ATLANTA REGIONAL MANAGED LANE SYSTEM PLAN

CORRIDOR EVALUATION AND FINAL RECOMMENDATIONS

PREPARED FOR

Georgia Department of Transportation
Office of Planning
600 West Peachtree Street NW
Atlanta, GA 30308
Phone: (404) 631-1796
Fax: (404) 631-1804
Contact: Michelle Caldwell

PREPARED BY

HNTB Corporation
3715 Northside Parkway
400 Northcreek, Suite 600
Atlanta, GA 30327
Phone: (404) 946-5708
Fax: (404) 841-2820
Contact: Andrew C. Smith, AICP

Georgia Department of Transportation

January 2010

HNTB

Atlanta Regional Managed Lane System Plan

Technical Memorandum 12: Corridor Evaluation and Final Recommendations

Prepared for:

Georgia Department of Transportation

One Georgia Center, Suite 2700

600 West Peachtree Street NW

Atlanta, Georgia 30308

Prepared by:

HNTB Corporation

CORRIDOR EVALUATION AND FINAL RECOMMENDATIONS FOR MANAGED LANES

A. Purpose

The objective of this task was to apply output from previous analyses (including transportation performance results, traffic and revenue results, project costs, and financial feasibility) in order to generate a comprehensive plan for managed lanes in Metro Atlanta. This effort ultimately links the technical analysis to the final plan. In this task, the planning team employed a three-tiered screening approach to arrive at corridor-specific, managed lane recommendations. Those recommendations were then prioritized to create a phased implementation plan that serves as the roadmap for a managed lane system in the Atlanta region.

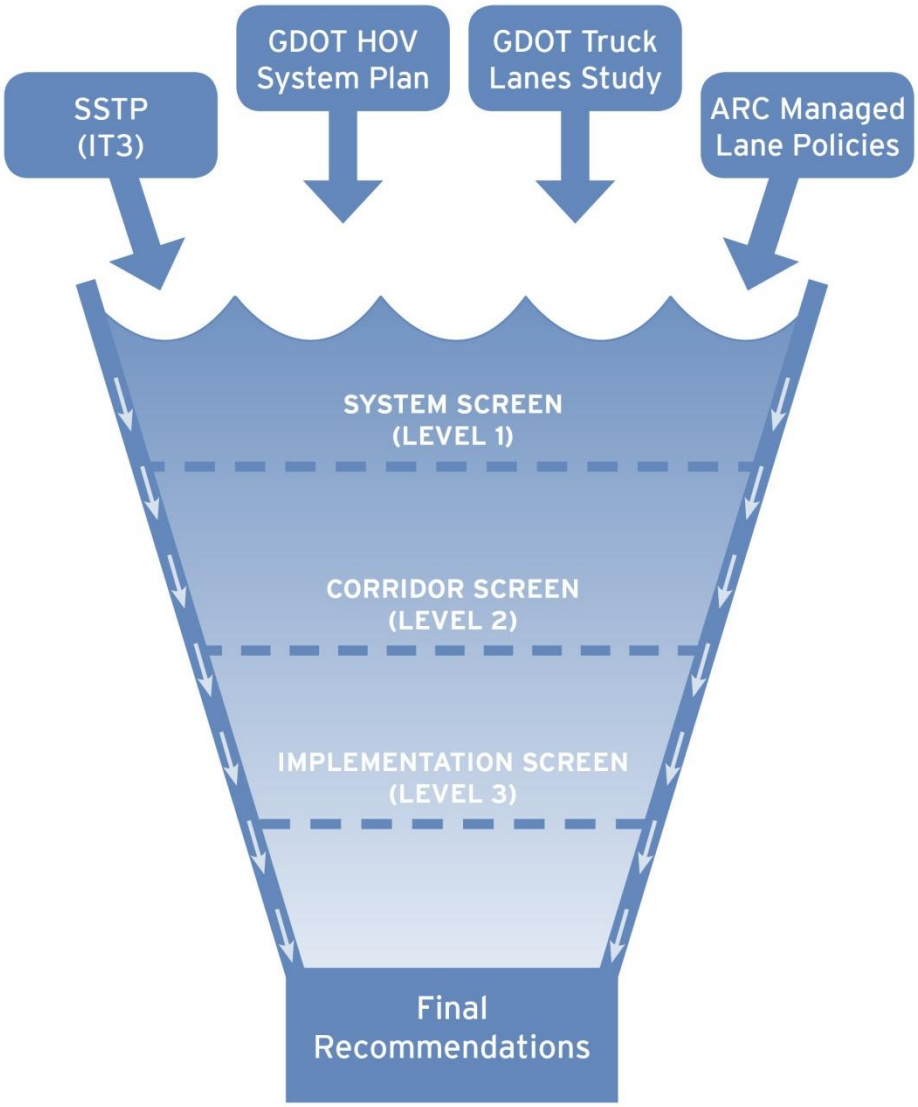
This chapter presents a summary of the methodology employed for each level of the screening process, the results and outcomes for each of the three screens, and the detailed implementation plan for the complete system of managed lanes.

B. Methodology

In order to determine the final recommendations for managed lanes on each corridor, it was important to understand the trade-offs associated with specific decisions related to configuration, policies, etc. The planning team developed a three-tiered screening approach designed to arrive at one preferred solution for each corridor in the managed lane network. This process sought balance between the system-optimal solution and what was best for each corridor, recognizing that individual projects would ultimately work in concert to provide transportation choice and improved mobility on a regional scale.

Initially, a comprehensive list of options was under consideration. Sources for these options included GDOT's HOV Strategic Implementation Study, completed in 2003, GDOT's Statewide Truck Lanes Needs Identification Study, completed in 2007, the Atlanta Regional Commission's managed lane policies, and Georgia's Statewide Strategic Transportation Plan Investing in Tomorrow's Transportation Today (IT3) initiative, completed in 2009. The first step in the evaluation process was application of the system-level screen. The purpose of this screen was to eliminate lower-performing alternatives for all corridors. Alternatives that survived the system-level screen were further analyzed in the corridor-level screen. Output from this included a limited set of potential solutions for each corridor. Finally, the implementation screen was employed to determine detailed managed lane recommendations. A schematic of this process can be seen in Figure 1. Each of the three screens is described in greater detail in the following sections.

Figure 1: Screening Process Schematic



Managed lane alternatives were packaged into four groups for screening purposes: location, operations, policies, and concept. These four groups of alternatives were explored in each of the three screening levels. A schematic of this analysis framework can be seen in Figure 2. Each of the four elements overlap among one another, and each is influenced by risks associated with the analysis techniques, particularly the traffic and revenue forecasts. This categorical approach provided a comprehensive overview of managed lane possibilities and helped in maintaining consistency throughout the screening processes.

Figure 2: Analysis Framework

System Screen (Level 1)

Under the system-level screen, the location element includes an evaluation of candidate corridors. Using screening factors such as eligibility, access, and system connectivity, the planning team was able to identify the corridors that would most benefit from managed lane treatments. The system-level operations analysis applied information on corridor operational performance, activity center access and growth trends, and peak period directional splits to determine managed lane corridors that could be enhanced through the implementation of reversible lanes. Transportation performance measures and revenue forecasts were used to determine the best-performing policies at the system level, and the approximate number of lanes associated with each policy. Finally the system-level concept analysis included evaluation of lane balance and managed lane terminal treatments.

Corridor Screen (Level 2)

Under the corridor-level screen, the location element includes an evaluation of travel demand to determine the number of managed lanes, appropriate termini, and access location needs. In addition, a constructability assessment was performed to determine whether managed lanes were best suited for the median or on the outside of existing lanes along each corridor. The corridor-level operations analysis factored in revenue, cost, revenue to cost (R/C) ratio, public sector gap, constructability, and lifecycle operations and maintenance (O&M) to determine the preferred configuration. Traffic and revenue forecasts, safety considerations, and system management issues were factored into the evaluation of truck eligibility in the managed lanes and to determine the preferred car-only option from the group of policies that was studied. Finally the corridor-level concept analysis included evaluation of barrier and buffer lane-separation treatments, along with engineering obstacles and challenges that could lead to fatal flaws.

Implementation Screen (Level 3)

Outcomes from the corridor screening process were further investigated under the implementation screen. For the location element, the ultimate corridor limits were reviewed to identify opportunities to contract the termini and/or reduce the number of managed lanes in order to capitalize on more cost-efficient project extents. Likewise, opportunities were also identified for policy changes (e.g. HOT4+, ETL, etc.) that could produce additional revenue if the financial goals of a project or projects were not being met. In addition, a planning-level financial analysis was conducted to evaluate operational configurations that minimized the public sector contribution required to fund these managed lane projects. Finally, the concept of general purpose lane conversion was studied as one alternative that could reduce cost and improve project financiability.

C. System Screen

Location

One of the first steps in establishing a managed lane system was to identify the set of corridors best suited for managed lane treatment. Figure 3 is a map of the study corridors. Every limited access facility in the 18-county Metro Atlanta region was included at this initial stage of evaluation.

Three primary factors were used as screening criteria for these corridors: eligibility, access, and system connectivity. From these primary factors, detailed characteristics were applied to determine the relative suitability of managed lanes. Corridors that scored highly according to these characteristics would be most favorable to managed lane application. Detailed screening criteria are shown in Table 1. A detailed explanation of this evaluation can be found in MLSP technical report titled *Candidate System Screening Process*.

Figure 3: Study Corridors

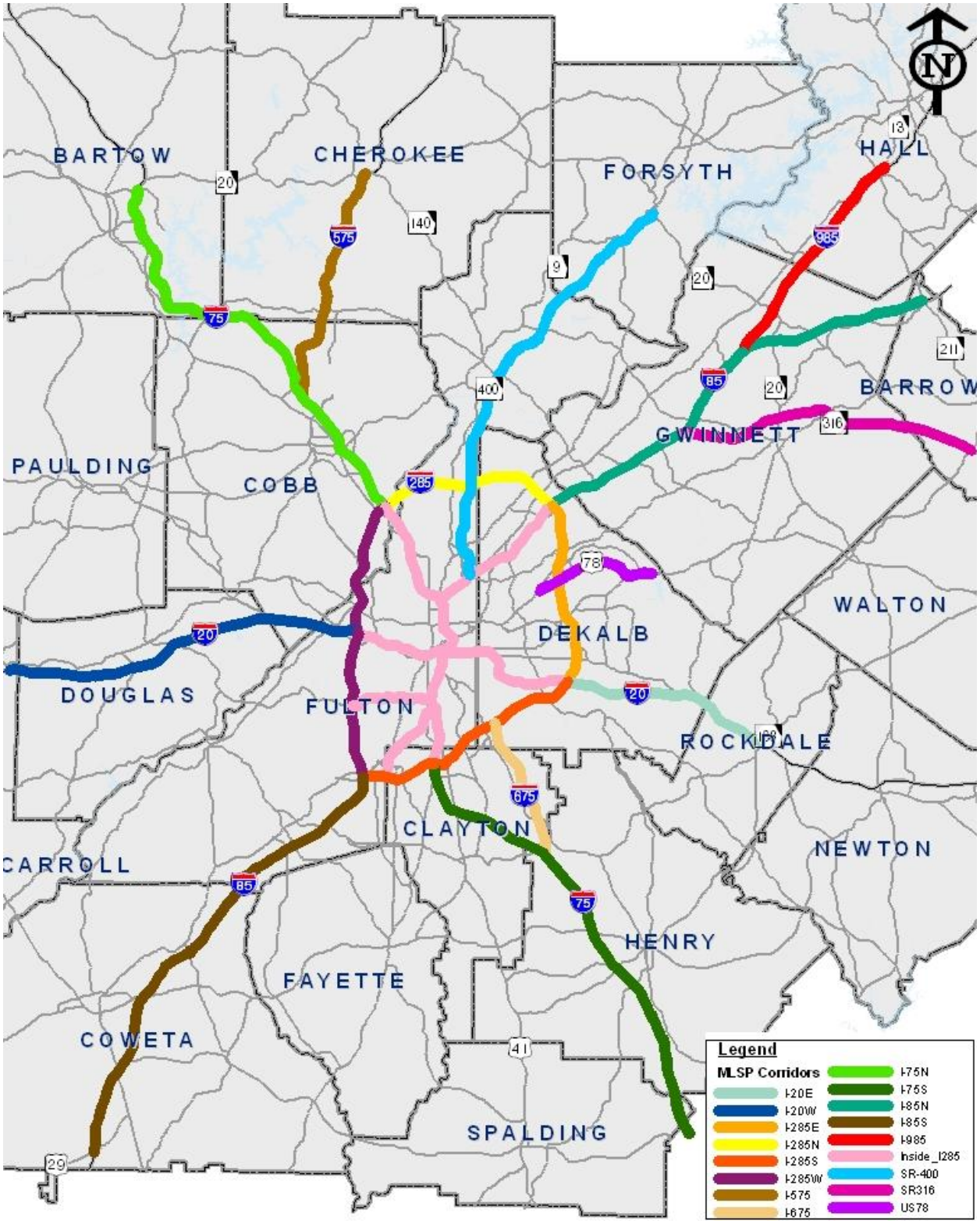


Table 1: Candidate System Screening Criteria

Factor	Metrics	Characteristics
Eligibility	Functional Classification	Functional classification as defined in the HPMS
	Existing Managed Lanes	Presence of Existing Managed Lanes
	Trip Length	Trips Length: > 10 miles
	Vehicle Occupancy	Percent of vehicles with 2 or more occupants
	Demand	Total Vehicles
		Total Trucks
		Total HOVs
	Level of Congestion	V/C Ratio
		Duration of Congestion (# of Hours)
		Travel Time Index
Access	Population Served	% Persons residing within 5 miles of corridor (2005)
		% Persons residing within 5 miles of corridor (2030)
	Jobs Served	% Jobs located within 5 miles of corridor (2005)
		% Jobs located within 5 miles of corridor (2030)
	Environmental Justice	EJ populations located along corridor
System Connectivity	Interchange Spacing	Interchanges per mile
	Connectivity to Other/ Candidate Managed Lanes	Number of System Connections
	Connectivity to Freight or Intermodal Facilities	Number of Freight Connections
	Connectivity to Transit	Presence of Existing Express Bus Service
		Presence of Planned Express Bus or BRT Service
		Presence of Park and Ride Lots
		Presence of Planned Park and Ride Lots
	Previous or On-Going Studies	Corridor identified as a candidate for TOL implementation by Truck Only Lane Study
		Design Activities Already Underway
		PPI Present on Corridor
		Corridor Identified as Priority in HOV System Plan

To achieve a better understanding of how some potential policy decisions can affect the suitability for managed lanes along these corridors, several sensitivity tests were conducted. The following policy scenarios were used to test sensitivity:

- Mobility Option – Policy decision to give users maximum mobility options;

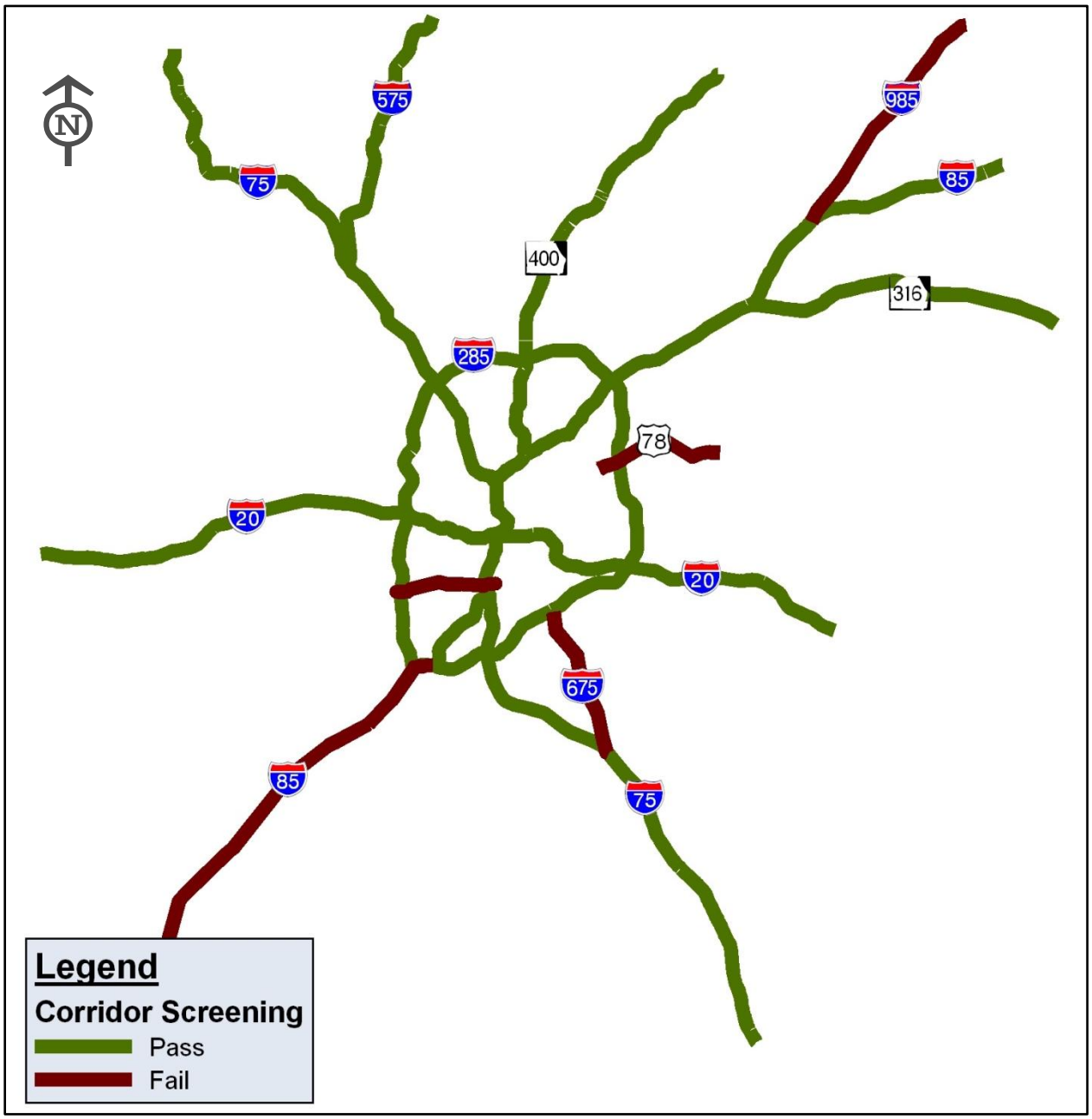
- Throughput – Policy decision to move the most amount of people through the transportation system;
- Support Transit Investment – Policy decision to support express bus service and Bus Rapid Transit;
- Revenue Maximization – Policy decision to maximize the revenue for managed lanes;
- Truck Movement – Policy decision to enhance the movement of trucks and freight; and,
- Fast Track Implementation – Policy decision to emphasize projects which have already moved forward in the planning and design process.

Upon review of the results of the candidate corridor screening and the flexibility of each candidate corridor under various policy decisions, the following tiers were developed:

- Tier 1 (Highest Priority)
  - I-75 North from I-285 North to SR 20
  - I-85 North from I-285 North to SR 211
  - I-20 East from I-285 East to SR 138
  - I-285 North from I-85 North to I-75 North
  - I-285 East from I-20 East to I-85 North
  - SR 400 from I-85 to SR 20
- Tier 2
  - I-75 South from I-285 South to SR 16
  - I-20 West from I-285 West to Post Road
  - I-285 Northwest from I-75 North to I-20 West
  - Inside I-285 (I-75, I-85, I-20, Langford Parkway)
  - I-575 from I-75 to SR 20
- Tier 3 (Lowest Priority)
  - I-85 South from I-285 South to US 29
  - I-285 South from I-75 South to I-20 East
  - I-285 Southwest from I-20 West to I-75 South
  - I-675 from I-75 to I-285
  - I-985 from I-85 to SR 13
  - SR 316 from I-85 to SR 81
  - US 78 from N Druid Hills Road to Rockbridge Road

All corridors in Tiers 1 and 2 were included in subsequent analyses. Also included was I-285 South, for system connectivity reasons, and SR 316, because of recent design activity. Corridors that passed the screening analysis are shown in green in Figure 4, and those that failed and were removed from consideration are shown in red.

Figure 4: Candidate Corridor Screen Results



Operations

Another major component of the system-level screen was the identification of corridors that would be enhanced through the implementation of reversible managed lanes. The base case assumption was bi-directional lanes, but those corridors where reversible lanes were deemed potentially successful were subject to additional analysis. Four primary factors were used to determine the suitability of reversible managed lanes on the project corridors: travel demand and operational performance, activity center access and regional growth trends, the market for reversible managed lanes, and the presence of HOV lanes. Metrics and detailed characteristics

were applied for each of these factors to determine the best candidates for this configuration. Detailed screening criteria are shown in Table 2.

Table 2: Reversible Managed Lanes Screening Criteria

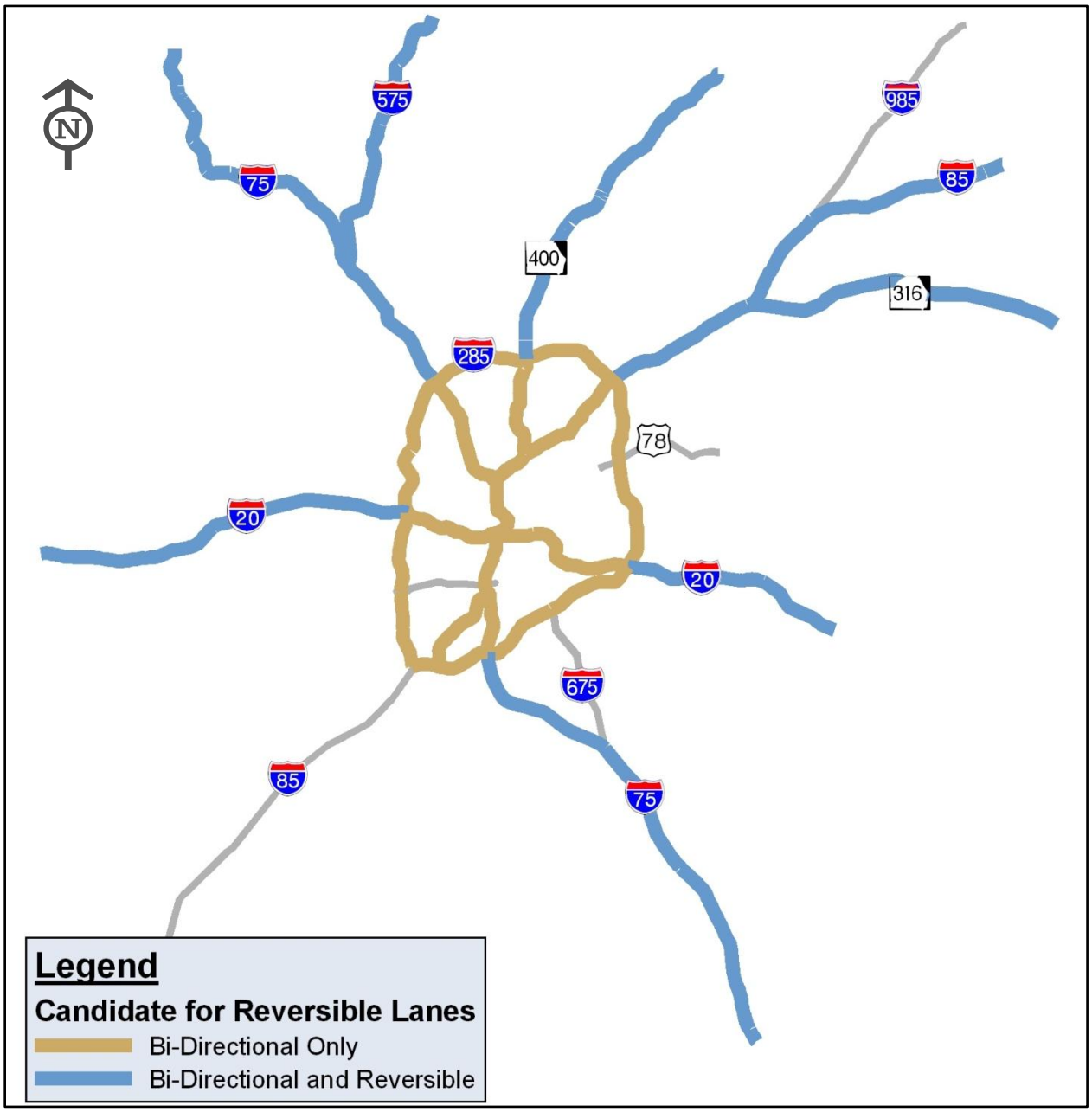
Factor	Metric	Characteristic
Travel Demand and Operational Performance	Peak Period Trip Length	Trips Length: > 10 miles
	Peak Period Travel Demand	Average Peak Direction Traffic Percentage (2005)
		Average Peak Direction Traffic Percentage (2030)
		Average Traffic Volume by Peak Direction (2005)
		Average Traffic Volume by Peak Direction (2030)
	Peak Period Operational Performance	V/C by Peak Direction (2005)
		V/C by Peak Direction (2030)
		Travel Time by Peak Direction (minutes) (2005)
		Travel Time by Peak Direction (minutes) (2030)
Activity Center Access and Regional Growth Trends	Employment Served	Activity Center and Regional Employment Growth from 2005 to 2030
Market for Reversible Managed Lanes	2030 Peak Period Peak Direction Express Toll Lanes Revenue Percentage	
Presence of HOV Lanes	Presence of HOV Lanes	

Low, medium, and high performing corridors were identified under each of these four factors. After blending the results for the factors, it became clear which corridors would potentially support reversible managed lanes. The radial freeways were most suited for such a treatment. There are significant problems with directionality and directional market share along I-285 and on the corridors inside I-285, precluding them from consideration for reversible lanes. The outcome from this analysis is summarized in the list below and in Figure 5. The technical memorandum titled "Identification of Candidate Corridors for Reversible Managed Lanes" contains a detailed description of the analysis results.

