,909	659	78	737	20,646	4.3	4.1	56.3	59.7	0.33	0.04	80,288	2,974	83,262	1,427	50	1,477	0.3	0.0	0.3	30
	15 Cents/mile	19,931	654	64	718	20,649	4.3	4.1	56.3	59.7	0.33	0.04	80,378	2,892	83,270	1,429	49	1,477	0.3	0.0	0.3	40
I-575 from I-75 Split to Sixes Road	***Baseline***	***15,418***	***697***	***0***	***697***	***16,115***	***11.3***	***10.5***	***58.9***	***61.0***	***0.26***	***0.04***	***170,076***	***7,478***	***177,554***	***2,892***	***123***	***3,015***	***0.4***	***0.0***	***0.4***	***0***
	2 Cents/mile	15,263	697	166	863	16,126	11.2	10.5	58.9	61.0	0.26	0.04	168,375	9,205	177,580	2,861	151	3,012	0.4	0.0	0.4	40
	5 Cents/mile	15,387	697	43	740	16,127	11.3	10.5	58.9	61.0	0.26	0.04	169,738	7,880	177,618	2,886	129	3,015	0.4	0.0	0.4	20
	10 Cents/mile	15,415	691	23	714	16,128	11.3	10.5	58.9	61.0	0.26	0.04	170,046	7,623	177,669	2,892	125	3,017	0.4	0.0	0.4	20
	15 Cents/mile	15,427	687	23	710	16,137	11.3	10.5	58.9	61.0	0.26	0.04	170,173	7,552	177,725	2,894	124	3,018	0.4	0.0	0.4	40

APPENDIX 6-A
Detailed Toll Equipment Capital Expenditures

CONCEPT A - PHASE 1 CAPITAL COST ESTIMATE
2010 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						**$ -**
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	6	$65,000	$390,000	**$570,000**
		Gantry Structure - 2 Lane Cross Section	Each	0	$60,000	$0	
		Toll & Communication Equipment Building	Each	6	$30,000	$180,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	6	$4,000	$24,000	**$124,500**
		ETC Reader (SOV lanes)	Each	12	$4,000	$48,000	
		Transceiver	Each	6	$3,500	$21,000	
		ETC Reader Controller	Each	6	$4,000	$24,000	
		Power Supply	Each	6	$250	$1,500	
		Surveillance Camera (Incident Management)	Each	6	$1,000	$6,000	
	3. Violation Enforcement System	Camera - HOV	Each	12	$3,500	$42,000	**$227,000**
		Camera - SOV	Each	24	$3,500	$84,000	
		Power Supply	Each	6	$250	$1,500	
		Indicator Light - HOV	Each	6	$2,000	$12,000	
		Indicator Light - SOV	Each	12	$2,000	$24,000	
		VES Controller	Each	6	$5,000	$30,000	
		Image Processor	Each	1	$6,500	$6,500	
		Optical Character Recognition Server	Each	1	$7,000	$7,000	
		Optical Character Recognition Software/Interface	Lump sum	1	$20,000	$20,000	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	6	$4,500	$27,000	**$93,000**
		Overhead/In-ground Sensor -SOV	Each	12	$4,500	$54,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	1	$12,000	$12,000	
	5. Lane Processing Equipment	Lane Controller	Each	6	$12,500	$75,000	**$314,000**
		Lane Cabinet & Electronics	Each	6	6,500	$39,000	
		Lane Software	Lump Sum	1	$200,000	$200,000	
	6. Signs	Variable Message Sign (Mainline)	Each	1	$120,000	$120,000	**$840,000**
		Variable Message Sign (Close Ramp Entrance)	Each	4	$60,000	$240,000	
		Fixed Overhead Signs (Bridge Structure)	Each	6	$60,000	$360,000	
		Fixed Overhead Signs (Butterfly Structure)	Each	4	$30,000	$120,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	7800	$40	$312,000	**$312,000**
	8. Communications	Connection to Existing Fiber	Each	6	$1,000	$6,000	**$75,000**
		Network Equipment	Each	6	$9,000	$54,000	
		Fiber to HOT Operation Center	Ft	15000	$1	$15,000	
	9. Power	Breaker Panel	Each	6	$2,000	$12,000	**$303,000**
		UPS & Battery Cabinet	Each	6	$5,000	$30,000	
		Conduit & Wiring	Each	6	$20,000	$120,000	
		Disconnect & By-Pass Switch	Each	6	$3,500	$21,000	
		Service Connection	Each	6	$20,000	$120,000	
	10. Mini Generator	Generator Unit	Each	6	$6,500	$39,000	**$51,000**
		Conduit & Wiring	Each	6	$2,000	$12,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$727,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$3,636,500**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$363,650**
	14. Construction Total	Total of Item 12 and Item 13					**$4,000,150**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$800,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	2	$100,000	$200,000	**$1,150,000**
		Database SW and Licenses	Each	2	$50,000	$100,000	
		Host Software	Lump Sum	1	$200,000	$200,000	
		System Application Software	Lump Sum	1	$400,000	$400,000	
		Maintenance Management	Lump Sum	1	$200,000	$200,000	
		Equipment Cabinet	Each	2	$2,000	$4,000	
		Router & Switch	Each	1	$2,000	$2,000	
		Network Equipment & Materials	Lump Sum	1	$8,000	$8,000	
		Workstations	Each	4	$2,000	$8,000	
		Printers	Each	1	$2,000	$2,000	
		UPS & Battery Cabinet	Each	1	$6,000	$6,000	
		Installation and Configuration Support	Lump Sum	1	$20,000	$20,000	
	2. Transponders	Transponders	Each	100,000	$25	$2,500,000	**$2,500,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	1	$2,000,000	$2,000,000	**$2,000,000**
	4. Operation Total	Operation Total					**$5,650,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$10,450,150**

