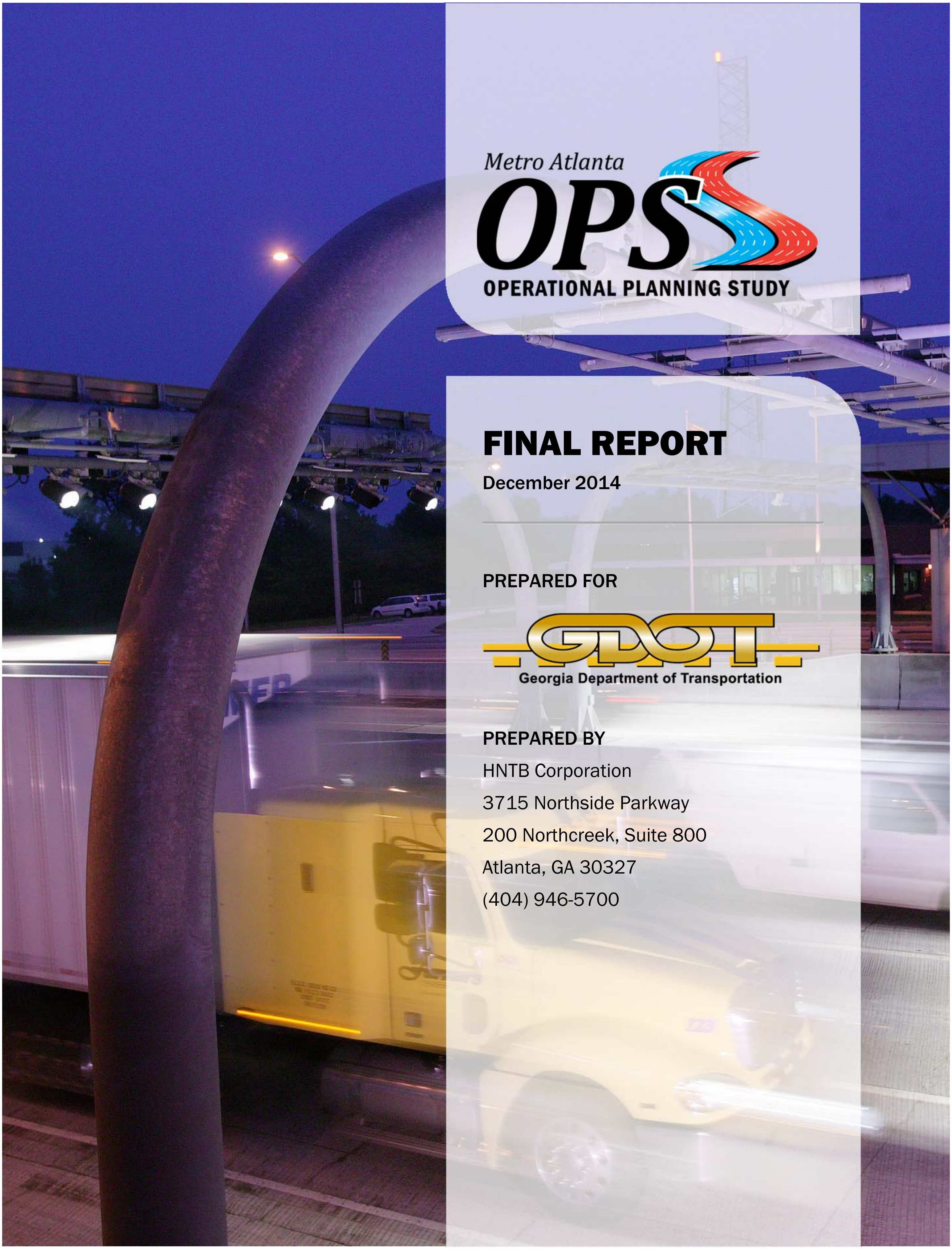

Metro Atlanta OPS
OPERATIONAL PLANNING STUDY

FINAL REPORT

December 2014

PREPARED FOR

Georgia Department of Transportation

PREPARED BY

HNTB Corporation
3715 Northside Parkway
200 Northcreek, Suite 800
Atlanta, GA 30327
(404) 946-5700

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1 INTRODUCTION

1.1 STUDY OVERVIEW

In November 2012, the Georgia Department of Transportation (GDOT) Division of Planning began two coordinated study efforts:

1. The Metro Atlanta Operational Planning Study (OPS), which identified low-cost operational strategies that can be quickly implemented to alleviate bottlenecks
2. The Atlanta Regional Managed Lanes Implementation Plan (MLIP), which updated the 2010 Managed Lanes System Plan (MLSP) with potentially lower-cost and easier to implement managed-lane projects to address major capacity issues.

This final report documents the OPS. However, given the coordinated efforts between the two studies, a high-level overview of each study is provided here. The MLIP final report is a separate document, entitled *Atlanta Regional Managed Lanes Implementation Plan (MLIP) Final Report, December 2014*.

1.1.1 Operational Planning Study (OPS)

Metro Atlanta has a well-established network of interstates and limited-access facilities. However, many of these facilities experience traffic congestion during peak travel periods. In some instances, this congestion is due to recurring bottlenecks; other times, congestion is incident-related. Given limited federal funding availability, the GDOT is looking to improve the existing transportation system.

The OPS provided an operational assessment of the interstate and limited-access system in the metro Atlanta region. Specifically, the OPS:

- Identified bottleneck areas along the limited-access facilities in the metro Atlanta region
- Identified and evaluated potential low-cost improvements that maximized capacity
- Documented a prioritized list of operational project recommendations

1.1.2 Managed Lanes Implementation Plan (MLIP)

GDOT's award-winning Atlanta Regional Managed Lane System Plan (MLSP) was the first system-wide evaluation of managed lanes in the United States – an innovative approach to urban area mobility. The plan met the following goals:

- Protected mobility
- Maximized person/vehicle throughput
- Minimized environmental impacts

- Provided a financially feasible system (using a blend of traditional, federal and state funds, and public-private partnerships)
- Designed and maintained a flexible infrastructure for varying lane management

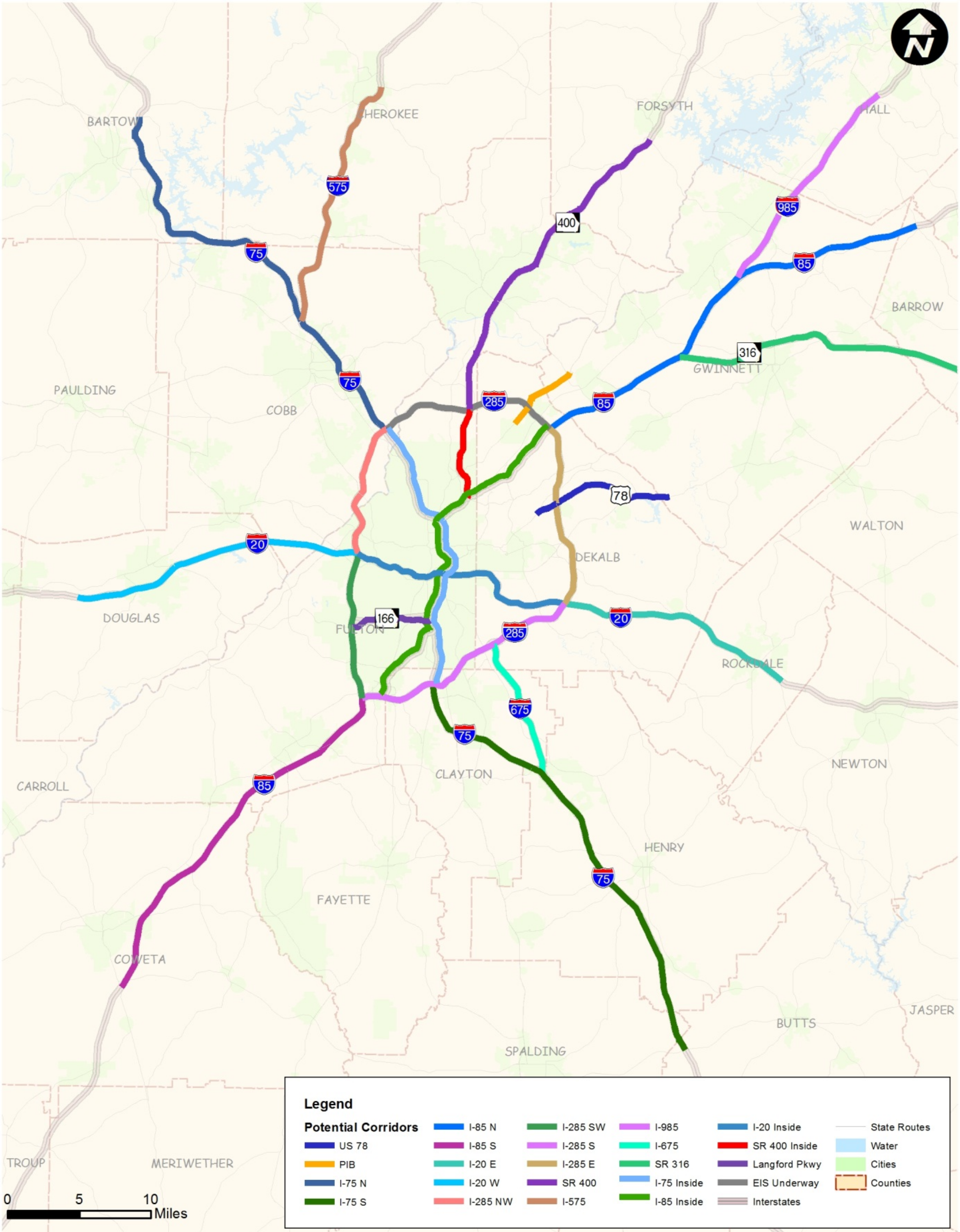
The Metro Atlanta Managed Lanes Implementation Plan (MLIP) is an update to the MLSP. The MLIP reflected current funding constraints and the knowledge gained by GDOT from projects implemented around the country since the MLSP was published in 2010. Specifically, the MLIP focused on identifying feasible locations for capacity-adding projects, redefining and reprioritizing projects from the previous plan based on current and future needs, and developing a funding plan for implementing these projects. The intent was to have a prioritized list of managed lane projects, which reduced the state's reliance on long-term private financing agreements.

1.2 STUDY AREA

A total of 22 corridors were evaluated for potential managed lanes and operational strategies as part of the MLIP and OPS. The OPS study area is illustrated in **Figure 1.1**. Interstate 285 from I-75 to I-85 (Top End) was removed from analysis due to ongoing planning efforts already underway along that corridor. The candidate corridors are as follows:

1. I-75 North from I-285 to SR 20
2. I-75 South from I-285 to SR 16
3. I-85 North from I-285 North to SR 211
4. I-85 South from I-285 South to US 29
5. I-20 West from I-285 West to Post Road
6. I-20 East from I-285 East to SR 138
7. I-285 South from I-75 South to I-20 East
8. I-285 East from I-20 East to I-85 North
9. I-285 Northwest from I-75 North to I-20 West
10. I-285 Southwest from I-20 West to I-75 South
11. SR 400 from I-285 to SR 20
12. I-75 Inside I-285
13. I-85 Inside I-285
14. I-20 Inside I-285
15. SR 400 Inside I-285
16. SR 166 / Langford Parkway
17. I-575 from I-75 to SR 20
18. I-675 from I-75 to I-285
19. I-985 from I-85 to SR 13
20. SR 316 from I-85 to SR 81
21. US 78 from N. Druid Hills Road to Rockbridge Road
22. Peachtree Industrial Boulevard

Figure 1.1: Study Corridors



1.3 PURPOSE OF THIS REPORT

The scope of the OPS includes the following tasks:

- Stakeholder Coordination and Outreach
- Data Collection
- Corridor Screening
- Needs Assessment
- Development of Alternative Strategies
- Evaluation of Potential Improvements
- Recommendations

This final report provides an overview of the methodology used to identify bottleneck locations and needs, including the collection and compilation of various transportation data for the study area corridors, as well as how potential solutions were developed, evaluated, and prioritized. As part of this process, extensive coordination and outreach took place between GDOT and its stakeholders to assist with what would ultimately be the list of recommended low-cost, operational projects.

2 STAKEHOLDER COORDINATION AND OUTREACH

Several stakeholders and agency groups were involved in the development of the OPS. Two committees were formed for the purpose of both the OPS and MLIP studies: 1) a Stakeholder Committee comprised of transportation agencies in the Atlanta region; and 2) a Community Improvement District (CID) Committee comprised of all the CIDs in the region at the time of the study. In addition, GDOT met with several industry partners to gain meaningful input into the OPS, in addition to presenting at multiple industry functions and conferences to assist with additional outreach.

2.1 STAKEHOLDER AND CID COMMITTEES

The Stakeholder Committee established for both the OPS and MLIP studies included representatives from the following agencies:

- GDOT
  - Deputy Commissioner
  - Division of Engineering
  - Division of Planning
  - Office of Traffic Operations
  - Office of Innovative Delivery
  - District 7
  - Traffic Management Center (TMC)
- Governor Nathan Deal's Office;
- Georgia State Road and Toll Authority (SRTA)
- Georgia Regional Transit Authority (GRTA)
- Atlanta Metropolitan Planning Organization (MPO)

- Metropolitan Atlanta Rapid Transit Authority (MARTA)
- Federal Highway Administration (FHWA)

Stakeholder Committee meetings were held on the following dates to cover the milestones noted:

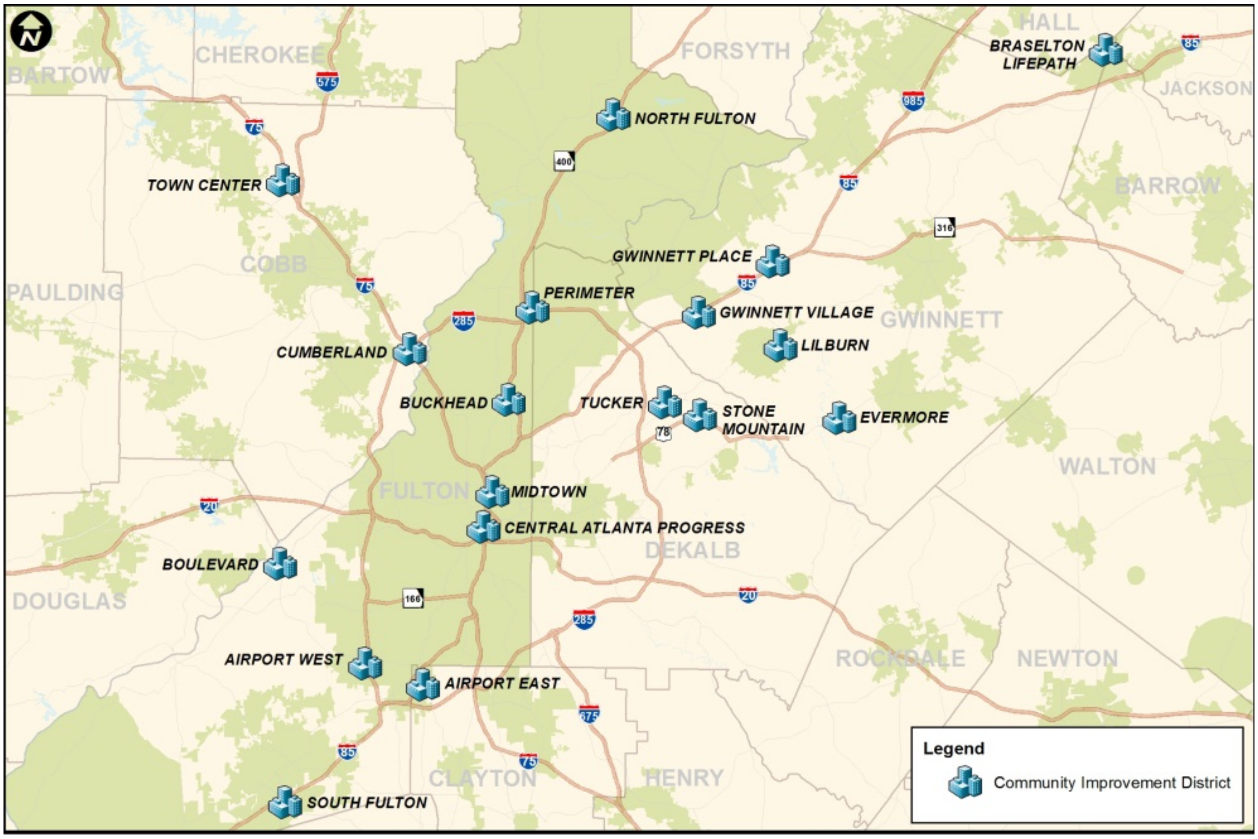
1. January 24, 2013 – Overview of the study
2. March 25, 2013 – Existing needs, corridor screening, and preliminary projects for evaluation
3. September 9, 2013 – Preliminary project prioritization structure and interactive exercise

The CID Committee established for both the OPS and MLIP studies included representatives from the following 18 CIDs:

- Boulevard CID
- Lilburn CID
- Gwinnett Place CID
- Gwinnett Village CID
- Cumberland CID
- Buckhead CID
- Evermore CID
- Midtown CID
- Stone Mountain CID
- Atlanta Downtown Improvement District
- Braselton Lifepath CID
- Tucker CID
- North Fulton CID
- Perimeter CID
- South Fulton CID
- Town Center CID
- Airport West CID
- Airport East CID

Figure 2.1 illustrates the CID locations in the study area.

Figure 2.1: CID Locations



CID Committee meetings were held on the following dates to cover the milestones noted:

1. May 2, 2013 - Overview of the study, existing needs, corridor screening, and preliminary projects for evaluation
2. September 16, 2013 – Preliminary project prioritization structure and interactive exercise

Each committee meeting was leveraged to engage the stakeholders and CIDs in order to gain meaningful input throughout each step of the process, including the development and testing of a variety of operational projects across metro Atlanta.

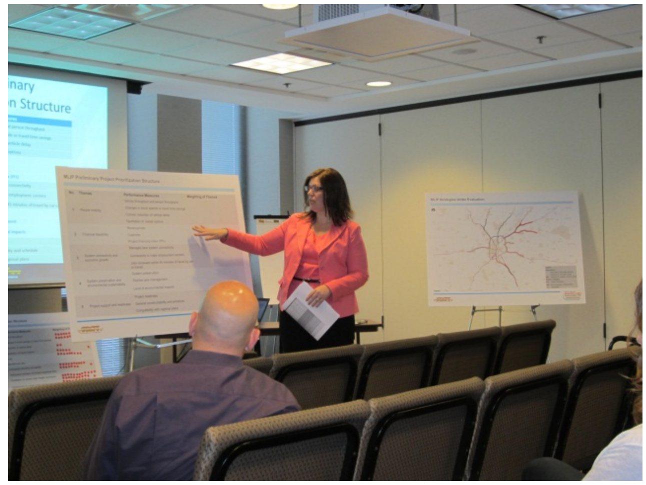
Techniques utilized at each meeting varied from PowerPoint presentations to interactive exercises, as well as roundtable discussions and break-out groups. For example, the Stakeholder and CID Committees both participated in an exercise in which they weighted what they value most in terms of project prioritization criteria and performance measures. The results were then used to assist with the development of weighting scenarios to apply to the project prioritization criteria in order to rank and prioritize projects.

A summary of both the Stakeholder and CID Committee meeting minutes, as well as copies of the PowerPoint presentations, is provided in **Appendix A**.

2.2 ADDITIONAL AGENCY COORDINATION

In addition to the Stakeholder and CID Committee meetings noted above, the OPS project team conducted several additional meetings with GDOT, SRTA, GRTA, and Atlanta MPO employees including:

- GDOT HERO unit operators (January 2013)
- GDOT TMC staff (January 2013);
- GDOT District 7 (February and May 2013)
- GDOT Operations group (January, February, May, 2014)
- GRTA Board members and staff (April 2013)
- GRTA bus drivers (2013)
- SRTA staff (April 2013)
- Atlanta MPO staff (December 2012; March, May, July, September 2013; January 2014)
- Atlanta MPO Technical Coordinating Committee (TCC) (May 2013)
- Atlanta MPO Roadway Operations and Capacity Subcommittee (March and June 2013)
- Atlanta MPO Transportation and Air Quality Subcommittee (May 2013)



Coordination efforts with these groups helped the OPS in evaluating and determining bottlenecks and physical constraints on metro Atlanta interstates and limited-access facilities. For example, GRTA staff surveyed their Xpress Bus operators who drive many of the study corridors daily during peak congestion hours. The survey was very helpful in identifying existing bottlenecks in the study area, as well as potential improvements to help resolve the bottlenecks. Another example is how GDOT's discussions with the HERO unit operators resulted in a more thorough understanding of the challenges and needs along Atlanta interstates in terms of placement, length, and signage for accident clearance investigation sites.