- Recommended for further analysis of reversible lanes
  - I-75 North from I-285 North to SR 20
  - I-75 South from I-285 South to SR 16
  - I-85 North from I-285 North to SR 211
  - I-20 East from I-285 East to SR 138
  - I-20 West from I-285 West to Post Road
  - SR 400 from I-85 to SR 20
  - I-575 from I-75 to SR 20

- NOT Recommended for further analysis of reversible lanes
  - I-285 Corridor
  - Inside I-285 (I-75, I-85, I-20, SR 400)

Figure 5: Reversible Lane Candidate Corridors



Policies

Several eligibility policies were studied in the initial costing and traffic and revenue efforts. These include HOT2+, HOT3+, HOT4+, ETL, METL, TOT, and ETL+TOT[1] and are described in detail in the MLSP technical report titled *Preliminary Traffic and Revenue Forecasts*. For the system screen, policies were removed from consideration if they did not perform well relative to other policies. Three of these policies showed relatively poor results and were removed from further consideration. These are outlined in the following discussion.

A HOT2+ policy allows HOVs with 2 or more occupants to access the managed lanes at no charge. Any remaining capacity can then be used by paying SOVs, but the number of SOVs is limited by the 45mph speed floor that managed lanes must observe, even in peak periods. Therefore, if all of the available lane capacity is utilized by free HOVs, then there is no opportunity for paying SOVs to use the lanes while maintaining the 45mph speed floor. Travel demand model results for year 2030 show that several corridors experience managed lane speeds below 45 mph in peak periods due to the future demand from HOVs. Figure 6 shows the demand profile for the managed lane system under an HOV2 configuration. The network used to develop this figure includes 2 HOV lanes in each direction on every corridor in the system.

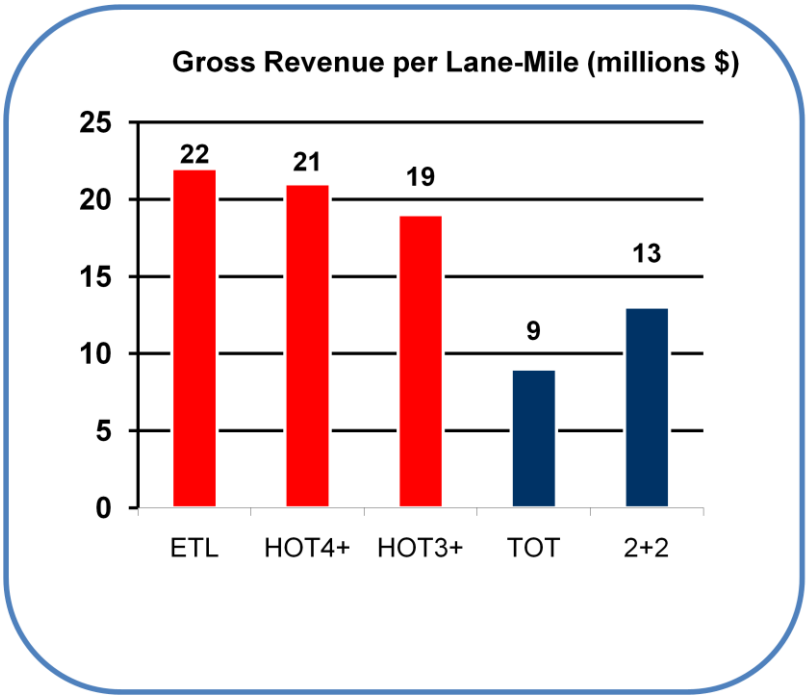
[1] HOT2+ is a managed lane designation where vehicles with 2 or more occupants are permitted in the lanes at no charge, while single-occupant vehicles can access the lanes only by paying a toll. Trucks are not permitted in the managed lanes.
HOT3+ means that vehicles with just 1 or 2 occupants are required to pay a toll. Vehicles with 3 or more occupants are permitted at no charge. Trucks are not permitted in the managed lanes.
HOT4+ means that vehicles with 1, 2 or 3 occupants are required to pay a toll. Vehicles with 4 or more occupants are permitted at no charge. Trucks are not permitted in the managed lanes.
ETL means that all vehicles in the managed lanes pay a toll. Trucks are not permitted in the managed lanes.
METL or Mixed ETL means that all vehicles, trucks included, are permitted in the managed lanes if they pay a toll.
TOT means the managed lanes are reserved for trucks willing to pay a toll.
2+2 or ETL + TOT means parallel systems of managed lanes, one with tolled passenger cars and the other with tolled trucks.

Figure 6: Year of HOV2+ Demand Exceeding Corridor Capacity

Figure 6 shows that on I-75 North between I-285 and I-575, there is no excess capacity to sell prior to year 2020, even with two HOV lanes provided in each direction. Much of the rest of the system exceeds capacity with free vehicles before 2030, while only some corridors still have capacity to sell after year 2030. A HOT2+ configuration will not provide a viable, revenue-generating system in the long term, and therefore does not meet the stated objectives of a managed lane system. In addition, it is not desirable to mix a HOT2+ policy with another policy, such as HOT3+, on a limited set of corridors. This could create compatibility and enforcement problems, and would likely lead to confusion among managed lane users. For these reasons HOT2+ was eliminated from further consideration.

The system that generates the most total revenue is the ETL+TOT system (2+2). The TOT system generates the least revenue, but is the least costly to build. However, examination of gross revenue per lane-mile of investment shows that neither of these systems is the most efficient in terms of revenue-to-cost ratios. Figure 7 indicates that ETL generates the most revenue per lane mile among these systems. HOT3+ and HOT4+ systems generate slightly less revenue per lane mile than the ETL system, but still more than the TOT and 2+2 systems.

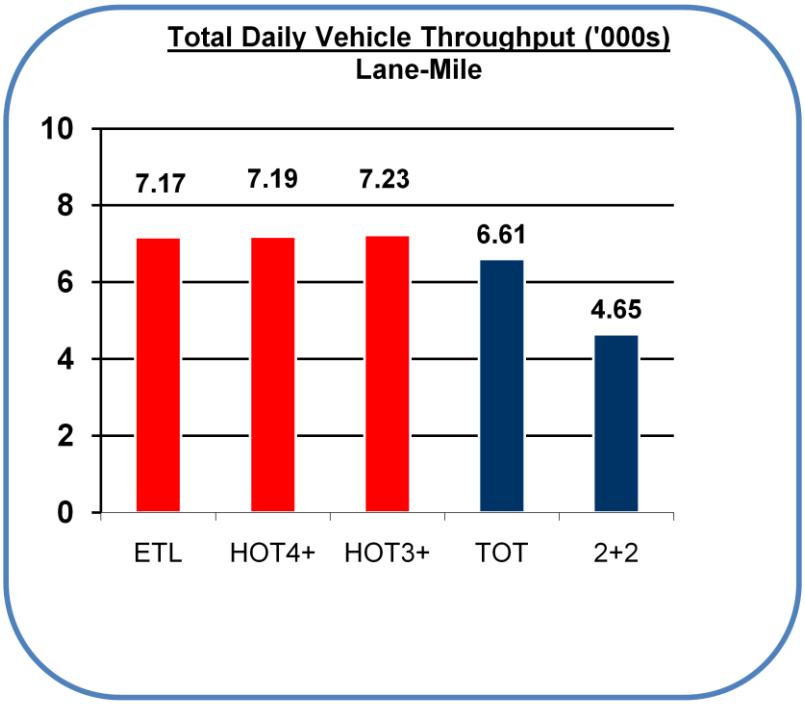
Figure 7: ETL, HOT4+, HOT3+, TOT, and 2+2 Gross Revenue per Lane-Mile



The ETL and HOT systems also provide greater mobility benefit to the region when compared to the TOT and 2+2 systems. Figure 8 highlights total daily vehicle throughput per lane-mile. This is a measure of mobility provided by the system normalized for the level of investment associated with the system. Again, the 2+2 system provides greater total mobility, but the ETL and HOT systems provide mobility more efficiently than the other two systems.

Overall, the ETL and HOT systems better accomplish the goals of a managed lane system than the TOT or ETL+TOT systems. Figures 7 and 8 highlight the extent to which ETL and HOT are more financially feasible and maximize throughput more efficiently. In general, TOT provides low revenues and minimal transportation system and user benefits. The 2+2 system provides marginal revenue benefits compared to ETL or HOT, but it does so with high cost and high impacts to the existing transportation network. For these reasons, TOT and ETL+TOT were removed from further consideration.

Figure 8: ETL, TOT, and 2+2 Vehicle Throughput per Lane-Mile

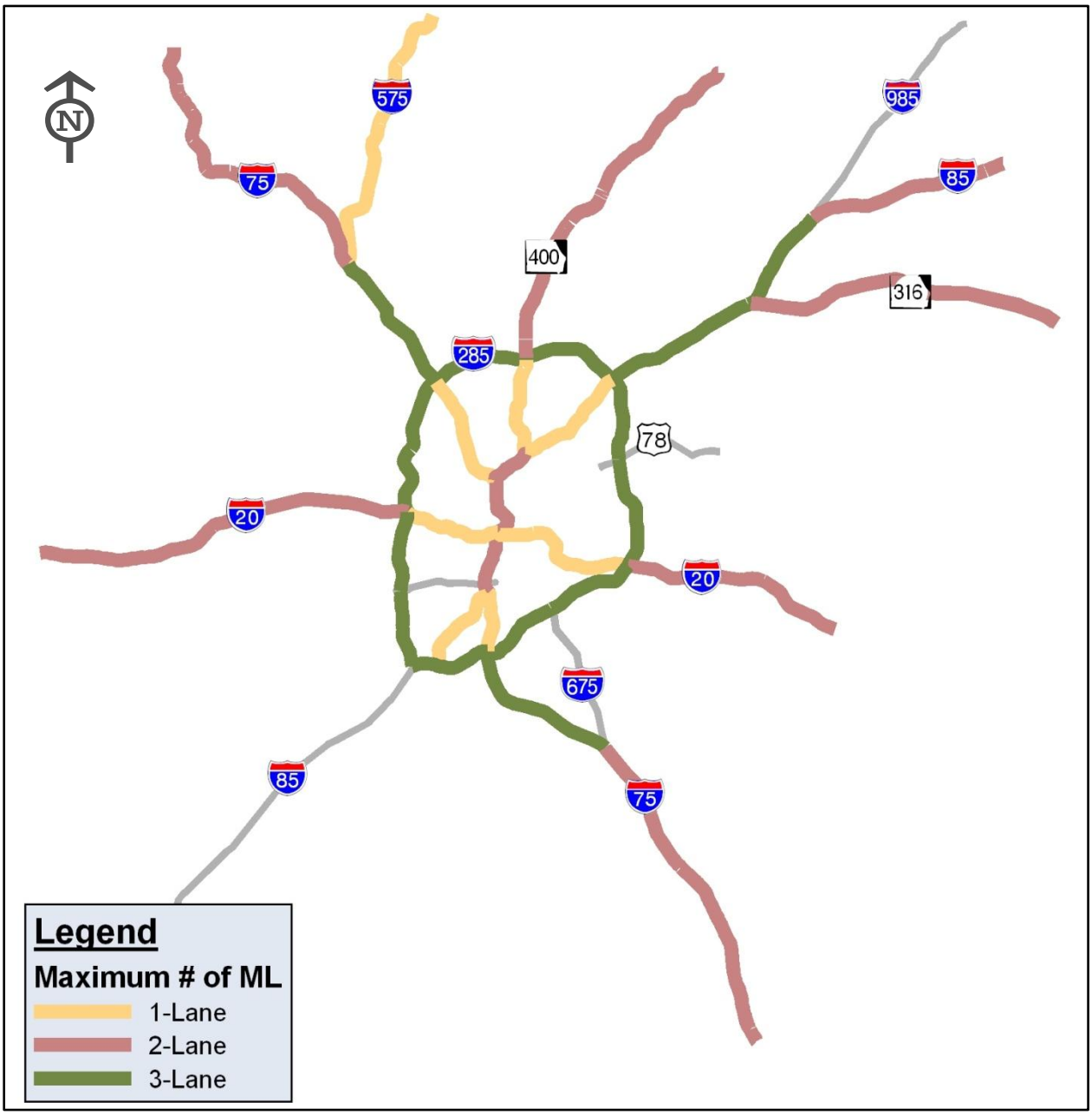


Concept

A couple key concepts were explored under the system-level screen. The first of these is "lane balance." The lane balance rule limits the total number of managed lanes in one direction to one less than the existing number of general purpose lanes in the same direction. For example, if there are just three general purpose lanes along a stretch of roadway, the maximum number of managed lanes that should be considered would be two. This rule was observed, in part, to maintain operational efficiency. If too many managed lanes were provided in a corridor, relative to total corridor demand, then the managed lanes would either be under-utilized or the toll rates would have to be held too low to encourage optimal utilization. In addition, managed lanes are considered premium capacity, and as a sort of "infrastructure commodity", it is important to strike a balance among mobility, revenue, and impact (project footprint).

Another key concept was the number of lanes at terminal and merge points. It was decided that two managed lanes would be merged down to one before eventually merging with the general purpose lanes along the radial freeways. This was done to mitigate potential bottlenecks that may emerge at managed lane termini. Inside I-285, where corridors merge into the Downtown Connector, the number of lanes was restricted as well. The corridors that feed the Downtown Connector were limited to one lane in each direction in order to avoid bottlenecks at merge points. These assumptions are summarized in Figure 9, which shows the maximum number of managed lanes that were considered for each corridor in the system.

Figure 9: Maximum Number of Managed Lanes



D. Corridor Screen

Alternatives that remained after the system-level screen were further examined at the corridor level. The objective of the corridor screen was to eliminate managed lane features that were unsuccessful for specific corridors. Again, the process involved an examination of location, policies, operations, and concept, as described in the framework for analysis. All four of these components were brought together to make decisions for each corridor. The outcome from this

screen was a limited set (typically two or three policy/concept combinations) of solutions on each corridor.

Policies

Policies that emerged from the system screen include HOT3+, HOT4+, ETL and METL. The only remaining policy that permits heavy trucks in the managed lanes is METL. The pros and cons associated with allowing heavy trucks in the managed lane system were examined. A detailed explanation of these pros and cons can be seen in the Managed Lane System Plan white paper titled "Trucks or No Trucks?". The main ideas expressed in that paper are included in summary form in the list below.

- Pros of Allowing Heavy Trucks in the Managed Lanes
  - Flexible system
  - Revenue
  - System linkage
  - Air quality benefits
  - Positive impact on GP lanes
  - Improved corridor mobility
  - Some regional benefit to addressing truck problems

- Cons of Allowing Heavy Trucks in the Managed Lanes
  - Risk in revenue forecasts and financeable revenue
  - No national precedent for trucks in managed lanes
  - Safety and operational concerns with mixed traffic
  - Increased maintenance costs
  - Managing access points
  - Management and signage complexity
  - Larger project footprint
  - Mismatch in target market and the goals of a managed lane system
  - More trucks on arterials in peak period

Upon review, it was determined that the cons associated with allowing heavy trucks in the network outweighed the pros. There was simply too much uncertainty, risk, and additional cost to move forward with a METL network recommendation, and therefore this policy was removed from further consideration.

The three remaining policies, HOT3+, HOT4+, and ETL were also compared to determine the best approach moving forward. These policies were examined with respect to revenue generation and transportation benefits. As an example, Figure 10 shows year 2030 gross revenues for the I-75 North corridor for all three policies. The ETL policy generates approximately 10% more revenue than HOT3+, with HOT4+ revenue falling between these two. This pattern was consistent for all corridors tested in the managed lane system. Results for other corridors can be seen in the MLSP technical report titled *Preliminary Traffic and Revenue Forecasts*.

Figure 11 shows year 2030 total daily vehicle delay for the I-75 North corridor. The No Project alternative represents 2030 delay assuming that no improvements are made to the corridor over the next 20 years. Each of the three managed lane eligibility policies shows marked improvement relative to this alternative. The HOT3+ results show the greatest improvement to

corridor delay. Even though managed lane delay is highest under HOT3+, the general purpose delay is low enough to offset this.

Figure 10: I-75 North Year 2030 Gross Revenue

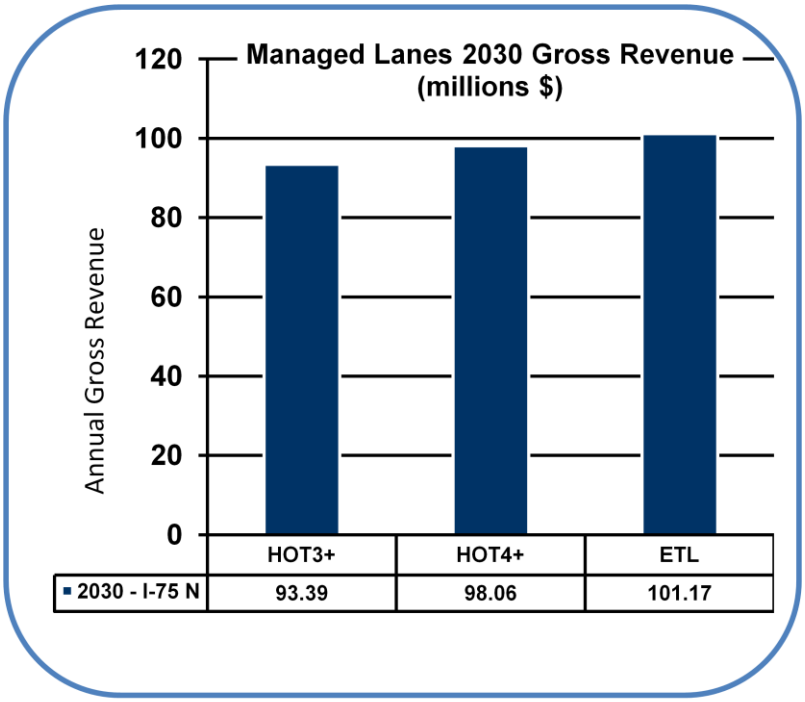
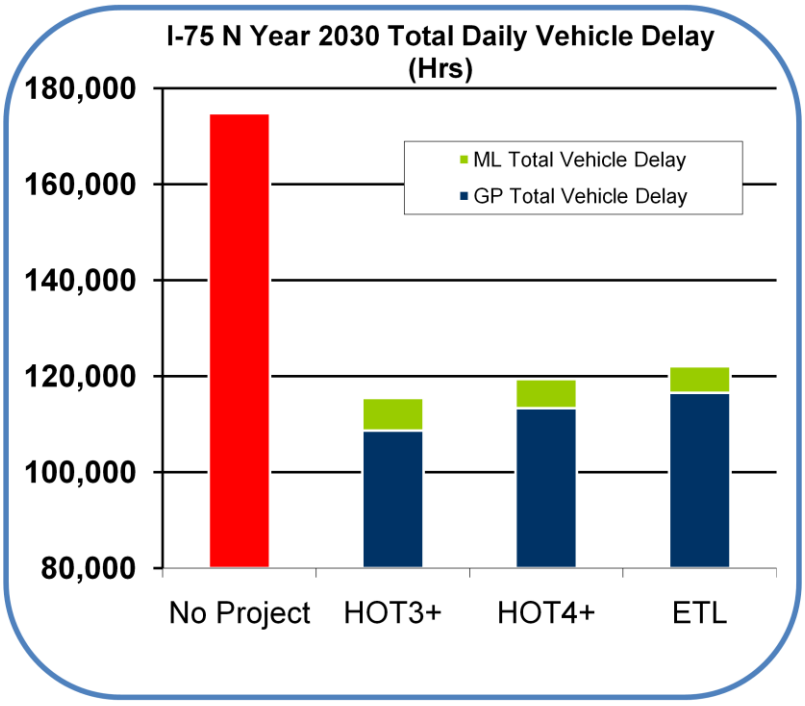


Figure 11: I-75 North Year 2030 Vehicle Delay

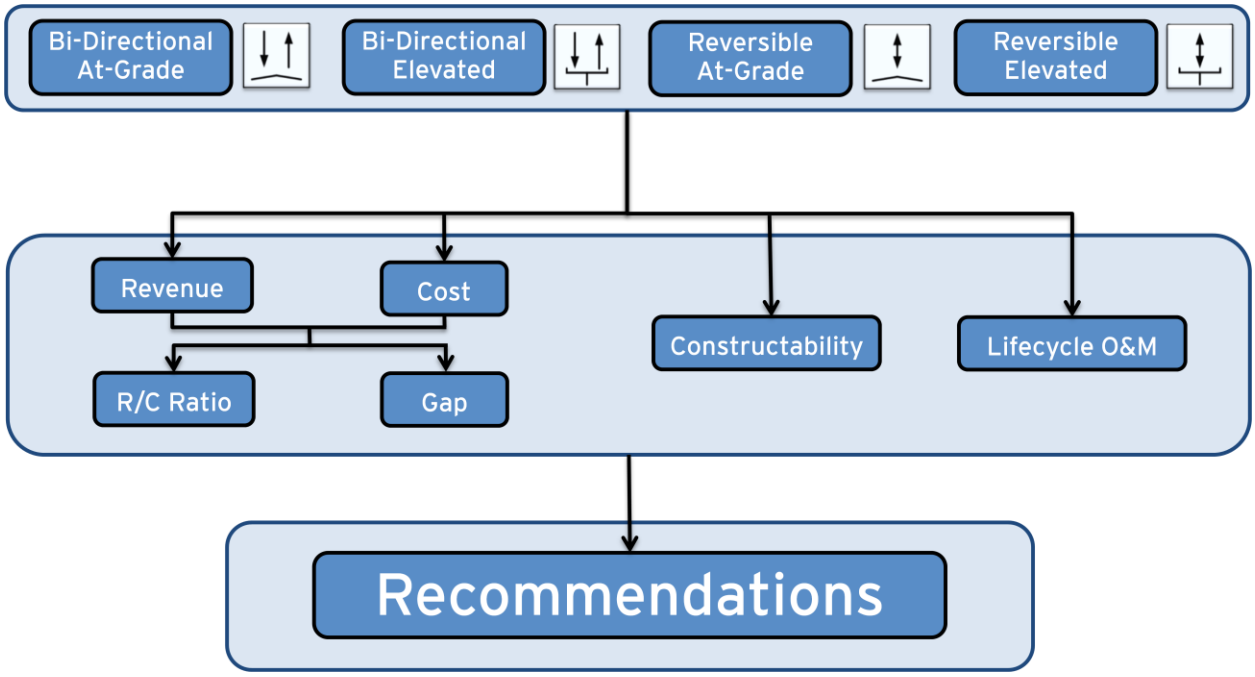


The quantitative results presented in Figures 10 and 11 helped lead to a recommendation of an eligibility policy of HOT3+ managed lanes. As noted previously, HOT3+ generates only slightly less revenue than HOT4+ and ETL, and it provides more delay relief than HOT4+ and ETL with the same mobility benefit. HOT3+ is an incremental, evolutionary change from HOV2+, which is the existing policy on Atlanta's HOV network. HOT3+ will also soon be implemented along I-85 North when that corridor is converted in 2011 from HOV2+ as a pilot project funded primarily by the federal government. In addition, HOT3+ still allows some free vehicles, and it allows more free vehicles than HOT4+, since HOT4+ vehicles are typically not concentrated in peak periods. HOT3+ also provides the financial flexibility to move to HOT4+ or ETL if financial goals are not met. For these reasons, HOT3+ is the recommended eligibility policy for the managed lane system.

Operations

Operations were also examined as part of the corridor screen. Figure 12 highlights the evaluation framework employed in this effort. Four configurations were considered for each of the corridors in the managed lane system. A number of configuration features were assessed, including revenue, capital cost, constructability, and lifecycle operations and maintenance costs. These features were considered as a group in the determination of the corridor-specific operational recommendations that resulted from this effort. Values for specific corridors can be seen in Figures 16 through 24 at the end of this section.

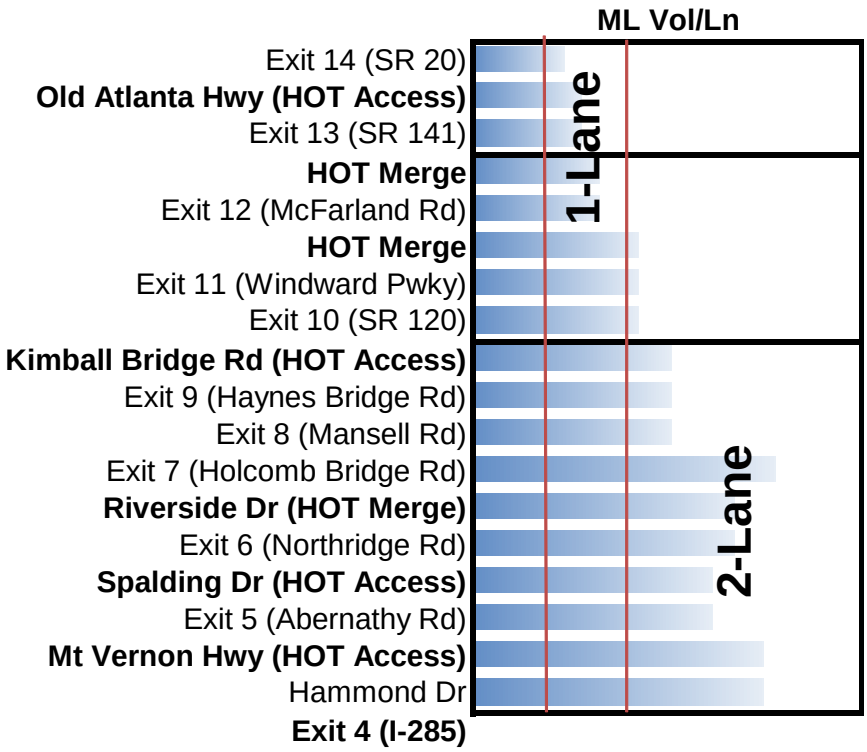
Figure 12: Corridor Screen Operations Evaluation Framework



Location

Location was also revisited in the corridor-level screen. Methodologies were established to determine logical termini for each corridor, access point locations, and whether managed lanes should be built in the median or to the outside of the existing corridor's cross-section. For the determination of logical termini, traffic volumes and lane usage were considered. Figure 13 shows an example diagram of this process for SR 400. Information on the detailed analysis results for each corridor can be seen in the respective corridor resource guides.