CONCEPT A - PHASE 2 CAPITAL COST ESTIMATE
2015 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						**$ -**
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	2	$65,000	$130,000	**$190,000**
		Gantry Structure - 2 Lane Cross Section	Each	0	$60,000	$0	
		Toll & Communication Equipment Building	Each	2	$30,000	$60,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	2	$4,000	$8,000	**$41,500**
		ETC Reader (SOV lanes)	Each	4	$4,000	$16,000	
		Transceiver	Each	2	$3,500	$7,000	
		ETC Reader Controller	Each	2	$4,000	$8,000	
		Power Supply	Each	2	$250	$500	
		Surveillance Camera (Incident Management)	Each	2	$1,000	$2,000	
	3. Violation Enforcement System	Camera - HOV	Each	4	$3,500	$14,000	**$64,500**
		Camera - SOV	Each	8	$3,500	$28,000	
		Power Supply	Each	2	$250	$500	
		Indicator Light - HOV	Each	2	$2,000	$4,000	
		Indicator Light - SOV	Each	4	$2,000	$8,000	
		VES Controller	Each	2	$5,000	$10,000	
		Image Processor	Each	0	$6,500	$0	
		Optical Character Recognition Server	Each	0	$7,000	$0	
		Optical Character Recognition Software/Interface	Lump sum	0	$20,000	$0	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	2	$4,500	$9,000	**$27,000**
		Overhead/In-ground Sensor -SOV	Each	4	$4,500	$18,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	0	$12,000	$0	
	5. Lane Processing Equipment	Lane Controller	Each	2	$12,500	$25,000	**$38,000**
		Lane Cabinet & Electronics	Each	2	6,500	$13,000	
		Lane Software	Lump Sum	0	$200,000	$0	
	6. Signs	Variable Message Sign (Mainline)	Each	0	$120,000	$0	**$600,000**
		Variable Message Sign (Close Ramp Entrance)	Each	4	$60,000	$240,000	
		Fixed Overhead Signs (Bridge Structure)	Each	4	$60,000	$240,000	
		Fixed Overhead Signs (Butterfly Structure)	Each	4	$30,000	$120,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	2600	$40	$104,000	**$104,000**
	8. Communications	Connection to Existing Fiber	Each	2	$1,000	$2,000	**$20,000**
		Network Equipment	Each	2	$9,000	$18,000	
		Fiber to HOT Operation Center	Ft	0	$1	$0	
	9. Power	Breaker Panel	Each	2	$2,000	$4,000	**$101,000**
		UPS & Battery Cabinet	Each	2	$5,000	$10,000	
		Conduit & Wiring	Each	2	$20,000	$40,000	
		Disconnect & By-Pass Switch	Each	2	$3,500	$7,000	
		Service Connection	Each	2	$20,000	$40,000	
	10. Mini Generator	Generator Unit	Each	2	$6,500	$13,000	**$17,000**
		Conduit & Wiring	Each	2	$2,000	$4,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$301,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$1,504,000**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$150,400**
	14. Construction Total	Total of Item 12 and Item 13					**$1,654,400**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$331,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each		$100,000	$0	**$0**
		Database SW and Licenses	Each		$50,000	$0	
		Host Software	Lump Sum		$200,000	$0	
		System Application Software	Lump Sum		$400,000	$0	
		Maintenance Management	Lump Sum		$200,000	$0	
		Equipment Cabinet	Each		$2,000	$0	
		Router & Switch	Each		$2,000	$0	
		Network Equipment & Materials	Lump Sum		$8,000	$0	
		Workstations	Each		$2,000	$0	
		Printers	Each		$2,000	$0	
		UPS & Battery Cabinet	Each		$6,000	$0	
		Installation and Configuration Support	Lump Sum		$20,000	$0	
	2. Transponders	Transponders	Each	50,000	$25	$1,250,000	**$1,250,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum		$2,000,000	$0	**$0**
	4. Operation Total	Operation Total					**$1,250,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$3,235,400**

CONCEPT A - PHASE 3 CAPITAL COST ESTIMATE
2020 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						**$ -**
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	0	$65,000	$0	**$540,000**
		Gantry Structure - 2 Lane Cross Section	Each	6	$60,000	$360,000	
		Toll & Communication Equipment Building	Each	6	$30,000	$180,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	6	$4,000	$24,000	**$100,500**
		ETC Reader (SOV lanes)	Each	6	$4,000	$24,000	
		Transceiver	Each	6	$3,500	$21,000	
		ETC Reader Controller	Each	6	$4,000	$24,000	
		Power Supply	Each	6	$250	$1,500	
		Surveillance Camera (Incident Management)	Each	6	$1,000	$6,000	
	3. Violation Enforcement System	Camera - HOV	Each	12	$3,500	$42,000	**$139,500**
		Camera - SOV	Each	12	$3,500	$42,000	
		Power Supply	Each	6	$250	$1,500	
		Indicator Light - HOV	Each	6	$2,000	$12,000	
		Indicator Light - SOV	Each	6	$2,000	$12,000	
		VES Controller	Each	6	$5,000	$30,000	
		Image Processor	Each	0	$6,500	$0	
		Optical Character Recognition Server	Each	0	$7,000	$0	
		Optical Character Recognition Software/Interface	Lump sum	0	$20,000	$0	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	6	$4,500	$27,000	**$54,000**
		Overhead/In-ground Sensor -SOV	Each	6	$4,500	$27,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	0	$12,000	$0	
	5. Lane Processing Equipment	Lane Controller	Each	6	$12,500	$75,000	**$114,000**
		Lane Cabinet & Electronics	Each	6	6,500	$39,000	
		Lane Software	Lump Sum	0	$200,000	$0	
	6. Signs	Variable Message Sign (Mainline)	Each	2	$120,000	$240,000	**$1,560,000**
		Variable Message Sign (Close Ramp Entrance)	Each	8	$60,000	$480,000	
		Fixed Overhead Signs (Bridge Structure)	Each	10	$60,000	$600,000	
		Fixed Overhead Signs (Butterfly Structure)	Each	8	$30,000	$240,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	7800	$40	$312,000	**$312,000**
	8. Communications	Connection to Existing Fiber	Each	6	$1,000	$6,000	**$60,000**
		Network Equipment	Each	6	$9,000	$54,000	
		Fiber to HOT Operation Center	Ft	0	$1	$0	
	9. Power	Breaker Panel	Each	6	$2,000	$12,000	**$303,000**
		UPS & Battery Cabinet	Each	6	$5,000	$30,000	
		Conduit & Wiring	Each	6	$20,000	$120,000	
		Disconnect & By-Pass Switch	Each	6	$3,500	$21,000	
		Service Connection	Each	6	$20,000	$120,000	
	10. Mini Generator	Generator Unit	Each	6	$6,500	$39,000	**$51,000**
		Conduit & Wiring	Each	6	$2,000	$12,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$809,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$4,043,000**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$404,300**
	14. Construction Total	Total of Item 12 and Item 13					**$4,447,300**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$889,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	0	$100,000	$0	**$0**
		Database SW and Licenses	Each	0	$50,000	$0	
		Host Software	Lump Sum	0	$200,000	$0	
		System Application Software	Lump Sum	0	$400,000	$0	
		Maintenance Management	Lump Sum	0	$200,000	$0	
		Equipment Cabinet	Each	0	$2,000	$0	
		Router & Switch	Each	0	$2,000	$0	
		Network Equipment & Materials	Lump Sum	0	$8,000	$0	
		Workstations	Each	0	$2,000	$0	
		Printers	Each	0	$2,000	$0	
		UPS & Battery Cabinet	Each	0	$6,000	$0	
		Installation and Configuration Support	Lump Sum	0	$20,000	$0	
	2. Transponders	Transponders	Each	75,000	$25	$1,875,000	**$1,875,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	0	$2,000,000	$0	**$0**
	4. Operation Total	Operation Total					**$1,875,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$7,211,300**