2.3 INDUSTRY ENGAGEMENT

In addition to engaging stakeholders in the Atlanta region, it was important to engage a wider audience of stakeholders from across the state and nation. The OPS accomplished this by presenting the project process, updates and preliminary results at several conferences throughout Georgia and the U.S. The OPS engaged stakeholders from within and outside the immediate Atlanta region through presentations at several conferences including those for:

- Georgia Chapter of the American Planning Association (GPA) Annual Conference (October 2013)
- GDOT/American Council of Engineering Companies (ACEC) Annual Transportation Summit (November 2013)
- American Planning Association (APA) Annual National Conference (April 2014)
- Southern District of the Institute of Traffic Engineers (SDITE) Annual Conference (April 2014)

It should also be noted that while at the GPA Annual Conference, GDOT received the 2013 award for "*Outstanding Planning Initiative for a Large Community*" for the OPS.

Several news articles were written throughout the course of this study and are included in **Appendix B**.

3 DATA COLLECTION

As part of the OPS, GDOT compiled existing available data, as well as purchased new data when deemed appropriate, to assist with identifying needs along limited access facilities in the study area. GDOT also reviewed previous studies, in addition to planned and programmed projects, to assist with bottleneck identification and to determine if operational projects were already underway or planned for the location. Furthermore, GDOT conducted a video log windshield survey on all limited access facilities in the region as part of the MLIP that was used to assist with determining physical constraints and problem areas. **Table 3.1** illustrates the data and user inputs used for the OPS.

Table 3.1: OPS Data Sources

Data Inputs	User Inputs
Speeds & Counts NAVIGATOR	GRTA Bus Drivers GRTA
Aerial Congestion Survey Skycomp	HERO Unit Operators GDOT Georgia Department of Transportation HERO
GPS Speeds & Duration of Congestion TOMTOM	 GDOT TMC Staff
Atlanta MPO Model ATLANTA REGION PLAN 2040	Stakeholders 

3.1 SUMMARY OF PREVIOUS STUDIES

There have been a variety of studies in the Atlanta region over the years evaluating operational strategies or congestion solutions along the interstate system and surrounding transportation system. Most of them are presented as part of long-range planning efforts or corridor studies. Overall, these studies have varied from high-level, system-wide (regional) assessments all the way down to more detailed analyses at the corridor level. **Figure 3.1** lists all of the recently completed relevant studies and indicates whether each one included managed lane and/or operational strategies for consideration.

In many cases where operational projects were identified in previous studies, such as the Atlanta Radial Freeway Strategic Plan (GDOT, 2010), these projects were further evaluated to determine if they should be included in the OPS recommendations and/or if a project modification would be deemed appropriate given more recent traffic conditions.

Figure 3.1: Findings of Relevant Studies

STUDY NAME	STUDY RECOMMENDATIONS: Managed Lane Strategies	STUDY RECOMMENDATIONS: Operational Strategies
2007		
• Buford Highway Multimodal Corridor Study (ARC)		✓
• Tara Blvd/US 19/41 Multimodal Corridor Study (ARC)		✓
• Southern Regional Accessibility Study (ARC)	✓	✓
2008		
• SR 6 Corridor Study (ARC)		✓
2010		
• GA 400 Variable Pricing Feasibility Study (SRTA)	✓	
• Statewide Strategic Transportation Plan 2010-2030 (IT3) (GRTA)	✓	✓
• Atlanta Radial Freeway Strategic Plan (GDOT)		✓
2011		
• Connect Atlanta (City of Atlanta)		✓
• Atlanta Strategic Regional Thoroughfare Plan (ARC)		✓
• Update on Congestion Snapshots (ARC)		✓
• I-285/I-20 West Interchange Reconstruct Feasibility Report (GDOT)	✓	✓
• I-85 North Express Managed Lane Alternatives: Moveable Barrier Wall System (GDOT)	✓	
• Misc. TIGER Grant Applications	✓	✓
2012		
• US 78 Moveable Barrier Reversible Lanes (Georgia Tech)		✓
2013		
• Feasibility of Implementing Reversible Movable Zipper Barrier Lanes I-20 East between Columbia Dr. and Panola Rd. (GDOT)		✓
On-going		
• Revive285 (GDOT)	✓	✓
• GA 400 Managed Lane Study (GDOT)	✓	✓
• I-85 HOT Lane Extension (GDOT)	✓	
• I-75 South Express Lanes (GDOT)	✓	
• I-20 East Managed Lane Study (GDOT)	✓	✓
• I-75 N Atlanta to Chattanooga Corridor Study (GDOT)	✓	✓
• I-75 Master Plan (GDOT)	✓	✓

3.2 SUMMARY OF PLANNED OR PROGRAMMED PROJECTS

Operational projects that are currently planned or programmed in the Atlanta MPO's Transportation Improvement Program (TIP), as well as GDOT's State Transportation Improvement Program (STIP) and Quick Fix program, were obtained early in the study process from GDOT Traffic Operations Staff. **Table 3.2** illustrates the operational projects (by fiscal year) for the study area.

Table 3.2: Programmed Operational Projects by Fiscal Year

Status	PI#	County	Description
Scheduled for FY '13			
CST	0009678	Fulton	I-75 @ Mt. Paran Ramp (ramp intersection reconfiguration; construction completed at time of this report)
CST	0009957	DeKalb/Fulton	I-285 @ SR 8 & @ SR 10; SR 13 @ SR 247 & @ CS 519; Freeway Interchange/Meter
CST	0010782	Clayton, Cobb, DeKalb, Fulton	I-285 Variable Speed Limit Signs
PE	0010878	Fulton	I-285 @ SR 400; Add ramp lane/interchange reconfiguration
PE	0011657	Cobb	I-75 @ Wade Green Rd.; Diverging Diamond Interchange
CST	0009723	Clayton	I-75 NB @ SR 3/Old Dixie/Tara Blvd. freeway interchange
Scheduled for FY '14			
CST	0010878	Fulton	I-285 @ SR 400; add ramp lane/interchange reconfiguration
CST	0010880	Fulton	SR 140 from SR 400 NB ramps to Old Alabama Rd.; add ramp lane/interchange reconfiguration
CST	0010881	Gwinnett	I-85 from Jimmy Carter Blvd. ramp to Indian Trail; add freeway auxiliary lane
CST	0009724	Clayton	I-675 @ SR 138; additional lane on ramp
CST	0010363	Cobb	SR 280 (Cobb Pkwy.) @ I-285; install turn lane
Scheduled for FY '15			
CST	0010858	Fulton	SR400 SB @ SR 140 – add ramp lane; interchange reconfiguration
CST	0012660	DeKalb	I-285 @ SR 141; interchange reconfiguration
CST	0010760	Fulton	SR 10/Freedom Pkwy. @ Boulevard; intersection improvements

Status	PI#	County	Description
Scheduled for FY '16			
PE	0010858	Fulton	SR 400 SB @ SR 140; add ramp lane/interchange reconfiguration
CST	0010877	Gwinnett	SR 141 @ Peachtree Industrial Blvd.; add ramp lane/interchange reconfiguration
CST	0011657	Cobb	I-75 @ Wade Green Rd.; Diverging Diamond Interchange
Scheduled for FY '17			
CST	0010880	Fulton	SR 140 from SR 400 NB ramps to Old Alabama Rd.; add ramp lane/interchange reconfiguration
Scheduled for FY '18			
CST	0010768	Fulton	SR 400 @ CR 9284/Windward Pkwy.; freeway interchange
Schedule to be Determined			
CST	0010344	DeKalb	I-285 from I-20 to Glenwood Rd.; freeway interchange/auxiliary lane (FOS & IMR required)

Note: PE = Preliminary Engineering, ROW = Right-of-Way, CST = Construction, Fiscal Year begins July 1st and ends June 31st.

3.3 TRAFFIC DATA

A major objective of the data collection activities for the OPS included locating and consolidating existing and new traffic data from several sources. The various data sources and a brief summary of each are discussed in the following sections.

3.3.1 Existing Data

Existing data sources were utilized as much as possible to maximize consistency with previous GDOT planning efforts. Existing traffic data compiled for the OPS included traffic counts and speeds, aerial congestion surveys, and crash data. The existing data sources and their purposes are displayed in **Table 3.3**.

Table 3.3: Existing Data Collected for the OPS

Type	Purpose	Source
Skycomp Aerial Congestion Surveys (2010)	Identification of congestion and bottleneck locations	GDOT
NaviGAtor Traffic Counts and Speeds by Lane (2012)	Identification of congestion and bottleneck locations	GDOT NaviGAtor
GDOT's Annual Traffic Counts (2011)	Identification of congestion and bottleneck locations	GDOT
Crash Data (2007-2009)	Identification of high crash locations, especially trucks	GDOT CARE

GDOT's NaviGAtor collects traffic volume and speed data every 15 minutes and distributes traffic information to the public through websites or 511 telephone services. Skycomp data is collected through aerial surveys that monitor traffic flow along metro Atlanta freeways. These data sources, along with 2011 traffic count and GDOT crash analysis reporting environment (CARE) data, will be discussed in more detail in Chapter 4 of this report.

3.3.2 New Traffic Data Collected

Along with the existing data, new data was collected for the OPS and is summarized in the following paragraphs.

3.3.2.1 Speed Data

Collecting accurate speed data along limited-access facilities was essential to effectively determine the most congested locations and peak congestion times at those locations throughout the study area. A variety of sources were considered, including GDOT NaviGAtor, INRIX, TomTom GPS, and AirSage. **Table 3.4** illustrates the various data sources that were considered for the OPS, as well as the purpose and source of each.

After careful consideration, it was determined that in addition to speed data from GDOT's NaviGAtor system, TomTom GPS data would be purchased as a supplemental data source. This allowed GDOT to maintain the project schedule and at the same time, provide an accurate and reliable sample size. The NaviGAtor speed data was obtained for October 2012, while the TomTom GPS speed data was obtained for October 2010.

Table 3.4: Speed Data Sources

(Data sources utilized indicated in bold text.)

Source	GDOT NaviGAtor	INRIX	TomTom GPS	AirSage
Type	**Cameras and Loop Detectors**	Probe	**GPS**	Cell phone
Time Intervals	**5 min.**	15 min.	**1 hour**	Varies
Pros	**Speed by lane** **24 hours per day, 7 days per week**	Larger sample size; Provides all 24 hours of the day for the entire year	**Although not as large of a sample size as INRIX, it is a sufficient sample size on limited-access facilities** **Maintain schedule**	Potential for lower cost
Cons	**Point locations, not segments**	Potential for schedule delays Third party licensing restrictions prevent sharing of GIS shape file with other agencies	**Limited to 6 hours of data per run and queries certain days of the month (mid-week)**	Potential for picking up speeds erroneously on parallel facilities

The speed data for both NaviGAtor and TomTom GPS were compared to determine if additional speed data or travel time runs would be necessary to clarify any areas of concern within the region. It was found that both data sources complemented each other and illustrated similar congested areas. Therefore, no additional speed data was necessary beyond the purchase of the TomTom GPS data. Details on the findings of the congested speed data analysis are included in Chapter 4 of this report and are documented at the corridor level in the *MLIP and OPS*.

3.3.2.2 Traffic Count Data

Additional traffic count data was collected to evaluate operational strategies as part of the OPS. These traffic counts were collected in the spring of 2013 on Tuesdays, Wednesdays, and/or Thursdays. Counts were not collected during holiday weeks or during the summer months when school was out. Details on the findings of the traffic county analysis are included in Chapter 4 of this report and are documented at the corridor level in the *MLIP and OPS*.

Traffic count needs were identified where existing traffic counts were not readily available from either the NaviGAtor or earlier studies for locations being analyzed for potential solutions (See Chapter 6 of this report). **Table 3.5** lists each count location, as well as the type of data collected (such as turning movement counts, average daily traffic (ADT), or weaving information). The method of collection and the hours of the day are also included.

Table 3.5: Traffic Count Data

Location	Data Collected	Collection Method	Hours of the Day
Old National Hwy. at I-285 WB ramps	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Old National Hwy. at I-285 EB ramps	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Old National Hwy. at Old National Pkwy.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Old National Hwy. at Godby Rd.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Godby Rd. at Old National Hwy.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 S from I-85 NB ramp	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 S from I-285 WB ramp	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 S from I-285 CD ramp	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Camp Creek Pkwy. at I-285 NB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Camp Creek Pkwy. at I-285 SB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Camp Creek Pkwy. at N Desert Dr.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Camp Creek Pkwy. at S Desert Dr.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Camp Creek Pkwy. at N Commerce Dr.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Marketplace Blvd. at Camp Creek Pkwy.	ADT	Tubes	24 Hours
Northside Dr. at I-75 NB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Northside Dr. at I-75 SB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Northside Dr. at I-75 HOV NB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM

Location	Data Collected	Collection Method	Hours of the Day
Howell Mill Rd. at I-75 NB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Howell Mill Rd. at I-75 SB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-75 btwn Northside Dr. & Howell Mill Rd.	Weaving/ Merging Traffic	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-85 at N Druid Hills Rd. SB ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-85 SB Access Rd. at Corporate Blvd.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-85 SB Access Rd. at Old Briarwood Rd. / SB Access turnaround	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-85 SB Access Rd. btwn Old Briarwood Rd. & Corporate Sq. driveway	ADT	Tube	24 hours
I-85 SB Access Rd. btwn Corporate Sq. driveway & Corporate Blvd.	ADT	Tube	24 hours
I-85 at N Druid Hills Rd. SB off-ramp	ADT	Tube	24 hours
I-285 NB on-ramp at Northlake Pkwy.	ADT	Tube	24 hours
I-285 SB off-ramp at Northlake Pkwy.	ADT	Tube	24 hours
I-285 NB ramp at Chamblee Tucker Rd.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 SB ramp at Chamblee Tucker Rd.	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 NB at Chamblee Tucker Rd.	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 NB to I-85 NB ramp at Chamblee Tucker Rd. (at bridge)	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 SB to I-85 SB ramp at Chamblee Tucker Rd.	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-285 SB at Chamblee Tucker Rd. (at bridge)	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
SR 400 NB on-ramp at McFarland Pkwy.	ADT	Tube	24 hours
SR 400 SB off-ramp at McFarland Pkwy.	ADT	Tube	24 hours
SR 400 SB on-ramp at Peachtree Pkwy. (SR 141)	ADT	Tube	24 hours

Location	Data Collected	Collection Method	Hours of the Day
SR 400 NB off-ramp at Peachtree Pkwy. (SR 141)	ADT	Tube	24 hours
SR 400 NB btwn McFarland Pkwy. & SR 141	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
SR 400 SB btwn SR 141 & McFarland Pkwy.	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Monroe Dr. at Buford Connector on & off-ramp	TMC	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
I-85 NB off-ramp to Buford Connector/Monroe Dr.	ADT	Tube	24 hours
Buford Connector NB on-ramp to I-85 NB	ADT	Tube	24 hours
Buford Connector NB off-ramp to Piedmont Rd.	ADT	Tube	24 hours
Piedmont Rd. on-ramp to Buford Connector SB	ADT	Tube	24 hours
Buford Connector NB at Monroe Dr.	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Buford Connector SB at Monroe Dr.	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Buford Connector SB at SB off-ramp to Monroe Dr.	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM
Buford Connector SB at I-85/SR 400	ADT	Video	6:30 – 8:30 AM 4:30 – 6:30 PM

3.3.3 Windshield Survey

GDOT conducted a windshield survey during the Fall of 2012 and Spring of 2013 along every limited-access facility in the study area. This windshield survey, which included a high-definition video log, was primarily utilized for evaluating physical constraints along the shoulders for the purpose of the MLIP. However, it was also used to assist with the OPS when developing potential operational projects to verify physical constraints. A detailed report documenting the windshield survey and its findings is included in **Appendix C** of the MLIP Final Report.

3.3.4 Other Input Data

In addition to the above data, input was obtained from the following resources to aid in identifying specific bottleneck locations:

- GRTA Bus Drivers
- HERO Unit Operators
- GDOT TMC Staff
- GDOT Operations Staff
- Stakeholder Committee Members
- CID Committee Members

Bottleneck locations received from the above-listed staff were added to the GIS database of bottleneck locations developed for this study, along with the source of the information. Chapter 4 provides detailed information on the identification of bottleneck locations.

4 NEEDS ASSESSMENT

This chapter will document the needs assessment that was conducted based on the existing conditions analysis and identification and understanding of bottleneck areas that could benefit from future transportation improvements.

4.1 DATA USED TO ASSIST WITH BOTTLENECK IDENTIFICATION

The existing conditions analysis builds on the data inputs outlined in Chapter 3 of this report. Three key factors were used in this analysis: congestion duration, congested speed, and distance. To document the existing conditions of the study area for this analysis, the data sources used to evaluate the three key factors were: GDOT's NaviGAtor data, Skycomp aerial congestion surveys, and TomTom GPS data. The speed data and total daily congested hours for all three data sources were compared to each other.

The three data sources complement each other and illustrate similar congested areas and needs. Therefore, all three data sources were used to help evaluate current corridor performance and recognize future needs, thereby identifying bottleneck locations where the study team could develop potential operational improvement projects.

4.1.1 NaviGAtor Data

GDOT NaviGAtor is the traffic management system used to collect and distribute traffic information to the public via websites or 511 telephone services. NaviGAtor provides traffic volume and average speed data by lane every 15 minutes for over 2,400 locations along 17 limited-access facilities in the metro Atlanta region, with the exception of I-20 East and West, which are not included in the coverage area for NaviGAtor data.

Figure 4.1 and Figure 4.2 highlight the speeds for those TMC stations during the AM peak hour (7 a.m. to 8 a.m.) and PM peak hour (6 p.m. to 7 p.m.), as defined using NaviGAtor data. **Figure 4.3** shows the total congested hours based on a speed threshold of 35 miles-per-hour (mph). The 35 mph threshold was chosen to illustrate peak-period speeds that signified congested operating conditions with a level of service (LOS) E or worse. Based on the NaviGAtor data illustrated in **Figures 4.1 through 4.3**, the following observations were made:

- The most common congested locations during the AM peak hour (7 a.m. – 8 a.m.) include:
    1. I-75/I-85 (Downtown Connector Northbound and Southbound)
    2. I-75 from Wade Green Road to I-575 (Southbound)
    3. I-575 from I-75 to Bells Ferry Road (Southbound)
    4. I-285 near Northside Drive and I-85 (Eastbound)
    5. SR 400 from SR 120 to I-85 (Southbound)
    6. I-85 from Pleasant Hill Road to I-285 North (Southbound)
    7. I-285 East at US 78 (Northbound)
    8. I-285 near Paces Ferry Road and Atlanta Road (Northbound)
    9. I-20 from Downtown Connector to Glenwood Avenue (Westbound)

- The most common congested locations during the PM peak hour (6 p.m. – 7 p.m.) include:
    1. I-75/I-85 (Downtown Connector) (Northbound and Southbound)
    2. I-85 from I-75/I-85 (Downtown Connector) to Cheshire Bridge Road (Southbound)
    3. I-285 at Northside Drive (Westbound) and the I-285/SR 400 interchange
    4. SR 400 from I-285 to SR 140 (Northbound)
    5. I-285 West from US 278 to I-20 (Northbound and Southbound)

Figure 4.1: NaviGAtor AM Peak Hour Speeds (7 a.m. to 8 a.m.)