Figure 13: SR 400 Lane Usage Diagram

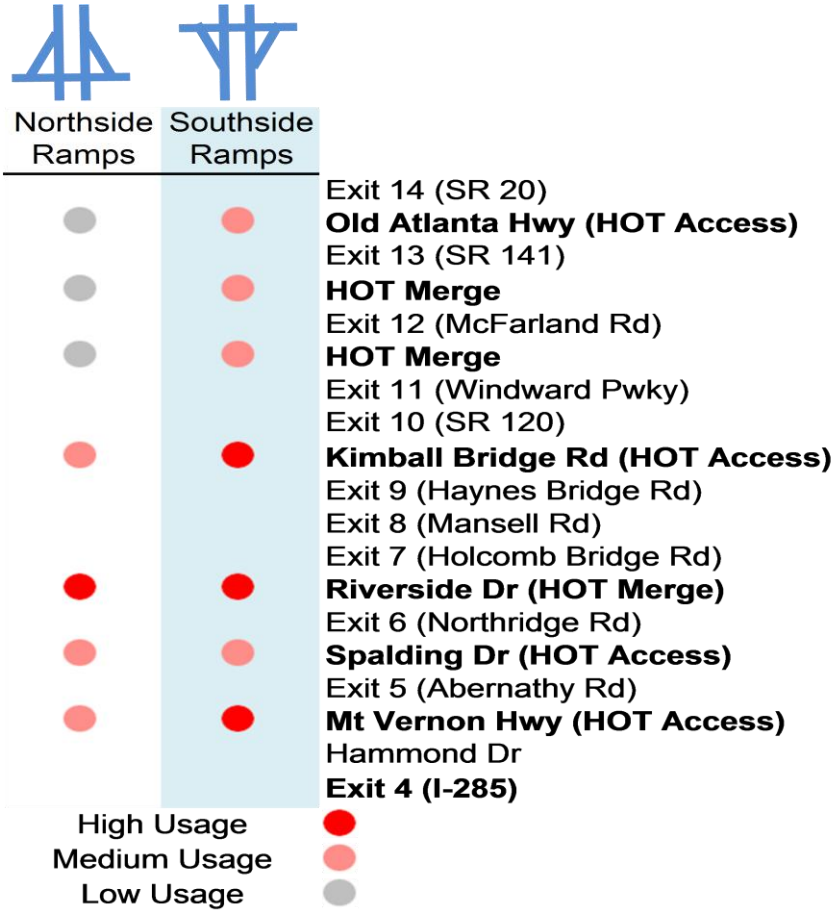


The red lines on this figure delineate the points at which traffic volumes support zero, one, or two managed lanes in year 2030. Where volume per lane exceeds the red line on the right (as shown by the blue bars that stretch beyond this line), both managed lanes are well utilized. Where the blue bar falls between the left and right red lines, two lanes are under-utilized and one managed lane may be a more appropriate configuration. If the blue bar were to fall to the left of the red line on the left, then volumes do not support even one managed lane, and this would represent a potential point for managed lane termination.

From I-285 north to Kimball Bridge Road, it appears that two lanes in each direction are well utilized in year 2030. However, north of Kimball Bridge Road, one lane would be enough to satisfy demand. Diagrams similar to this were generated for each corridor in the system to determine where two managed lanes in each direction could be reduced to one, and ultimately where the managed lanes would end as traffic is merged back into the general purpose lanes. The outcomes from this analysis for each corridor can be seen in Figures 16 through 24 at the end of this section.

Access locations were also examined in similar fashion to the lane usage analysis. Factors considered in this evaluation included managed lane volumes and ramp usage, the existence of park and ride lots, and previous HOV System Plan and Public-Private Partnership proposals. Figure 14 highlights the quantitative analysis that was used as part of this evaluation. Access points with the highest usage rates are shown with dark red circles. Those with the lowest usage rates were candidates to be removed from consideration and are shown with gray circles. Again the outcomes from this analysis for each corridor can be seen in Figures 16 through 24 at the end of this section.

Figure 14: SR 400 Access Point Usage Diagram



For each corridor, managed lanes were considered both in the median and to the outside of the existing roadway. This process involved an examination of engineering realities and cost-saving opportunities. A detailed description of this evaluation procedure and results can be found in the MLSP technical report titled *Concept and Operations*. The final recommendations on managed lane location (inside vs. outside) are included in Figure 54 at the end of this chapter.

Concept

The managed lane concept analysis that was conducted for the corridor screen included an evaluation of buffer and barrier managed lane separation techniques. Several of the key factors associated with these separation methods were considered, and the conclusions for each were summarized in an evaluation matrix, shown in Table 3.

Table 3: Buffer/Barrier Evaluation Matrix

Separation	Cost	Access	Safety	Tolling Operations	Enforcement	Public Perception	Incident Management
Buffer	Low	More	Mixed	Ease of Use	Challenging	Mixed	More Access
Barrier	High	Less	Mixed	Ease of Management	Easier	Mixed	Less Access

While enforcement and toll collection management would be easier under the barrier separation method, the buffer separation method would be significantly cheaper, would make usage simpler from the customer's perspective, and would provide more access for incident management purposes. There are safety benefits and drawbacks associated with both systems, which leads to the "Mixed" rating shown in the matrix above. The barrier method segregates traffic and decreases opportunities for conflict between managed lane and general purpose lane users. Buffer separation provides simplified access for incident response, and affords managed lane vehicles the opportunity to maneuver into the general purpose lanes to avoid crashes in the manage lanes. Public perception is also mixed for both buffer and barrier separation since there are benefits to both. There is no clear preference among the driving public for one particular treatment. A description of these mixed benefits can be seen in *Dallas Area Guidance for HOV Lane Implementation* (http://tti.tamu.edu/documents/7-4961-P1.pdf. Last accessed on January 12, 2010).

When all the factors were considered together, buffer separation appeared to be the more reasonable approach, and for this reason, buffer separation of managed lanes is the recommended treatment. However, as projects move forward into the implementation phase, barrier separation should remain a potential option. The buffer recommendation is based on a high-level system analysis. The detailed corridor analysis that would be conducted prior to construction may conclude that barrier is more appropriate in certain locations.

Another task that fell under the concept analysis for the corridor screen was the identification of engineering challenges and obstacles. These serve as potential roadblocks to implementation, and could indicate fatal flaws associated with some proposed solutions. Figure 15, highlights potential engineering challenges and obstacles, and Table 4 provides a detailed listing. Identification of these potential impediments drove the final concepts that were recommended as part of the managed lane system plan. For example, construction of 2 managed lanes in each direction was eliminated from consideration on the Downtown Connector and I-20 West inside of I-285 because nearby buildings and cemeteries precluded the acquisition of the necessary right of way. Many of the other points identified did not directly impact the recommendations, but did influence the implementation concepts.

Figure 15: Engineering Challenges and Obstacles

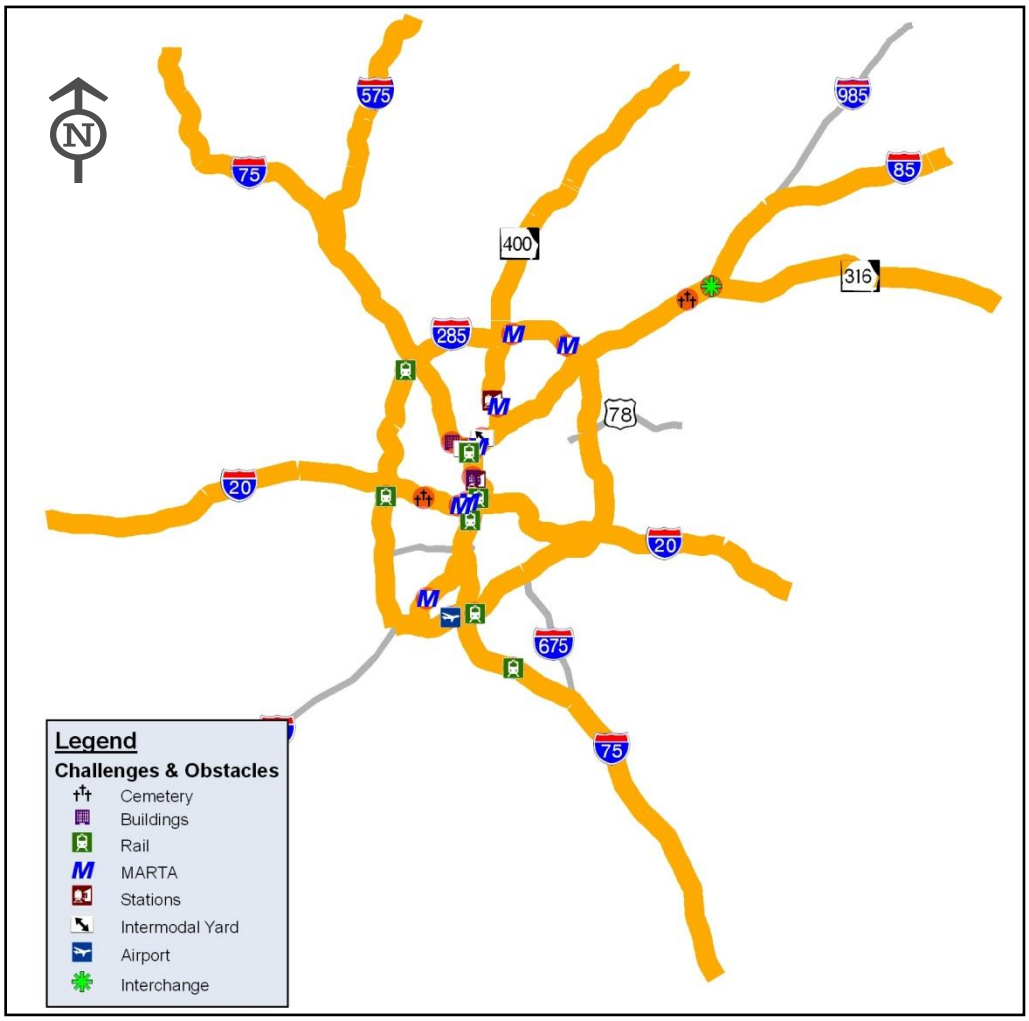


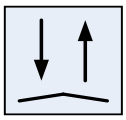
Table 4: Challenges and Obstacles

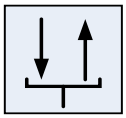
Corridor	Location Name	Type
Downtown Connector	Marta Civic Center Station & Emory Parking Lot	Stations
Downtown Connector	Railroad Bridges near Decatur Street	Rail
Downtown Connector	Railroad Bridges near University Avenue	Rail
Downtown Connector	Major high rise buildings	Buildings
Downtown Connector	Railroad overpass	Rail
I-20 West Inside I-285	MARTA rail overpass on I-20 W near Connector	MARTA
I-20 West Inside I-285	Railroads and MARTA rail run adjacent	MARTA
I-20 West Inside I-285	Westview Cemetery	Cemetery
I-285 North	MARTA overpass near Ashford Dunwoody Road	MARTA
I-285 North	MARTA overpass near Buford Highway & Railroad	MARTA
I-285 South	5th runway overpass	Airport
I-285 South	Railroad overpass	Rail
I-285 West	Railroad overpass	Rail
I-285 West	Railroad overpass	Rail

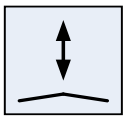
I-75 North Inside I-285	Amtrak Station	Stations
I-75 North Inside I-285	Howell Mill Shopping Center	Buildings
I-75 North Inside I-285	Tanyard CSO Facility	Intermodal Yard
I-75 South Outside I-285	Railroad overpass	Rail
I-85 North Inside I-285	Railyard	Intermodal Yard
I-85 North Inside I-285	MARTA rail overpass	MARTA
I-85 North Outside I-285	Cemetery at Pleasant Hill Road	Cemetery
I-85 South Inside I-285	MARTA rail overpass	MARTA
SR 316	SR 316 Interchange project	Interchange
SR 400 Inside I-285	Atlanta Financial Center Tunnel	Buildings
SR 400 Inside I-285	Buckhead MARTA station	Stations
SR 400 Inside I-285	MARTA rail overpass	MARTA

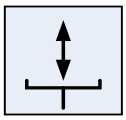
Summaries of the corridor screening results for each corridor are shown in Figures 16 through 24. Operational concepts highlighted in yellow were moved forward to the implementation screen. Text for the top two performers in each category is highlighted in green, and text for the bottom two performers is highlighted in red.

Figure 16 shows the summary for the I-75 North corridor. On the left is a graphic showing the project limits and access points as determined through the location analysis. Listed to the right is the recommended HOT3+ policy, followed by the operational analysis details. The system type is represented graphically as follows:

 Bi-directional, at-grade;

 Bi-directional, elevated;

 Reversible, at-grade;

 Reversible, elevated.

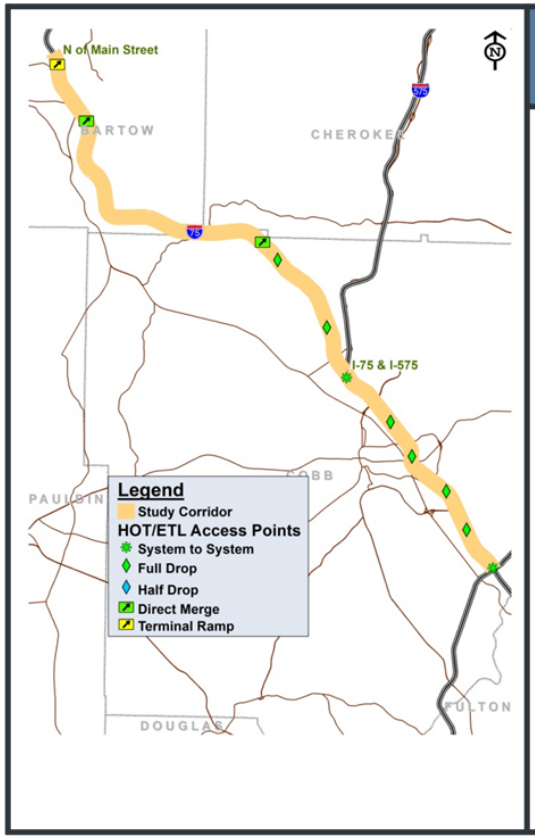
Planning-level 30-year accumulated gross revenues are shown in billions of 2009 dollars. A range of costs is included, with the low end representing a reduced, cost-savings alternative, and the high end indicating full reconstruction and bridge replacement along the corridor. These alternative cost-related concepts are discussed in detail in the MLSP technical report titled *Concept and Operations*. Operations and maintenance (O&M) costs for both the roadway and tolling technology are also presented in a range. Roadway O&M was calculated as a percentage of capital costs, and tolling O&M was calculated as a percentage of revenue. The estimate for project gap is simply the difference between capital cost and financeable revenue, which at this point was calculated as a percentage of gross revenue. This estimate was refined

in the planning-level financial analysis used in the subsequent implementation screen. Finally the ratio of 30-year accumulated gross revenue and capital cost is presented as an R/C ratio for the project.

For the I-75 North corridor, three of the four operational concepts moved forward to the next screen. Only the bi-directional, elevated concept was eliminated from further consideration. For this alternative, the outcomes for gap and R/C ratio compared poorly with the others. The other three alternatives had comparable results for these metrics, and each of these configurations also had historical precedent in the form of previous studies. For these reasons, all three were moved forward (bi-directional at-grade, reversible elevated, and reversible at-grade). Most of the other corridors that were studied had just one or two configurations move on to the next stage of analysis. Explanations concerning which alternatives moved forward in the process are included below the figures for each corridor.

To the right of the operations analysis are the location details for both corridor limits and access points. On the far right is the recommendation for buffer separation and a comment on the number of obstacles and challenges associated with the corridor. I-75 North showed minimal impact from these. Summary figures follow, in the same format, for the other corridors in the system.

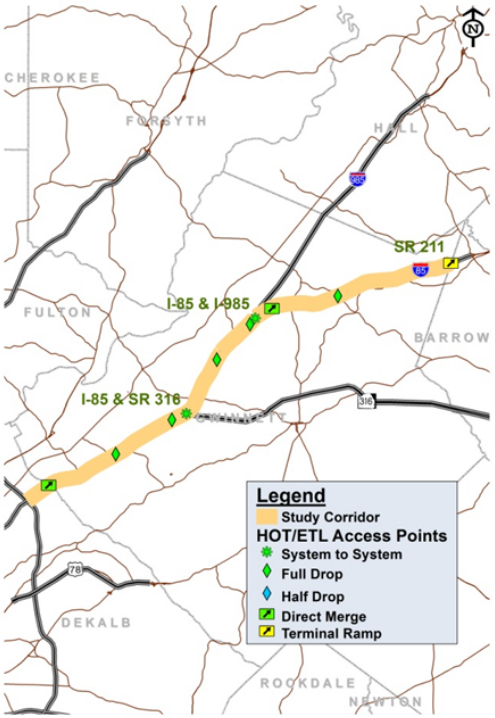
Figure 16: I-75 North Corridor Screen Results



Policy	Operations						Location	Concept
	System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]		
HOT3+	2↓ ↑2	$2.90	$1.22 $1.85	$0.76 $0.86	$0.55 $1.18	2.38 1.57	**Limits** 2-lanes from I-285 to I-575 1-lane from I-575 to SR 20	**Separation** Buffer
	2↓ ↑2	$3.08	$1.98 $2.34	$0.91 $0.97	$1.27 $1.63	1.56 1.32		
	↕2	$2.33	$1.10 $1.68	$0.63 $0.72	$0.56 $1.14	2.12 1.39	**Access Points** Termination N of Main St S of Red Top Mtn Rd – Direct Merge S of SR 92 – Direct Merge Hickory Grove Rd – Full Access Town Center – Full Access I-575 System Interchange Allgood Rd – Full Access Roswell Rd – Full Access Franklin Rd – Full Access Terrell Mill Rd – Full Access I-285 System Interchange	**Challenges & Obstacles** Minimal
	↕2	$2.33	$1.35 $1.49	$0.67 $0.69	$0.81 $0.95	1.73 1.56		

Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.

Figure 17: I-85 North Corridor Screen Results

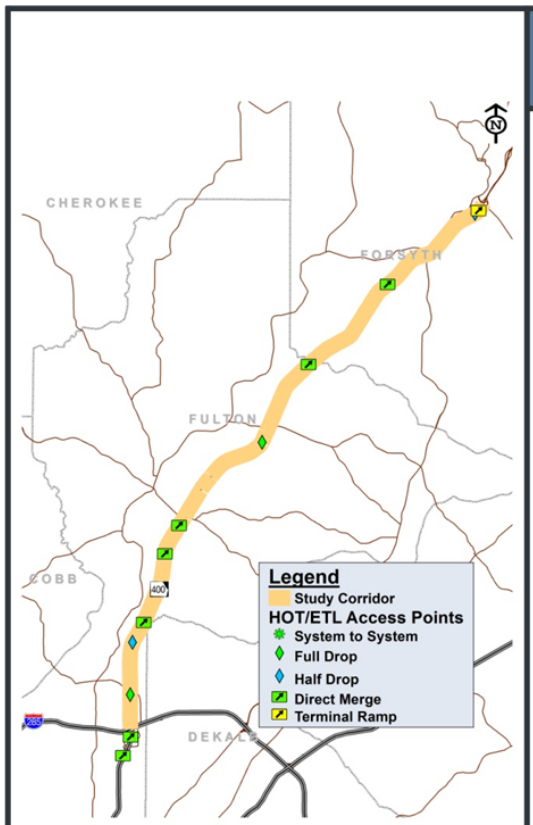


Policy	Operations: System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]	Location	Concept
HOT3+	2↓ ↑2	$2.07	$1.24 $2.17	$0.60 $0.74	$0.76 $1.69	1.67 0.95	**Limits** 2-lanes from I-285 to I-985 1-lane from I-985 to SR 211	**Separation** Buffer
	2↓ ↑2	$2.19	$2.20 $2.58	$0.77 $0.83	$1.70 $2.08	1.00 0.85	**Access Points** Termination N of SR 211 Gravel Springs Rd – Full Access W of SR20 – Direct Merge I-985 System Interchange Smithtown Rd – Full Access N of Peachtree Rd – Full Access SR 316 System Interchange Old Norcross Rd – Full Access E of Indian Trail Rd – Full Access I-285 System Interchange	**Challenges & Obstacles** Cemetery at Pleasant Hill Road Newly Constructed SR 316 Interchange
	↕2	$1.53	$1.22 $2.04	$0.49 $0.61	$0.87 $1.68	1.25 0.75		
	↕2	$1.53	$1.51 $1.70	$0.53 $0.56	$1.16 $1.34	1.01 0.91		

Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.

Both the bi-directional at-grade and reversible at-grade alternatives scored relatively well in this screening analysis. These alternatives had generally lower gap values and higher R/C ratio values than the two elevated alternatives, and were therefore advanced to the next level of screening.

Figure 18: SR 400 North Corridor Screen Results

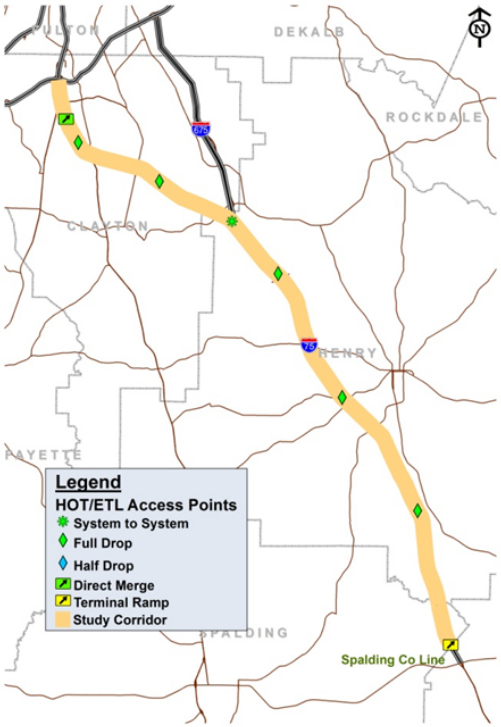


Policy	Operations: System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]	Location	Concept
HOT3+	2↓ ↑2	$1.11	$0.78 $1.22	$0.34 $0.41	$0.52 $0.96	1.42 0.91	**Limits** 2-lanes from I-285 to Kimball Bridge Rd 1-lane from Kimball Bridge Rd to SR 20	**Separation** Buffer
	2↓ ↑2	$1.16	$1.71 $2.06	$0.49 $0.54	$1.44 $1.79	0.68 0.56		
	↕2	$0.80	$0.79 $1.16	$0.28 $0.33	$0.61 $0.98	1.01 0.69	**Access Points** Termination S of SR 20 Old Atlanta Rd – Half Access S of Peachtree Pkwy – Direct Merge S of McFarland Rd – Direct Merge Kimball Bridge Rd – Full Access S of Holcomb Bridge Rd – Direct Merge S of Riverside Dr – Direct Merge S of Pitts Rd – Direct Merge Spalding Dr – Half Access Mount Vernon Hwy – Full Access Johnson Ferry Rd – Direct Merge N of Northland Rd – Direct Merge	**Challenges & Obstacles** Minimal
	↕	$0.80	$1.07 $1.21	$0.32 $0.34	$0.89 $1.03	0.75 0.66		

Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.

SR 400 scored well for the bi-directional at-grade alternative. This configuration generated significantly higher R/C ratio values and lower gap values than the other alternatives, and was therefore advanced to the next screening level.