CONCEPT A - BUILD-OUT

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						**$ -**
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	8	$65,000	$520,000	**$1,300,000**
		Gantry Structure - 2 Lane Cross Section	Each	6	$60,000	$360,000	
		Toll & Communication Equipment Building	Each	14	$30,000	$420,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	14	$4,000	$56,000	**$266,500**
		ETC Reader (SOV lanes)	Each	22	$4,000	$88,000	
		Transceiver	Each	14	$3,500	$49,000	
		ETC Reader Controller	Each	14	$4,000	$56,000	
		Power Supply	Each	14	$250	$3,500	
		Surveillance Camera (Incident Management)	Each	14	$1,000	$14,000	
	3. Violation Enforcement System	Camera - HOV	Each	28	$3,500	$98,000	**$431,000**
		Camera - SOV	Each	44	$3,500	$154,000	
		Power Supply	Each	14	$250	$3,500	
		Indicator Light - HOV	Each	14	$2,000	$28,000	
		Indicator Light - SOV	Each	22	$2,000	$44,000	
		VES Controller	Each	14	$5,000	$70,000	
		Image Processor	Each	1	$6,500	$6,500	
		Optical Character Recognition Server	Each	1	$7,000	$7,000	
		Optical Character Recognition Software/Interface	Lump sum	1	$20,000	$20,000	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	14	$4,500	$63,000	**$174,000**
		Overhead/In-ground Sensor -SOV	Each	22	$4,500	$99,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	1	$12,000	$12,000	
	5. Lane Processing Equipment	Lane Controller	Each	14	$12,500	$175,000	**$466,000**
		Lane Cabinet & Electronics	Each	14	6,500	$91,000	
		Lane Software	Lump Sum	1	$200,000	$200,000	
	6. Signs	Variable Message Sign (Mainline)	Each	3	$120,000	$360,000	**$3,000,000**
		Variable Message Sign (Close Ramp Entrance)	Each	16	$60,000	$960,000	
		Fixed Overhead Signs (Bridge Structure)	Each	20	$60,000	$1,200,000	
		Fixed Overhead Signs (Butterfly Structure)	Each	16	$30,000	$480,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	18200	$40	$728,000	**$728,000**
	8. Communications	Connection to Existing Fiber	Each	14	$1,000	$14,000	**$155,000**
		Network Equipment	Each	14	$9,000	$126,000	
		Fiber to HOT Operation Center	Ft	15000	$1	$15,000	
	9. Power	Breaker Panel	Each	14	$2,000	$28,000	**$707,000**
		UPS & Battery Cabinet	Each	14	$5,000	$70,000	
		Conduit & Wiring	Each	14	$20,000	$280,000	
		Disconnect & By-Pass Switch	Each	14	$3,500	$49,000	
		Service Connection	Each	14	$20,000	$280,000	
	10. Mini Generator	Generator Unit	Each	14	$6,500	$91,000	**$119,000**
		Conduit & Wiring	Each	14	$2,000	$28,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$1,837,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$9,183,500**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$918,350**
	14. Construction Total	Total of Item 12 and Item 13					**$10,101,850**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$2,020,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	2	$100,000	$200,000	**$1,150,000**
		Database SW and Licenses	Each	2	$50,000	$100,000	
		Host Software	Lump Sum	1	$200,000	$200,000	
		System Application Software	Lump Sum	1	$400,000	$400,000	
		Maintenance Management	Lump Sum	1	$200,000	$200,000	
		Equipment Cabinet	Each	2	$2,000	$4,000	
		Router & Switch	Each	1	$2,000	$2,000	
		Network Equipment & Materials	Lump Sum	1	$8,000	$8,000	
		Workstations	Each	4	$2,000	$8,000	
		Printers	Each	1	$2,000	$2,000	
		UPS & Battery Cabinet	Each	1	$6,000	$6,000	
		Installation and Configuration Support	Lump Sum	1	$20,000	$20,000	
	2. Transponders	Transponders	Each	225,000	$25	$5,625,000	**$5,625,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	1	$2,000,000	$2,000,000	**$2,000,000**
	4. Operation Total	Operation Total					**$8,775,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$20,896,850**