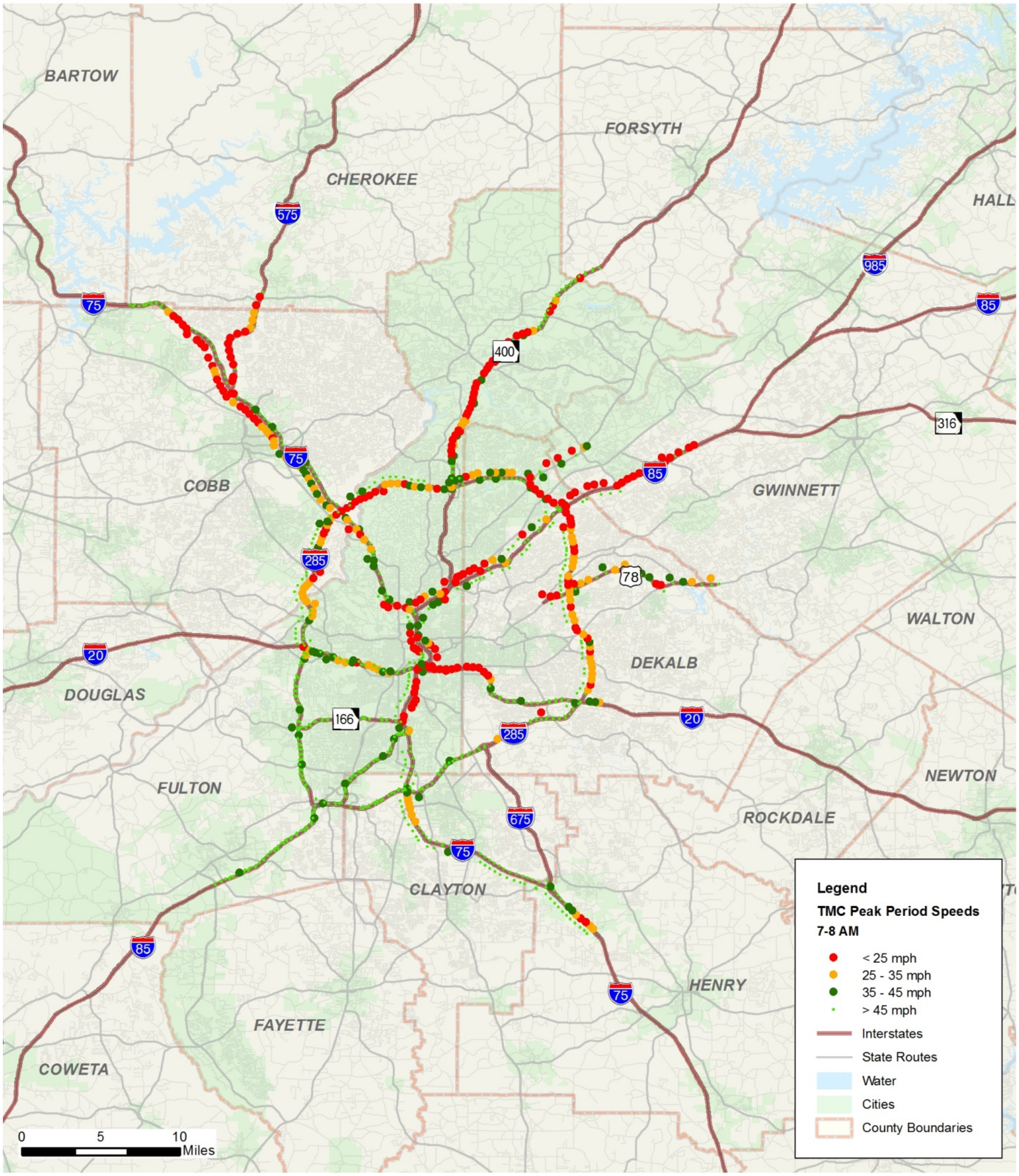


Figure 4.2: NaviGAtor PM Peak Hour Speeds (6 p.m. to 7 p.m.)

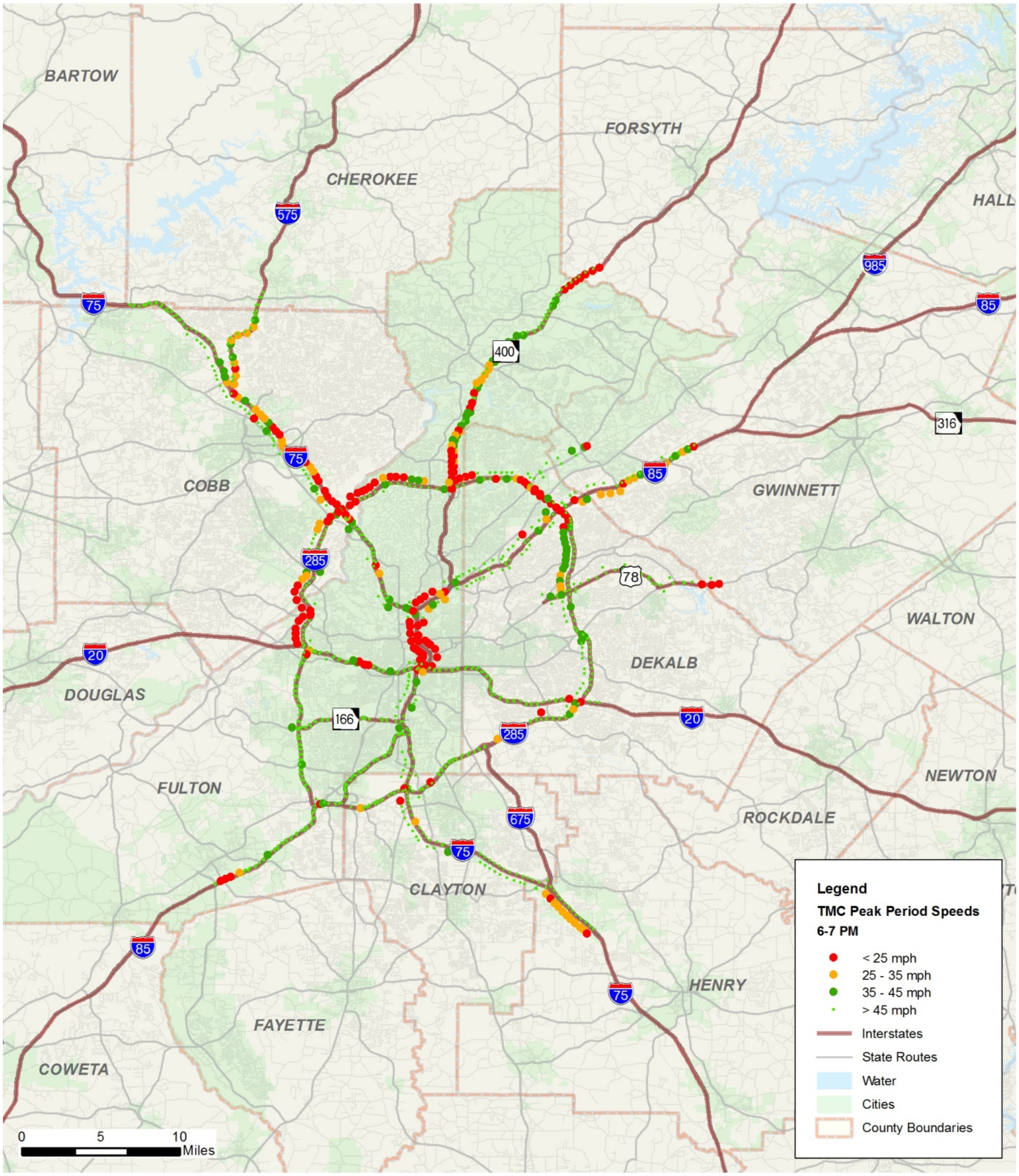
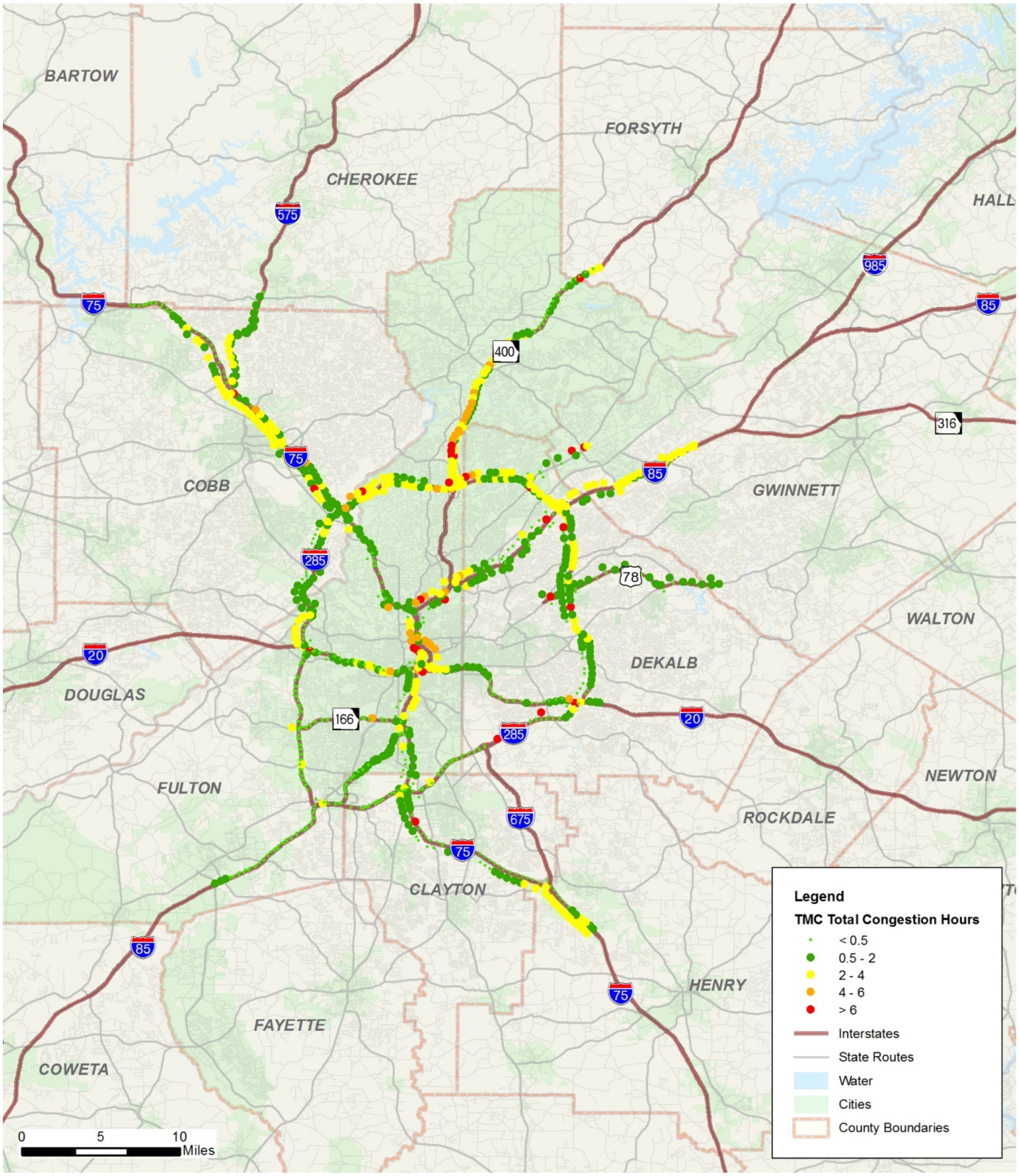


Figure 4.3: NaviGAtor Total Daily Congested Hours



4.1.2 Skycomp Aerial Congestion Surveys

GDOT's Skycomp aerial congestion survey program monitors the quality of highway traffic flow across the 22-county Atlanta urbanized state highway network by using time-lapse photography acquired from aircraft. These aerial photographs reveal insights about the underlying causes of congested bottlenecks, provide useful information for analysis, and help decision-makers better understand the congestion issues and technical recommendations.

The aerial survey data covers peak morning (6:30 a.m. to 9:30 a.m.) and evening (4:00 p.m. to 7:00 p.m.) commute periods in the spring and fall seasons. The average density of traffic flow is calculated for all surveyed links (by flight, direction, and time period) and aggregated by hour and by link. It is then converted to LOS performance ratings "A" through "F" based on ranges defined in the *2010 Highway Capacity Manual* (a widely-used planning guide produced by the Transportation Research Board of the National Academy of Sciences). An example of what each LOS looks like is shown in **Figure 4.4**. It is important to note that Skycomp has excluded the effects of confirmed or suspected incidents in their traffic flow and density analysis.

Figure 4.4: Level of Service Example

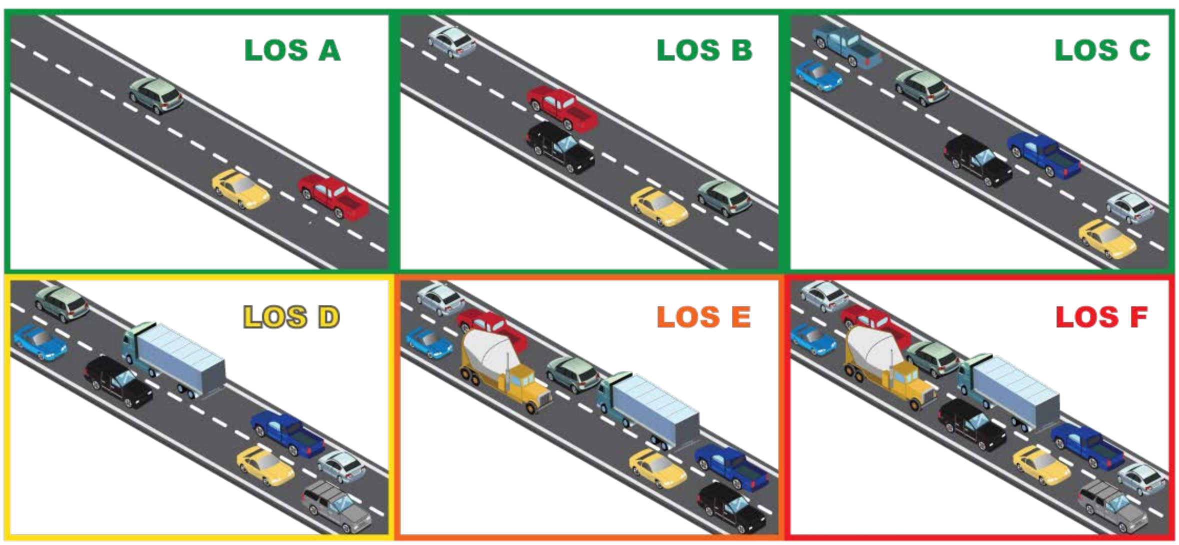


Figure 4.5 and Figure 4.6 highlight LOS performance ratings during the AM peak hour (7:30 a.m. to 8:30 a.m.) and PM peak hour (6 p.m. to 7 p.m.) based on the average density of traffic flow from the Skycomp aerial survey data. Peak travel hours were selected based on the data. **Figure 4.7** illustrates the total congested hours based on an LOS threshold of "E" or worse.

Based on the Skycomp data illustrated in Figures 4.5 through 4.7, the following observations were made:

- The locations with a low LOS (E or worse) during the AM peak hour (7:30 a.m. to 8:30 a.m.) include:
    1. I-75/I-85 (Downtown Connector) (Northbound and Southbound)
    2. I-75 Inside from I-285 to Downtown Connector (Northbound and Southbound)
    3. I-285 North from I-85 North to Peachtree Industrial Boulevard (Westbound)
    4. SR 400 from I-85 to SR 20 (Southbound)
    5. I-285 East from I-20 East to I-85 North (Northbound)
    6. I-285 West from I-75 to S. Cobb Drive (Southbound)
    7. I-75 North from I-285 to I-575 (Northbound and Southbound)
    8. I-575 from Sixes Road to I-75 (Southbound)
    9. I-85 North from I-285 North to SR 316 (Northbound and Southbound)
    10. I-20 West from I-285 to Thornton Road (Eastbound)
    11. Peachtree Industrial Boulevard (Northbound and Southbound)
- The locations with a low LOS (E or worse) during the PM peak hour (6 p.m. to 7 p.m.) include:
    1. I-75/I-85 (Downtown Connector) (Northbound and Southbound)
    2. I-285 North from at I-75 and I-85 (Eastbound and Westbound)
    3. SR 400 from I-85 to SR 20 (Northbound)
    4. I-285 East from I-85 to US 78 (Southbound)
    5. I-75 North at I-575 (Northbound)
    6. I-575 from I-75 to Sixes Road (Northbound)

Figure 4.5: Skycomp AM Level of Service (7:30 a.m. to 8:30 a.m.)

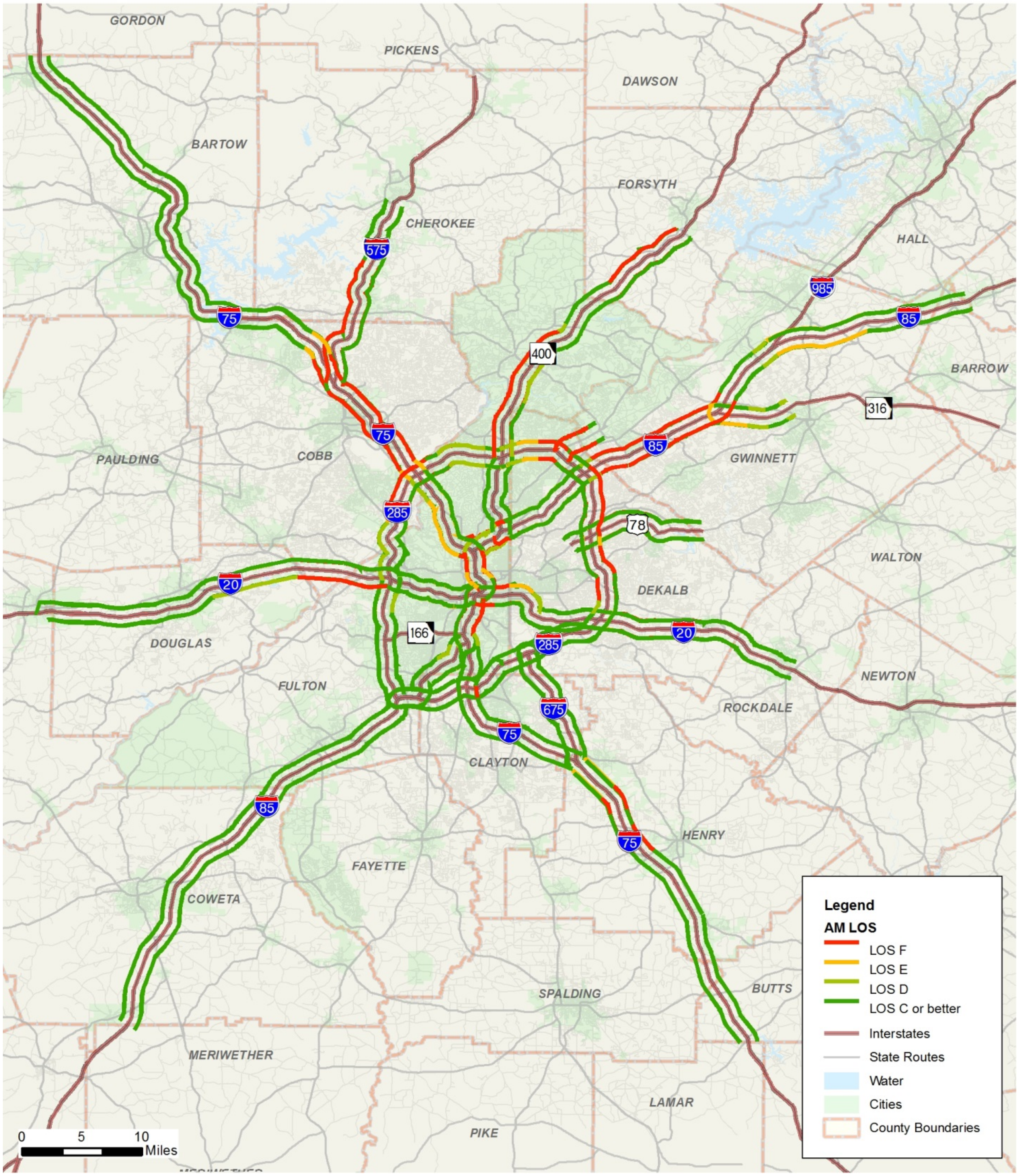


Figure 4.6: Skycomp PM Level of Service (6 p.m. to 7 p.m.)