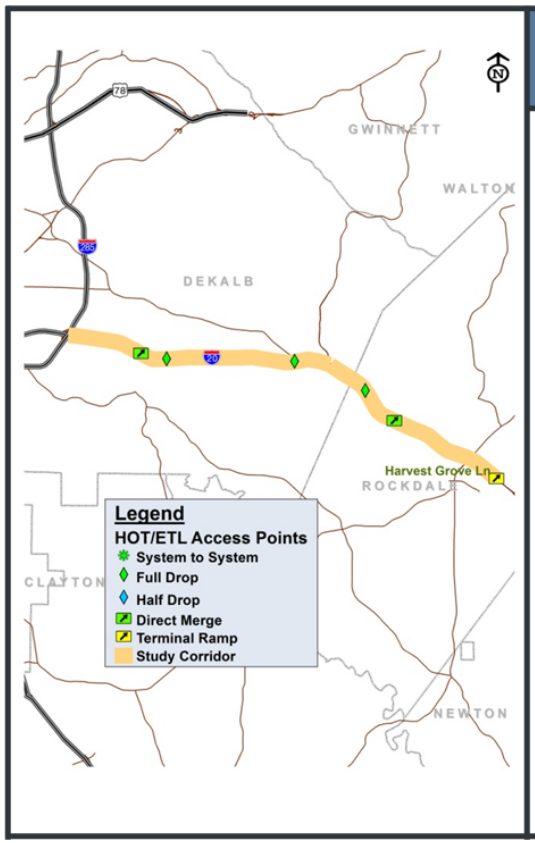
Figure 19: I-75 South Corridor Screen Results



Policy	Operations						Location	Concept
	System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]		
HOT3+	2↓ ↑2	$1.35	$1.35 $1.82	$0.47 $0.54	$1.04 $1.51	1.00 0.74	**Limits** 2-Lanes from I-285 to SR 16	**Separation** Buffer
	2↓ ↑2	$1.41	$1.99 $2.34	$0.58 $0.63	$1.67 $2.02	0.71 0.60		
	↕2	$0.95	$1.28 $1.75	$0.38 $0.45	$1.06 $1.53	0.74 0.54	**Access Points** Termination N of SR 16 N of Bill Gardner Pkwy – Full Access N of Hampton Rd – Full Access N of Hudson Bridge Rd – Full Access I-675 System Interchange N of Mt. Zion Blvd – Full Access Poplar Springs Rd – Full Access S of Forest Pkwy – Direct Merge I-285 System Interchange	**Challenges & Obstacles** Minimal
	↕	$0.95	$1.45 $1.64	$0.41 $0.44	$1.23 $1.42	0.66 0.58		
	Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.							

I-75 South scored well for the bi-directional at-grade alternative. This configuration generated significantly higher R/C ratio values and lower gap values than the other alternatives, and was therefore advanced to the next screening level. Reversible operations generated significantly lower revenue than did bi-directional operations, and the elevated configuration was more expensive than the low-cost at-grade configuration.

Figure 20: I-20 East Corridor Screen Results

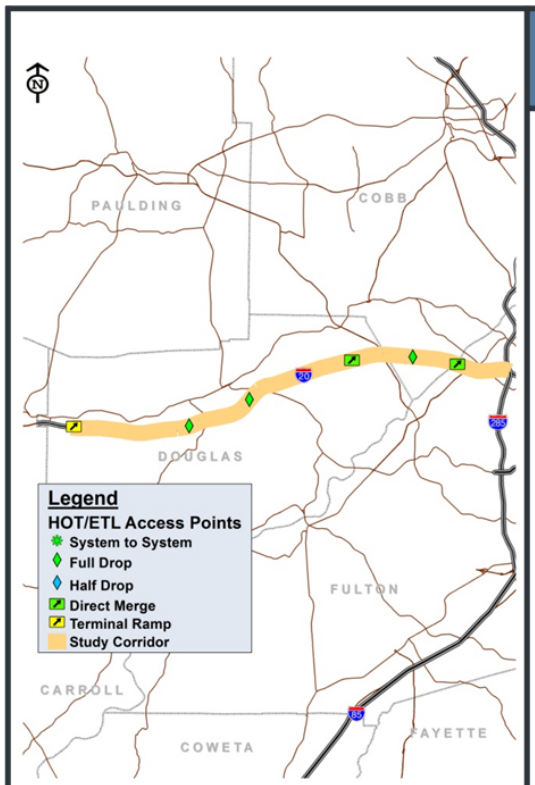


Policy	Operations						Location	Concept
	System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]		
HOT3+	2↓ ↑2	$0.79	$0.80 $1.07	$0.28 $0.32	$0.62 $0.89	0.99 0.74	**Limits** 2-lanes from I-285 to Sigman Rd 1-Lane from Sigman Rd to Salem Rd	**Separation** Buffer
	2↓ ↑2	$0.84	$1.24 $1.53	$0.35 $0.40	$1.05 $1.34	0.68 0.55		
	↕2	$0.65	$0.86 $1.10	$0.26 $0.30	$0.71 $0.95	0.76 0.59	**Access Points** Termination Harvest Grove Ln Between West Ave & Sigman Rd – Direct Merge W of SR20 – Full Access Klondilke Rd – Full Access Miller Rd – Full Access Wesley Chapel Rd – Direct Merge I-285 System Interchange	**Challenges & Obstacles** Minimal
	↕	$0.65	$0.69 $0.80	$0.23 $0.25	$0.54 $0.65	0.94 0.81		

Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.

Along I-20 East, there were cost savings opportunities associated with a reversible elevated configuration. Details on the costs estimated for this corridor can be seen in the MLSP technical report titled *Concept and Operations*. This alternative, in addition to the bi-directional at-grade alternative generated the lowest values for gap and highest values for R/C ratio and were therefore advanced in the screening process.

Figure 21: I-20 West Corridor Screen Results

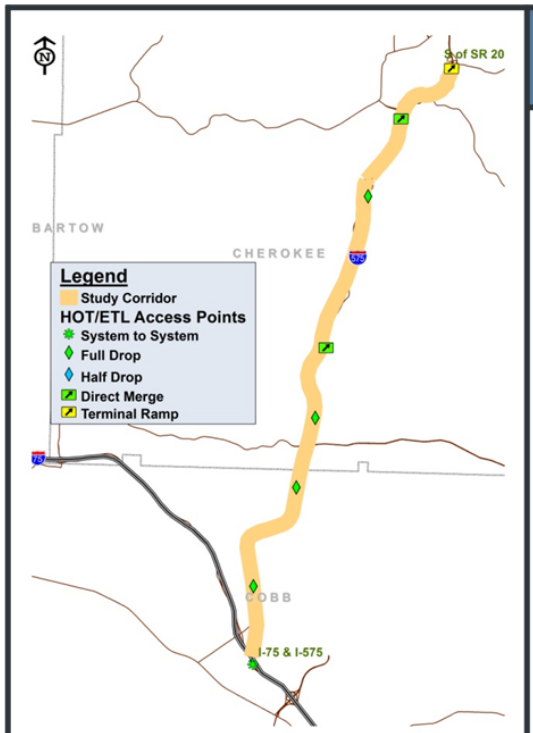


Policy	Operations						Location	Concept
	System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]		
HOT3+	2↓ ↑2	$1.51	$0.78 $1.02	$0.42 $0.46	$0.43 $0.67	1.94 1.48	**Limits** 2-Lanes from I-285 to Prestley Mill Rd 1-Lane from Prestley Mill Rd to Liberty Rd	**Separation** Buffer
	2↓ ↑2	$1.57	$1.26 $1.37	$0.50 $0.52	$0.90 $1.01	1.25 1.15		
	↕2	$1.29	$0.75 $1.04	$0.37 $0.41	$0.45 $0.74	1.72 1.24	**Access Points** Termination between Post Rd & Liberty Rd Bright Star Rd – Full Access E of Prestley Mill Rd – Full Access E of Mt Vernon Rd – Direct Merge Factory Shoals Rd – Full Access Chattahoochee River – Direct Merge I-285 System Interchange	**Challenges & Obstacles** Minimal
	↕	$1.29	$0.87 $0.99	$0.39 $0.41	$0.57 $0.69	1.48 1.30		

Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.

The two at-grade alternatives, bi-directional and reversible, scored relatively well in this screening analysis. They produced lower gap values and higher R/C ratio values than the elevated alternatives, which cost significantly more than at-grade alternatives along this corridor. For these reasons, both the bi-direction at-grade and reversible at-grade alternatives were advanced to the next screening level.

Figure 22: I-575 Corridor Screen Results

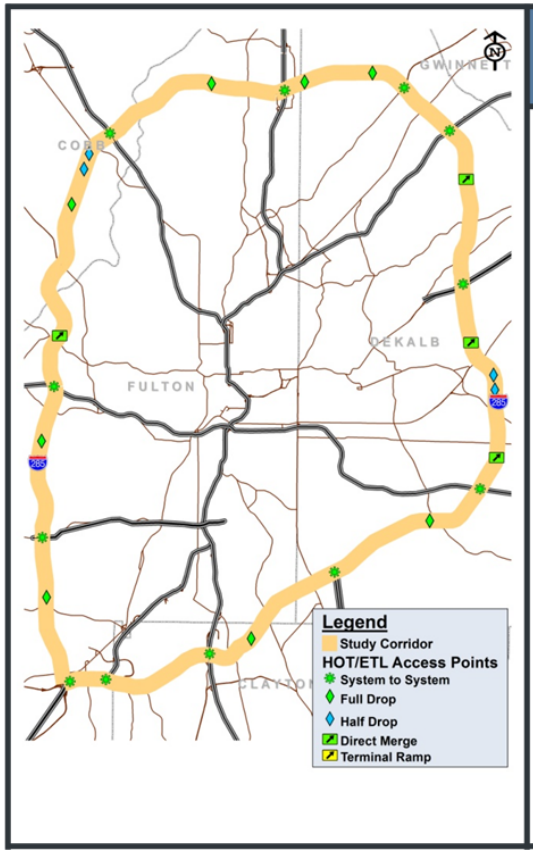


Policy	Operations: System Type	Revenue ($B)	Cost ($B)	O&M ($B)	Gap ($B)	R/C	Location	Concept
							Limits	**Separation**
HOT3+	1 ↓ ↑ 1	$0.90	$0.54 $0.86	$0.26 $0.31	$0.33 $0.65	1.67 1.05	1-Lane from I-75N to SR20	Buffer
							Access Points	**Challenges & Obstacles**
	↕ 1	$0.77	$0.58 $0.86	$0.24 $0.28	$0.40 $0.68	1.33 0.90	Termination S of SR 20 S Hickory Flat Hwy – Direct Merge Between Holly St and Atlanta Ave – Full Access Between Towne Lake Pkwy and Sixes Rd – Direct Merge Dupree Rd – Full Access Shallowford Rd – Full Access Big Shanty Rd – Full Access I-75 System Interchange	Minimal

Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.

The bi-directional alternative for I-575 has smaller gap values and higher R/C ratio values than the reversible alternative. However, the configuration for this corridor will be driven by the recommendation on I-75 North. If that corridor is recommended as a reversible facility, I-575 will be reversible as well. Since, that determination is yet to be made, both alternatives for I-575 advance to the next screening level.

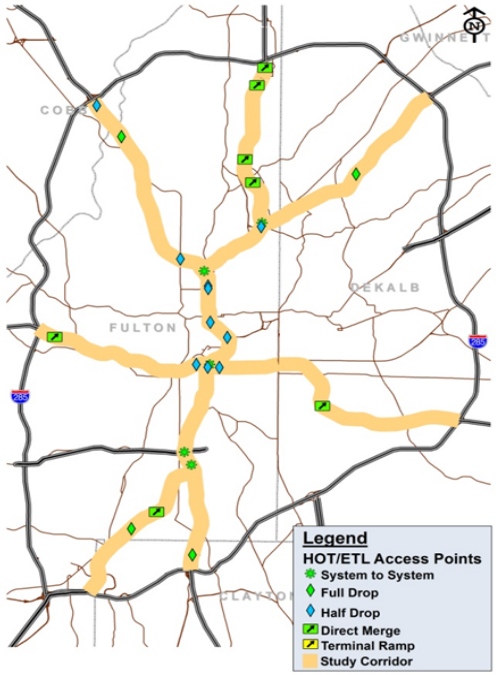
Figure 23: I-285 Corridor Screen Results



Policy	Operations						Location	Concept
	System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]		
HOT3+	2↓ ↑2	$3.77	$3.30 $4.74	$1.25 $1.47	$2.43 $3.87	1.14 0.80	**Limits** 2-Lanes on Entire I-285	**Separation** Buffer
	2↓ ↑2	$3.95	$4.28 $6.43	$1.43 $1.75	$3.37 $5.52	0.92 0.61	**Access Points** **System Interchanges:** SR 400 & I-285, I-85N & I-285,I-20E & I-285, I-675 & I-285, I-7S & I-285,I-85SInside & I-285, I-85S & I-285, SR 166 & I-285, I-20W & I-285,I-75N & I-285 **Full Access**: Perimeter Center Pkwy, Shallowford Rd, Panthersville Rd, Conley Rd, Red Wine Rd, Benjamin E Mays Dr, Orchard Rd, Mt Vernon Hwy. **Half Access**: Durham Park Rd (N Ramps), Redan Rd (S Ramps), Mt Wilkinson Pkwy (S Ramps), Cumberland Blvd (N Ramps) **Direct Merge**: Henderson Rd, N Decatur Rd, Glenwood Rd, S of Bolton Rd	**Challenges & Obstacles** Railroad Overpasses MARTA Rail 5th Runway
	Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.							

The elevated alternative generates slightly more revenue than the at-grade alternative. However, the high cost for the elevated configuration leads to higher gap values and lower R/C values. The at-grade alternative was therefore advanced in the screening process.

Figure 24: Inside I-285 Corridor Screen Results



Policy	Operations						Location	Concept
	System Type	Revenue ($B) [a]	Cost ($B) [b]	O&M ($B) [c]	Gap ($B) [d]	R/C [e]		
HOT3+	2↓ ↑2 1↓ ↑1	$6.64	$1.01 $1.31	$1.48 $1.52	($0.52) ($0.22)	6.57 5.11	**Limits** 1-Lane I-75N Inside, SR 400 Inside I-85N Inside, I-20W Inside I-75S Inside, I-85S Inside I-20E Inside, 2-Lanes Downtown Connector (DC)	**Separation** Buffer
	2↓ ↑2	$6.64	$3.85 $4.38	$1.91 $1.99	$2.32 $2.85	1.72 1.52	**Access Points** **System Interchange:** SR 400 & I-85N, DC & I-85N/I-75N, DC & I-20, DC & SR 166, DC & I-85S /I-75S. **Full Access**: Mt Paran Rd (I-75N Inside), N of Clairmont Rd (I-85N Inside), Aviation Blvd (I-75S Inside), Loop Rd (I-85S Inside) **Half Access**: Akers Mills Rd (I-75N Inside N Ramps), N of Northside Dr (I-75 N Inside), Lenox Rd (SR 400 Inside N Ramps), 15th St (DC N Ramps), 14th St (DC S Ramps), Spring St (DC S Ramps), Freedom Pkwy (DC S Ramps), Pryor-Central (DC S Ramps), Martin St (I-20E Inside E Ramps), Spring St (I-20W Inside, W Ramps) Direct Merge: Johnson Ferry Rd, N of Northland Dr, Old Ivy Rd, S of Buckhead Loop, E of Fayetteville Rd, Linkwood Rd, Willingham Dr	**Challenges & Obstacles** Railroad Overpasses MARTA Rail & Station Amtrak Station High Rise Buildings Atlanta Financial Center Westview Cemetery
	Notes: (a) 30-year accumulated gross revenues. (b) Costs range from a cost savings alternative to the full reconstruction, full bridge replacement alternative. (c) O&M costs are estimates for both tolling technology and roadway O&M. (d) Gap is the difference between capital cost and financeable revenue. (e) R/C is the ratio of gross revenue and capital cost.							

The costs for the elevated alternative are significantly more than the at-grade alternative, with no appreciable impact on revenue. This leads to higher values for gap and lower R/C ratios. The at-grade alternative was therefore carried forward in the screening process, and the elevated alternative was eliminated from further consideration.

E. Implementation Screen

There were two desired outcomes of the implementation screen. The first was to establish a preferred operational configuration from among the remaining alternatives. The second was to compare an ultimate, or ideal alternative, with a minimum alternative. Each ultimate alternative was the most appropriate managed lane strategy for that corridor. Conversely, each minimum alternative was the minimum managed lane strategy on a corridor that still maintains the goals and objectives of the managed lane system. The objective of this exercise was to identify potential interim steps that could be taken to capitalize on the most efficient aspects of a managed lane treatment on a particular corridor, while preserving the opportunity to eventually construct the full, ideal alternative on the corridor. The outcome from this screen was a set of results used as guidance for establishing the implementation plan, described in the following section.

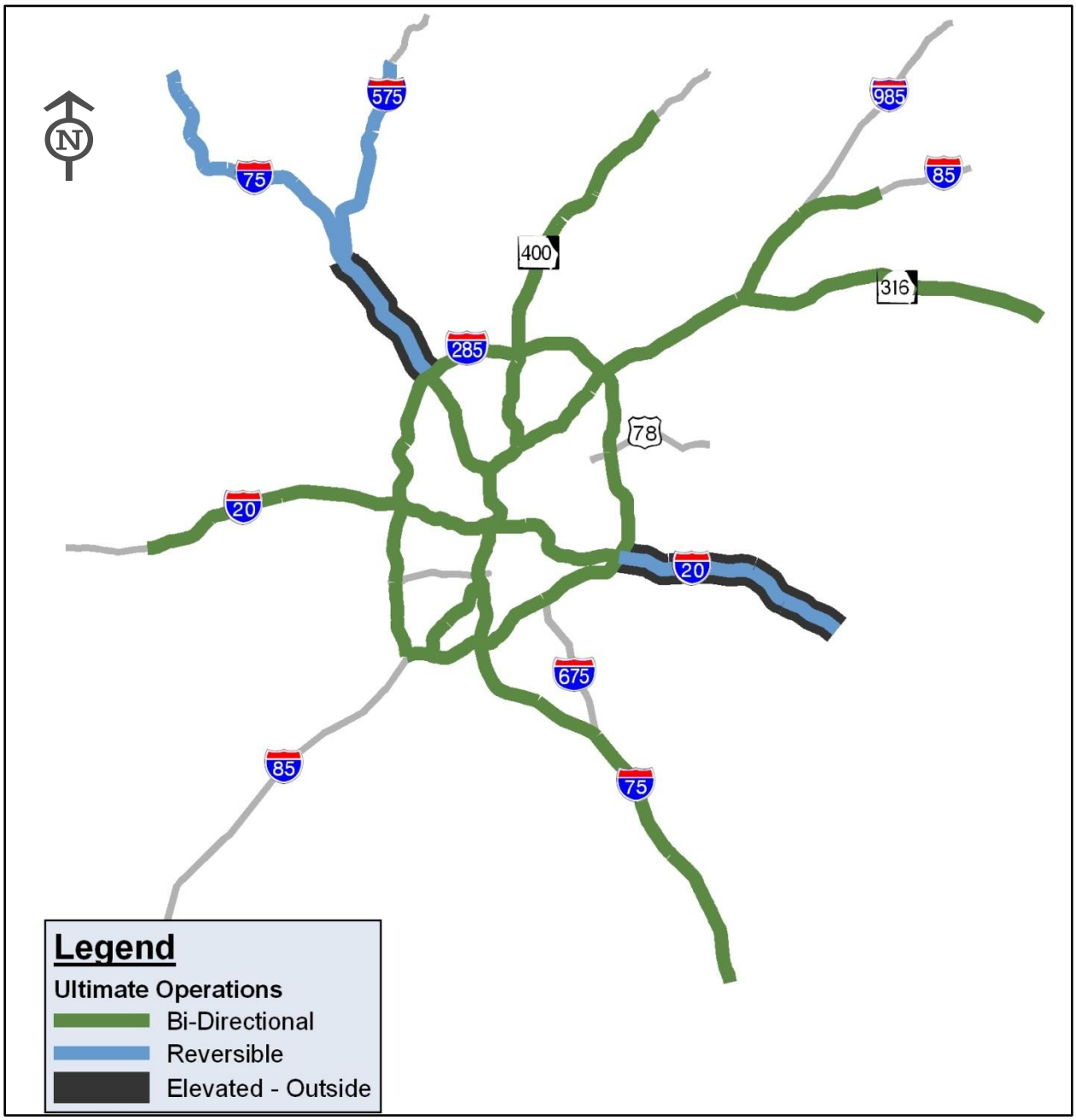
Operations Recommendations

Some corridors had more than one operational configuration advance from the corridor-level screen. For these corridors, decisions were made to advance particular alternatives based on project-specific realities that fell outside the scope of the technical screening process. The details behind these decisions are described below.

Three alternatives emerged from the analysis on I-75 North outside of I-285. At the time of this study, momentum from ongoing analysis associated with other studies was gathered around an elevated reversible configuration. In order to maintain consistency with these parallel efforts, and because the results from the Managed Lane System Plan were close for all three remaining configurations, an elevated reversible alternative was carried forward into the implementation screen. On I-85 North outside of I-285, bi-directional and reversible alternatives were both advanced from the corridor screen. However, the HOV-to-HOT conversion project on I-85 that will open in 2011 provides managed lanes in both directions. If a reversible configuration were to be recommended, a directional movement in place since 2011 would actually be eliminated. For this reason, the bi-directional alternative was advanced to the implementation screen. Reversible and bi-directional alternatives also advanced on I-20 West outside of I-285. However, while the reversible option performed well, the bi-directional option performed better and was therefore carried forward to the implementation screen.

Remaining alternatives for operational configuration were subjected to a detailed financial analysis as part of the implementation screen. Through this process, opportunities were identified that minimized the gap between financeable revenue and capital costs. Some of the details can be seen in Figures 26 through 48 at the end of this section. The conclusions of this effort are summarized in Figure 25 which shows operational recommendations for each corridor in the managed lane system.

Figure 25: Recommendations for Operations



Policy Recommendations

HOT3+ is the recommended policy for the managed lane system. This policy allows flexibility to change eligibility to a higher revenue-generating alternative, namely HOT4+ or ETL, if financial goals are not met in the future. The recommended tolling policy for HOT3+ is maximum efficiency. Under this scheme, variable toll rates allow maximum throughput while maintaining a 45 mph minimum speed. This policy also allows flexibility, as toll rates can be increased if financial goals are not met.

Location Recommendations

Two alternatives were developed for each corridor's termini and access locations: an ultimate and a minimum recommendation. The minimum alternative provided the opportunity to examine the impacts of pulling back project limits and eliminating access points. The objective was to see if the cost savings associated with these decisions would exceed the negative impact on revenue generation. Results for this comparison can be seen in Figures 26 through 48 at the end of this section.

Concept Recommendations

Buffer separation was the recommended concept that emerged from the corridor screen. In addition, the engineering challenges and obstacles that were identified forced two specific decisions. The first is that on the Downtown Connector, one general purpose lane in each direction is recommended for conversion to a managed lane. The same is recommended for I-20 West inside I-285. In order to maintain system integrity, two lanes are required in each direction on the Downtown Connector. But due to right-of-way constraints, the only way to secure a second managed lane is to convert an existing lane. Likewise, existing development along I-20 West near downtown Atlanta precludes construction of an additional lane. Any recommendation for I-20 West will therefore require a general purpose lane conversion as well. However, unlike the Downtown Connector, this section of I-20 West is not an integral piece of the managed lane system. For this reason, one alternative is to not build managed lanes on this corridor.

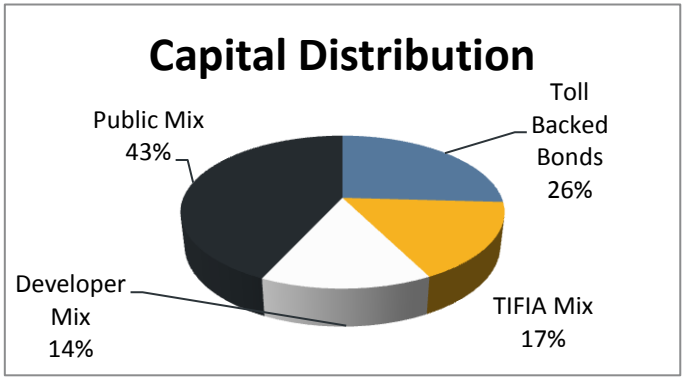
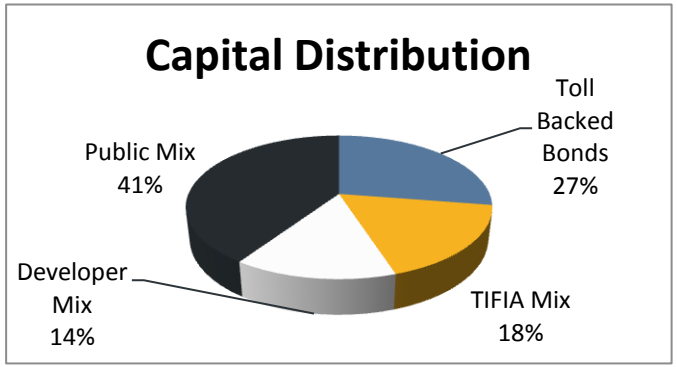
Figures 26 through 49 outline details of the ultimate, or ideal recommendation, and the minimum alternative recommendation for each corridor. Output from the financial analysis then follows, highlighting the results based on an assumption of a public-private partnership (PPP) delivery format. The net present value of public cash outflows represents the public sector investment required to build the project. Capital distribution figures show the percent contribution from toll backed bonds (current interest bonds, capital appreciation bonds, etc.), TIFIA bonds, developer mix (only if P3 structure), and public mix for the capital expenditures associated with project development.

A PPP arrangement is just one potential method for delivering managed lanes projects. It is not required that the public sector seek to partner with a private developer to implement these managed lanes, but the financial results in the following figures assumed such an arrangement. Notes are provided in the financial-related figures; however a more detailed description of inputs, parameters, and outputs can be seen in the MLSP technical report titled *Financial Feasibility*.