CONCEPT B-1 - PHASE 1 CAPITAL COST ESTIMATE
2010 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	2	$65,000	$130,000	**$790,000**
		Gantry Structure - 2 Lane Cross Section	Each	4	$60,000	$240,000	
		Gantry Structure - 1 Lane Cross Section	Each	4	$30,000	$120,000	
		Toll & Communication Equipment Building	Each	10	$30,000	$300,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	6	$4,000	$24,000	**$187,500**
		ETC Reader	Each	12	$4,000	$48,000	
		Transceiver	Each	18	$3,500	$63,000	
		ETC Reader Controller	Each	10	$4,000	$40,000	
		Power Supply	Each	10	$250	$2,500	
		Surveillance Camera (Incident Management)	Each	10	$1,000	$10,000	
	3. Violation Enforcement System	Camera - HOV	Each	10	$3,500	$35,000	**$158,750**
		Camera - SOV	Each	12	$3,500	$42,000	
		Power Supply	Each	5	$250	$1,250	
		Indicator Light - HOV	Each	5	$2,000	$10,000	
		Indicator Light - SOV	Each	6	$2,000	$12,000	
		VES Controller	Each	5	$5,000	$25,000	
		Image Processor	Each	1	$6,500	$6,500	
		Optical Character Recognition Server	Each	1	$7,000	$7,000	
		Optical Character Recognition Software/Interface	Lump sum	1	$20,000	$20,000	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	5	$4,500	$22,500	**$61,500**
		Overhead/In-ground Sensor -SOV	Each	6	$4,500	$27,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	1	$12,000	$12,000	
	5. Lane Processing Equipment	Lane Controller	Each	10	$12,500	$125,000	**$390,000**
		Lane Cabinet & Electronics	Each	10	6,500	$65,000	
		Lane Software	Lump Sum	1	$200,000	$200,000	
	6. Signs	Variable Message Sign (Mainline)	Each	1	$120,000	$120,000	**$770,000**
		Variable Message Sign (Ramp Entrance)	Each	4	$60,000	$240,000	
		Fixed Overhead Signs (Bridge Structure)	Each	5	$60,000	$300,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	11	$10,000	$110,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	6500	$40	$260,000	**$260,000**
	8. Communications	Connection to Existing Fiber	Each	10	$1,000	$10,000	**$115,000**
		Network Equipment	Each	10	$9,000	$90,000	
		Fiber to HOT Operation Center	Ft	15000	$1	$15,000	
	9. Power	Breaker Panel	Each	10	$2,000	$20,000	**$505,000**
		UPS & Battery Cabinet	Each	10	$5,000	$50,000	
		Conduit & Wiring	Each	10	$20,000	$200,000	
		Disconnect & By-Pass Switch	Each	10	$3,500	$35,000	
		Service Connection	Each	10	$20,000	$200,000	
	10. Mini Generator	Generator Unit	Each	10	$6,500	$65,000	**$85,000**
		Conduit & Wiring	Each	10	$2,000	$20,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$831,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$4,153,750**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$415,000**
	14. Construction Total	Total of Item 12 and Item 13					**$4,568,750**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$914,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	2	$100,000	$200,000	**$1,150,000**
		Database SW and Licenses	Each	2	$50,000	$100,000	
		Host Software	Lump Sum	1	$200,000	$200,000	
		System Application Software	Lump Sum	1	$400,000	$400,000	
		Maintenance Management	Lump Sum	1	$200,000	$200,000	
		Equipment Cabinet	Each	2	$2,000	$4,000	
		Router & Switch	Each	1	$2,000	$2,000	
		Network Equipment & Materials	Lump Sum	1	$8,000	$8,000	
		Workstations	Each	4	$2,000	$8,000	
		Printers	Each	1	$2,000	$2,000	
		UPS & Battery Cabinet	Each	1	$6,000	$6,000	
		Installation and Configuration Support	Lump Sum	1	$20,000	$20,000	
	2. Transponders	Transponders	Each	100,000	$25	$2,500,000	**$2,500,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	1	$2,000,000	$2,000,000	**$2,000,000**
	4. Operation Total	Operation Total					**$5,650,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$11,132,750**

CONCEPT B-1 - PHASE 2 CAPITAL COST ESTIMATE
2015 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	0	$65,000	$0	**$180,000**
		Gantry Structure - 2 Lane Cross Section	Each	2	$60,000	$120,000	
		Gantry Structure - 1 Lane Cross Section	Each	0	$30,000	$0	
		Toll & Communication Equipment Building	Each	2	$30,000	$60,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	2	$4,000	$8,000	**$40,500**
		ETC Reader	Each	2	$4,000	$8,000	
		Transceiver	Each	4	$3,500	$14,000	
		ETC Reader Controller	Each	2	$4,000	$8,000	
		Power Supply	Each	2	$250	$500	
		Surveillance Camera (Incident Management)	Each	2	$1,000	$2,000	
	3. Violation Enforcement System	Camera - HOV	Each	4	$3,500	$14,000	**$46,500**
		Camera - SOV	Each	4	$3,500	$14,000	
		Power Supply	Each	2	$250	$500	
		Indicator Light - HOV	Each	2	$2,000	$4,000	
		Indicator Light - SOV	Each	2	$2,000	$4,000	
		VES Controller	Each	2	$5,000	$10,000	
		Image Processor	Each	0	$6,500	$0	
		Optical Character Recognition Server	Each	0	$7,000	$0	
		Optical Character Recognition Software/Interface	Lump sum	0	$20,000	$0	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	2	$4,500	$9,000	**$18,000**
		Overhead/In-ground Sensor -SOV	Each	2	$4,500	$9,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	0	$12,000	$0	
	5. Lane Processing Equipment	Lane Controller	Each	2	$12,500	$25,000	**$38,000**
		Lane Cabinet & Electronics	Each	2	6,500	$13,000	
		Lane Software	Lump Sum	0	$200,000	$0	
	6. Signs	Variable Message Sign (Mainline)	Each	0	$120,000	$0	**$280,000**
		Variable Message Sign (Ramp Entrance)	Each	2	$60,000	$120,000	
		Fixed Overhead Signs (Bridge Structure)	Each	2	$60,000	$120,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	4	$10,000	$40,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	2600	$40	$104,000	**$104,000**
	8. Communications	Connection to Existing Fiber	Each	2	$1,000	$2,000	**$20,000**
		Network Equipment	Each	2	$9,000	$18,000	
		Fiber to HOT Operation Center	Ft	0	$1	$0	
	9. Power	Breaker Panel	Each	2	$2,000	$4,000	**$101,000**
		UPS & Battery Cabinet	Each	2	$5,000	$10,000	
		Conduit & Wiring	Each	2	$20,000	$40,000	
		Disconnect & By-Pass Switch	Each	2	$3,500	$7,000	
		Service Connection	Each	2	$20,000	$40,000	
	10. Mini Generator	Generator Unit	Each	2	$6,500	$13,000	**$17,000**
		Conduit & Wiring	Each	2	$2,000	$4,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$211,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$1,056,000**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$106,000**
	14. Construction Total	Total of Item 12 and Item 13					**$1,162,000**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$232,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	0	$100,000	$0	**$0**
		Database SW and Licenses	Each	0	$50,000	$0	
		Host Software	Lump Sum	0	$200,000	$0	
		System Application Software	Lump Sum	0	$400,000	$0	
		Maintenance Management	Lump Sum	0	$200,000	$0	
		Equipment Cabinet	Each	0	$2,000	$0	
		Router & Switch	Each	0	$2,000	$0	
		Network Equipment & Materials	Lump Sum	0	$8,000	$0	
		Workstations	Each	0	$2,000	$0	
		Printers	Each	0	$2,000	$0	
		UPS & Battery Cabinet	Each	0	$6,000	$0	
		Installation and Configuration Support	Lump Sum	0	$20,000	$0	
	2. Transponders	Transponders	Each	50,000	$25	$1,250,000	**$1,250,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	0	$2,000,000	$0	**$0**
	4. Operation Total	Operation Total					**$1,250,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$2,644,000**