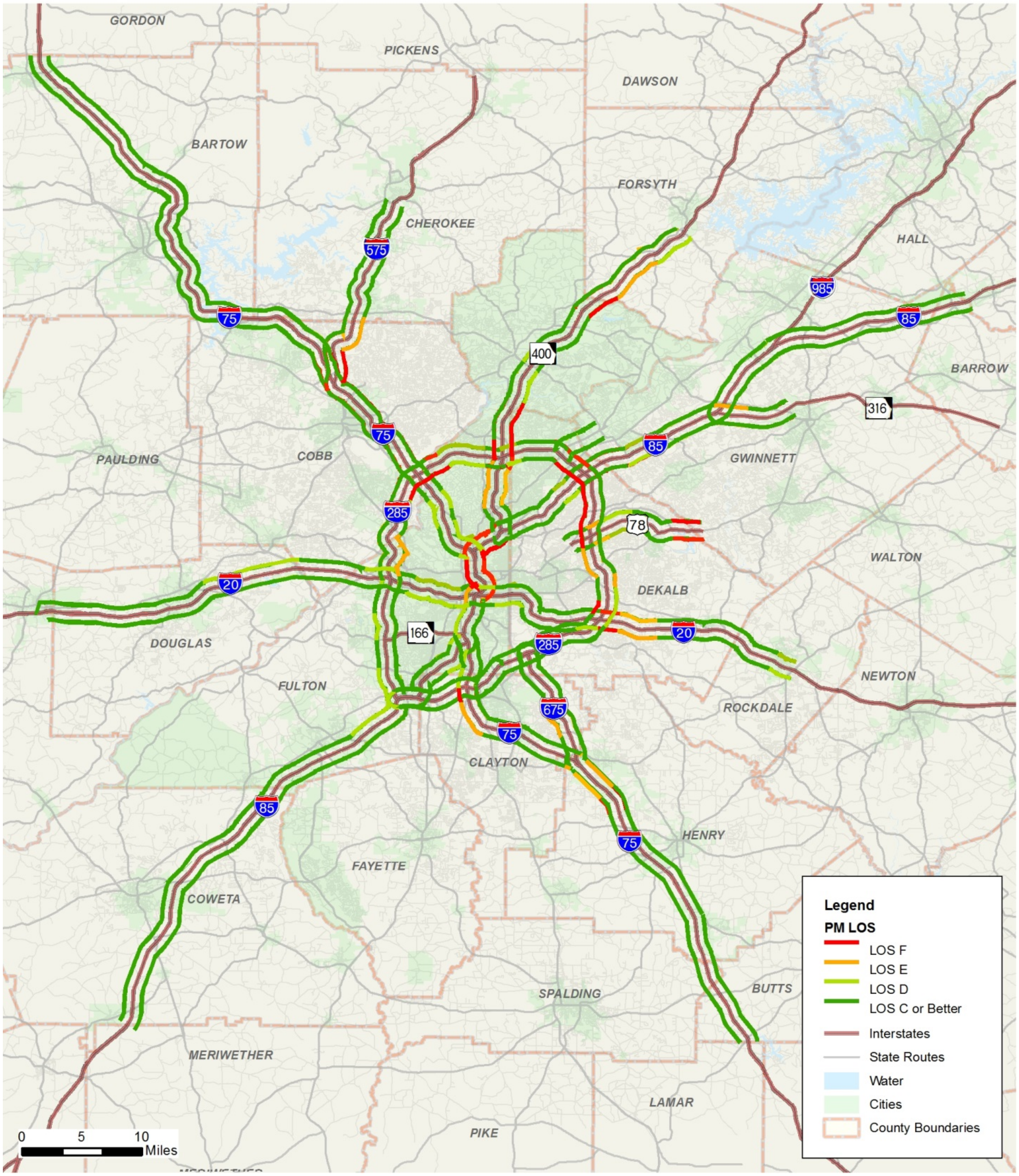
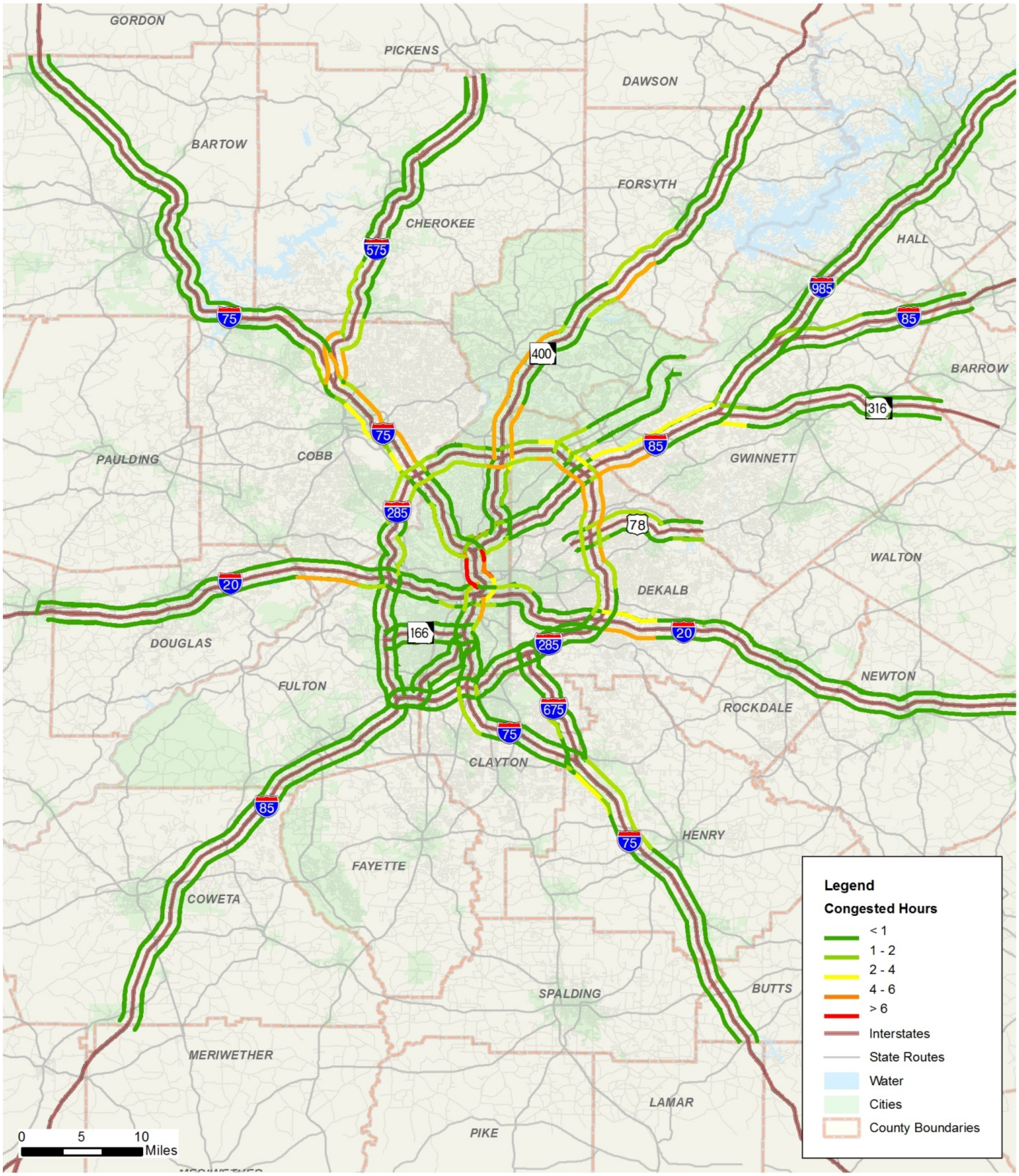


Figure 4.7: Skycomp Total Daily Congested Hours



4.1.3 TomTom GPS Speed Data

TomTom speed data is comprised of historic and realistic average roadway speeds for specific times of day and week by aggregating billions of GPS measurements. TomTom GPS Speed data was purchased to supplement the GA NaviGAtor speed data and Skycomp data for Tuesdays, Wednesdays and Thursdays in October 2010 for all of the study's 22 limited-access corridors. Traffic data along I-285 top end was not purchased, because there are ongoing planning efforts already underway along the corridor and it is outside of the study area of the OPS.

For each corridor, the following statistics were available, by hour, during the AM peak period (6 a.m. to 9 a.m.) and PM peak period (3 p.m. to 7 p.m.):

- Sample size (average per segment)
- Average travel time
- Median travel time
- Average speed (mph)
- Travel time ratios (peak travel time divided by off-peak travel time)
- Percentile travel time (for example: 90th percentile travel time means that for any particular route, 90 percent of the measured trips take less than this time).

Figure 4.8 and **Figure 4.9** highlight the speed during the AM peak hour (7:30 a.m. to 8:30 a.m.) and PM peak hour (6 p.m. to 7 p.m.) based on TomTom GPS speed data. **Figure 4.10** shows the total congested hours based on a speed threshold of 35 mph.

Based on the TomTom GPS data illustrated in Figures 4.8 through 4.10, the following observations were made:

- The locations with congested speeds during the AM peak hour (6:00 a.m. to 7:00 a.m.) include:
    1. I-75/I-85 (Downtown Connector) (Northbound and Southbound)
    2. I-75 North from I-575 to SR 120 (Southbound)
    3. I-575 from Sixes Road to I-75 (Southbound)
    4. SR 400 from McGinnis Ferry Road to SR 140 (Southbound)
    5. I-85 North from SR 316 to Beaver Ruin Road (Southbound)
    6. I-285 East at US 78
    7. I-20 Inside from Downtown Connector to Glenwood Avenue (Westbound)
    8. I-20 West from Thornton Road to I-285 (Eastbound)
    9. I-20 East from Panola Road to I-285 (Westbound)
    10. I-75 South from SR 155 to US 23 (Northbound)
    11. Peachtree Industrial Boulevard from SR 140 to I-285 (Southbound)
- The locations with congested speeds during the PM peak hour (6 p.m. to 7 p.m.) include:
    1. I-75/I-85 (Downtown Connector) (Northbound and Southbound)
    2. SR 400 at I-285 (Northbound and Southbound)
    3. I-285 East at I-85 (Eastbound)
    4. I-75 South SR 155 to US 23 (Northbound)
    5. US 78 at I-285 (Eastbound)
    6. Peachtree Industrial Boulevard (Southbound)

Figure 4.8: TomTom GPS AM Peak Hour Speeds (6:00 a.m. to 7:00 a.m.)

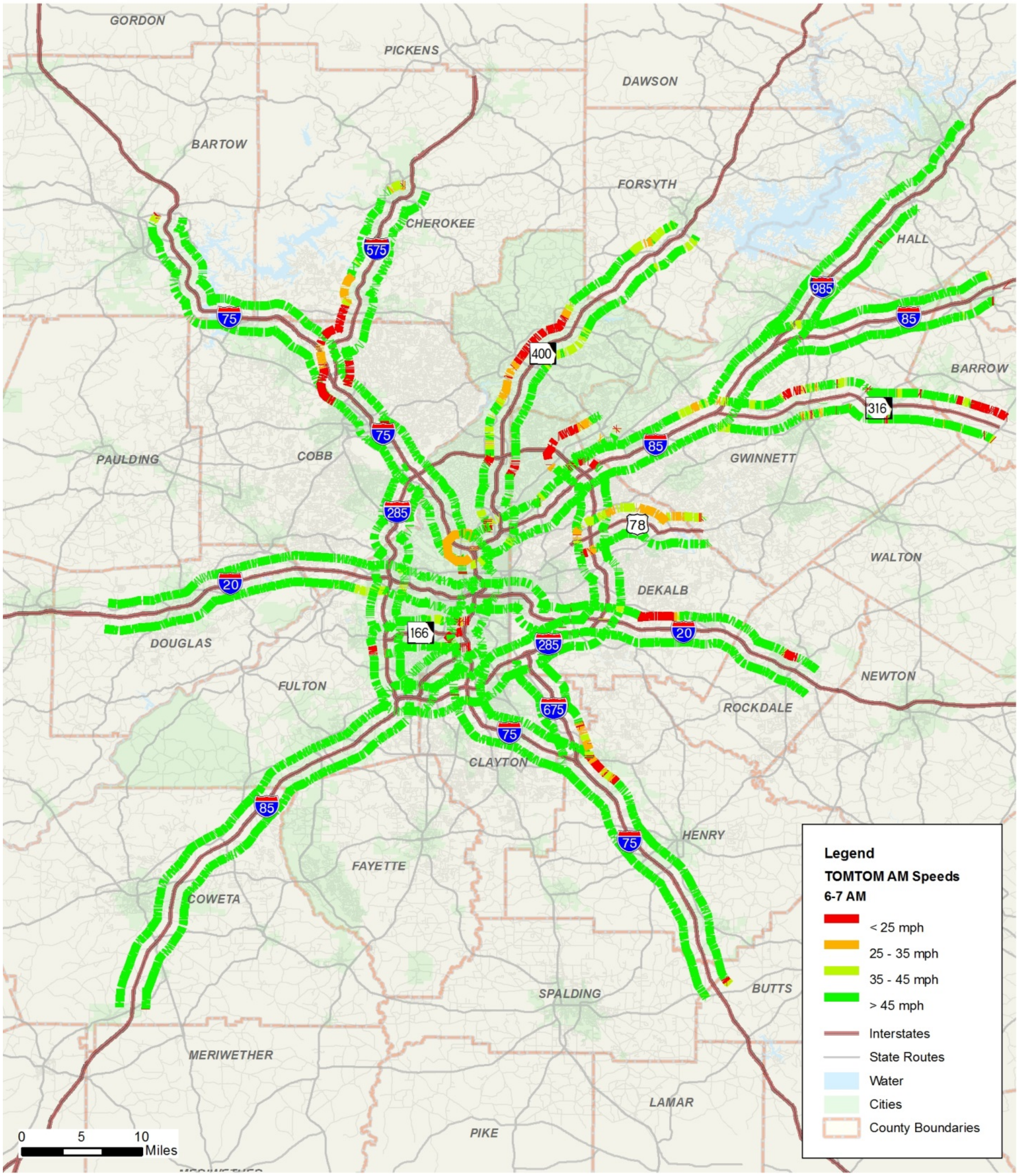


Figure 4.9: TomTom GPS PM Peak Hour Speeds (6p.m. to 7p.m.)

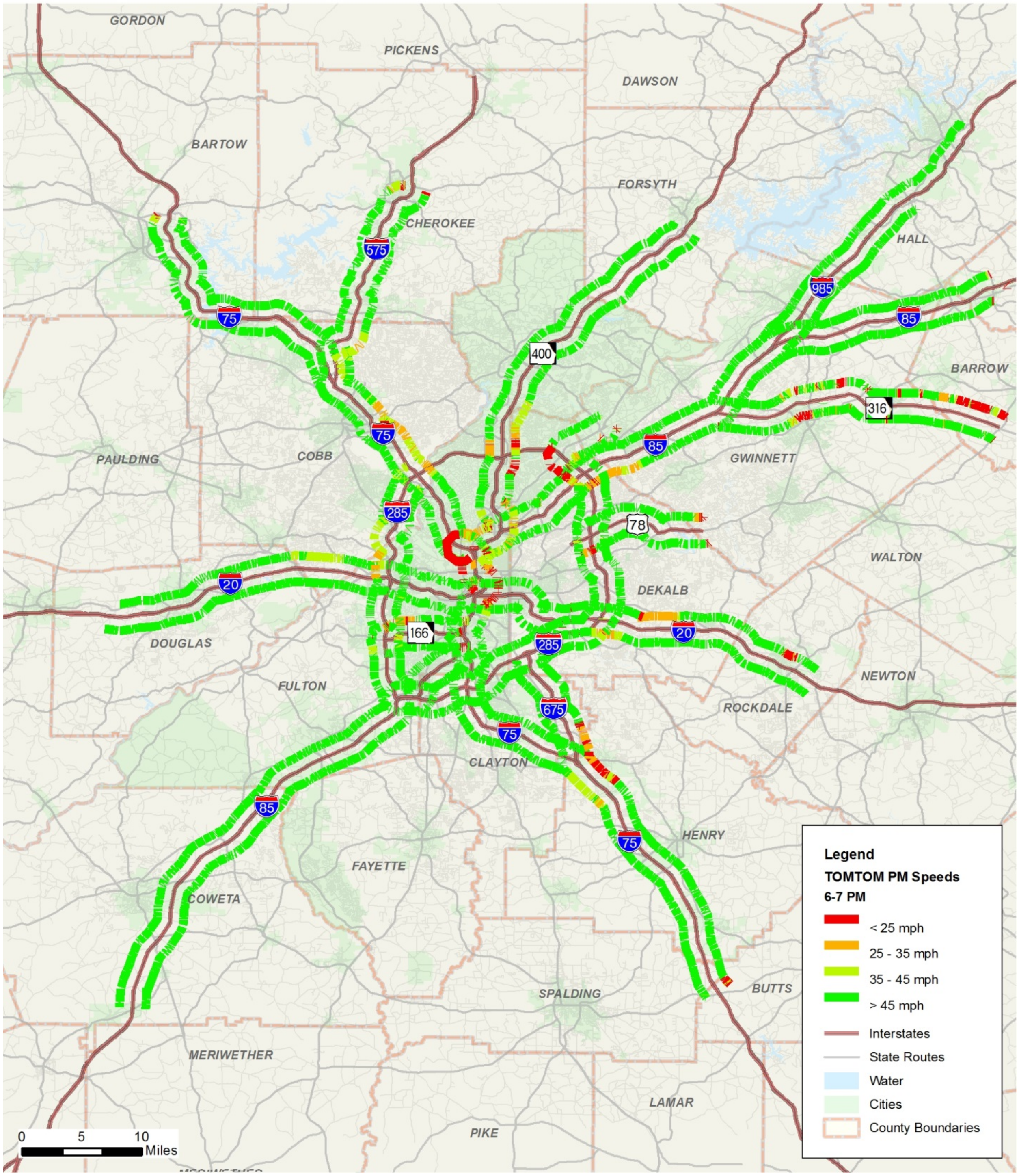
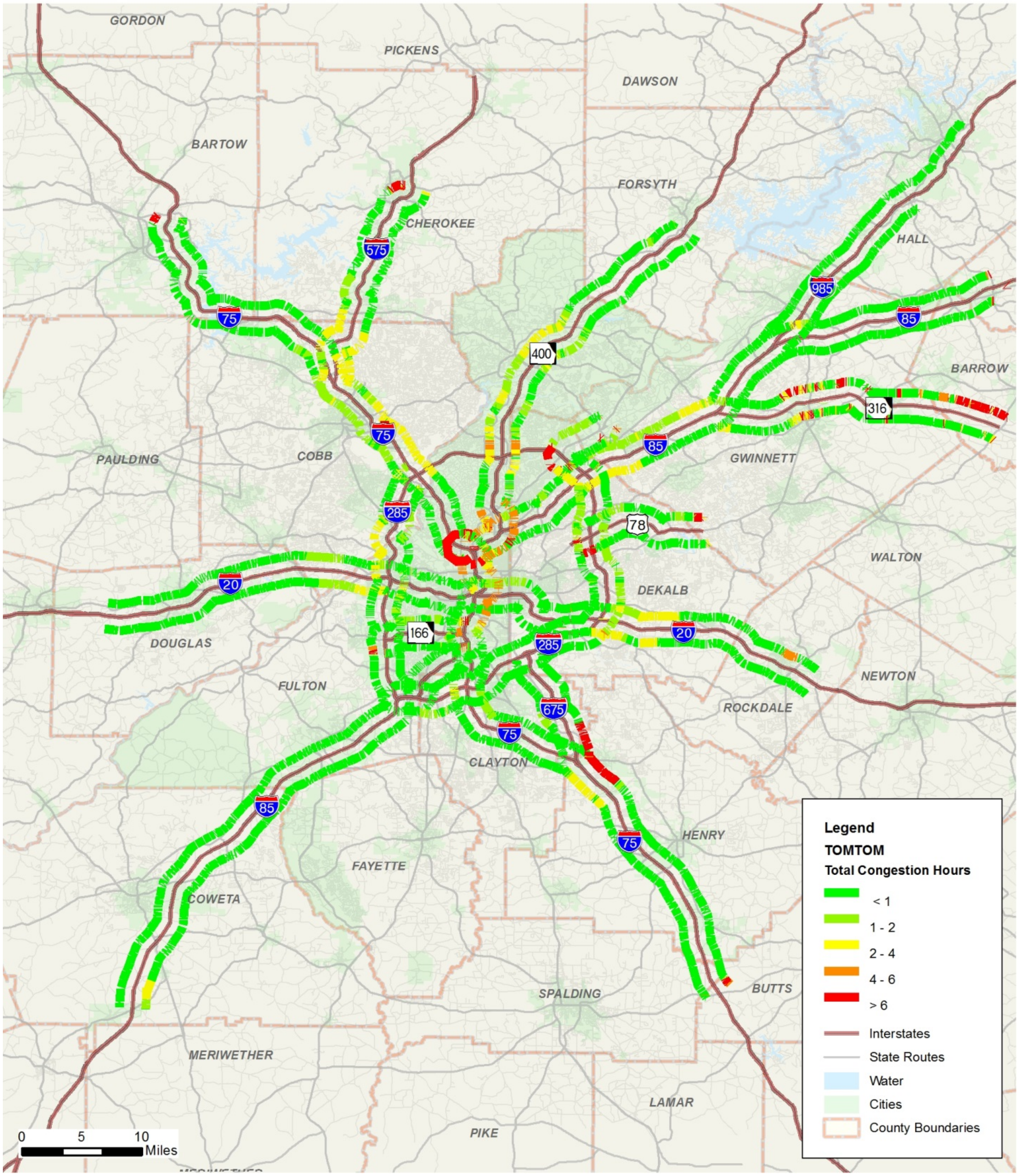