Figure 26: I-75 North Ultimate and Minimum Recommendations

Policy	Location	Concept	Operations	Policy	Location	Concept	Operations
HOT3+	2-lanes I-285 to I-575 1-lane I-575 to S of SR 113	Barrier Desirable *Desirable = 12-foot travel lanes, 8-foot shoulders*	Reversible Elevated Westside from I-285 to I-575 Reversible At-Grade Inside from I-575 to SR 113	HOT3+	2-lanes I-285 to I-575 1-lane I-575 to N of Hickory Grove Rd	Barrier Reduced *Reduced = 11-foot travel lanes, 4-foot shoulders*	Reversible Elevated Westside from I-285 to I-575 Reversible At-Grade Inside from I-575 to Hickory Grove Rd

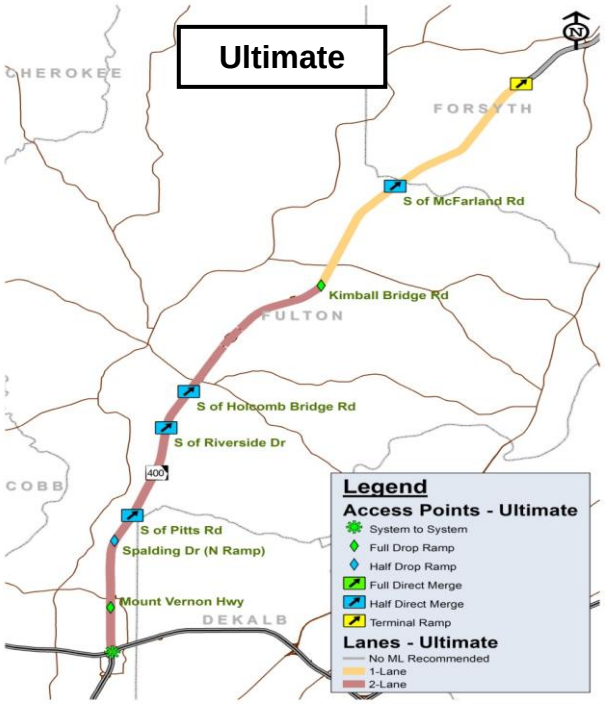
Figure 27: I-75 North Ultimate and Minimum Financial Summary

Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
Net Present Value (NPV) of Public Sector Contribution **$533M**	Revenue (a): $2.24B Capital Costs (b): $1.52B Toll O&M (c): $0.34B Roadway O&M (d): $5.9M	**Net Present Value (NPV) of Public Sector Contribution** **$365M**	Revenue (a): $1.69B Capital Costs (b): $1.10B Toll O&M (c): $0.25B Roadway O&M (d): $3.8M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

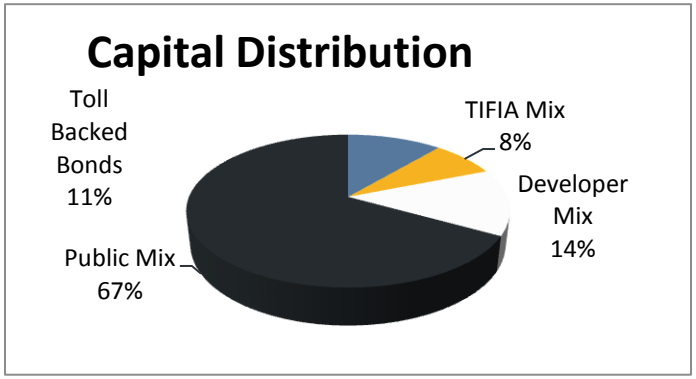
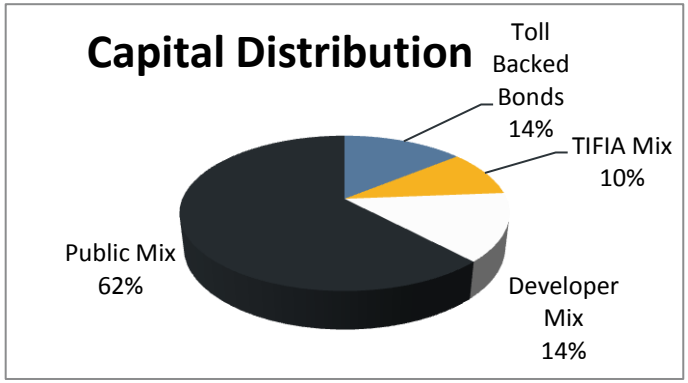
Figure 28: SR 400 North Ultimate and Minimum Recommendations



Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to Kimball Bridge Rd 1-lane per direction Kimball Bridge Rd to S of Peachtree Pkwy	Barrier Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to Holcomb Bridge Rd 1-lane per direction Holcomb Bridge Rd to S of McFarland Rd	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

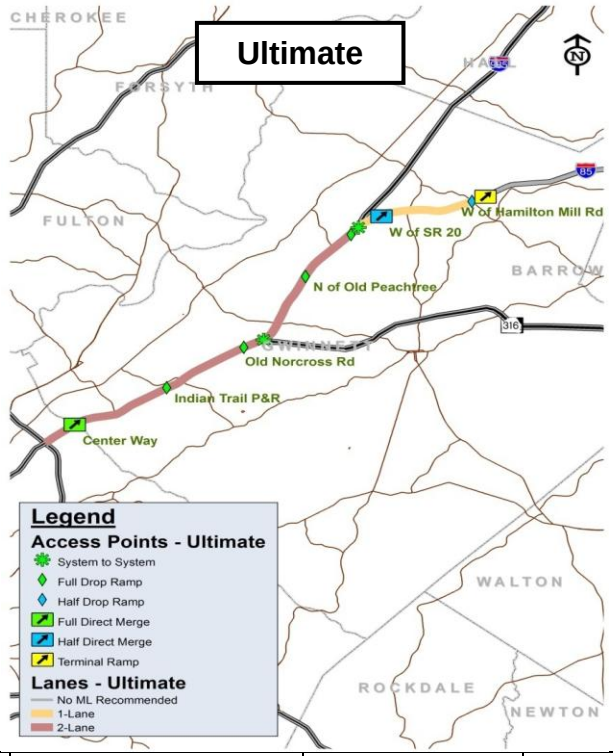
Figure 29: SR 400 North Ultimate and Minimum Financial Summary

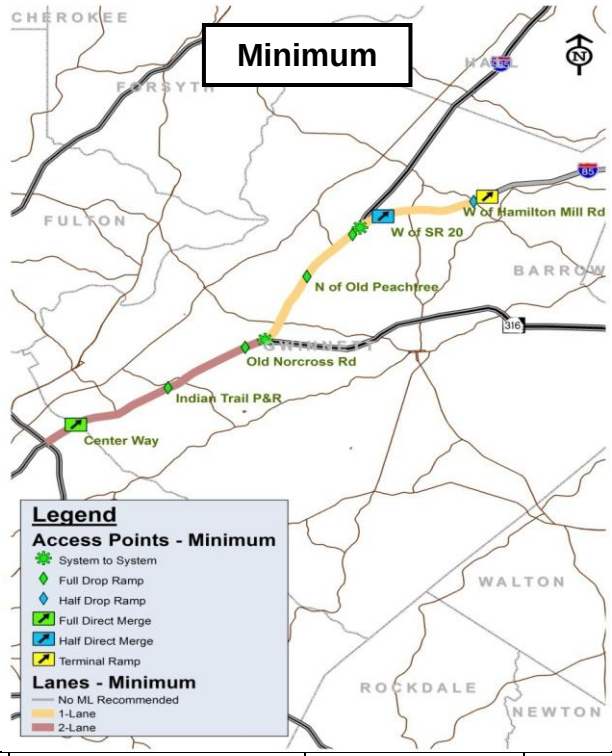
Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$592M**	Revenue (a): $0.92B Capital Costs (b): $1.09B Toll O&M (c): $0.14B Roadway O&M (d): $3.5M	**NPV of Public Sector Contribution** **$419M**	Revenue (a): $0.83B Capital Costs (b): $0.83B Toll O&M (c): $0.12B Roadway O&M (d): $2.2M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 30: I-85 North Ultimate and Minimum Recommendations



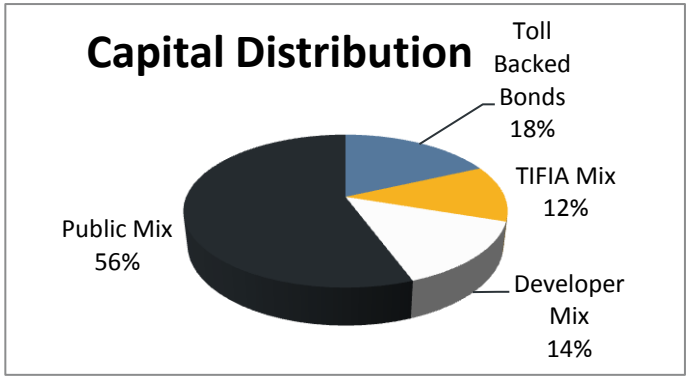
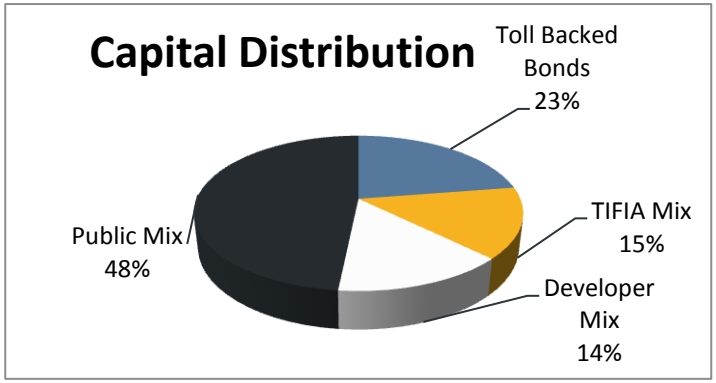


Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to I-985 1-lane per direction I-985 to S of Hamilton Mill Rd	Barrier Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to SR 316 1-lane per direction SR 316 to S of Hamilton Mill Rd	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Note: Assumed that 1 additional general purpose lane would be constructed between I-985 and SR 211 in accordance with ARC's RTP.

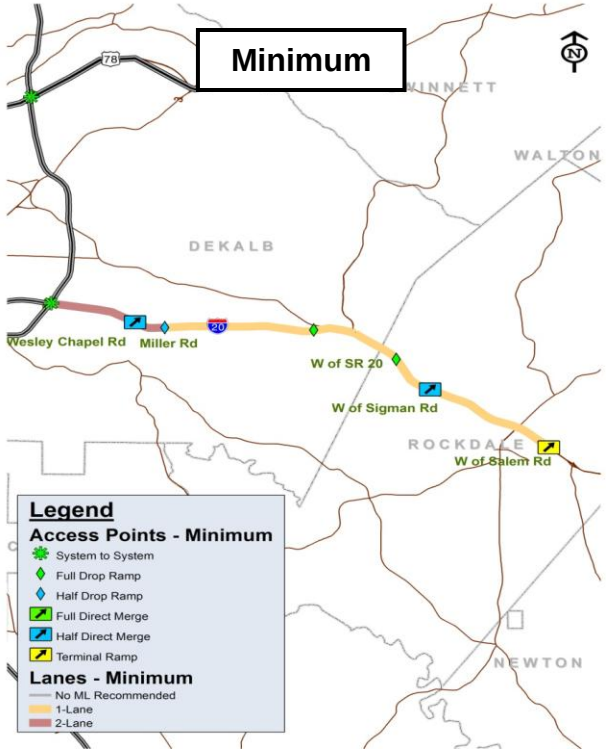
Figure 31: I-85 North Ultimate and Minimum Financial Summary

Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$833M**	Revenue (a): $2.10B Capital Costs (b): $1.84B Toll O&M (c): $0.31B Roadway O&M (d): $7.0M	**NPV of Public Sector Contribution** **$602M**	Revenue (a): $2.08B Capital Costs (b): $1.53B Toll O&M (c): $0.31B Roadway O&M (d): $5.5M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

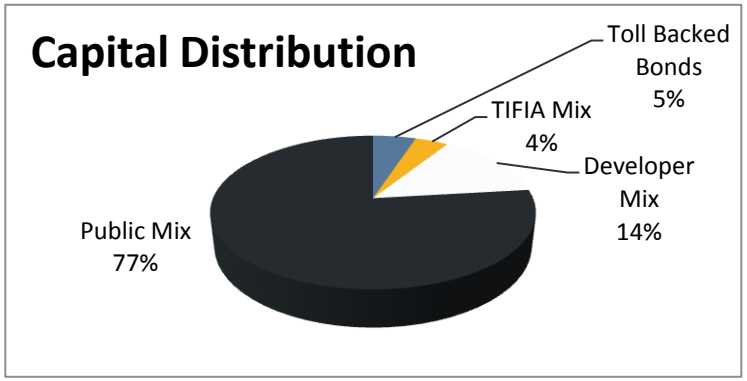
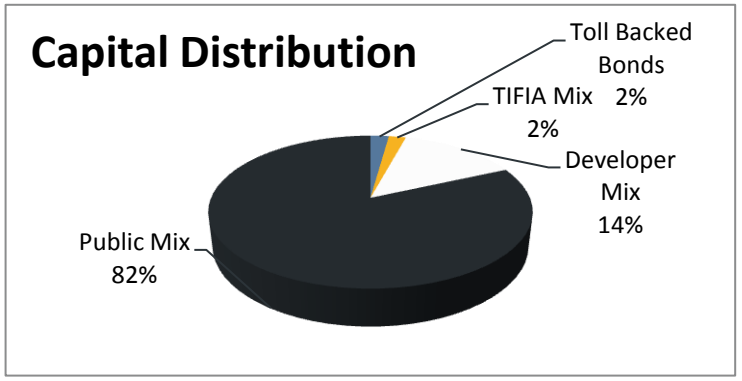
Figure 32: I-20 East Ultimate and Minimum Recommendations



Policy	Location	Concept	Operations	Policy	Location	Concept	Operations
HOT3+	2-lanes I-285 to Sigman Rd 1-lane Sigman Rd to W of Salem Rd	Barrier Desirable	Reversible Elevated Northside from I-285 to Salem Rd	HOT3+	2-lanes per direction I-285 to Miller Rd 1-lane per direction Miller Rd to W of Salem Rd	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Note: Both reversible and bi-directional configurations emerged from the corridor screening and were evaluated in the implementation screen. Preliminary results in Figure 20 indicate similar revenue-cost relationships for these alternatives. The reversible alternative was tested as the "Ultimate" since it capitalizes on the directional nature of travel in this corridor with 2 lanes in peak directions between I-285 and Sigman Rd.

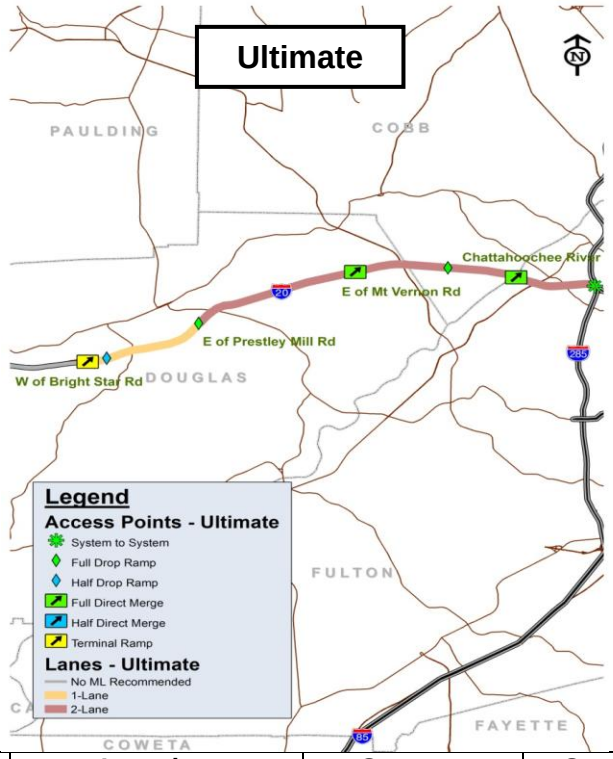
Figure 33: I-20 East Ultimate and Minimum Financial Summary

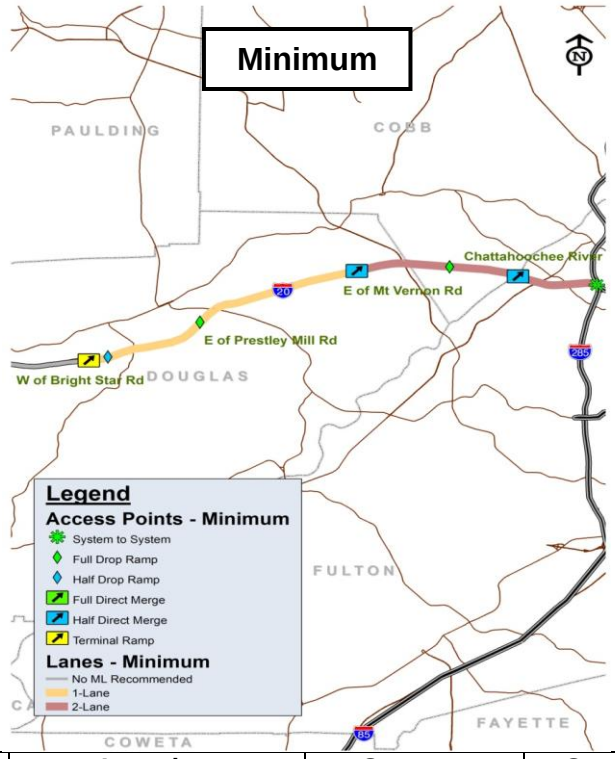
Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$575M**	Revenue (a): $0.53B Capital Costs (b): $0.92B Toll O&M (c): $0.08B Roadway O&M (d): $3.6M	**NPV of Public Sector Contribution** **$624M**	Revenue (a): $0.40B Capital Costs (b): $0.94B Toll O&M (c): $0.06B Roadway O&M (d): $3.2M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 34: I-20 West Ultimate and Minimum Recommendations

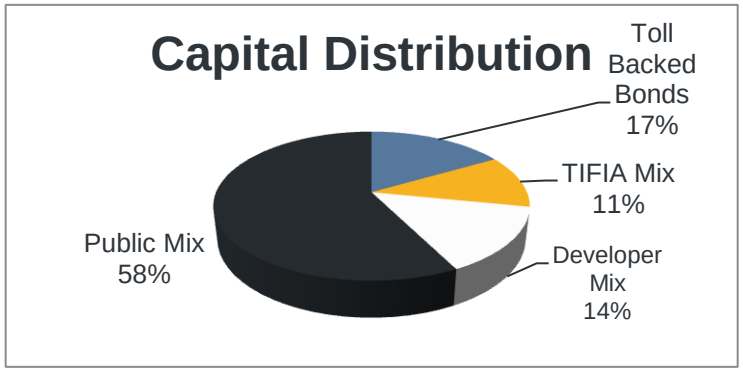
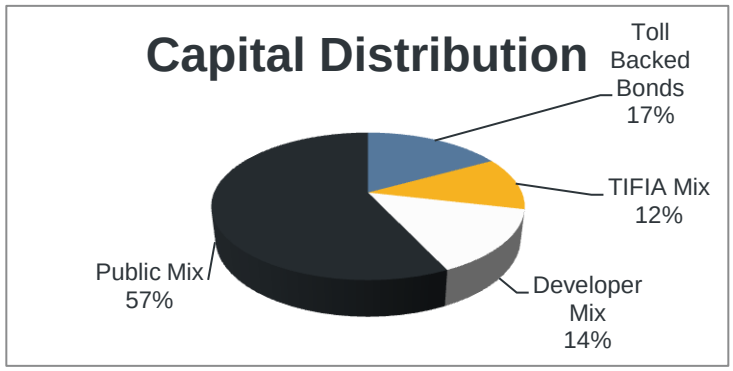




Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to Presley Mill Rd 1-lane per direction Presley Mill Rd to W of Bright Star Rd	Buffer Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to Mt Vernon Rd 1-lane per direction Mt Vernon Rd to W of Bright Star Rd	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

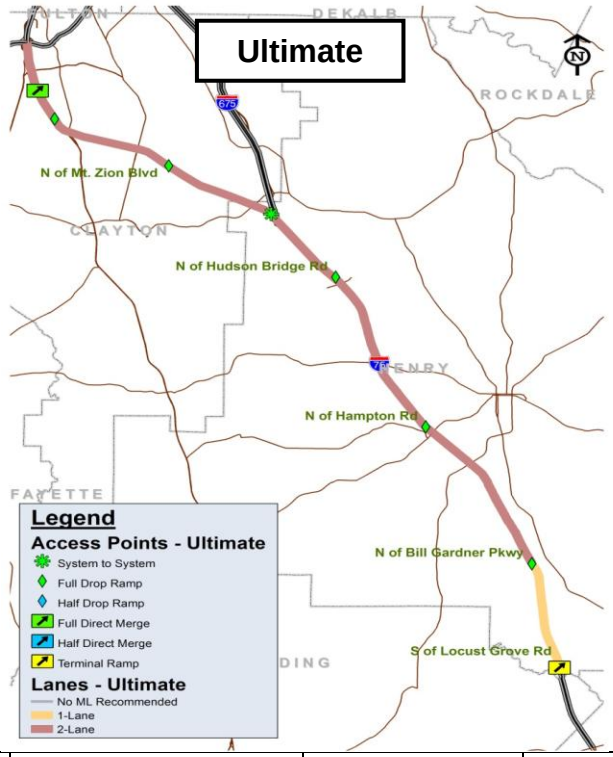
Figure 35: I-20 West Ultimate and Minimum Financial Summary

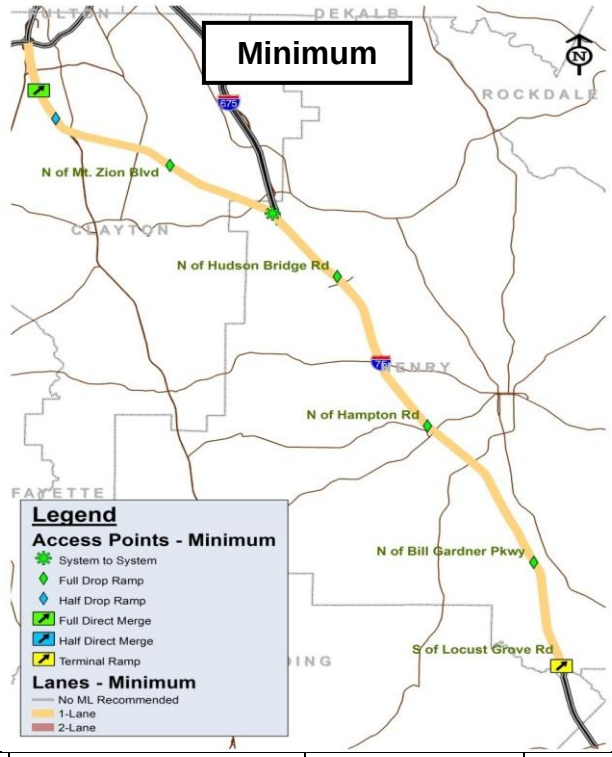
Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$483M**	Revenue (a): $1.20B Capital Costs (b): $1.03B Toll O&M (c): $0.18B Roadway O&M (d): $3.5M	**NPV of Public Sector Contribution** **$429M**	Revenue (a): $1.10B Capital Costs (b): $0.92B Toll O&M (c): $0.16B Roadway O&M (d): $2.9M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 36: I-75 South Ultimate and Minimum Recommendations



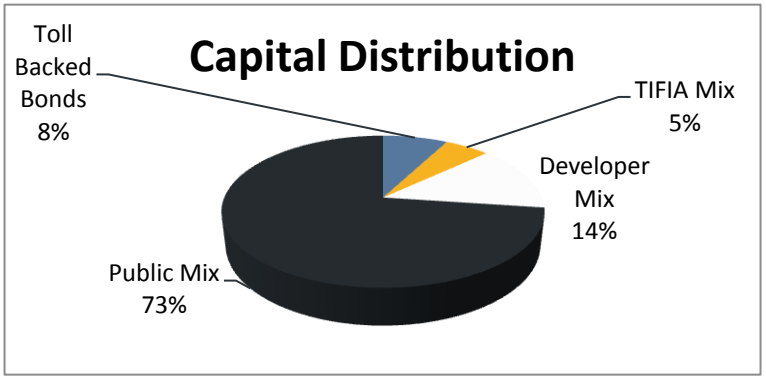


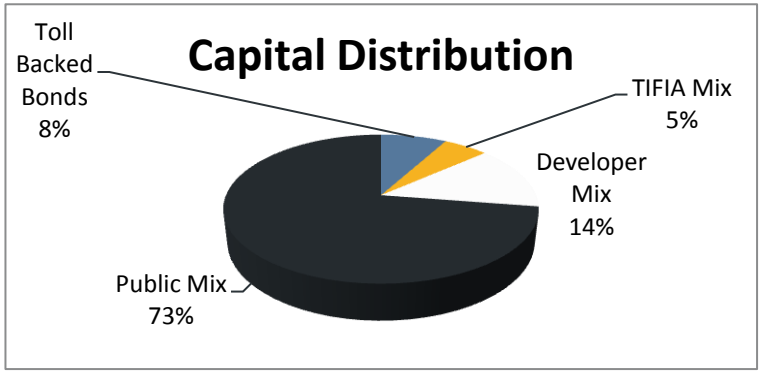
Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-285 to Bill Gardner Pkwy 1-lane per direction Bill Gardner Pkwy to S of Locust Grove Rd	Buffer Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	1-lane per direction I-285 to S of Locust Grove Rd	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Figure 37: I-75 South Ultimate and Minimum Financial Summary

Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$1,028M**	Revenue (a): $1.13B Capital Costs (b): $1.73B Toll O&M (c): $0.17B Roadway O&M (d): $6.6M	**NPV of Public Sector Contribution** **$717M**	Revenue (a): $0.79B Capital Costs (b): $1.21B O&M Costs (c): $0.12B Roadway O&M (d): $4.0M