CONCEPT B-1 - PHASE 3 CAPITAL COST ESTIMATE
2020 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	0	$65,000	$0	**$1,260,000**
		Gantry Structure - 2 Lane Cross Section	Each	10	$60,000	$600,000	
		Gantry Structure - 1 Lane Cross Section	Each	6	$30,000	$180,000	
		Toll & Communication Equipment Building	Each	16	$30,000	$480,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	10	$4,000	$40,000	**$279,000**
		ETC Reader	Each	16	$4,000	$64,000	
		Transceiver	Each	26	$3,500	$91,000	
		ETC Reader Controller	Each	16	$4,000	$64,000	
		Power Supply	Each	16	$250	$4,000	
		Surveillance Camera (Incident Management)	Each	16	$1,000	$16,000	
	3. Violation Enforcement System	Camera - HOV	Each	16	$3,500	$56,000	**$186,000**
		Camera - SOV	Each	16	$3,500	$56,000	
		Power Supply	Each	8	$250	$2,000	
		Indicator Light - HOV	Each	8	$2,000	$16,000	
		Indicator Light - SOV	Each	8	$2,000	$16,000	
		VES Controller	Each	8	$5,000	$40,000	
		Image Processor	Each	0	$6,500	$0	
		Optical Character Recognition Server	Each	0	$7,000	$0	
		Optical Character Recognition Software/Interface	Lump sum	0	$20,000	$0	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	8	$4,500	$36,000	**$72,000**
		Overhead/In-ground Sensor -SOV	Each	8	$4,500	$36,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	0	$12,000	$0	
	5. Lane Processing Equipment	Lane Controller	Each	16	$12,500	$200,000	**$304,000**
		Lane Cabinet & Electronics	Each	16	6,500	$104,000	
		Lane Software	Lump Sum	0	$200,000	$0	
	6. Signs	Variable Message Sign (Mainline)	Each	2	$120,000	$240,000	**$1,240,000**
		Variable Message Sign (Ramp Entrance)	Each	6	$60,000	$360,000	
		Fixed Overhead Signs (Bridge Structure)	Each	8	$60,000	$480,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	16	$10,000	$160,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	10400	$40	$416,000	**$416,000**
	8. Communications	Connection to Existing Fiber	Each	16	$1,000	$16,000	**$160,000**
		Network Equipment	Each	16	$9,000	$144,000	
		Fiber to HOT Operation Center	Ft	0	$1	$0	
	9. Power	Breaker Panel	Each	16	$2,000	$32,000	**$808,000**
		UPS & Battery Cabinet	Each	16	$5,000	$80,000	
		Conduit & Wiring	Each	16	$20,000	$320,000	
		Disconnect & By-Pass Switch	Each	16	$3,500	$56,000	
		Service Connection	Each	16	$20,000	$320,000	
	10. Mini Generator	Generator Unit	Each	16	$6,500	$104,000	**$136,000**
		Conduit & Wiring	Each	16	$2,000	$32,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$1,215,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$6,076,000**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$608,000**
	14. Construction Total	Total of Item 12 and Item 13					**$6,684,000**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$1,337,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	0	$100,000	$0	**$0**
		Database SW and Licenses	Each	0	$50,000	$0	
		Host Software	Lump Sum	0	$200,000	$0	
		System Application Software	Lump Sum	0	$400,000	$0	
		Maintenance Management	Lump Sum	0	$200,000	$0	
		Equipment Cabinet	Each	0	$2,000	$0	
		Router & Switch	Each	0	$2,000	$0	
		Network Equipment & Materials	Lump Sum	0	$8,000	$0	
		Workstations	Each	0	$2,000	$0	
		Printers	Each	0	$2,000	$0	
		UPS & Battery Cabinet	Each	0	$6,000	$0	
		Installation and Configuration Support	Lump Sum	0	$20,000	$0	
	2. Transponders	Transponders	Each	75,000	$25	$1,875,000	**$1,875,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	0	$2,000,000	$0	**$0**
	4. Operation Total	Operation Total					**$1,875,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$9,896,000**

CONCEPT B-1 - BUILD-OUT

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	2	$65,000	$130,000	**$2,230,000**
		Gantry Structure - 2 Lane Cross Section	Each	16	$60,000	$960,000	
		Gantry Structure - 1 Lane Cross Section	Each	10	$30,000	$300,000	
		Toll & Communication Equipment Building	Each	28	$30,000	$840,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	18	$4,000	$72,000	**$507,000**
		ETC Reader	Each	30	$4,000	$120,000	
		Transceiver	Each	48	$3,500	$168,000	
		ETC Reader Controller	Each	28	$4,000	$112,000	
		Power Supply	Each	28	$250	$7,000	
		Surveillance Camera (Incident Management)	Each	28	$1,000	$28,000	
	3. Violation Enforcement System	Camera - HOV	Each	30	$3,500	$105,000	**$391,250**
		Camera - SOV	Each	32	$3,500	$112,000	
		Power Supply	Each	15	$250	$3,750	
		Indicator Light - HOV	Each	15	$2,000	$30,000	
		Indicator Light - SOV	Each	16	$2,000	$32,000	
		VES Controller	Each	15	$5,000	$75,000	
		Image Processor	Each	1	$6,500	$6,500	
		Optical Character Recognition Server	Each	1	$7,000	$7,000	
		Optical Character Recognition Software/Interface	Lump sum	1	$20,000	$20,000	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	15	$4,500	$67,500	**$151,500**
		Overhead/In-ground Sensor -SOV	Each	16	$4,500	$72,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	1	$12,000	$12,000	
	5. Lane Processing Equipment	Lane Controller	Each	28	$12,500	$350,000	**$732,000**
		Lane Cabinet & Electronics	Each	28	6,500	$182,000	
		Lane Software	Lump Sum	1	$200,000	$200,000	
	6. Signs	Variable Message Sign (Mainline)	Each	3	$120,000	$360,000	**$2,290,000**
		Variable Message Sign (Ramp Entrance)	Each	12	$60,000	$720,000	
		Fixed Overhead Signs (Bridge Structure)	Each	15	$60,000	$900,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	31	$10,000	$310,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	19500	$40	$780,000	**$780,000**
	8. Communications	Connection to Existing Fiber	Each	28	$1,000	$28,000	**$295,000**
		Network Equipment	Each	28	$9,000	$252,000	
		Fiber to HOT Operation Center	Ft	15000	$1	$15,000	
	9. Power	Breaker Panel	Each	28	$2,000	$56,000	**$1,414,000**
		UPS & Battery Cabinet	Each	28	$5,000	$140,000	
		Conduit & Wiring	Each	28	$20,000	$560,000	
		Disconnect & By-Pass Switch	Each	28	$3,500	$98,000	
		Service Connection	Each	28	$20,000	$560,000	
	10. Mini Generator	Generator Unit	Each	28	$6,500	$182,000	**$238,000**
		Conduit & Wiring	Each	28	$2,000	$56,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$2,257,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$11,285,750**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$1,129,000**
	14. Construction Total	Total of Item 12 and Item 13					**$12,414,750**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$2,483,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	2	$100,000	$200,000	**$1,150,000**
		Database SW and Licenses	Each	2	$50,000	$100,000	
		Host Software	Lump Sum	1	$200,000	$200,000	
		System Application Software	Lump Sum	1	$400,000	$400,000	
		Maintenance Management	Lump Sum	1	$200,000	$200,000	
		Equipment Cabinet	Each	2	$2,000	$4,000	
		Router & Switch	Each	1	$2,000	$2,000	
		Network Equipment & Materials	Lump Sum	1	$8,000	$8,000	
		Workstations	Each	4	$2,000	$8,000	
		Printers	Each	1	$2,000	$2,000	
		UPS & Battery Cabinet	Each	1	$6,000	$6,000	
		Installation and Configuration Support	Lump Sum	1	$20,000	$20,000	
	2. Transponders	Transponders	Each	225,000	$25	$5,625,000	**$5,625,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	1	$2,000,000	$2,000,000	**$2,000,000**
	4. Operation Total	Operation Total					**$8,775,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$23,672,750**