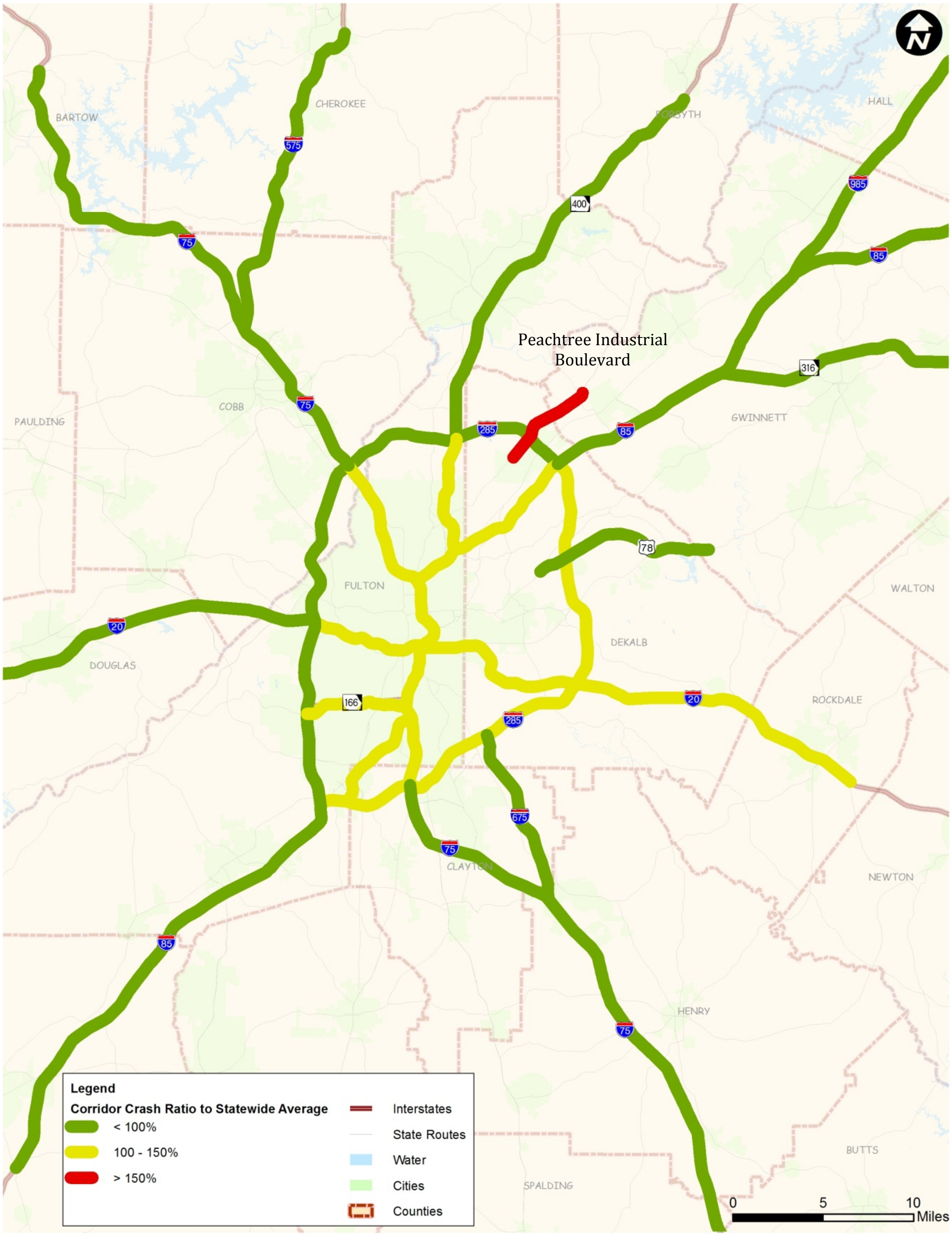
Figure 4.10: TomTom GPS Total Daily Congested Hours



4.1.4 Existing Crash Data

The most recently available crash data came from the Critical Analysis Reporting Environment (CARE) software developed by the University of Alabama with supporting crash data from GDOT's Office of Traffic Safety and Design for the years 2007-2011. The crash data was used to determine the location of potential safety concerns along the corridors and is compared to the Georgia statewide crash average to understand the potential deficiencies. The study corridors have experienced a total of 101,055 crashes with 0.3 percent of fatal crashes and 24 percent of non-fatal injury crashes during the four-year analysis period. During the same analysis period, the State of Georgia experienced a total of 944,408 crashes, 0.4 percent of which involved fatalities and 25 percent with non-fatal crashes involving injury. **Figure 4.11** shows crash rates along the study corridors compared to the statewide average for crashes.

Figure 4.11: Crash Comparison to GA Statewide Average



4.2 STAKEHOLDER INPUT USED TO ASSIST WITH BOTTLENECK IDENTIFICATION

A large percentage of traffic congestion results from recurring causes or "bottlenecks." Some recurring congestion occurs at specific locations on the limited-access highway system where periodic volume surges coupled with roadway geometrics overwhelm the physical capacity of roadway segments, thereby creating traffic bottlenecks. Bottlenecks are often caused by weaving at interchanges or lane drops, changes in grade, and ramp terminal intersections.

Due to rising costs related to congestion, it is important to diagnose and identify cost-effective bottleneck solutions. Transportation agencies have observed that traffic bottlenecks can be alleviated using low-cost and cost-effective solutions, resulting in a better return on investment than more expensive infrastructure investments.

In addition to the collected data illustrated in previous sections, input was obtained from the following sources to help identify specific bottleneck locations for the OPS:

- GDOT TMC Staff
- HERO Unit Operators
- GDOT Operations Staff
- GRTA Bus Drivers
- Stakeholder Committee Members

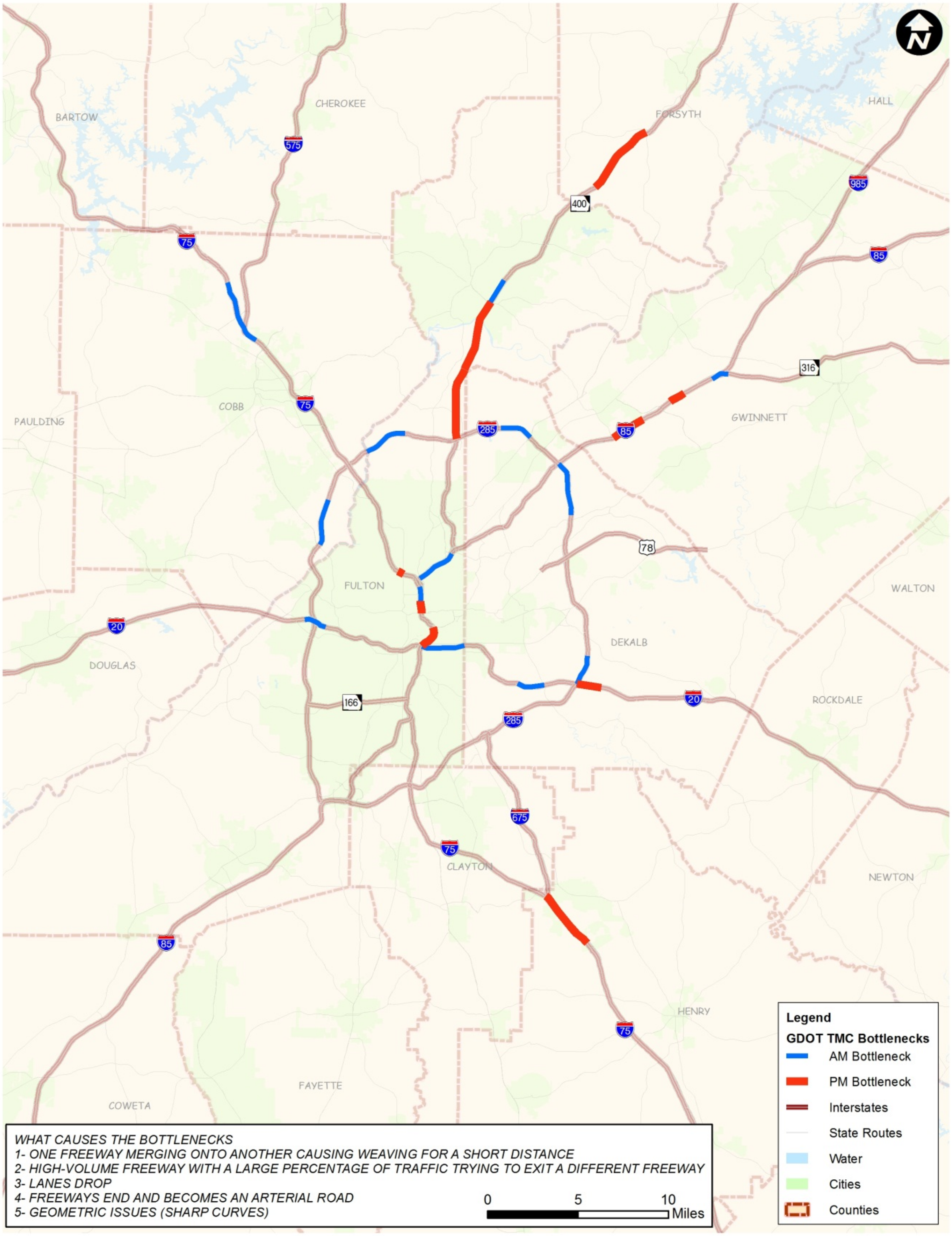
4.2.1 GDOT TMC

GDOT's Traffic Management Center staff helped to identify bottleneck locations that currently exist on the region's limited access freeways. TMC staff was asked the following questions to help identify bottlenecks:

1. Where are the key bottlenecks that should be considered?
2. What may be the cause of these bottlenecks?
3. In terms of duration, what are the top ten problem areas?
4. In terms of consistency (i.e., always having congestion), what are the top ten problem areas?
5. What might be done to mitigate these bottlenecks?
6. What types of improvement strategies do you think would work well? Which would not?
7. Could you see these strategies improving the locations you mentioned before?
8. Are there specific locations at which you have experienced recurring incidents? Do you have any thoughts on what may be causing these incidents?

Figure 4.12 illustrates the bottlenecks that were identified by GDOT TMC staff.

Figure 4.12: TMC Staff Observations of Bottleneck Locations



4.2.2 HERO Unit Operators

GDOT HERO unit operators were also engaged to help identify operational needs for the region. HERO operators were asked the following questions to help identify existing bottlenecks:

1. On what corridors do you currently operate?
2. Are there specific locations at which you see recurring incidents? Do you have any thoughts on what may be causing these incidents?
3. In what areas do you see bottlenecks occurring, and what may be the cause of these bottlenecks? What might be done to mitigate these bottlenecks?
4. What types of improvement strategies do you think would work well? Which would not?
5. Do you see any of these strategies negatively impacting your ability to perform your duties safely and efficiently?
6. The use of shoulders is occurring on SR 400 currently. Do you think this is working well or not?
7. Where do you see the need for crash investigation sites?
8. Do you see any issues with the current Express Lanes that should be considered when new ones are implemented in the region?

4.2.3 GDOT Operations Staff

GDOT Operations staff was engaged to help identify operational needs and bottlenecks throughout the region. Collaboration with operations staff was helpful in understanding current projects that have been programmed that may already mitigate bottlenecks or needs identified by other organizations or stakeholders. This list of projects was previously provided in **Table 3.2**.

4.2.4 GRTA Bus Drivers

GRTA bus drivers were also asked to help identify operational bottlenecks in the region because they cover a majority of the interstate corridors in Atlanta. They were able to identify several bottleneck areas that their drivers experience daily. Bottleneck locations received from GRTA have been added to the GIS shape file of bottleneck locations, including the source of the information. In addition, some of the projects that were evaluated and eventually recommended originated from the GRTA bus drivers.

4.2.5 Stakeholder Committee Members

Representatives from GDOT, FHWA, SRTA, GRTA, ARC, MARTA, and the Governor's office were engaged during three meetings to provide periodic updates on the OPS and to ask for participants' feedback on the project prioritization structure. During the meetings, participants were divided into two groups to participate in a weighting exercise. Their weighting of the themes was then incorporated into the overall project prioritization evaluation.

4.3 SUMMARY OF OPERATIONAL BOTTLENECKS

In total, 130 bottleneck locations were identified from the data analysis and various stakeholders, as listed below. There are heavy concentrations of bottlenecks at many system-to-system interchanges in the study area, but bottlenecks could also include freeway segments, ramps, and arterial roadways.

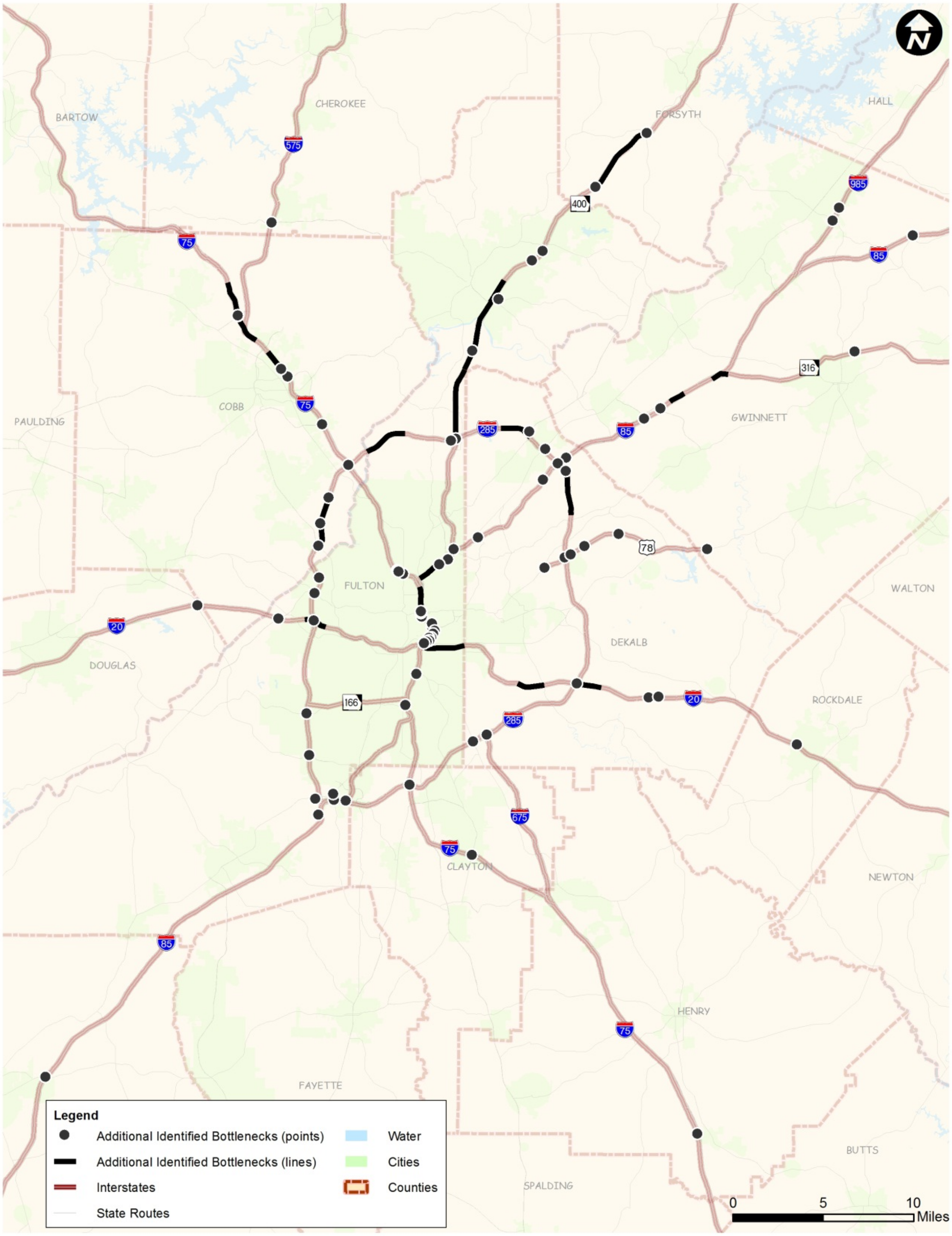
- Buford Highway at:
  - Monroe Drive
- Downtown Connector at:
  - North Avenue
  - Freedom Parkway
  - John Wesley Dobbs Avenue
  - Edgewood Avenue
  - Decatur Street
  - Martin Luther King, Jr. Boulevard
  - Memorial Drive / Capitol Avenue / Piedmont Avenue
  - North Avenue to 10th Street
  - University Avenue
  - Williams Street
  - I-20 Interchange to International Boulevard
  - Brookwood Interchange to North Avenue
  - Freedom Parkway to I-20 Interchange
- I-20 East at:
  - SR 138
  - Panola Road
  - Klondike / West Avenue
  - Wesley Chapel Road to I-285
  - I-285 to Wesley Chapel Road
- I-20 Inside I-285 at:
  - Moreland Avenue to Downtown Connector
  - Fairburn Road to Linkwood Road
- I-20 West at:
  - Fulton Industrial Boulevard
  - Thornton Road
- I-285 East at:
  - US 78
  - I-20 East Interchange
  - I-85 North Interchange to Lavista Road
  - Glenwood Road to I-20 East Interchange
- I-285 North at:
  - Buford Highway
  - Peachtree Industrial Boulevard
  - Glenridge Drive
  - Riverside Drive
  - Chattahoochee River to Riverside Drive
  - Chamblee-Dunwoody Road to Peachtree Industrial Boulevard
- I-285 Northwest at:
  - I-20 West Interchange
  - I-75 North Interchange
  - D.L. Hollowell Parkway
  - Bolton Road
  - S. Cobb Drive
  - Atlanta Road
  - Paces Ferry Road
  - S. Cobb Drive to Paces Ferry Road
  - Paces Ferry Road to S. Cobb Drive

- I-285 South at:
  - I-675 Interchange
  - I-75 South Interchange
  - I-85 Inside Interchange
  - I-85 South Interchange
  - Moreland Avenue
  - Old National Highway
- I-285 Southwest at:
  - Camp Creek Parkway
  - SR 166
- I-575 at:
  - SR 92
- I-675 at:
  - SR 138
- I-75 Inside I-285 at:
  - Howell Mill Road
  - Northside Drive
  - Mount Paran Road
  - Northside Drive to Howell Mill Road
- I-75 North at:
  - North Loop
  - Wade Green Road
  - Delk Road
  - SR 120 / North Marietta Street
  - Barrett Parkway
  - SR 5
  - Marietta Parkway to Canton Road
  - Windy Hill Road
- I-75 South at:
  - Jonesboro Road
  - Jodeco Road
  - Tara Boulevard
  - SR 54
  - Bill Gardner Parkway
  - I-675 Interchange to Hudson Bridge Road
- I-85 Inside I-285 at:
  - North Druid Hills Road
  - SR 400
  - Chamblee Tucker Road
  - Piedmont Road
  - SR 400 Interchange to Brookwood Interchange
- I-85 North at:
  - Hamilton Mill Road
  - I-285 East Interchange
  - Northcrest Drive
  - Indian Trail / Lilburn Road
  - Beaver Ruin Road
  - Pleasant Hill Road
  - Steve Reynolds Boulevard
  - Jimmy Carter Boulevard to Indian Trail / Lilburn Road
  - Old Norcross Road to Boggs Road
- I-85 South at:
  - SR 74
  - SR 34
  - SR 138
  - I-285 South Interchange

- I-985 at:
  - Buford Drive / SR 20
- Peachtree Industrial Boulevard at:
  - SR 140
  - I-285 North Interchange
- SR 400 at:
  - Northridge Road
  - Holcomb Bridge Road
  - Haynes Bridge Road
  - Windward Parkway
  - Holcomb Bridge to Pitts Road
  - McFarland Parkway to SR 141 / Peachtree Parkway
  - I-285 North Interchange
  - McFarland Parkway
  - Peachtree Parkway / SR 141
  - Mansell Road to Holcomb Bridge Road
  - I-285Interchange to North Springs MARTA Station
- SR 166 at:
  - Downtown Connector Interchange
- SR 316 at:
  - High Hope Road
- US 78 at:
  - Rockbridge Road
  - North Druid Hills Road / Lawrenceville Highway
  - Hugh Howell Road
  - Mountain Industrial Boulevard
  - Brockett Road / Coolidge Road

Figure 4.13 illustrates all 130 operational bottlenecks identified as part of the OPS.