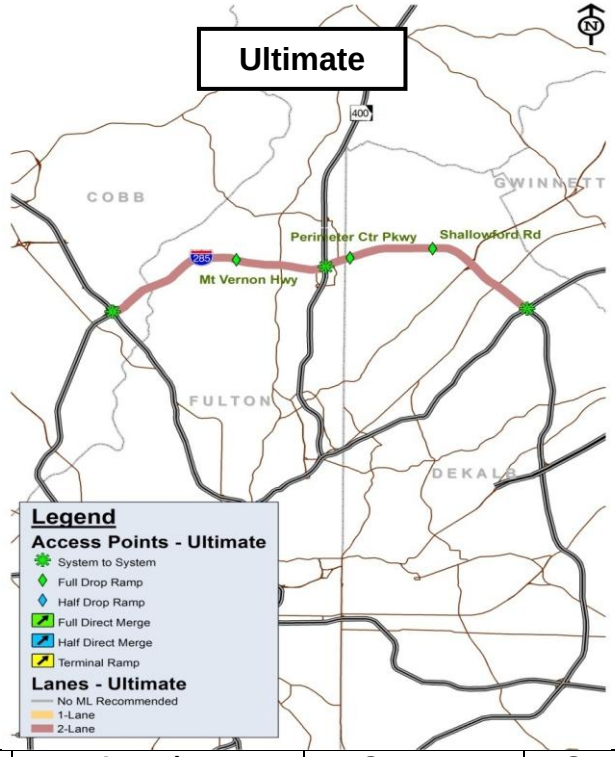




Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 38: I-285 North Ultimate Recommendation



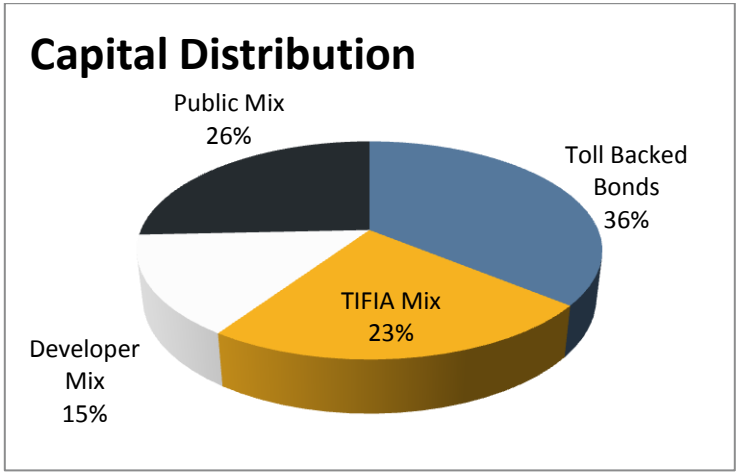
Policy	Location	Concept	Operations
HOT3+	2-lanes per direction	Buffer Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Ultimate Recommendation (PPP)

NPV of Public Sector Contribution

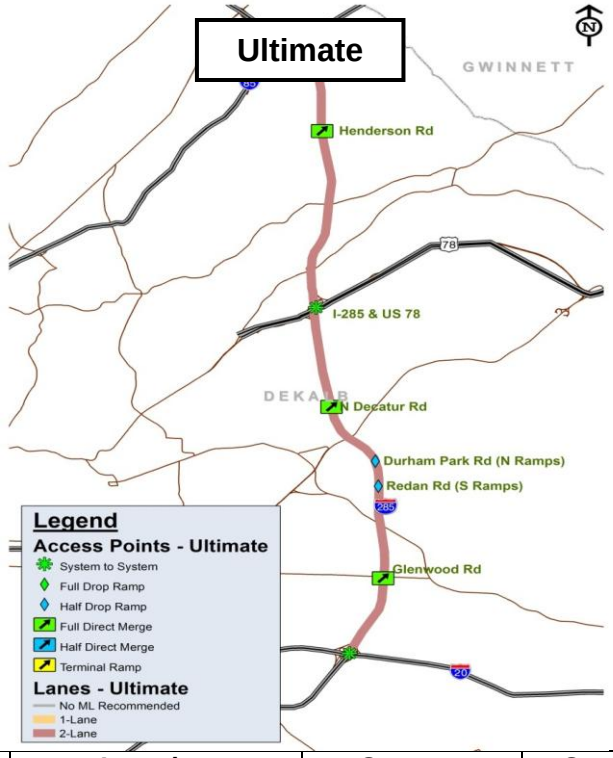
$204M

Revenue (a): $2.00B
Capital Costs (b): $0.98B
Toll O&M (c): $0.30B
Roadway O&M (d): $4.9M



Note: No Minimum Recommendation for I-285 North.

Figure 39: I-285 East Ultimate Recommendation



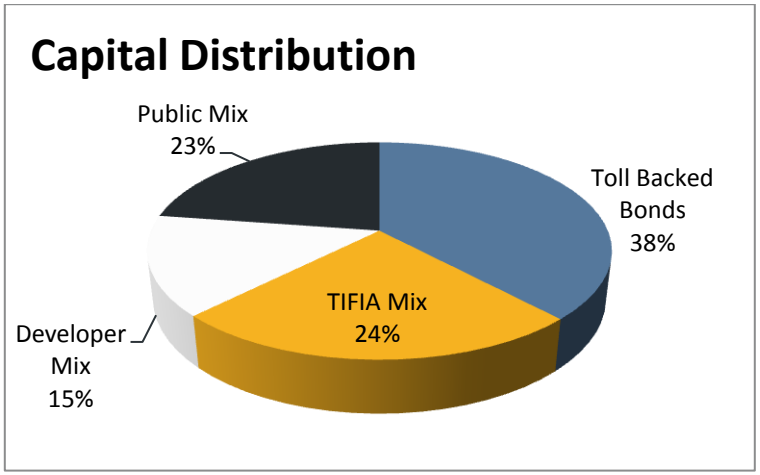
Policy	Location	Concept	Operations
HOT3+	2-lanes per direction	Buffer Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Ultimate Recommendation (PPP)

NPV of Public Sector Contribution

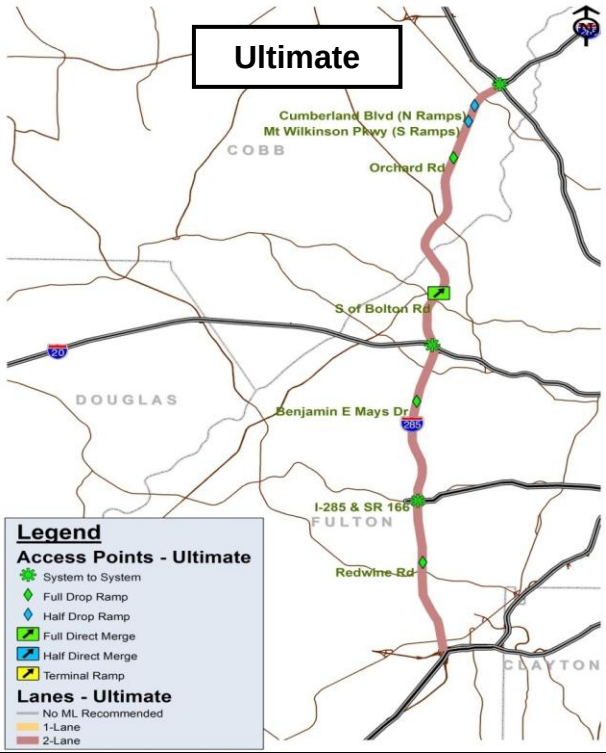
$136M

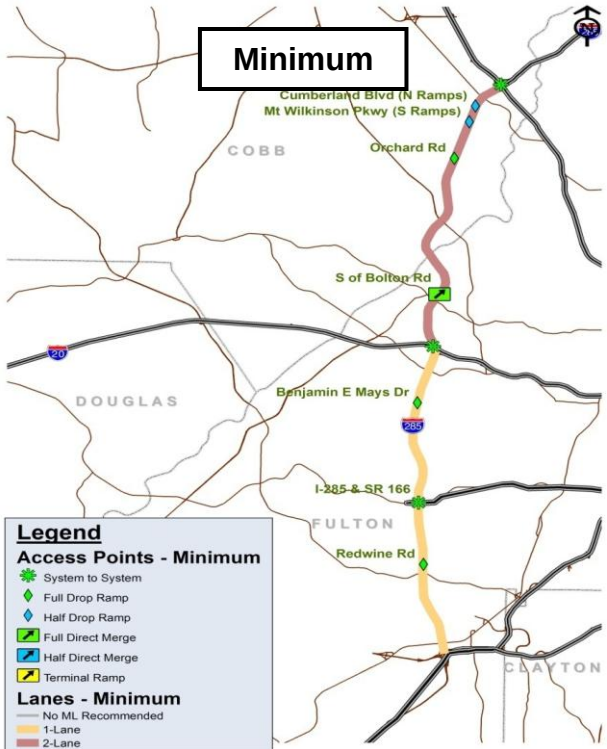
Revenue (a): $1.54B
Capital Costs (b): $0.73B
Toll O&M (c): $0.23B
Roadway O&M (d): $3.7M



Note: No Minimum Recommendation for I-285 East.

Figure 40: I-285 West Ultimate and Minimum Recommendations

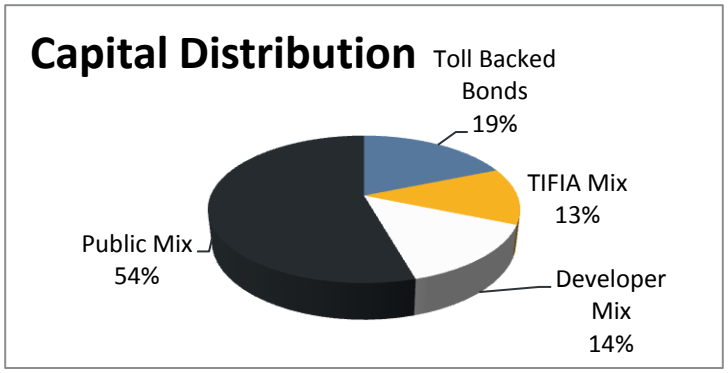
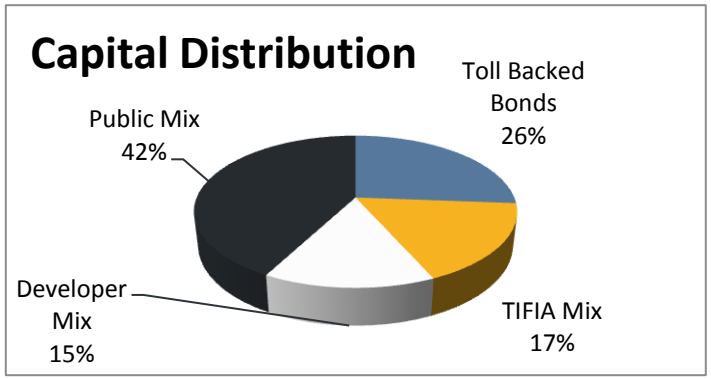




Policy	Location	Concept	Operations
HOT3+	2-lanes per direction	Buffer Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	2-lanes per direction I-75N to I-20 W 1-lane per direction I-20 W to I-85 S	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

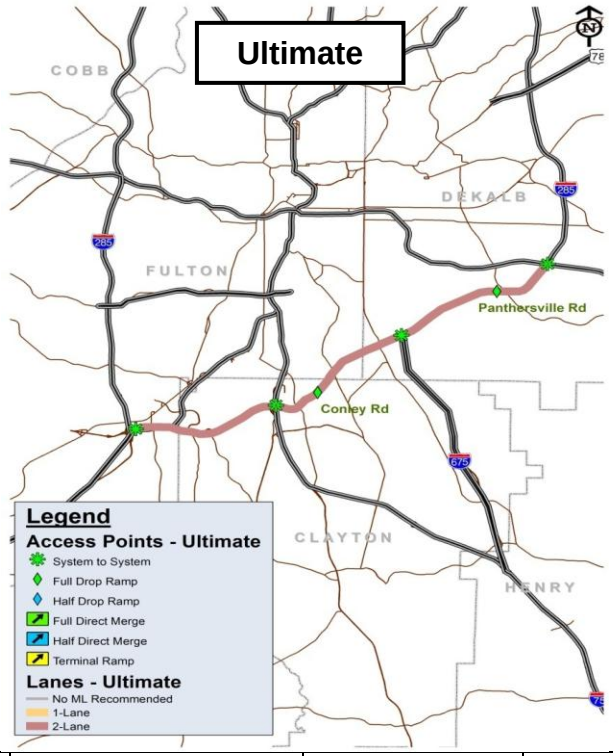
Figure 41: I-285 West Ultimate and Minimum Financial Summary

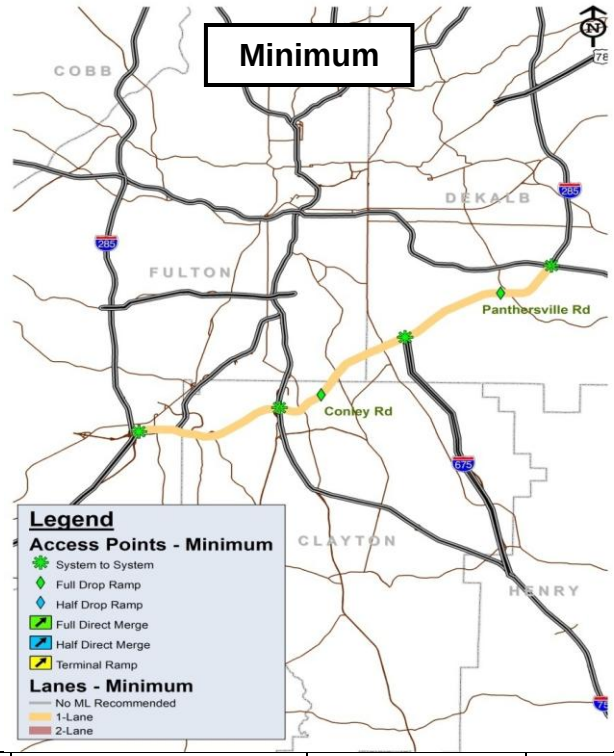
Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$440M**	Revenue (a): $1.19B Capital Costs (b): $0.99B Toll O&M (c): $0.18B Roadway O&M (d): $5.0M	**NPV of Public Sector Contribution** **$234M**	Revenue (a): $1.05B Capital Costs (b): $0.68B O&M Costs (c): $0.16B Roadway O&M (d): $3.4M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 42: I-285 South Ultimate and Minimum Recommendations

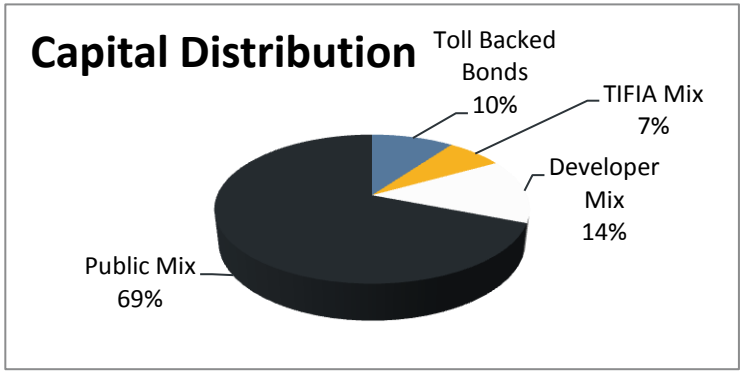
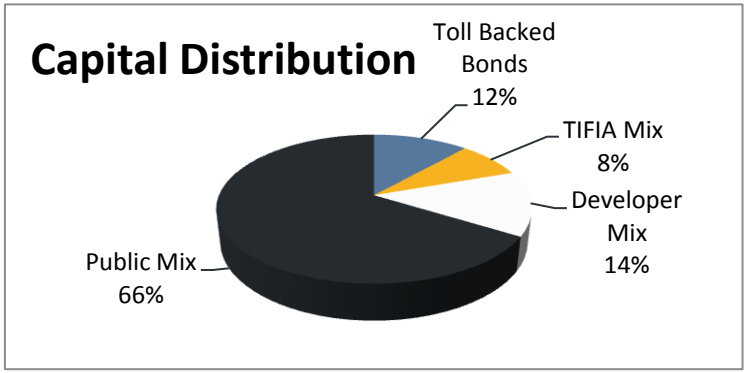




Policy	Location	Concept	Operations
HOT3+	2-lanes per direction	Buffer Desirable Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	1-lane per direction	Buffer Reduced Pavement Overlay Design Exceptions through Bridges	Bi-Directional At-Grade

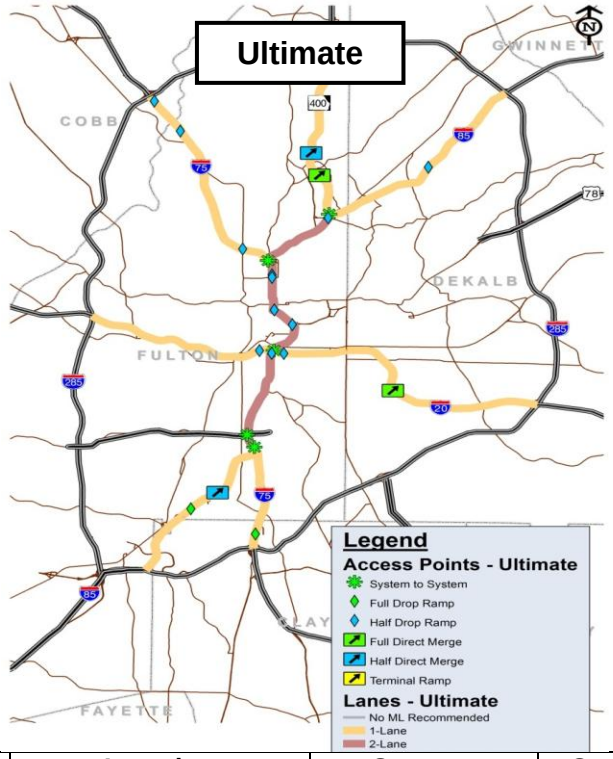
Figure 43: I-285 South Ultimate and Minimum Financial Summary

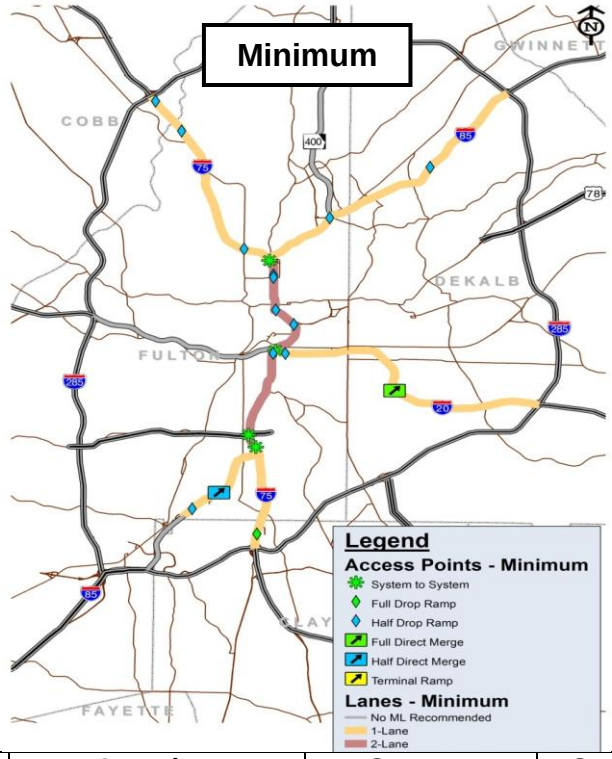
Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$464M**	Revenue (a): $0.63B Capital Costs (b): $0.82B Toll O&M (c): $0.10B Roadway O&M (d): $4.1M	**NPV of Public Sector Contribution** **$267M**	Revenue (a): $0.43B Capital Costs (b): $0.50B O&M Costs (c): $0.06B Roadway O&M (d): $2.5M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 44: Inside I-285 Ultimate and Minimum Recommendations

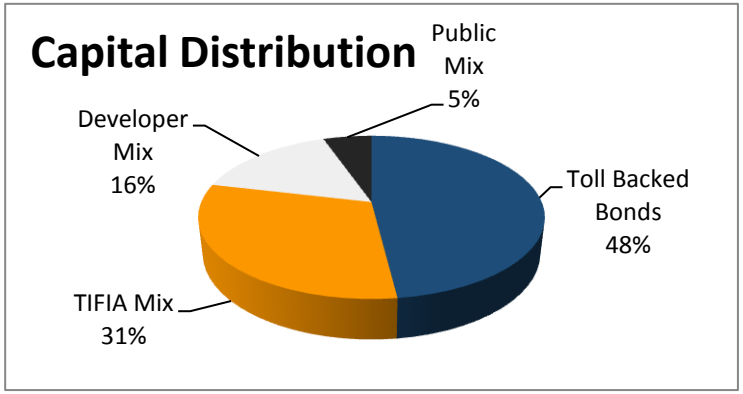
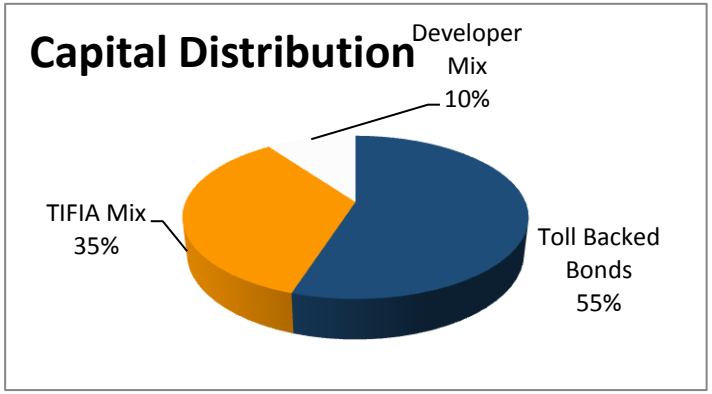




Policy	Location	Concept	Operations
HOT3+	2-lanes per direction Downtown Connector I-85N from Brookwood to SR400 1-lane I-75 N/S I-85 N/S I-20 E/W SR 400	Buffer Reduced Pavement Overlay Design Exceptions through Bridges General Purpose Lane Conversion (Downtown Connector, I-20W)	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	2-lanes per direction Downtown Connector 1-lane I-75 N/S I-85 N/S I-20	Buffer Reduced Pavement Overlay Design Exceptions through Bridges General Purpose Lane Conversion (Downtown Connector)	Bi-Directional At-Grade

Figure 45: Inside I-285 Ultimate and Minimum Financial Results

Ultimate Recommendation (PPP*)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$106M**	Revenue (a): $5.26B Capital Costs (b): $2.08B Toll O&M (c): $0.79B Roadway O&M (d): $7.5M	**NPV of Public Sector Contribution** **-$111M*** *There is actually a NPV *surplus* associated with this recommendation	Revenue (a): $4.34B Capital Costs (b): $1.10B Toll O&M (c): $0.65B Roadway O&M (d): $3.8M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures. Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

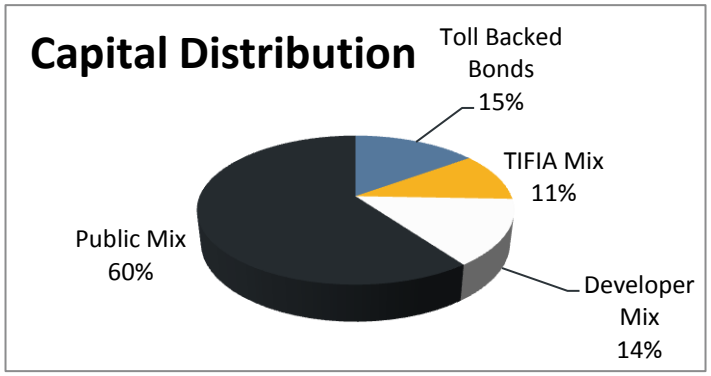
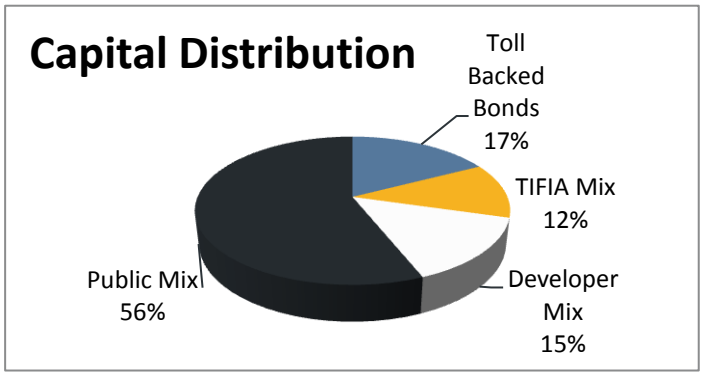
***** This study is not recommending specific project delivery mechanisms or strategies. However, these corridors inside I-285 would probably not lend themselves as good candidates for a PPP.