CONCEPT B-2 - PHASE 1 CAPITAL COST ESTIMATE
2010 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	2	$65,000	$130,000	**$670,000**
		Gantry Structure - 2 Lane Cross Section	Each	0	$60,000	$0	
		Gantry Structure - 1 Lane Cross Section	Each	8	$30,000	$240,000	
		Toll & Communication Equipment Building	Each	10	$30,000	$300,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	2	$4,000	$8,000	**$157,500**
		ETC Reader	Each	12	$4,000	$48,000	
		Transceiver	Each	14	$3,500	$49,000	
		ETC Reader Controller	Each	10	$4,000	$40,000	
		Power Supply	Each	10	$250	$2,500	
		Surveillance Camera (Incident Management)	Each	10	$1,000	$10,000	
	3. Violation Enforcement System	Camera - HOV	Each	2	$3,500	$7,000	**$122,750**
		Camera - SOV	Each	12	$3,500	$42,000	
		Power Supply	Each	5	$250	$1,250	
		Indicator Light - HOV	Each	1	$2,000	$2,000	
		Indicator Light - SOV	Each	6	$2,000	$12,000	
		VES Controller	Each	5	$5,000	$25,000	
		Image Processor	Each	1	$6,500	$6,500	
		Optical Character Recognition Server	Each	1	$7,000	$7,000	
		Optical Character Recognition Software/Interface	Lump sum	1	$20,000	$20,000	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	1	$4,500	$4,500	**$43,500**
		Overhead/In-ground Sensor -SOV	Each	6	$4,500	$27,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	1	$12,000	$12,000	
	5. Lane Processing Equipment	Lane Controller	Each	10	$12,500	$125,000	**$390,000**
		Lane Cabinet & Electronics	Each	10	6,500	$65,000	
		Lane Software	Lump Sum	1	$200,000	$200,000	
	6. Signs	Variable Message Sign (Mainline)	Each	1	$120,000	$120,000	**$770,000**
		Variable Message Sign (Ramp Entrance)	Each	4	$60,000	$240,000	
		Fixed Overhead Signs (Bridge Structure)	Each	5	$60,000	$300,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	11	$10,000	$110,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	1300	$40	$52,000	**$52,000**
	8. Communications	Connection to Existing Fiber	Each	10	$1,000	$10,000	**$115,000**
		Network Equipment	Each	10	$9,000	$90,000	
		Fiber to HOT Operation Center	Ft	15000	$1	$15,000	
	9. Power	Breaker Panel	Each	10	$2,000	$20,000	**$505,000**
		UPS & Battery Cabinet	Each	10	$5,000	$50,000	
		Conduit & Wiring	Each	10	$20,000	$200,000	
		Disconnect & By-Pass Switch	Each	10	$3,500	$35,000	
		Service Connection	Each	10	$20,000	$200,000	
	10. Mini Generator	Generator Unit	Each	10	$6,500	$65,000	**$85,000**
		Conduit & Wiring	Each	10	$2,000	$20,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$728,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$3,638,750**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$364,000**
	14. Construction Total	Total of Item 12 and Item 13					**$4,002,750**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$801,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	2	$100,000	$200,000	**$1,150,000**
		Database SW and Licenses	Each	2	$50,000	$100,000	
		Host Software	Lump Sum	1	$200,000	$200,000	
		System Application Software	Lump Sum	1	$400,000	$400,000	
		Maintenance Management	Lump Sum	1	$200,000	$200,000	
		Equipment Cabinet	Each	2	$2,000	$4,000	
		Router & Switch	Each	1	$2,000	$2,000	
		Network Equipment & Materials	Lump Sum	1	$8,000	$8,000	
		Workstations	Each	4	$2,000	$8,000	
		Printers	Each	1	$2,000	$2,000	
		UPS & Battery Cabinet	Each	1	$6,000	$6,000	
		Installation and Configuration Support	Lump Sum	1	$20,000	$20,000	
	2. Transponders	Transponders	Each	100,000	$25	$2,500,000	**$2,500,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	1	$2,000,000	$2,000,000	**$2,000,000**
	4. Operation Total	Operation Total					**$5,650,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$10,453,750**