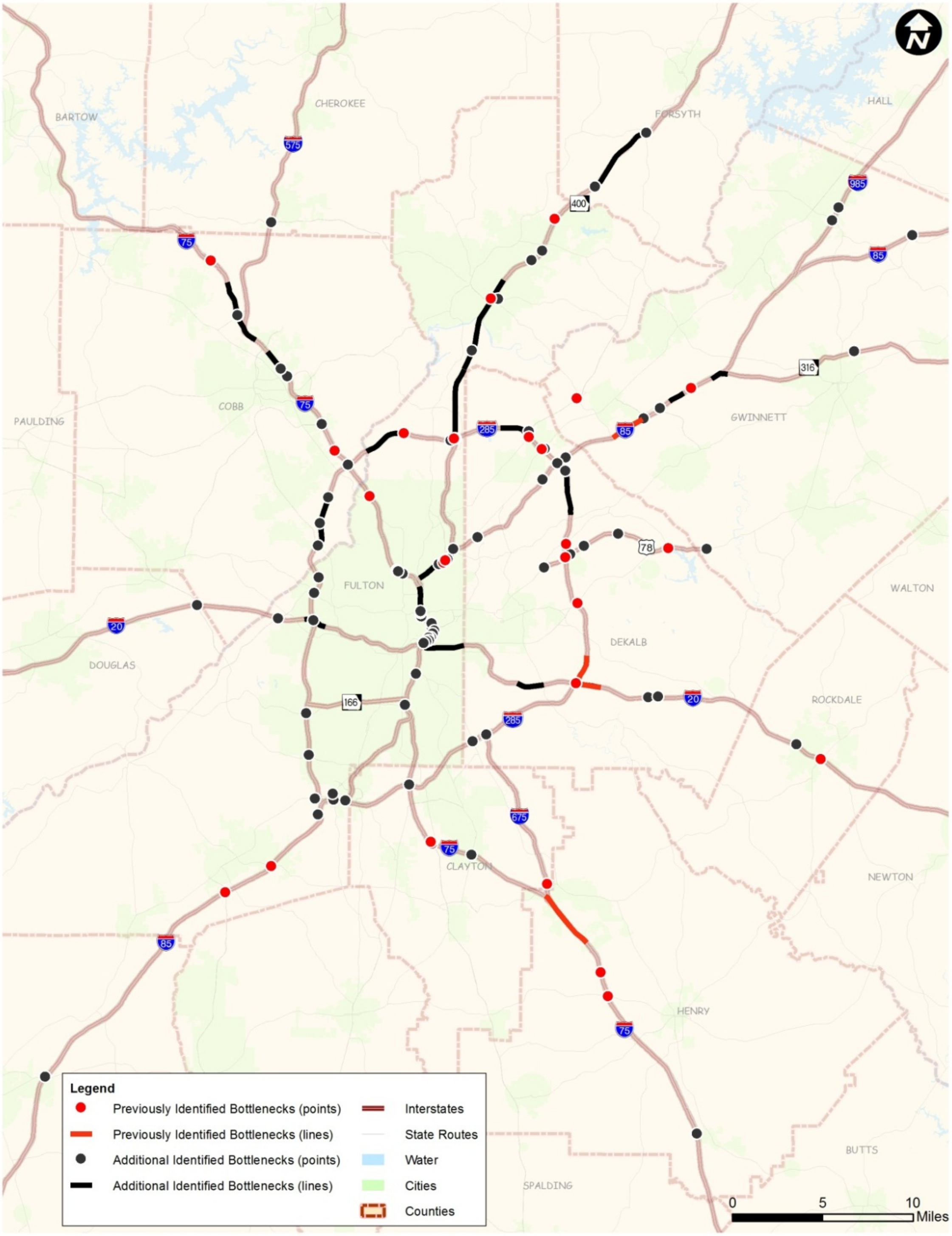
Figure 4.13: Operational Bottlenecks Identified



As a result of the data analysis, GDOT has already programmed projects at 29 of the 130 bottleneck locations identified by stakeholders. Those projects that are already part of GDOT's programmed projects list were removed from further consideration. **Figure 4.14** illustrates the GDOT programmed projects in red. Programmed projects (discussed earlier in more detail in Chapter 3) that are located at these identified bottleneck locations include:

- Buford Connector at Monroe Drive (Ramp meter)
- Buford Connector at Piedmont Road (Ramp meter)
- I-75 North at Wade Green Road (Diverging Diamond Interchange)
- I-75 North at Windy Hill (Interchange reconfiguration)
- I-75 Inside at Mt. Paran Road (Interchange reconfiguration)
- I-75 South from I-675 to Hudson Bridge Road/Eagles Landing Parkway (Auxiliary lane)
- I-75 South at SR 3/Old Dixie/Tara Boulevard (Interchange reconfiguration)
- I-75 South at Jonesboro Road (Interchange reconfiguration)
- I-75 South at Jodeco Road (Interchange reconfiguration)
- I-20 East at SR 138 (Interchange reconfiguration/ramp widening)
- I-20 East from Wesley Chapel Road to I-285 (C/D road)
- I-285 at SR 400 (Interchange reconfiguration/ramp widening)
- I-285 at SR 141/Peachtree Industrial Boulevard (Interchange reconfiguration)
- I-285 from I-20 to Glenwood Road (Auxiliary lane)
- I-285 East at US 78 (Interchange reconfiguration)
- I-285 East at SR 10/Memorial Drive (Freeway interchange/meter)
- I-285 East at SR 8/Lawrenceville Highway (Freeway interchange/meter)
- I-285 East at I-20 East (Interchange reconfiguration)
- I-285 North at Riverside Drive (Interchange reconfiguration)
- I-285 North at Peachtree Industrial Boulevard (Interchange reconfiguration)
- I-285 North at Buford Highway (Interchange reconfiguration)
- I-675 at SR 138 (Widen on-ramp)
- I-85 North at Pleasant Hill Road (Interchange reconfiguration)
- I-85 North from Jimmy Carter Boulevard to Indian Trail (Auxiliary lane)
- I-85 South at SR 74/Senoia Road (Interchange reconfiguration)
- I-85 South at SR 138/Jonesboro Road (Interchange reconfiguration)
- SR 400 at SR 140/Holcomb Bridge Road (Interchange reconfiguration)
- SR 400 at Windward Parkway (Interchange reconfiguration)
- US 78 at Hugh Howell Road (Extend ramp capacity/ramp meter)

Figure 4.14: Operational Bottlenecks and GDOT Programmed Projects

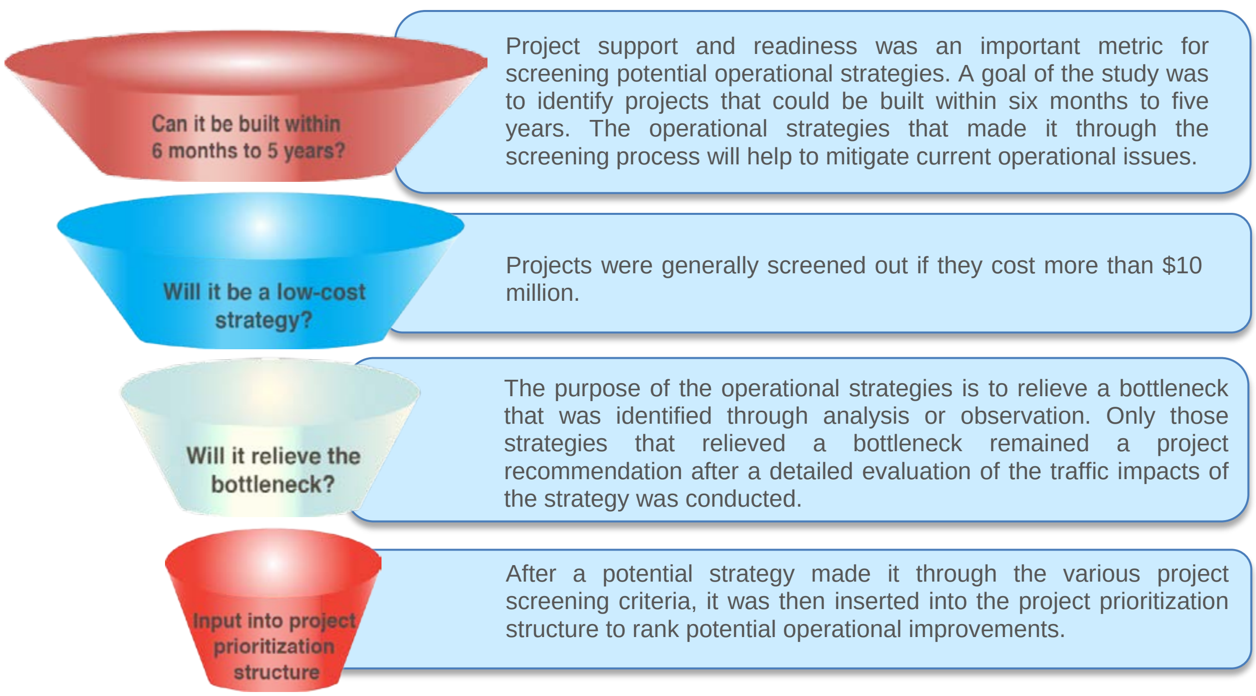


The remaining bottleneck locations were moved forward for further analysis. A variety of operational strategies were evaluated and are discussed in more detail in Chapter 5.

5 DEVELOPMENT OF POTENTIAL OPERATIONAL STRATEGIES FOR EVALUATION

A menu of operational improvement strategies were considered at a system level and were evaluated to identify those mitigation projects that were most practical for metro Atlanta. Operational strategies were considered with a focus on projects that are lower-cost (typically less than $10 million) and have a short-term implementation time frame (within five years). Widening of general purpose lanes was not considered for this study. **Figure 5.1** illustrates the operational strategy considerations used to assist with screening projects, specifically, the implementation time frame and cost of the strategy or project. Considerations for developing operational projects at specific locations are documented in this chapter. Chapter 6 documents whether or not the project relieves the bottleneck (project evaluation) and the project prioritization process. Chapter 7 then lists the resulting recommendations.

Figure 5.1: Considerations for Developing Operational Strategies



5.1 MENU OF OPERATIONAL STRATEGIES

Research was conducted to identify a range of potential operational strategies that could be applicable for improving the identified corridors. This section summarizes each of the potential operational strategy's improvement concept and key benefits. **Figure 5.2** lists the entire menu of strategies that was considered. Strategies that are italicized indicate a strategy that did not move forward for evaluation. Further detail describing these strategies follows.

Figure 5.2: Menu of Operational Strategies for Consideration

Category A — ADDED CORRIDOR CAPACITY

1 - Bottleneck mitigation
2 - Reversible/changeable lanes
3 - Driveable/hard shoulder running
4 - General Capacity
5 - Managed lanes
6 - Bus Lanes/Bus Ways

Category B — IMPROVED DESIGN GEOMETRICS

1 - Roundabouts
2 - Diverging diamond interchanges
3 - Loop ramps reducing left turns
4 - Ramp configuration to increase queuing capacity
5 - Channelization
6 - Innovative intersections
7 - Minimum intersection/interchange and ramp spacing
8 - Improvements to median
9 - Crash investigation sites
10 - Improved arterials/frontage roads
11 - Improvements to detour routes*
12 - Access Management
13 - Superstreet Arterials
14 - Improvements to Detour Routes

Category C — INTELLIGENT TRANSPORTATION SYSTEMS

1 - Traveler information systems
2 - Quick response incident clearance
3 - Roadside and motorist assistance
4 - ITS support infrastructure
5 - CCTV cameras/traffic flow monitoring
6 - Signal operation and management
7 - Variable speed limits
8 - Queue warning
9 - Dynamic merge control
10 - Ramp metering/flow control
11 - Express lanes*
12 - Queue jumpers*
13 - Traffic signal preemption/transit signal priority*
*14 - Connected vehicles**
15 - Integrated Corridor Management

Category D — FREIGHT

1 - Commercial vehicle geometric accommodations
2 - Truck lane restrictions
3 - Dedicated Truck Lanes and Ramps
4 - Enhanced Weigh Stations
5 - Intermodal Connector Roads

Category E — DEMAND MANAGEMENT AND POLICY CONSIDERATIONS

1 - Demand management strategies
2 - Variable/dynamic ramp closures
3 - Vehicle eligibility/occupancy
4 - Variable/dynamic pricing
*5 - Trip reduction ordinances**
6 - Increasing Bus Route Coverage & Frequency
7 - Park-and-Ride Lots
8 - Land Use & Transportation
9 - Weathering / Winter Maintenance Systems

** Added strategy for consideration as result of stakeholder input.*

Table 5.1 provides a high-level description of each type of strategy included in the initial menu of strategies.

Table 5.1: Definitions of Strategies That Moved Forward for Further Evaluation

Strategy		Description
A) ADDED CORRIDOR CAPACITY	Bottleneck Mitigation	This strategy is comprised of operational improvements including acceleration/deceleration lanes, auxiliary lanes and/or collector-distributor lanes.
	Reversible/ Changeable Lanes	This strategy adds capacity by utilizing designated lanes that operate in the peak direction to capitalize on infrastructure and maximize throughput during peak periods.
	Drivable/Hard Shoulder Running	Shoulder running includes drivable shoulders or hard shoulder running, which permits the use of shoulders by cars, buses, or incident management vehicles on a temporary basis to increase capacity.
B) IMPROVED DESIGN GEOMETRICS	Roundabouts	Roundabouts counteract safety and congestion issues associated with standard intersections by controlling the entering traffic with yield signs (rather than stop signs or signals), and the design reduces vehicle speeds along each approach.
	Diverging Diamond Interchanges	This strategy consists of a nontraditional interchange design that moves traffic to the left side of the road, thus eliminating delays typically associated with left turns onto and from the interstate.
	Loop Ramps Reducing Left Turns	Interchange designs that include loop ramps help eliminate bottlenecks (normally due to ramps backing up onto the interstate) by removing the left turn movement from the exit ramp onto the cross street.
	Ramp Configuration to Increase Queuing Capacity	This strategy involves changes to ramps, including implementing new ramps, reversing ramps, braiding pairs of ramps by physical grade or even closing ramps, in order to improve operations on the freeway.
	Channelization	Channelization creates a physical separation between lanes to enhance safety and operations. Examples include delineators and concrete barriers.
	Innovative Intersections	Various designs have been implemented to improve the efficiency and safety of intersections, typically by reducing conflict points caused by left turns. Examples include continuous flow intersections and median U-turn intersections.
	Minimum Intersection/ Interchange & Ramp Spacing	Defining minimum spacing values greatly impacts operations of the interstate facility. In places without adequate minimum spacing, mitigation strategies can include incorporating Collector/Distributor (C/D) roads, braided ramps and frontage roads, or removing interchanges altogether.

	Improvements to Median	In urban areas, median enhancements typically involve increasing the height of the median (by physically extending the median or by adding extenders), thus reducing the chance for tractor-trailer crossover and providing a visual barrier. In rural areas, cable barriers are often used to prevent crossover crashes.
	Crash Investigation Sites	Crash investigation sites are designated areas for law enforcement, roadside assistance and affected vehicles after an incident. These are particularly important in areas with limited shoulder space or where hard shoulder running occurs, in order to provide a safe refuge for vehicles where they do not impact the travel lanes.
	Improved Arterials/ Frontage Roads	This strategy improves the operations along arterials and frontage roads by modifying turning lanes or restriping frontage road access for more efficient movement of local traffic.
	Improvements to Detour Routes	This strategy calls for the provision of variable message signs (VMS) on arterials approaching interstates, so vehicles can be dynamically diverted or detoured.
C) INTELLIGENT TRANSPORTATION SYSTEMS	Traveler Information Systems	Traveler Information Systems provide critical information via signage, media, mobile devices, websites, etc., including real-time traffic information, weather-related information, emergency alerts, alternate routes, etc. An additional function could be to push information to smart phones via text or a user-downloaded application.
	Quick Response Incident Clearance	This strategy is comprised of programs to quickly identify, respond to, and clear incidents. Often, incentives are provided to responders for meeting certain performance metrics.
	Roadside and Motorist Assistance	Service vehicles that patrol the facility, such as HERO units, assist with disabled vehicles and provide support to control traffic issues associated with incidents.
	ITS Support Infrastructure	Intelligent Transportation Systems (ITS) rely on coordination of operations via a traffic management center (TMC). The TMC collects and consolidates roadway information and redistributes this information via roadside signage or communication with enforcement or incident management providers.
	CCTV Cameras/Traffic Flow Monitoring	This technology provides live footage of roadway conditions to the TMC for the purpose of monitoring and distributing information to incident responders and the public regarding incidents and traffic conditions.
	Signal Operation & Management	Signals can be upgraded through improved hardware and software that allows for more advanced timing and coordination, thus improving the efficiency of a corridor.
	Variable Speed Limits	Sensors along the roadway detect when congestion or weather conditions exceed specified thresholds and automatically reduce the speed limit in five mph increments to slow traffic uniformly and delay the onset of congestion.

	Queue Warning	Queue warning signs display dynamic messages to inform motorists of upcoming congestion. This reduces emergency braking and, therefore, queue-related incidents.
	Dynamic Merge Control	This strategy regulates lanes upstream of an interchange to improve traffic flow by closing and opening lanes with dynamic signs. For example, where a two-lane entrance ramp meets the mainline (with one lane merging into the mainline and one having a dedicated lane), Dynamic Merge Control could close either the far right hand lane of the mainline or the left lane on the entrance ramp (depending on the dominant movement) to improve traffic flow.
	Ramp Metering/Flow Control	The use of signaling on entrance ramps helps to maintain a consistent flow of traffic. This mitigates the "wave" of vehicles that can result from the signalization at the cross street. By releasing only one or two vehicles at an even pace, merges can occur more easily, and therefore, the freeway will operate more efficiently. Additional application could include adding a second lane for dual ramp meters and changing signage to allow "two cars per green."
	Express Lanes	Express lanes are designated lanes exclusively used for through trips typically covering longer distances and having limited ingress and egress points. Traditionally, these types of lanes have not been priced.
	Queue Jumpers	Queue jumper lanes at ramps for buses and/or high-occupancy vehicles (HOVs) allow eligible vehicles to move faster than the general traffic. This could potentially be a bypass to ramp meters.
	Traffic Signal Preemption/Transit Signal Priority	This strategy allows for signal preemption for buses at ramp meters or at traffic signals on access ramps. Another application could be for closed ramps that still allow transit or emergency vehicles.
D) FREIGHT	Commercial Vehicle Geometric Accommodations	This strategy requires design accommodations such as providing enhanced shoulder width and material, turning radii, parking, acceleration and deceleration lanes, and truck/car separations.
	Truck Lane Restrictions	Truck restrictions from certain lanes (typically the lane closest to the median) on a roadway are intended to address pavement and structural considerations and to improve operations and reduce crashes.
E) DEMAND MANAGEMENT AND POLICY CONSIDERATIONS	Demand Management Strategies	These are strategies and policies focused on reducing single-occupant vehicle trips. Some strategies include telecommuting, flex time/alternative work hours, parking management, transit incentives, and rideshare programs.
	Variable/Dynamic Ramp Closures	Ramps can be closed, via manual barriers or automatic gates, to manage traffic entering a freeway. Closures may be based on time of day (e.g., during peak hours) or may be used for non-recurring traffic, such as incident removal.
	Vehicle Eligibility/ Occupancy	This strategy is comprised of tactics used to manage the use of a facility or lane based on the type of vehicle (auto, truck, bus, etc.) or number of passengers.

There are a wide variety of strategies beyond those listed in **Table 5.1**. Those additional strategies were eliminated from further consideration either due to constraints related to each strategy, limitations of the scope of this study, or lack of applicability. **Table 5.2** lists and describes the operational strategies that did not move forward for consideration and evaluation as part of the OPS.

Table 5.2: Strategies Not Considered for Further Evaluation

Strategy	Reason Eliminated from Further OPS Consideration
General Capacity	Increasing general purpose lane capacity by adding through lanes to Metro Atlanta freeways is outside the scope of this study. Based on a GDOT Board policy, there will be no new, unmanaged capacity in metro Atlanta. New auxiliary lanes and hard shoulder running strategies are not improvements that fall under the General Capacity Improvement category.
Managed Lanes	Managed lanes control usage of a lane by vehicle eligibility, price and/or access control. (Please refer to GDOT's Atlanta Regional Managed Lane Implementation Plan for further documentation of the development of managed lane solutions.)
Bus Lanes/Bus Ways	The intent of this study was to evaluate solutions that address mobility for passenger vehicles, commercial vehicles and buses. While bus-only facilities would improve transit mobility in Atlanta, these improvements would not accomplish the goal of this study. The Metro Atlanta transit plan, Concept 3, which is currently being implemented by ARC's Regional Transit Committee, identifies the transit needs for Metro Atlanta.
Access Management	This study focused on Metro Atlanta's freeway system. Access management could be a viable solution along arterials connecting to the interstates; however, since this was a region-wide study evaluating only limited-access freeways, there was insufficient data to assess the impacts of access management strategies.
Superstreet Arterials	This study focused on Metro Atlanta's freeway system. Converting existing arterial highways to superstreet arterials could be a viable solution along arterials connecting to the interstates. The cost of developing this type of solution would typically exceed the maximum limit identified for this study.
Improvements to Detour Routes	This study focused on Metro Atlanta's freeway system and recommending solutions to bottlenecks predominately related to reoccurring congestion during weekday peak periods. Improvements to detour routes have the potential to enhance traffic operations during non-reoccurring events such as traffic incidents but not necessarily under other conditions.
Connected Vehicles	Connected vehicles utilize emerging technologies such as in-vehicle collision avoidance systems, which provide vehicles with traveler information and roadside warnings in order to alert the driver. Connected vehicles are an emerging technology that was outside of the identified scope for this study.