Figure 46: I-575 Ultimate and Minimum Recommendations

Policy	Location	Concept	Operations
HOT3+	1-lane I-75 to N of Canton Rd	Barrier Desirable	Reversible At-Grade Inside from I-75 to Canton Rd

Policy	Location	Concept	Operations
HOT3+	1-lane I-75 to S of Sixes Rd	Barrier Reduced	Reversible At-Grade Inside from I-75 to Sixes Rd

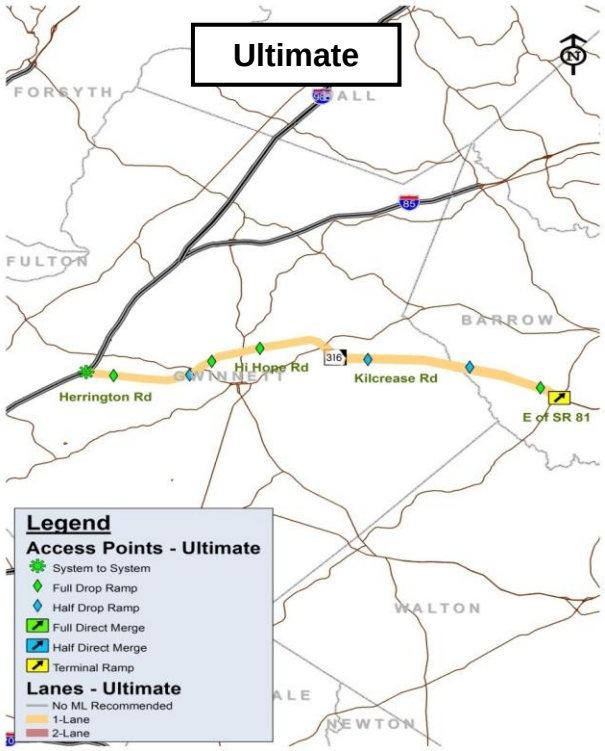
Figure 47: I-575 Ultimate and Minimum Financial Results

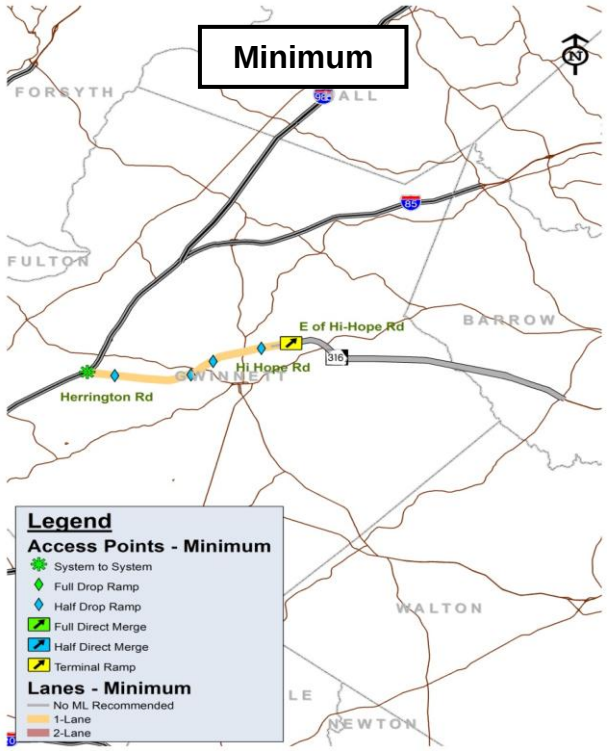
Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$257M**	Revenue (a): $0.59B Capital Costs (b): $0.53B Toll O&M (c): $0.09B Roadway O&M (d): $2.4M	**NPV of Public Sector Contribution** **$197M**	Revenue (a): $0.53B Capital Costs (b): $0.43B Toll O&M (c): $0.08B Roadway O&M (d): $2.0M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

Figure 48: SR 316 Ultimate and Minimum Recommendations

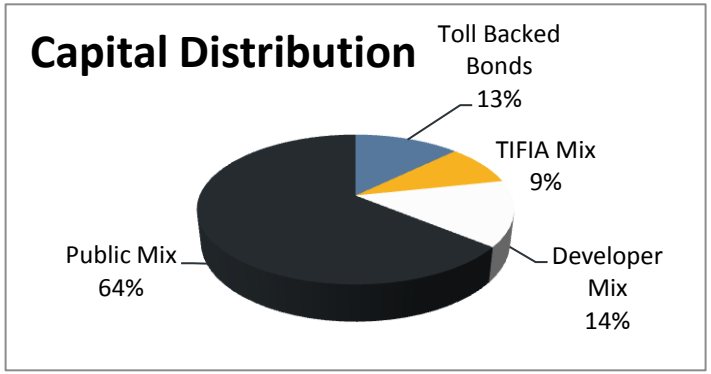
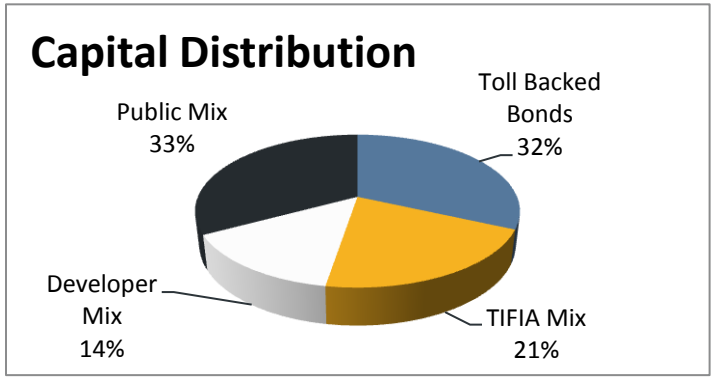




Policy	Location	Concept	Operations
HOT3+	1-lane per direction I-85 to E of SR 81	Buffer Desirable	Bi-Directional At-Grade

Policy	Location	Concept	Operations
HOT3+	1-lane per direction I-85 to E of Hi-Hope Rd	Buffer Reduced	Bi-Directional At-Grade

Figure 49: SR 316 Ultimate and Minimum Financial Results

Ultimate Recommendation (PPP)		Minimum Recommendation (PPP)	
NPV of Public Sector Contribution **$274M**	Revenue (a): $0.50B Capital Costs (b): $0.52B Toll O&M (c): $0.07B Roadway O&M (d): $2.6M	**NPV of Public Sector Contribution** **$46M**	Revenue (a): $0.32B Capital Costs (b): $0.17B Toll O&M (c): $0.05B Roadway O&M (d): $0.9M
			

Notes: (a) 35-year accumulated gross revenues from 2020 to 2055. (b) Costs include corridor and interchange components. (c) 35-year toll operations O&M as a percent of revenue. (d) Annual roadway operations O&M as a percent of capital expenditures.

Interest rates: 5% for toll-backed bonds, 4% for TIFIA, and 12.5% for developer required IRR. All dollar amounts in $2008.

F. Implementation Plan

Several factors were considered in the establishment of an implementation plan for managed lanes in Metro Atlanta. The approach included separating individual projects into distinct tiers, that when built over time, would result in the ultimate recommendations on each corridor. It was understood that there would not be resources available to construct the entire system at one time. It was also recognized that some corridors had significant momentum in terms of recent or active design and/or environmental work. By tiering projects, the focus could be placed on the most critical corridors first, allowing the system to gradually expand into a fully realized network of managed lanes.

Tiers were determined using a number of criteria. These included ease of implementation, recently completed and ongoing environmental analysis and design activities, the level of public contribution necessary to cover project costs, system connectivity, and regional equity. The screening process described previously fed directly into this process. Those projects that best met these criteria were targeted for early tiers. In some cases, a minimum alternative was assigned to an early tier, with ultimate build-out resigned to a later tier. This was done to capitalize on the most efficient pieces of managed lane corridors to build momentum for their completion later in the process.

Tier 1

The first tier included projects with significant momentum in terms of design and environmental work. Also included were HOV-to-HOT lane conversions along the existing HOV system. These projects would not require a significant amount of construction. Table 5 shows the projects assigned to Tier 1. The total cost for the tier is estimated to be approximately $3.0B, and the funding gap assuming a 35-year financing period under a PPP arrangement is projected to be $240M.

Table 5: Implementation Plan Tier 1 Projects

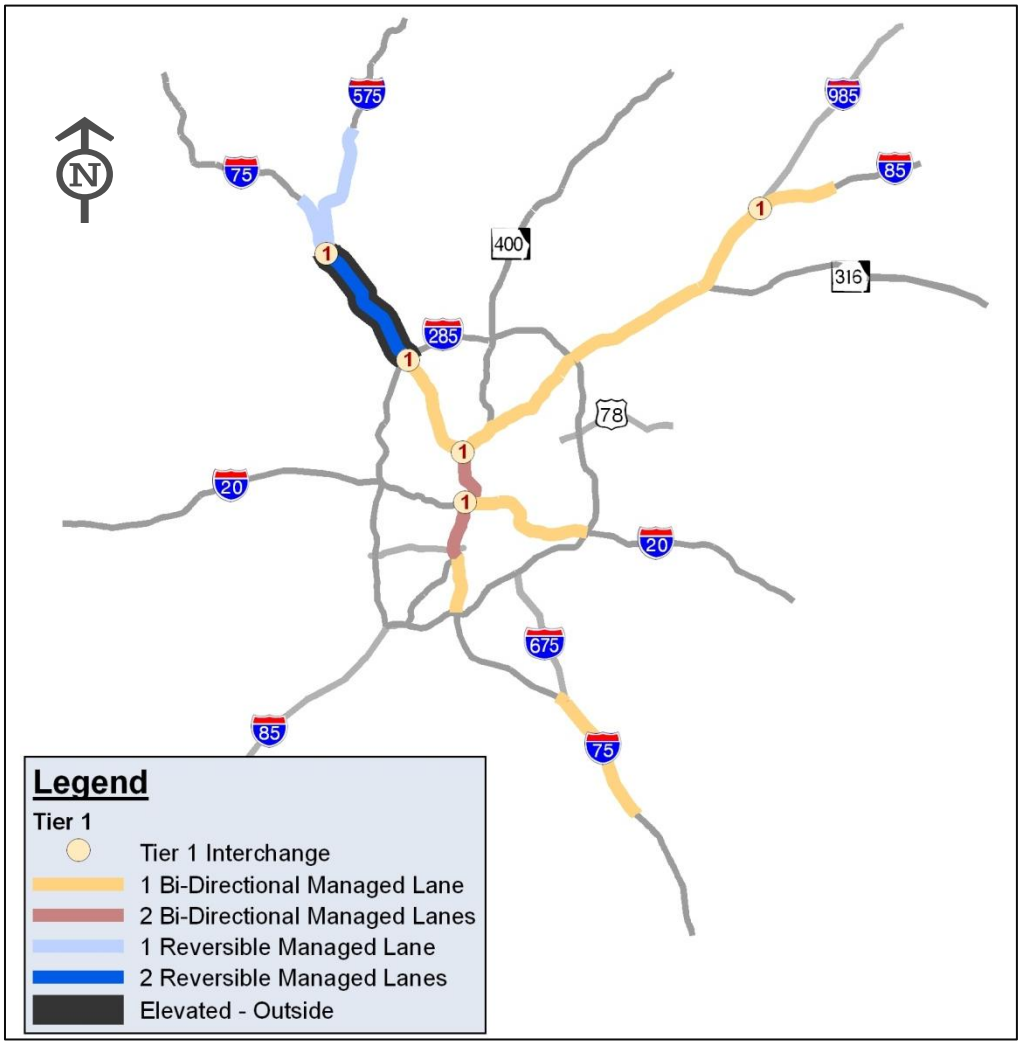
Corridor	From	To	Scope	Cost
I-75 North Outside I-285	I-285	North of Hickory Grove Rd	Build 2 HOT3+ reversible lanes, elevated to I-575 and 1 reversible lane, at-grade from I-575 to Hickory Grove Rd	$1.1B
I-575	I-75 North	South of Sixes Rd	Build 1 reversible HOT3+ lane, at grade	
I-75 South Outside I-285	SR 138	SR 155	Build 1 HOT3+ lane in each direction from SR 138 to SR 155	$75M
I-85 North Outside I-285	I-285	Old Peachtree Rd	Convert existing HOV lanes to HOT3+ lanes from I-285 to Old Peachtree Rd	$249M
I-85 North Outside I-285	Old Peachtree Rd	South of Hamilton Mill Rd	Build 1 HOT3+ lane in each direction from Old Peachtree Rd to Hamilton Mill Rd	$135M
Downtown Connector	Brookwood Interchange	I-75/I-85 Split	Convert existing HOV lanes (one lane in each direction), convert 1 GP lane in each direction to provide 2 HOT3+ lanes in each direction	$84M

Corridor	From	To	Scope	Cost
I-75 North Inside I-285	I-285	Brookwood Interchange	Convert existing HOV lanes to HOT3+ to provide 1 HOT3+ lane in each direction	$122M
I-85 North Inside I-285	I-285	Brookwood Interchange	Convert existing HOV lanes (one in each direction) to HOT3+ to provide 1 HOT3+ lane in each direction	$170M
I-75 South Inside I-285	I-285	Airport Split	Convert existing HOV lanes (one in each direction) to HOT3+ to provide 1 HOT3+ lane in each direction	$38M
I-20 East Inside I-285	I-285	Downtown Connector	Convert existing HOV lanes (one in each direction) to HOT3+ to provide 1 HOT3+ lane in each direction	$122M

Interchange	Interchange Movements Included	Cost
Downtown Connector/ I-75N/I-85N	DC to I-75; DC to I-85; I-85 to DC; I-75 to DC	$69M
Downtown Connector/ I-20E	DC SB to I-20 EB; I-20 EB to DC NB	$177M
I-75N/I-285	I-75SB to I-285EB&WB; I-75NB to I-285WB; I-285EB to I-75NB&SB; I-285WB to I-75NB	$542M
I-75N/I-575	I-75NB to I-575NB; I-575SB to I-75SB	$36M
I-85N/I-985	I-85NB to I-985NB; I-985SB to I-85SB	$36M

Figure 50 is a map highlighting the corridors and interchanges targeted for Tier 1 implementation. The figure shows managed lanes per direction. For example, two northbound and two southbound lanes are recommended for the Downtown Connector, shown in red in the figure. The numbered dots indicate the location and respective tier of each interchange improvement. This same format is used in Figures 50 through 54.

Figure 50: Managed Lanes System Tier 1



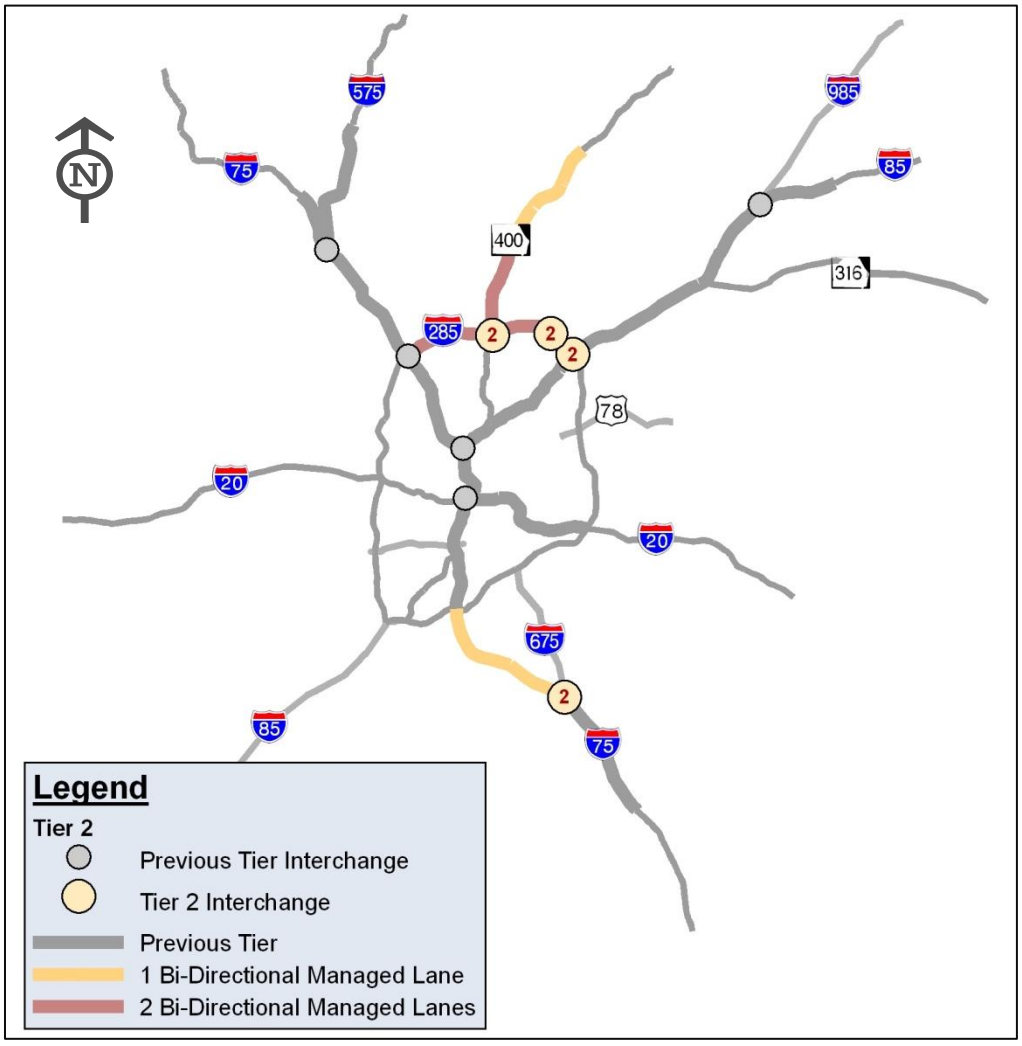
Tier 2

Projects in the second tier also have some level of momentum in terms of previous and ongoing studies and design work. But in contrast to many of the Tier 1 projects, there is significant construction associated with these, including four system to system interchanges. The estimated total capital cost associated with this tier is $2.9B. If combined with Tier 1, the cumulative gap for these two tiers over a 35-year period is $1.6B. Table 6 and Figure 51 show the specific projects associated with Tier 2.

Table 6: Implementation Plan Tier 2 Projects

Corridor	From	To	Scope	Cost
SR 400 North Outside I-285	I-285	South of McFarland Rd	Build 2 HOT3+ lanes in each direction to Holcomb Bridge Rd, build 1 HOT3+ lane in each direction to McFarland Rd	$411M
I-285 North	I-75N	I-85N	Build 2 HOT3+ lanes in each direction from I-75N to I-85N	$976M
I-75 South Outside I-285	I-285	SR 138	Build 1 HOT3+ lane in each direction from I-285 to SR 138	$512M
Interchange	**Interchange Movements Included**			**Cost**
I-85N/I-285	I-85SB to I-285WB&EB; I-285WB to I-85NB; I-285EB to I-85NB			$393M
SR400/I-285	SR400SB to I-285EB&WB; SR400NB to I-285EB; I-285EB to SR400NB; I-285WB to SR400NB&SB			$381M
Peachtree Industrial Blvd/I-285	All Movements Provided			$210M
I-75S/I-675	I-75NB to I-675NB; I-675SB to I-75SB			$44M

Figure 51: Managed Lanes System Tier 2



Tier 3

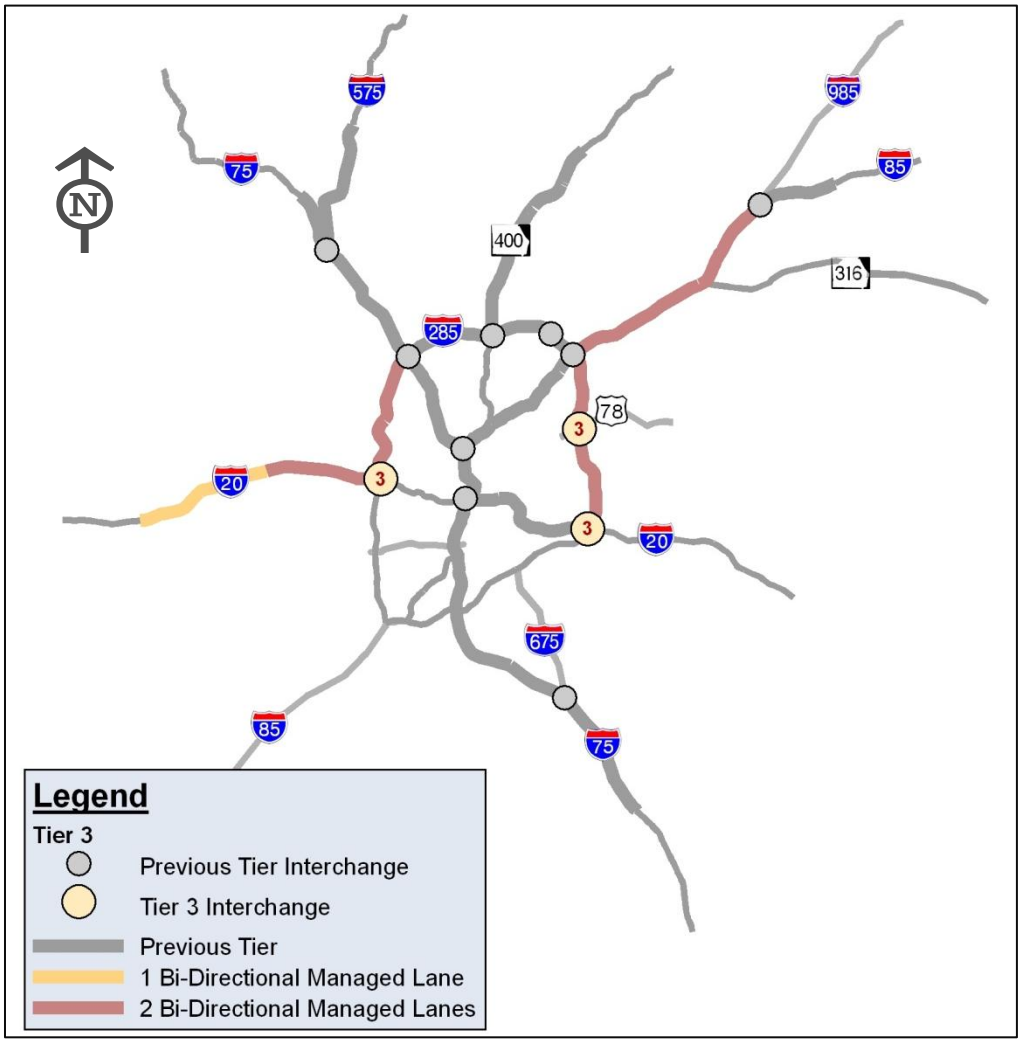
The third tier of projects expands the system further and includes adding to the Tier 1 HOT lanes project on I-85 North outside I-285. A second lane is added in each direction from I-285 to I-985, which brings that corridor to the ultimate recommendation identified in the screening process. Total costs for Tier 3 are estimated to be $3.7B, making the cumulative cost for the first three tiers $9.6B with a cumulative gap of $3.2B. Table 7 and Figure 52 show the Tier 3 projects.

Table 7: Implementation Plan Tier 3 Projects

Corridor	From	To	Scope	Cost
I-85 North Outside I-285	I-285	I-985	Build 1 additional HOT3+ lane in each direction from I-285 to I-985 (for a total of 2 HOT3+ lanes in each direction from I-285 to I-985)	$1,024M
I-285 East	I-85	I-20	Build 2 HOT3+ lanes in each direction from I-85 to I-20	$734M
I-285 West	I-75	I-20	Build 2 HOT3+ lanes in each direction from I-75 to I-20	$536M
I-20 West Outside I-285	I-285	West of Bright Star Rd	Build 2 HOT3+ lanes in each direction from I-285 to Mt. Vernon Rd, build 1 HOT3+ lane in each direction to Bright Star Rd	$589M

Interchange	Interchange Movements Included	Cost
I-20E/I-285	I-20WB to I-285NB&SB; I-285SB to I-20EB; I-285NB to I-20EB	$296M
US78/I-285	All Movements Provided	$153M
I-20W/I-285	I-20EB to I-285NB&SB; I-285SB to I-20WB; I-285NB to I-20WB	$335M

Figure 52: Managed Lanes System Tier 3



Tier 4

Tier 4 projects include significant investment on much of I-285 and I-20 East, along with the addition of one managed lane on I-85 North inside I-285 from SR 400 to the Brookwood Interchange. This additional lane supports the managed lane project along SR 400 inside I-285 and helps mitigate merging problems associated with this section. Total costs for Tier 4 are estimated to be $3.6B, making the cumulative cost for the first four tiers $13.2B with a cumulative gap of $5.2B. Figure 53 and Table 8 show the Tier 4 projects.