CONCEPT B-2 - PHASE 2 CAPITAL COST ESTIMATE
2015 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	0	$65,000	$0	**$180,000**
		Gantry Structure - 2 Lane Cross Section	Each	2	$60,000	$120,000	
		Gantry Structure - 1 Lane Cross Section	Each	0	$30,000	$0	
		Toll & Communication Equipment Building	Each	2	$30,000	$60,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	2	$4,000	$8,000	**$40,500**
		ETC Reader	Each	2	$4,000	$8,000	
		Transceiver	Each	4	$3,500	$14,000	
		ETC Reader Controller	Each	2	$4,000	$8,000	
		Power Supply	Each	2	$250	$500	
		Surveillance Camera (Incident Management)	Each	2	$1,000	$2,000	
	3. Violation Enforcement System	Camera - HOV	Each	4	$3,500	$14,000	**$46,500**
		Camera - SOV	Each	4	$3,500	$14,000	
		Power Supply	Each	2	$250	$500	
		Indicator Light - HOV	Each	2	$2,000	$4,000	
		Indicator Light - SOV	Each	2	$2,000	$4,000	
		VES Controller	Each	2	$5,000	$10,000	
		Image Processor	Each	0	$6,500	$0	
		Optical Character Recognition Server	Each	0	$7,000	$0	
		Optical Character Recognition Software/Interface	Lump sum	0	$20,000	$0	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	2	$4,500	$9,000	**$18,000**
		Overhead/In-ground Sensor -SOV	Each	2	$4,500	$9,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	0	$12,000	$0	
	5. Lane Processing Equipment	Lane Controller	Each	2	$12,500	$25,000	**$38,000**
		Lane Cabinet & Electronics	Each	2	6,500	$13,000	
		Lane Software	Lump Sum	0	$200,000	$0	
	6. Signs	Variable Message Sign (Mainline)	Each	0	$120,000	$0	**$280,000**
		Variable Message Sign (Ramp Entrance)	Each	2	$60,000	$120,000	
		Fixed Overhead Signs (Bridge Structure)	Each	2	$60,000	$120,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	4	$10,000	$40,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	2600	$40	$104,000	**$104,000**
	8. Communications	Connection to Existing Fiber	Each	2	$1,000	$2,000	**$20,000**
		Network Equipment	Each	2	$9,000	$18,000	
		Fiber to HOT Operation Center	Ft	0	$1	$0	
	9. Power	Breaker Panel	Each	2	$2,000	$4,000	**$101,000**
		UPS & Battery Cabinet	Each	2	$5,000	$10,000	
		Conduit & Wiring	Each	2	$20,000	$40,000	
		Disconnect & By-Pass Switch	Each	2	$3,500	$7,000	
		Service Connection	Each	2	$20,000	$40,000	
	10. Mini Generator	Generator Unit	Each	2	$6,500	$13,000	**$17,000**
		Conduit & Wiring	Each	2	$2,000	$4,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$211,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$1,056,000**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$106,000**
	14. Construction Total	Total of Item 12 and Item 13					**$1,162,000**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$232,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	0	$100,000	$0	**$0**
		Database SW and Licenses	Each	0	$50,000	$0	
		Host Software	Lump Sum	0	$200,000	$0	
		System Application Software	Lump Sum	0	$400,000	$0	
		Maintenance Management	Lump Sum	0	$200,000	$0	
		Equipment Cabinet	Each	0	$2,000	$0	
		Router & Switch	Each	0	$2,000	$0	
		Network Equipment & Materials	Lump Sum	0	$8,000	$0	
		Workstations	Each	0	$2,000	$0	
		Printers	Each	0	$2,000	$0	
		UPS & Battery Cabinet	Each	0	$6,000	$0	
		Installation and Configuration Support	Lump Sum	0	$20,000	$0	
	2. Transponders	Transponders	Each	75,000	$25	$1,875,000	**$1,875,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	0	$2,000,000	$0	**$0**
	4. Operation Total	Operation Total					**$1,875,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$3,269,000**

CONCEPT B-2 - PHASE 3 CAPITAL COST ESTIMATE
2020 Construction Year

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	0	$65,000	$0	**$1,080,000**
		Gantry Structure - 2 Lane Cross Section	Each	4	$60,000	$240,000	
		Gantry Structure - 1 Lane Cross Section	Each	12	$30,000	$360,000	
		Toll & Communication Equipment Building	Each	16	$30,000	$480,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	4	$4,000	$16,000	**$234,000**
		ETC Reader	Each	16	$4,000	$64,000	
		Transceiver	Each	20	$3,500	$70,000	
		ETC Reader Controller	Each	16	$4,000	$64,000	
		Power Supply	Each	16	$250	$4,000	
		Surveillance Camera (Incident Management)	Each	16	$1,000	$16,000	
	3. Violation Enforcement System	Camera - HOV	Each	4	$3,500	$14,000	**$132,000**
		Camera - SOV	Each	16	$3,500	$56,000	
		Power Supply	Each	8	$250	$2,000	
		Indicator Light - HOV	Each	2	$2,000	$4,000	
		Indicator Light - SOV	Each	8	$2,000	$16,000	
		VES Controller	Each	8	$5,000	$40,000	
		Image Processor	Each	0	$6,500	$0	
		Optical Character Recognition Server	Each	0	$7,000	$0	
		Optical Character Recognition Software/Interface	Lump sum	0	$20,000	$0	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	2	$4,500	$9,000	**$45,000**
		Overhead/In-ground Sensor -SOV	Each	8	$4,500	$36,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	0	$12,000	$0	
	5. Lane Processing Equipment	Lane Controller	Each	16	$12,500	$200,000	**$304,000**
		Lane Cabinet & Electronics	Each	16	6,500	$104,000	
		Lane Software	Lump Sum	0	$200,000	$0	
	6. Signs	Variable Message Sign (Mainline)	Each	2	$120,000	$240,000	**$1,240,000**
		Variable Message Sign (Ramp Entrance)	Each	6	$60,000	$360,000	
		Fixed Overhead Signs (Bridge Structure)	Each	8	$60,000	$480,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	16	$10,000	$160,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	2600	$40	$104,000	**$104,000**
	8. Communications	Connection to Existing Fiber	Each	16	$1,000	$16,000	**$160,000**
		Network Equipment	Each	16	$9,000	$144,000	
		Fiber to HOT Operation Center	Ft	0	$1	$0	
	9. Power	Breaker Panel	Each	16	$2,000	$32,000	**$808,000**
		UPS & Battery Cabinet	Each	16	$5,000	$80,000	
		Conduit & Wiring	Each	16	$20,000	$320,000	
		Disconnect & By-Pass Switch	Each	16	$3,500	$56,000	
		Service Connection	Each	16	$20,000	$320,000	
	10. Mini Generator	Generator Unit	Each	16	$6,500	$104,000	**$136,000**
		Conduit & Wiring	Each	16	$2,000	$32,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$1,061,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$5,304,000**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$530,000**
	14. Construction Total	Total of Item 12 and Item 13					**$5,834,000**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$1,167,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	0	$100,000	$0	**$0**
		Database SW and Licenses	Each	0	$50,000	$0	
		Host Software	Lump Sum	0	$200,000	$0	
		System Application Software	Lump Sum	0	$400,000	$0	
		Maintenance Management	Lump Sum	0	$200,000	$0	
		Equipment Cabinet	Each	0	$2,000	$0	
		Router & Switch	Each	0	$2,000	$0	
		Network Equipment & Materials	Lump Sum	0	$8,000	$0	
		Workstations	Each	0	$2,000	$0	
		Printers	Each	0	$2,000	$0	
		UPS & Battery Cabinet	Each	0	$6,000	$0	
		Installation and Configuration Support	Lump Sum	0	$20,000	$0	
	2. Transponders	Transponders	Each	50,000	$25	$1,250,000	**$1,250,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	0	$2,000,000	$0	**$0**
	4. Operation Total	Operation Total					**$1,250,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$8,251,000**