Strategy	Reason Eliminated from Further OPS Consideration
Integrated Corridor Management	Integrated Corridor Management (ICM) systems combine individual transportation assets along a corridor into one integrated operating system. ICM is best utilized in corridors with multiple infrastructure assets, such as freeways, arterials, transit, and rail. ICM could be a viable solution when evaluating a wider area of arterials and interstates with various local, state, and private agencies responsible for operations. The cost of developing this type of solution would typically exceed the maximum limit identified for this study.
Dedicated Truck Lanes and Ramps	Based on recommendations in two GDOT-sponsored studies, Statewide Truck Lanes Needs Identification Study (2008) and the 2010 Atlanta Regional Managed Lane System Plan, truck lanes are not a viable solution in Metro Atlanta. This conclusion was based on the high projected costs of dedicated truck-only lanes, which would only benefit a limited number of highway users.
Enhanced Weigh Stations	The intent of this solution is to enhance traditional weigh stations. There are no weigh stations in the study area.
Intermodal Connector Roads	The intent of this study was to evaluate solutions that address mobility for passenger vehicles, commercial vehicles and buses. Intermodal connector roads would not contribute to accomplishing the goal(s) of this study.
Variable/Dynamic Pricing	Pricing strategies manage demand by adjusting the cost to use the lane or facility. Price increases in times of high demand (peak periods) help to ensure a more reliable trip. *(Please refer to GDOT's Atlanta Regional Managed Lane Implementation Plan for further documentation of the development of pricing solutions.)*
Trip Reduction Ordinances	Regulations or measures may be put in place requiring the implementation of some form of congestion mitigation via trip reduction ordinances. This could include developer requirements or restrictions, employer trip reduction programs, and transportation management associations or districts.
Increasing Bus Route Coverage and Frequency	The intent of this study was to evaluate solutions that address mobility for passenger vehicles, commercial vehicles, and buses. This strategy would only benefit a limited number of highway users. The Metro Atlanta transit plan, Concept 3, which is currently being implemented by the Atlanta Regional Commission's Regional Transit Committee, identifies the transit needs for Metro Atlanta.
Park-and-Ride Lots	Park-and-Ride improvements have been evaluated as part of other studies and are not included in the analysis of the OPS. This study considered those identified locations of future improvements as they may influence transit related operational strategies such as ramp meter bypass lanes for transit vehicles.
Land Use & Transportation	This study focused on Metro Atlanta's limited-access freeway system. While managing land use plays a large role in maintaining a sustainable transportation system, the scope of this study does not include making land-use-related recommendations.
Weathering/Winter Maintenance Systems	GDOT participated in the Governors Severe Weather Task Force formed in February 2014 and recommended future actions to better prepare the state for severe weather incidents.

Several technology strategies were discussed early in the study process and should be considered in the future as technology improves over time. These include traveler information systems, connected vehicles, and autonomous (self-driving) vehicles. Detailed information on what these are and considerations of their potential impact to the transportation infrastructure on Atlanta interstates is included in Chapter 7.

5.2 APPLYING OPERATIONAL STRATEGIES TO SPECIFIC LOCATIONS

Once the initial menu of strategies were screened and refined to a list of strategies to be considered further as part of this study (See **Table 5.1**), the project team held multiple internal workshops that included transportation planners, traffic engineers, and roadway design engineers to collaborate on the development of specific operational projects to be evaluated for particular bottleneck locations. In many instances, multiple projects were developed for the same location. Some required that they be implemented collectively while others could be implemented independently of one another. A potential solution, or set of potential solutions for addressing the identified needs, were conceptually evaluated to identify the design challenges as well as the physical requirements, barriers, and impacts related to the potential implementation of the identified strategies.

As indicated in **Figure 4.14** in Chapter 4, there were 101 bottleneck locations that do not currently have an identified project or improvement. It was determined that several of these bottleneck locations required solutions much more costly than an operational strategy and in some cases, warranted further consideration as a major capacity project as part of the MLIP. However, 100 potential strategies were identified at 65 of the bottleneck locations (as shown in **Figure 5.3**) and were moved forward for further evaluation. These operational strategies can be categories as 12 different types:

1. Ramp meters
2. Widen ramps
3. Re-striping
4. Auxiliary lanes
5. Collector/Distributor roads
6. Modification of ramp geometrics to accommodate trucks
7. Truck rollover warning system
8. Ramp meter bypass for transit
9. Upgrade signage
10. Ramp terminal reconfiguration
11. Dynamic ramp closures during peak hours or periods
12. Channelization

Table 5.3 corresponds to the map on the next page and lists the details of each of these 100 evaluated operational strategies identified at 65 of the bottleneck locations.

Figure 5.3: Operational Strategies by Type

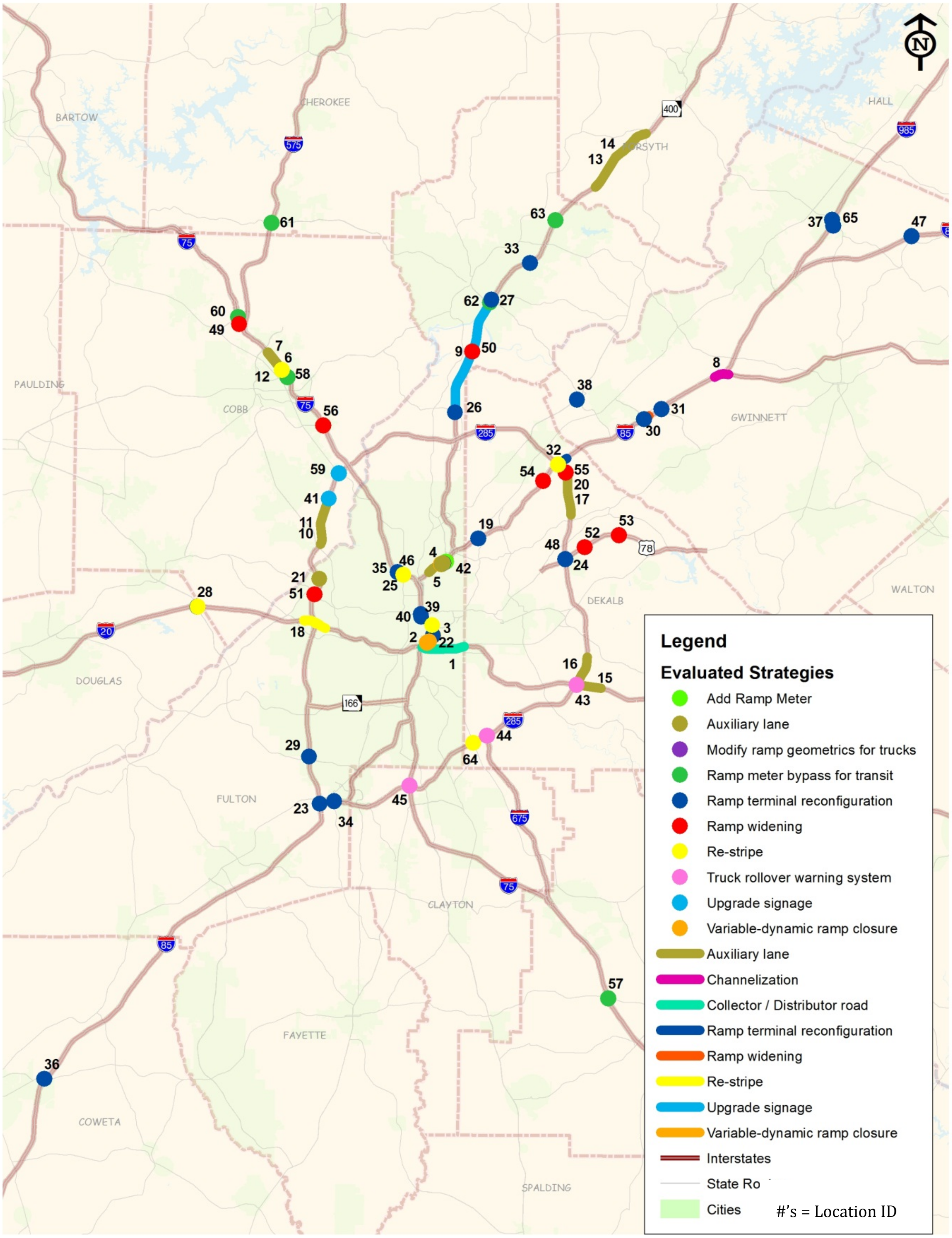


Table 5.3: List of All Projects to be Evaluated

Location ID	Option	Location	Potential Operational Strategy
1	1	I-20 East from Moreland Ave. to DT Connector (WB)	Dynamically close Capitol Ave.
1	2	I-20 East from Moreland Ave. to DT Connector (WB)	Dynamically close Hill St.
1	3	I-20 East from Moreland Ave. to DT Connector (WB)	C/D System
2	1	DT Connector from I-20 to International Blvd. (NB)	Close Edgewood Ave. NB
2	2	DT Connector from I-20 to International Blvd. (NB)	Drop thru lane
2	3	DT Connector from I-20 to International Blvd. (NB)	Close Fulton St. on-ramp
3	1a	DT Connector from Freedom Pkwy. to I-20 (SB)	Close Ellis St. on-ramp
3	1b	DT Connector from Freedom Pkwy. to I-20 (SB)	Close Edgewood Ave. on-ramp
3	2	DT Connector from Freedom Pkwy. to I-20 (SB)	Close MLK Jr. Dr. off-ramp
3	3	DT Connector from Freedom Pkwy. to I-20 (SB)	Interchange reconfiguration
4	1	Buford Connector at Monroe Dr. (NB)	Close Monroe Dr. on-ramp
4	2	Buford Connector at Monroe Dr. (NB)	Add ramp meter on Monroe Dr.
4	3	Buford Connector at Monroe Dr. (NB)	Auxiliary lane
4	4	Buford Connector at Monroe Dr. (NB)	Add left turn lane to off-ramp
4	5	Buford Connector from Piedmont Rd. to I-85 (NB)	Auxiliary lane using shoulder
5	1	I-85 N from I-85/SR 400 to Buford Connector (SB)	Auxiliary lane using shoulder
6	1	I-75 N from SR 5 to SR 120 (SB)	Auxiliary lane using shoulder
7	1	I-75 N from SR 120 to SR 5 (NB)	Auxiliary lane using shoulder
8	1	I-85 N at SR 316 (SB)	Extend HOT lane merge
9	1	SR 400 from Holcomb Bridge Rd. to Abernathy Rd. (SB)	Active Traffic Management (full gantry)
10	1	I-285 NW from S Cobb Dr. to Paces Ferry Rd. (NB)	Auxiliary lane using shoulder
11	1	I-285 NW from Paces Ferry Rd. to S. Cobb Dr. (SB)	Auxiliary lane using shoulder

Location ID	Option	Location	Potential Operational Strategy
12	1	I-75 N at North Loop (NB)	Extend on-ramp
12	2	I-75 N at North Loop (NB)	Widen on-ramp
13	1	SR 400 from McFarland Rd. to Peachtree Pkwy. (NB)	Auxiliary lane using shoulder
14	1	SR 400 from Peachtree Pkwy. to McFarland Rd. (SB)	Auxiliary lane using shoulder
15	1	I-20 E from Wesley Chapel Rd. to I-285 E (WB)	Auxiliary lane using shoulder
16	1	I-285 E from I-20 to Glenwood Rd. (NB)	Auxiliary lane using shoulder
17	1	I-285 E from Northlake Pkwy. to I-85 N (NB)	Auxiliary lane using shoulder
18	1	I-285 W at I-20 W (WB)	Add mainline lane
18	2	I-285 W at I-20 W (EB)	Drop mainline lane
19	1	I-85 Inside at N Druid Hills Rd. (SB)	Close frontage road access
19	2	I-85 Inside at N Druid Hills Rd. (SB)	Off-ramp restriping
19	3	I-85 Inside at N Druid Hills Rd. (NB)	On-ramp restriping
19	4	I-85 Inside at N Druid Hills Rd. (Inter.)	Dual left turns restriping
20	1	I-285 E from I-85 to Northlake Pkwy. (SB)	Auxiliary lane using shoulder
21	1	I-285 NW at Bolton Rd. (NB)	Add arterial thru lane
22	1	DT Connector from Freedom Pkwy. to Pine St. (NB)	Re-stripe and extend aux. lane
23	1	I-285 SW at I-85 S (NB)	Ramp reconfiguration
24	1	US 78 at I-285 NB (WB)	Ramp reconfiguration
25	1	I-75 Inside at Northside Dr. (NB)	HOV on-ramp restriping
26	1	SR 400 at Abernathy Rd. (SB)	Ramp upgrade
27	1	SR 400 at Holcomb Bridge Rd. (SB)	Add off-ramp right turn lane arterial thru lane
28	1	I-20 W at Thornton Rd. (Inter.)	DDI

Location ID	Option	Location	Potential Operational Strategy
28	2	I-20 W at Thornton Rd. (EB)	Add on-ramp lane
29	1	I-285 SW at Camp Creek Pkwy. (Inter.)	DDI – 6-lane
29	2	I-285 SW at Camp Creek Pkwy. (Inter.)	Modified displaced left turn
29	3	I-285 SW at Camp Creek Pkwy. (Inter.)	Partial DDI
29	4	I-285 SW at Camp Creek Pkwy. (Inter.)	DDI – 5-Lane
30	1	I-85 N at Indian Trail/Lilburn Rd. (Inter.)	DDI
30	2	I-85 N at Indian Trail/Lilburn Rd. (NB)	Widen on-ramp
31	1	I-85 N at Beaver Ruin Rd. (Inter.)	DDI
31	2	I-85 N at Beaver Ruin Rd. (Inter.)	Partial DDI
32	1	I-85 N at I-285 (Inter.)	Construct flyover
32	2	I-85 N at I-285 (WB)	Interchange restriping
33	1	SR 400 at Haynes Bridge Rd. (NB)	Ramp reconfiguration
34	1	I-285/85 S at Old National Hwy. (Inter.)	DDI
34	2	I-285/85 S at Old National Hwy. (Inter.)	Quadrant road and roundabout
34	3	I-285/85 S at Old National Hwy. (Inter.)	Roundabout
35	1	I-75 at Howell Mill Rd. (Inter.)	DDI
36	1	I-85 S at SR 34 (SB)	Add right turn lane
37	1	I-985 at SR 20 (NB)	Ramp upgrade
38	1	PIB at SR 140	DDI
39	1	DT Connector at North Ave. (SB)	Add right turn lane
40	1	DT Connector at Williams St. (SB)	Prohibit left turn
40	2	DT Connector at Williams St. (SB)	Right turn restriping
40	3	DT Connector at Williams St. (SB)	Add right turn lane

Location ID	Option	Location	Potential Operational Strategy
40	4	DT Connector at Williams St. (SB)	Re-stripe off-ramp
41	1	I-285 NW at Paces Ferry Rd. (NB & SB)	Ramp meter signal timing
42	1	Buford Connector at Piedmont Rd. (SB)	Add ramp meter
42	2	Buford Connector at Armour Dr. (SB)	Add ramp meter
43	1	I-20 E at I-285 E (WB)	Modify geometrics for trucks
43	2	I-20 E at I-285 E (WB)	Upgrade signage for trucks
44	1	I-285 S at I-675 (Inter.)	Upgrade signage for trucks
45	1	I-75 S at I-285 S (NB/SB)	Upgrade signage for trucks
46	1	I-75 between Northside Dr. and Howell Mill Rd.	C/D road
47	1	I-85 N at Hamilton Mill Rd. (Inter.)	Indirect left turn intersection
47	2	I-85 N at Hamilton Mill Rd. (Inter.)	Quadrant road intersection
47	3	I-85 N at Hamilton Mill Rd. (Inter.)	Quadrant road intersection
47	4	I-85 N at Hamilton Mill Rd. (Inter.)	Ramp relocation
48	1	I-285 E from US 78 to Ponce de Leon Ave. (SB)	Auxiliary lane
49	1	I-75 N at Barrett Pkwy. (SB)	Widen on-ramp
50	1	SR 400 at Northridge Dr. (SB)	Widen on-ramp
50	2	SR 400 at Northridge Dr. (NB)	Widen on-ramp
51	1	I-285 NW at Hollowell Pkwy. (SB)	Widen on-ramp
52	1	US 78 at Brockett Rd. (WB)	Widen on-ramp
53	1	US 78 at Mtn. Industrial Blvd. (WB)	Widen on-ramp
54	1	I-85 N at Chamblee Tucker Rd. (NB)	Widen on-ramp
55	1	I-285 East Chamblee Tucker Rd. (SB)	Widen on-ramp
56	1	I-75 N at Delk Rd. (NB)	Widen on-ramp

Location ID	Option	Location	Potential Operational Strategy
57	1	I-75 S at Jonesboro Rd. (NB)	Ramp meter bypass for transit
58	1	I-75 N at North Loop (SB)	Ramp meter bypass for transit
59	1	I-285 NW at Cobb Pkwy. (Inter.)	Upgrade directional signage
60	1	I-75 N at Barrett Pkwy. (SB)	Ramp meter bypass for transit
61	1	I-575 at SR 92 (SB)	Ramp meter bypass for transit
62	1	SR 400 at Holcomb Bridge Rd. (SB)	Ramp meter bypass for transit
63	1	SR 400 at Windward Pkwy. (SB)	Ramp meter bypass for transit
64	1	I-285 S at Moreland Ave. (EB)	Re-stripe on-ramp
65	1	I-985 at SR 20 (Inter.)	Partial DDI
65	2	I-985 at SR 20 (SB)	Add off-ramp right-turn lane arterial thru lane

The remainder of this chapter describes each of the 12 types of strategies in detail and highlights an example project for each. **Appendix D** includes a graphic and details for each of the 65 locations. These 100 operational strategies moved forward for further evaluation. The evaluation tools, methods, and results, along with the project prioritization process, are documented in Chapter 6 with recommendations following in Chapter 7.

5.2.1 Ramp Strategies

There are several operational strategies that can be implemented at freeway ramps to improve traffic operations as vehicles access the freeway mainline. The most common ramp management strategies include ramp metering and ramp closures. However, the OPS also considered ramp widening, ramp geometry modifications to accommodate trucks, signage improvements, and ramp meter bypass lanes for transit vehicles. Ramp terminal reconfigurations are discussed separately in **Section 5.2.7**.

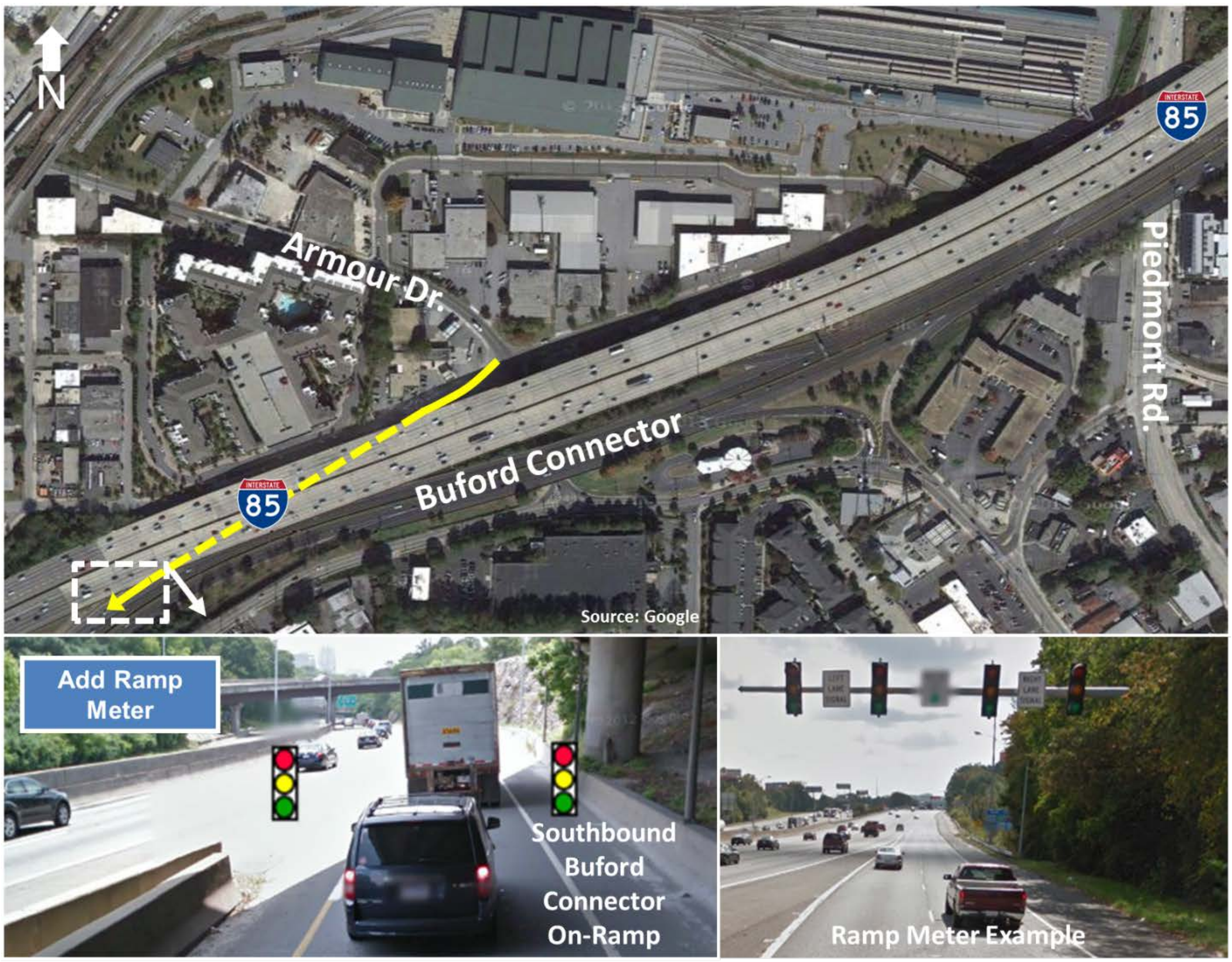
5.2.1.1 Ramp Metering

Ramp metering is a common strategy used to manage traffic entering or exiting the freeway by way of ramps. A ramp meter is a device that regulates the flow of traffic entering a freeway. Ramp meters have been used to reduce traffic congestion in more than 20 cities nationwide for more than 20 years. There are currently 160 ramp meters in Metro Atlanta, all of which are operated and maintained by GDOT. By pacing the entry of vehicles onto the freeway, the merging vehicles are less likely to slow the freeway traffic. The ramp meters are typically used during morning and afternoon peak hours to:

- Interrupt the continuous flow of traffic from entrance ramps
- Allow vehicles to merge with freeway traffic more smoothly
- Make travel safer
- Enable the freeway to accommodate more vehicles during peak hour travel

Figure 5.4 illustrates an example of a potential ramp metering strategy at the Armour Drive on-ramp to the southbound Buford Connector.