Figure 53: Managed Lanes System Tier 4

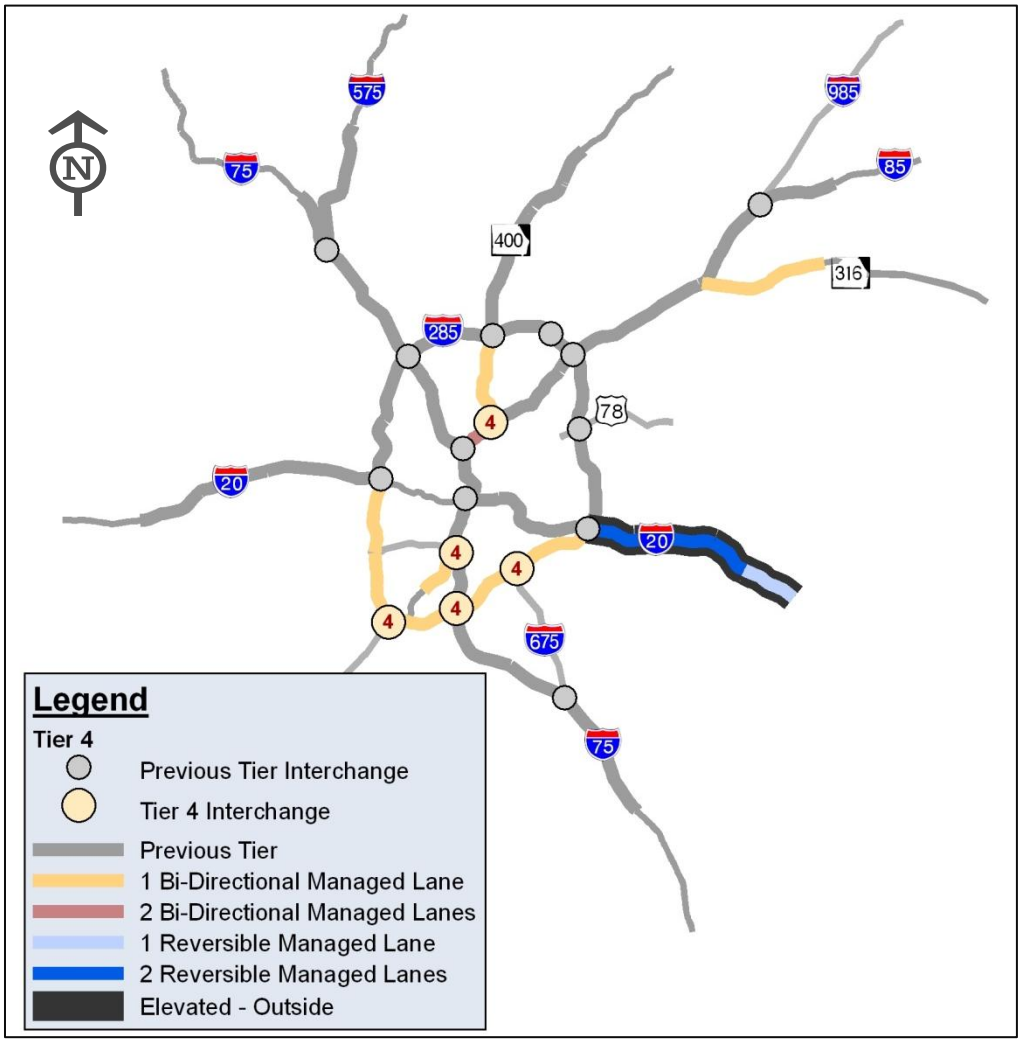


Table 8: Implementation Plan Tier 4 Projects

Corridor	From	To	Scope	Cost
I-20 East Outside I-285	I-285	West of Salem Rd	Build 2 elevated reversible lanes to Sigman Rd, and build 1 elevated reversible lane to Salem Rd	$724M
SR 316	I-85 North Outside I-285	East of High Hope Rd	Build 1 HOT3+ lane in each direction from I-85 to High Hope Rd	$316M
I-85 South Inside I-285	I-75/I-85	Loop Rd	Build 1 HOT3+ lane in each direction from the I-75/I-85 Split to Loop Rd	$235M
I-85 North Inside I-285	Brookwood Interchange	SR 400 North Inside I-285	Build 1 HOT3+ lane in each direction from the Brookwood Interchange to SR 400 North Inside I-285	$500M
SR 400 North Inside I-285	I-285	I-85 North Inside I-285	Build 1 HOT3+ lane in each direction from I-285 to I-85 North Inside I-285	$60M
I-285 South/ I-285 West	I-20 East	I-20 West	Build 1 HOT3+ lane in each direction from I-20 East to I-20 West	$713M

Interchange	Interchange Movements Included	Cost
I-675/I-285	I-675NB to I-285EB; I-285WB to I-675SB	$59M
I-75S/I-285	I-75NB to I-285EB&WB; I-75SB to I-285EB; I-285WB to I-75NB&SB; I-285EB to I-75SB	$366M
I-85/SR400	I-85NB to SR400NB; SR400SB to I-85SB	$258M
I-85S Outside/I-285	I-85NB to I-285WB&EB; I-285EB to I-85SB; I-285WB to I-85SB	$248M
Downtown Connector/ I-75S/I-85S	DC SB to I-75 SB; DC SB to I-85 SB; I-85 NB to DC NB; I-75 NB to DC NB	$80M

Tier 5

The managed lane network is completed in Tier 5. This tier includes a number of projects throughout the region totaling $3.0B in capital expenditures. The total cost for all five tiers in the system is $16.2B, and the cumulative gap for the system is $7.0B. That is, for an upfront public sector investment of $7.0B, the region could expect over $16B in managed lane infrastructure. The remaining costs would be supported by toll revenues, which would be used to pay down the debt over time (over a 35-year period in this case). Table 9 and Figure 54 show the Tier 5 projects.

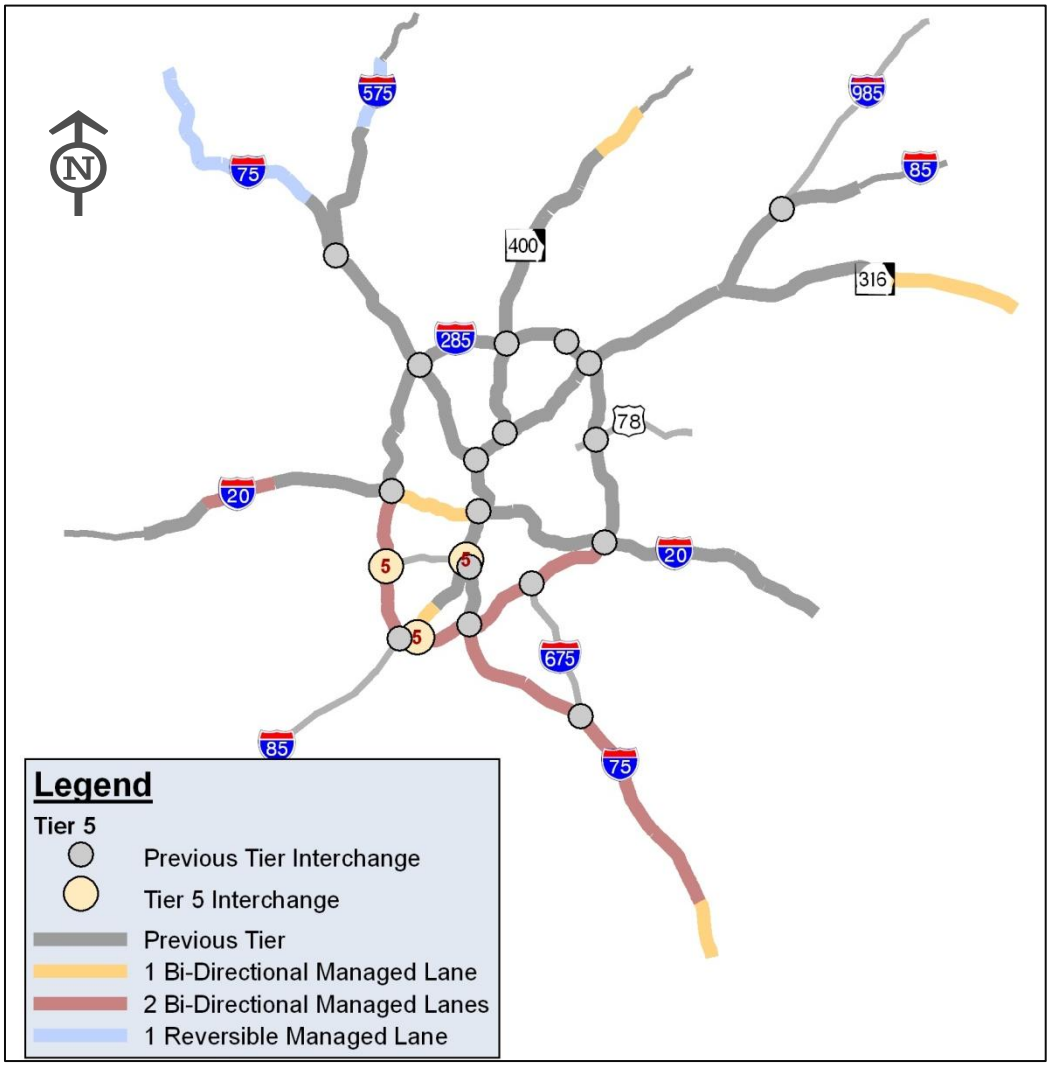
Table 9: Implementation Plan Tier 5 Projects

Corridor	From	To	Scope	Cost
I-75 North Outside I-285	North of Hickory Grove Rd	South of SR 113	Build 1 at-grade HOT3+ reversible lane from Hickory Grove Rd to SR 113	$425M
I-575 North	Sixes Rd	North of Canton Rd	Build 1 at-grade HOT3+ reversible lane from Sixes Rd to Canton Rd	$114M

Corridor	From	To	Scope	Cost
SR400 North Outside I-285	Holcomb Bridge Rd	South of Peachtree Pkwy	Build 1 HOT3+ lane in each direction from Holcomb Bridge Rd to Kimball Bridge Rd, build 1 HOT3+ lane in each direction from McFarland Rd to Old Peachtree Pkwy	$294M
I-75 South Outside I-285	I-285	South of Locust Grove Rd	Build 1 additional HOT3+ lane in each direction from I-285 to S of Locust Grove Rd (for a total of 2 HOT lanes in each direction from I-285 to Bill Gardner Pkwy)	$736M
SR 316	East of High Hope Rd	East of SR 81	Build 1 HOT3+ lane in each direction from High Hope Rd to SR 81	$208M
I-20 West Outside I-285	East of Mt Vernon Rd	East of Presley Mill Rd	Build 2 HOT lanes from Mt Vernon Rd to E of Presley Mill Rd (for a total of 2 HOT lanes in each direction from I-285 to Presley Mill Rd)	$107M
I-285 South/ I-285 West	I-20 East	I-20 West	Build 1 additional HOT3+ lane in each direction from I-20E to I-20W (for a total of 2 HOT lanes in each direction from I-20E to I-20W)	$568M
I-20 West Inside I-285	Downtown Connector	I-285	Convert 1 GP in each direction where there are 4+ in each direction, build 1 HOT3+ lane in each direction where there are 3 or fewer GP lanes in each direction	$68M

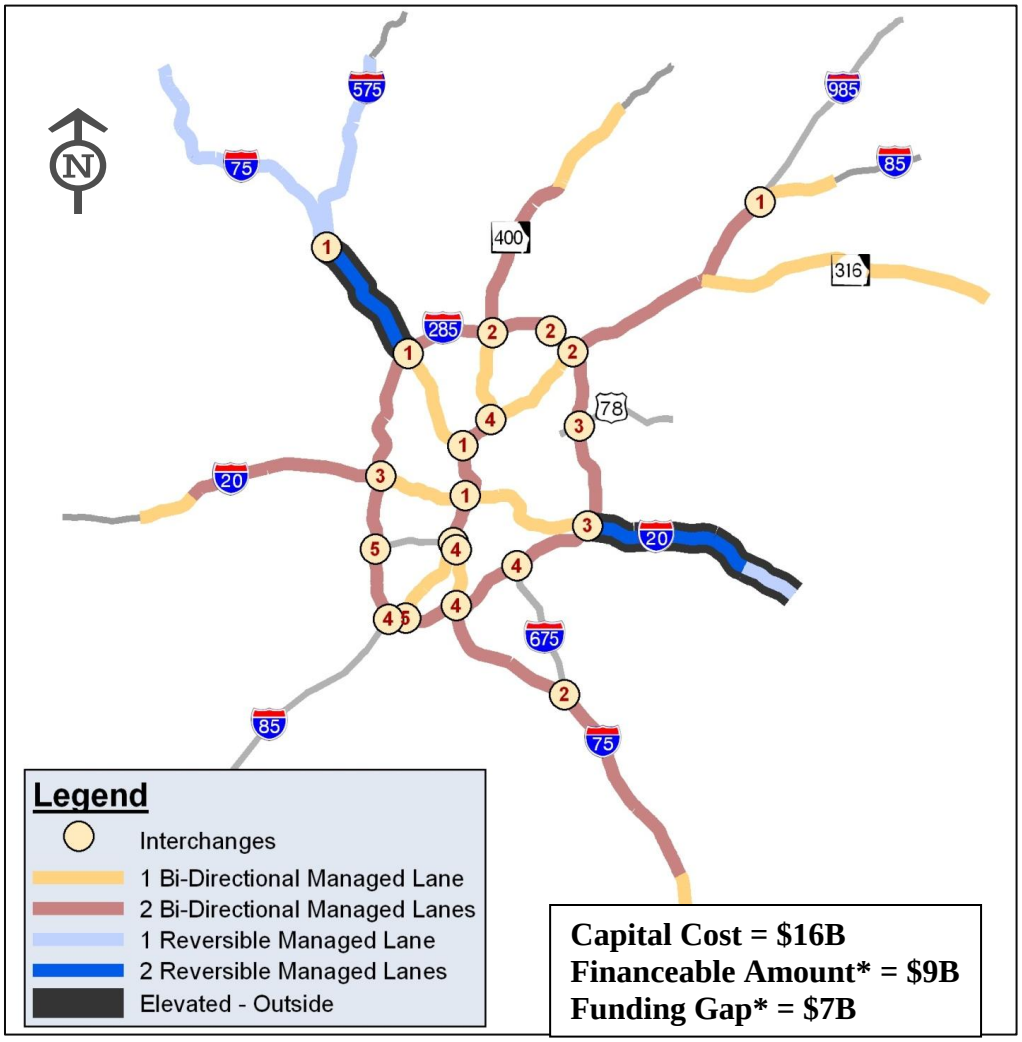
Interchange	Interchange Movements Included	Cost
I-85S Inside/I-285	I-85SB to I-285WB; I-285EB to I-85NB	$248M
Downtown Connector/ Langford Pkwy	DC SB to Langford Pkwy WB; Langford Pkwy EB to DC NB	$78M
I-285/ Langford Pkwy	Langford Pkwy WB to I-285 NB&SB; I-285 NB to Langford Pkwy EB; I-285 SB to Langford Pkwy EB	$111M
Downtown Connector/ I-20W	No access provided between I-20W and DC	N/A

Figure 54: Managed Lanes System Tier 5



The complete managed lane system is shown in Figure 55. Final build out includes both 1 and 2-lane managed lane applications based on specific corridor needs. The vast majority of the system is bi-directional, at-grade, with the exception of I-75 north, I-575, and I-20 East outside of I-285. These are the only examples of reversible lane applications in the system. These corridors are elevated where indicated in the figure: I-75 North between I-285 and I-575, and I-20 East between I-285 and Salem Road. The I-75 North and I-575 reversible sections are designated at-grade. The proposed system to system interchanges are significant elements in this system, and contribute significantly to the overall cost of the system. These have been strategically phased in the implementation plan to capitalize of revenue potential as specific corridors open for service.

Figure 55: Complete Managed Lanes System



*Assuming PPP arrangement, open to traffic in year 2020, and 35-year revenue generating period.

G. System Benefits

The recommended managed lane system presented in Figure 55 will not generate enough revenue to cover operations, maintenance and capital costs. Estimates in the previous section indicate that over 35 years, the five tiers of projects will leave a $7.0B funding gap. This amount must be covered by the public sector or some other funding source. However, the managed lanes do produce significant public benefits, including an 8% system-wide reduction in vehicle delay. Managed lane users experience an 83% reduction in delay compared to a 2030 no-build scenario. This delay benefit equates to a $47B system-wide reduction in the cost of congestion and a $37B decrease in congestion cost for the managed lane users. Average travel speeds in the managed lanes average approximately 52 miles per hour, while those in the adjacent general purpose lanes average just 28 miles per hour.

Figures 56 and 57 highlight the impact of the managed lane system to the Atlanta region. These figures show travel time contours with and without the managed lanes in place. Figure 56 shows a tremendous increase in accessibility from the Downtown Atlanta employment center to the surrounding area. With the managed lanes in place, there is a 196% increase in workers within 45 minutes of Downtown by car. In addition, there is a 132% increase in workers within 90 minutes of Downtown by car. Table 10 shows travel time differences in the general purpose and managed lanes for five sample trips. Managed lanes provide up to a 40% travel time savings over the general purpose lanes.

In spite of the funding gap associated with the managed lane system, there are significant benefits to its implementation in terms of travel time savings and delay reduction. While primary benefits are realized by managed lane users, there are secondary, system-wide benefits that extend to all vehicles in the region.

Figure 56: 2030 PM Period Travel Time Contour without Managed Lanes

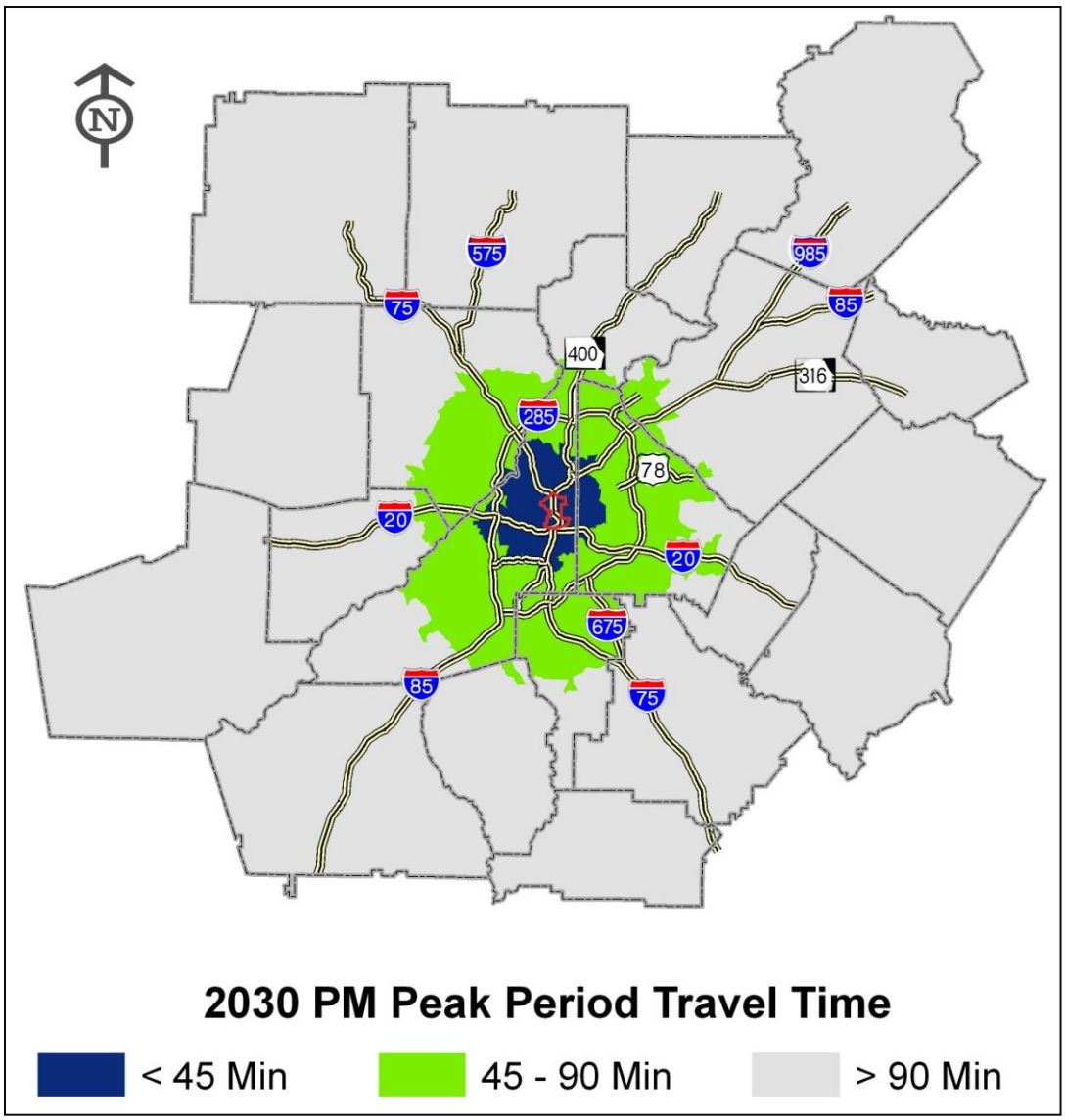


Figure 57: 2030 PM Period Travel Time Contour with Managed Lanes (for Travelers in the Managed Lanes)

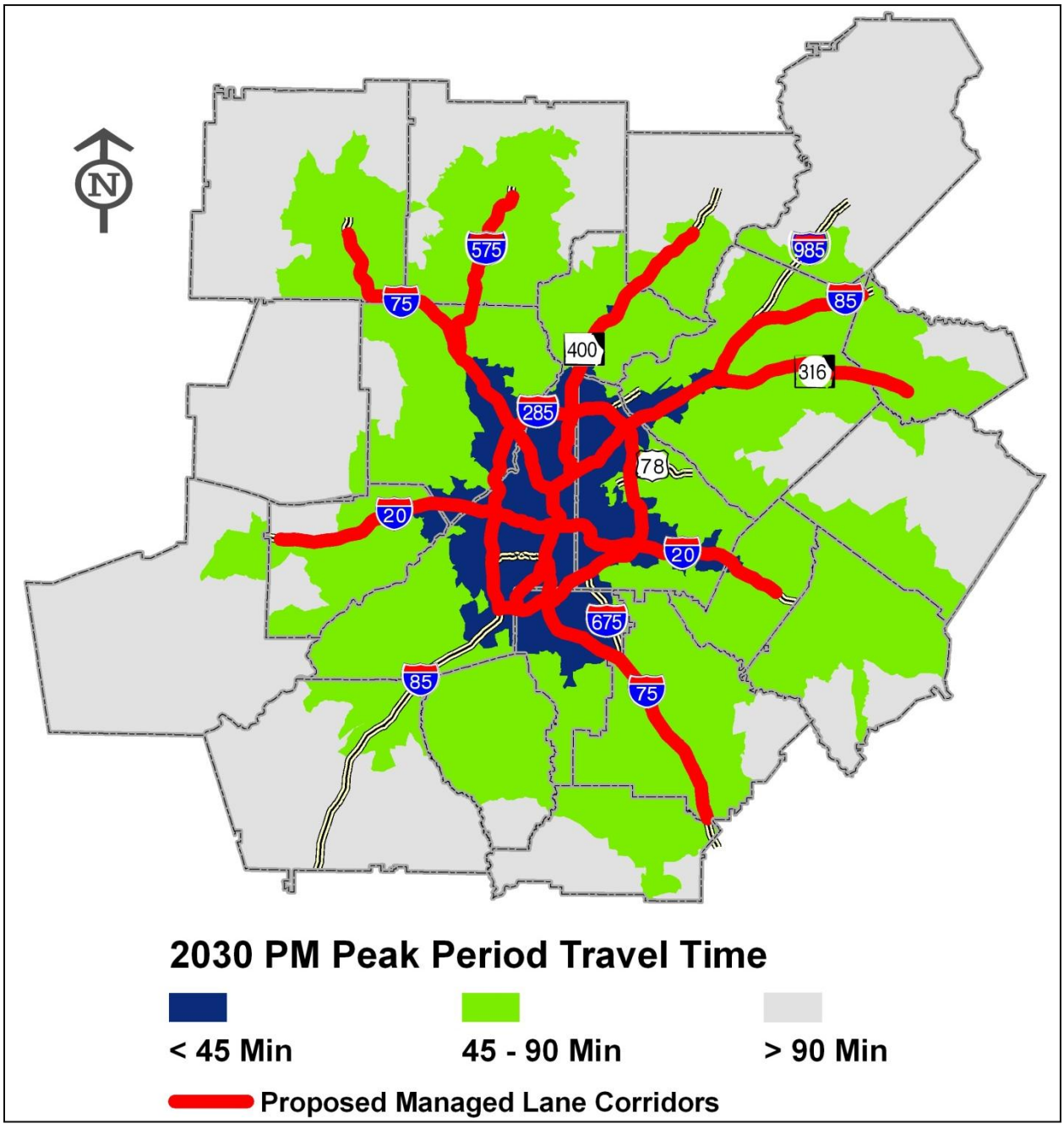


Table 10: 2030 Sample PM Period Trip Time Savings

Sample Trip Routes	2030 PM Peak Period		
	Travel Time Via GP Lanes (min)	Travel Time Via Managed Lanes (min)	Travel Time Savings (min)
Downtown to I-85/Pleasant Hill Rd (Gwinnett Place Mall area) - 23 miles	105	60	45
I-285/I-75 (Cobb Co) to SR 400/Holcomb Bridge Road - 19 miles	70	45	25
I-20/Panola Road to I-285/SR 400 (via I-20/I-285) - 22 miles	65	40	25
I-20/SR138 (Conyers) to Atlanta Airport (via I-20/I-285) - 29 miles	80	65	15
I-75/Hampton Locust Grove Rd to Atlanta Airport (via I-75) - 35 miles	90	70	20

H. Conclusion

This chapter has detailed the screening analysis and implementation plan process used to arrive at the final recommendations for the Managed Lane System Plan. A three-step screening process was used, including system, corridor, and implementation screens, to arrive at ultimate and minimum recommendations for the managed lane system. In each of these screens, the analysis focused on four key components: location, policies, operations, and concept, which helped categorize and organize the myriad of details associated with managed lanes. Output from the screening process was then linked with other key criteria to develop a 5-tiered implementation plan that resulted in a complete managed lane network for Metro Atlanta. These final recommendations were based on a comprehensive analysis that included traffic and revenue, cost, engineering, and financial analyses, along with stakeholder input, to produce the best possible proposal for Atlanta's managed lane system.

I. Next Steps

In order to move forward with a system of managed lanes in the Atlanta region, a number of steps need to be taken. These are detailed in the MLSP technical report titled *Implementation Strategy*, and are summarized below. The first steps would be to define the need and purpose of specific projects and establish a funding need for those projects. Next would be the

establishment of a public involvement plan. Then it would be necessary to develop a strategy based on the approach taken to implement the managed lane system plan projects. This would require the determination of the general "footprint" of the plan and the compilation of existing studies and/or the initiation of new studies. Much needs to take place in order to realize a network of managed lanes in metro Atlanta, but following the roadmap set forth in the MLSP technical report titled *Implementation Strategy,* will move the region closer to this goal.