CONCEPT B-2 - BUILD-OUT

CAPITAL COST ESTIMATE

Cost Category	Cost Items	Sub-Item Description	Unit of Measure	Quantity	Unit Price	Extended Price	Sub Total
I. Right of Way	**Right of Way**						
II. Construction	1. Structures	Gantry Structure - 3 Lane Cross Section	Each	2	$65,000	$130,000	**$1,930,000**
		Gantry Structure - 2 Lane Cross Section	Each	6	$60,000	$360,000	
		Gantry Structure - 1 Lane Cross Section	Each	20	$30,000	$600,000	
		Toll & Communication Equipment Building	Each	28	$30,000	$840,000	
	2. Electronic Toll Collection	ETC Reader (HOV lane)	Each	8	$4,000	$32,000	**$432,000**
		ETC Reader	Each	30	$4,000	$120,000	
		Transceiver	Each	38	$3,500	$133,000	
		ETC Reader Controller	Each	28	$4,000	$112,000	
		Power Supply	Each	28	$250	$7,000	
		Surveillance Camera (Incident Management)	Each	28	$1,000	$28,000	
	3. Violation Enforcement System	Camera - HOV	Each	10	$3,500	$35,000	**$301,250**
		Camera - SOV	Each	32	$3,500	$112,000	
		Power Supply	Each	15	$250	$3,750	
		Indicator Light - HOV	Each	5	$2,000	$10,000	
		Indicator Light - SOV	Each	16	$2,000	$32,000	
		VES Controller	Each	15	$5,000	$75,000	
		Image Processor	Each	1	$6,500	$6,500	
		Optical Character Recognition Server	Each	1	$7,000	$7,000	
		Optical Character Recognition Software/Interface	Lump sum	1	$20,000	$20,000	
	4. Vehicle Detection & Violation Trigger	Overhead/In-ground Sensor -HOV	Each	5	$4,500	$22,500	**$106,500**
		Overhead/In-ground Sensor -SOV	Each	16	$4,500	$72,000	
		Software, Interface Support, engineering Support & Documentation	Lump Sum	1	$12,000	$12,000	
	5. Lane Processing Equipment	Lane Controller	Each	28	$12,500	$350,000	**$732,000**
		Lane Cabinet & Electronics	Each	28	6,500	$182,000	
		Lane Software	Lump Sum	1	$200,000	$200,000	
	6. Signs	Variable Message Sign (Mainline)	Each	3	$120,000	$360,000	**$2,290,000**
		Variable Message Sign (Ramp Entrance)	Each	12	$60,000	$720,000	
		Fixed Overhead Signs (Bridge Structure)	Each	15	$60,000	$900,000	
		Fixed Overhead Signs (mounted on the gantry)	Each	31	$10,000	$310,000	
	7. Pavement	Mainline Widening at the Tolling Zone	per square yard (12" concrete)	6500	$40	$260,000	**$260,000**
	8. Communications	Connection to Existing Fiber	Each	28	$1,000	$28,000	**$295,000**
		Network Equipment	Each	28	$9,000	$252,000	
		Fiber to HOT Operation Center	Ft	15000	$1	$15,000	
	9. Power	Breaker Panel	Each	28	$2,000	$56,000	**$1,414,000**
		UPS & Battery Cabinet	Each	28	$5,000	$140,000	
		Conduit & Wiring	Each	28	$20,000	$560,000	
		Disconnect & By-Pass Switch	Each	28	$3,500	$98,000	
		Service Connection	Each	28	$20,000	$560,000	
	10. Mini Generator	Generator Unit	Each	28	$6,500	$182,000	**$238,000**
		Conduit & Wiring	Each	28	$2,000	$56,000	
	11. Contigencies	25% of Subtotal (Item 1 through Item 10)	25%				**$2,000,000**
	12. Construction Subtotal	subtotal of Item 1 Through Item 11					**$9,998,750**
	13. Mobilization	10% of Construction Subtotal (Item 12)	10%				**$1,000,000**
	14. Construction Total	Total of Item 12 and Item 13					**$10,998,750**
III. Design Engineering and Admin	Design Engineering and Admin	20% of Line Construction Total	20%				**$2,200,000**
IV. Capital Cost for Operations	1. Back-office Equipment	Host Server & Data Storage	Each	2	$100,000	$200,000	**$1,150,000**
		Database SW and Licenses	Each	2	$50,000	$100,000	
		Host Software	Lump Sum	1	$200,000	$200,000	
		System Application Software	Lump Sum	1	$400,000	$400,000	
		Maintenance Management	Lump Sum	1	$200,000	$200,000	
		Equipment Cabinet	Each	2	$2,000	$4,000	
		Router & Switch	Each	1	$2,000	$2,000	
		Network Equipment & Materials	Lump Sum	1	$8,000	$8,000	
		Workstations	Each	4	$2,000	$8,000	
		Printers	Each	1	$2,000	$2,000	
		UPS & Battery Cabinet	Each	1	$6,000	$6,000	
		Installation and Configuration Support	Lump Sum	1	$20,000	$20,000	
	2. Transponders	Transponders	Each	200,000	$25	$5,000,000	**$5,000,000**
	3. CSC Hardware and Software	Customer Service Center	Lump Sum	1	$2,000,000	$2,000,000	**$2,000,000**
	4. Operation Total	Operation Total					**$8,150,000**
V. Total Estimate Cost	**Total of Construction Cost and Design Cost**						**$21,348,750**

STATE ROAD AND TOLLWAY AUTHORITY

Value Pricing on the I-75 HOV/BRT Project

STATE ROAD & TOLLWAY AUTHORITY SRTA

JACOBS HNTB