Figure 5.4: Example of Potential Ramp Meter Project



Ramp metering strategies were considered at the following locations:

1. Buford Connector at Armour Drive (illustrated above)
2. Buford Connector at Monroe Drive
3. I-285 NW at Paces Ferry Road

5.2.1.2 Ramp Widening

Another common operational improvement measure for freeway ramps is widening the ramp to create more space and provide safer merging conditions for vehicles waiting to enter the freeway lanes. **Figure 5.5** illustrates an example of a potential ramp widening strategy for SR 400 at Northridge Drive.

Figure 5.5: Example of Potential Ramp Widening Project

Ramp widening strategies were considered at the following locations:

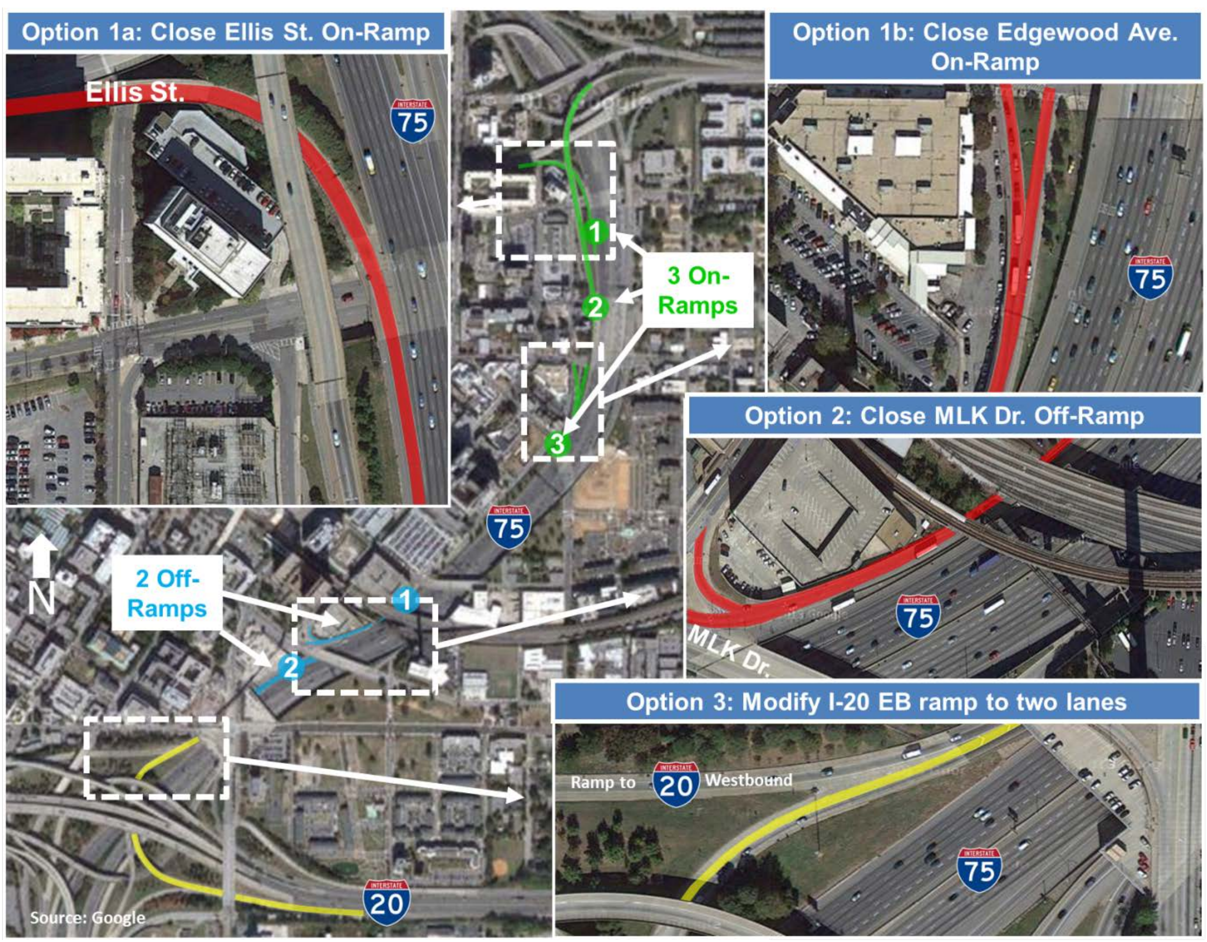
1. SR 400 at Northridge Drive (NB & SB) (illustrated above)
2. I-75 N at Barrett Parkway (SB)
3. I-285 NW at Hollowell Parkway (SB)
4. US 78 at Brockett Road (WB)
5. US 78 at Mountain Industrial Boulevard (WB)
6. I-85 N at Chamblee Tucker Road (NB)
7. I-75 N at Delk Road (NB)

8. I-285 E at Chamblee Tucker Road (SB)
9. I-75 N at North Loop (NB)
10. I-85 N at Indian Trail/Lilburn Road (NB)

5.2.1.3 Dynamic Ramp Closures

Dynamic ramp closure refers to an operational strategy that would close freeway ramps during the most congested times of the day to effectively minimize traffic disruptions that are caused by merging traffic in the vicinity of those freeway ramps. This strategy often works well when there are many on- and off-ramps clustered closely together. However, these ramp clusters can significantly diminish the level of service on adjacent freeway lanes. **Figure 5.6** illustrates an example of a potential ramp closure strategy located on the Downtown Connector between Freedom Parkway and I-20. At this location, there are five on-/off-ramps located within three-fourths of a mile, which may be one of many factors contributing to heavy congestion in this segment of the freeway. In this example, the closing of the Ellis Street on-ramp and Edgewood Avenue on-ramp were evaluated independently of one another (i.e. either/or, not both).

Figure 5.6: Example of Potential Ramp Closure Project



Ramp closure strategies were considered at the following locations:

1. Downtown Connector at Ellis Street (NB)
2. Downtown Connector at Edgewood Avenue (NB)
3. Downtown Connector at Fulton Street (NB)
4. Downtown Connector from Freedom Parkway to I-20 at Ellis Street (SB) (illustrated above)
5. Downtown Connector from Freedom Parkway to I-20 at Edgewood Avenue (SB) (illustrated above)
6. Downtown Connector from Freedom Parkway to I-20 at MLK Drive (SB) (illustrated above)
7. I-85 Inside at North Druid Hills Road (SB)
8. Buford Connector at Monroe Drive (NB)
9. I-20 E from Moreland Avenue to Downtown Connector (WB)

5.2.1.4 Modify Ramp Geometrics and Upgrade Signage to Accommodate Trucks

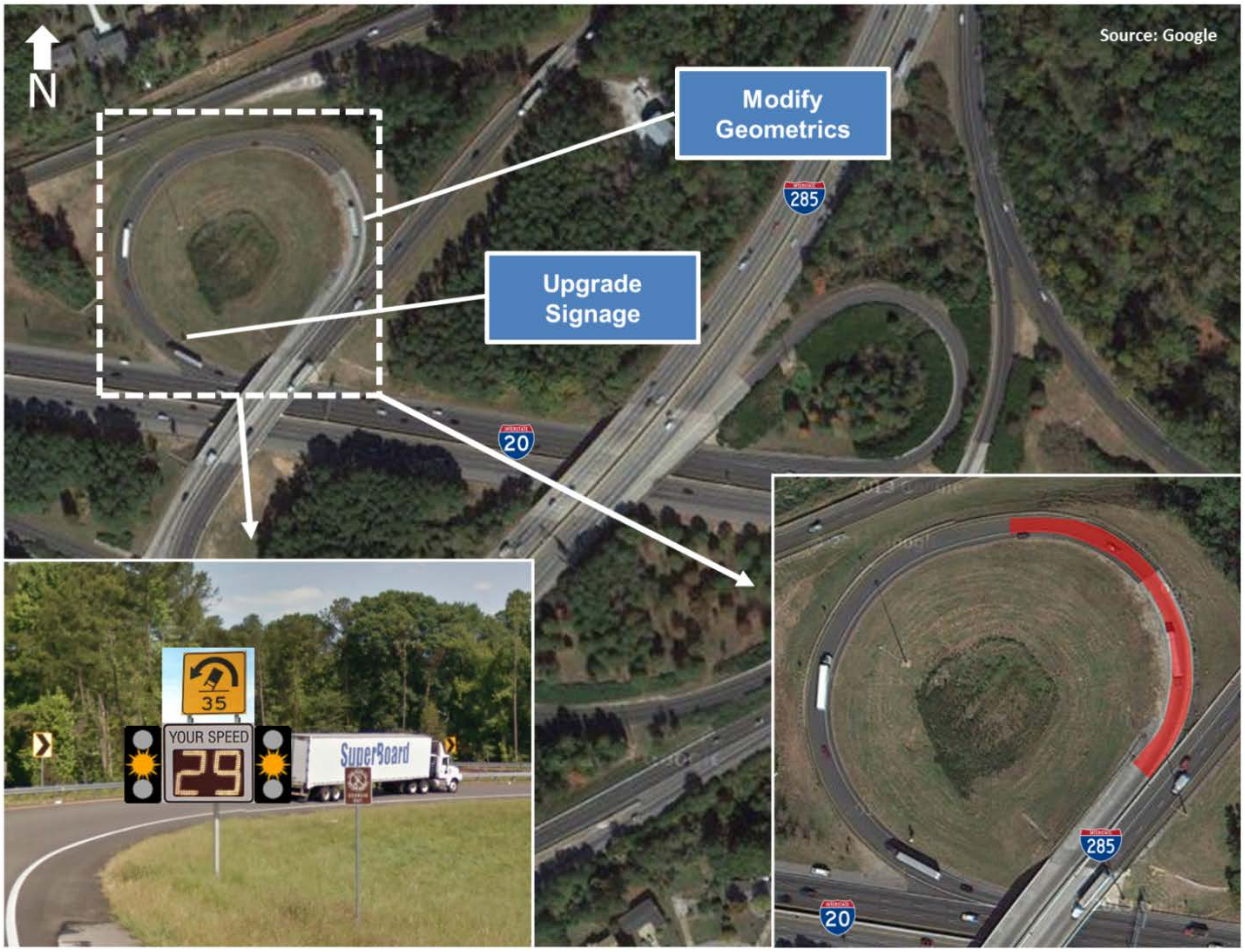
Figure 5.7: Truck Rollover Advisory System in Pennsylvania[1]

In addition to lengthening or widening ramps to create more storage for queued vehicles, it is important to also consider the geometric design of the ramp to make sure vehicles can safely operate on the ramp. Heavy vehicles require a larger turning radius and must also manage their speed on ramps to ensure their tractor trailers do not overturn. There are some locations in the study area that are more heavily used by trucks, and these areas should receive extra consideration for the operating conditions of those vehicles. Automated truck rollover warning systems should be considered for any tight curves or steep incline/declines to make sure drivers have the necessary time to slow down in order to navigate these problem areas. One location that ramp geometrics and signage should be considered is on the system-to-system interchange at I-285 East and I-20 East. An example of a truck warning sign located in Pennsylvania is illustrated in **Figure 5.7**.

Figure 5.8 illustrates an example of a potential ramp geometric modification strategy at the I-285 East/I-20 East Interchange. There are currently no truck rollover warning systems in the Atlanta region.

[1] *PennDOT Bureau of Highway Safety and Traffic Engineering*

Figure 5.8: Example of Potential Project to Modify Ramp Geometrics and Upgrade Signage to Accommodate Trucks



Projects that modified ramp geometrics and/or upgraded signage to accommodate trucks were considered at the following locations:

1. I-20 E at I-285 E (WB) (illustrated above)
2. I-75 S at I-285 S (NB & SB)
3. I-285 S at I-675 (WB & EB)

5.2.1.5 Ramp Meter Bypass Lanes

Ramp meter bypass lanes are designed to provide signal preference to buses and vanpools at arterial intersections and freeway on-ramps. They are often called "transit bypass lanes" or "queue jumper lanes" and have historically been developed to aide in the operational efficiency of a bus rapid transit (BRT) or regional express bus system. Ramp meter bypass lanes consist of an additional travel lane allowing certain vehicles to bypass the queue that can form as a result of ramp metering.

Ramp meter bypass lanes were considered at several of metro Atlanta's freeway on-ramps to optimize transit reliability, reduce transit delays, and promote Park-and-Ride use. Ramp meter bypass lanes allow eligible vehicles to get a "head start" over queued vehicles as they use on-ramps to merge onto freeways. While cars are waiting for a green signal to move onto the expressway, buses and other high-capacity vehicles can use the bypass lane to pass waiting traffic, reducing the delay caused by ramp metering and improving the overall operational efficiency of the freeway system. Also, ramp meter bypass lanes do not take a lane away from general purpose traffic at freeway on-ramps, thereby making them easier to build and implement.

Figure 5.9 illustrates what a typical ramp meter bypass lane for transit might look like entering the interstate.

Figure 5.9: 3D Simulation of Ramp Meter Bypass Lane for Transit

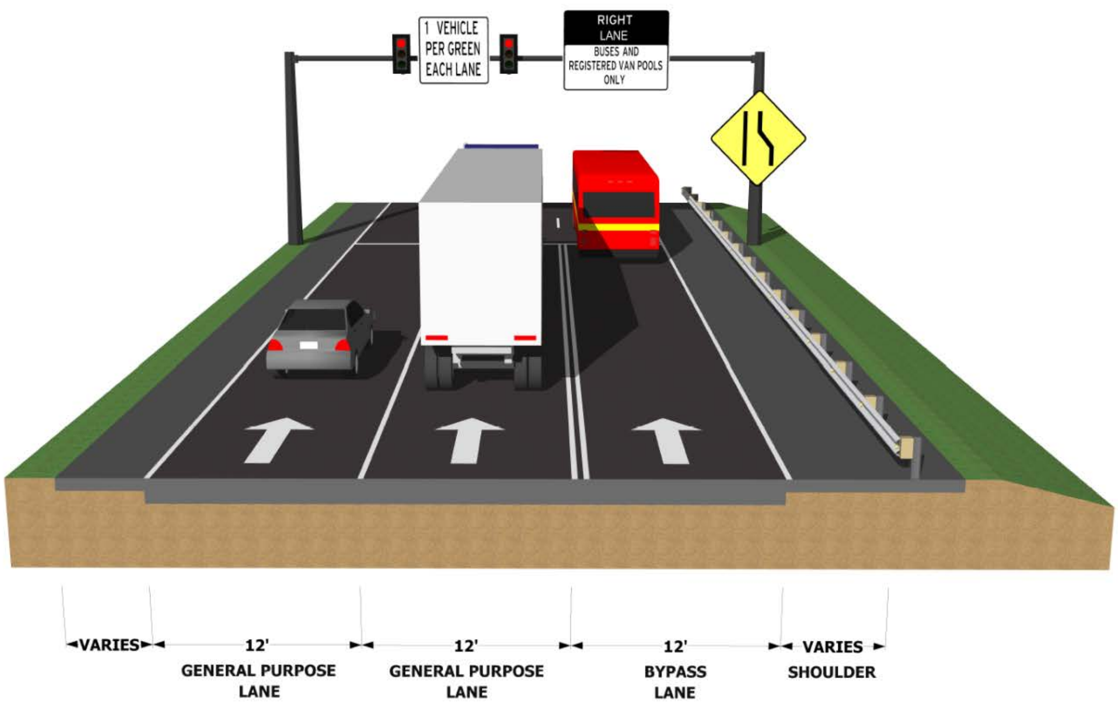
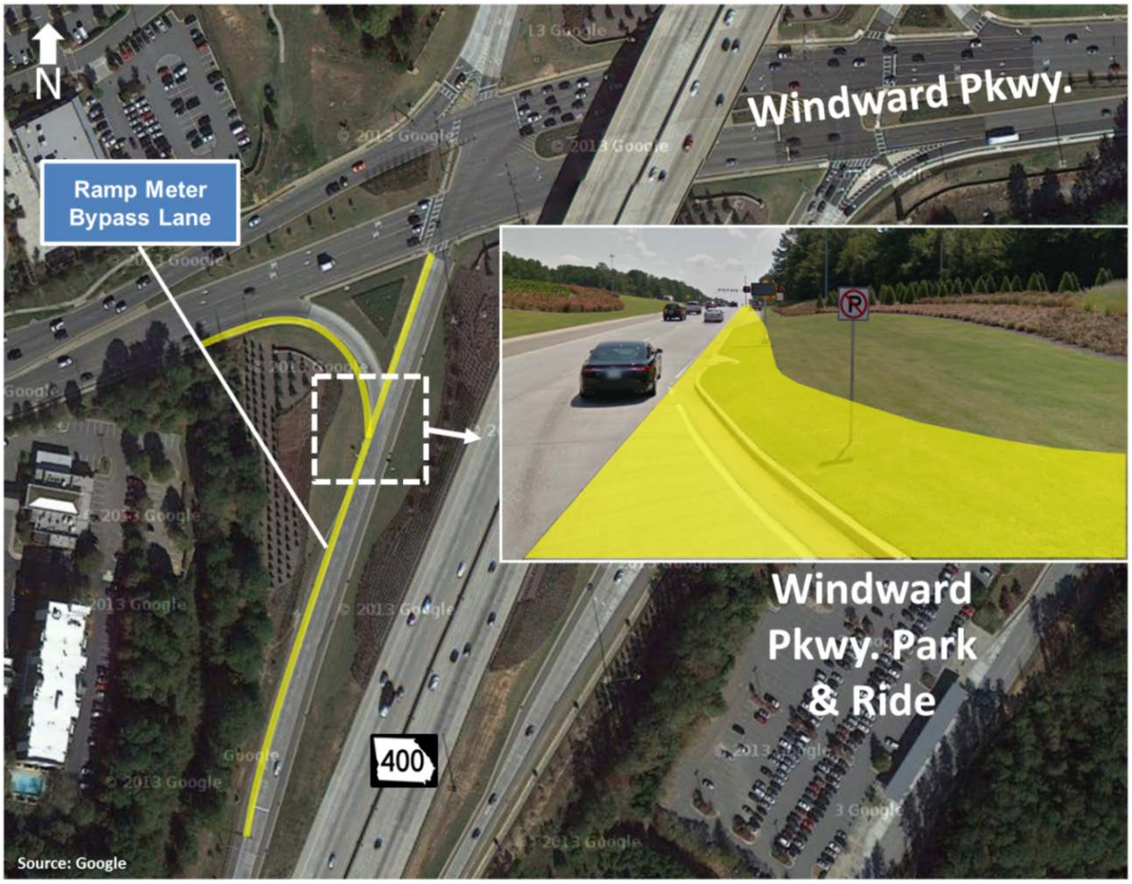


Figure 5.10 illustrates an example of a potential ramp meter bypass lane near the Windward Parkway Park-and-Ride facility.

Figure 5.10: Example of Potential Ramp Meter Bypass Lanes Project

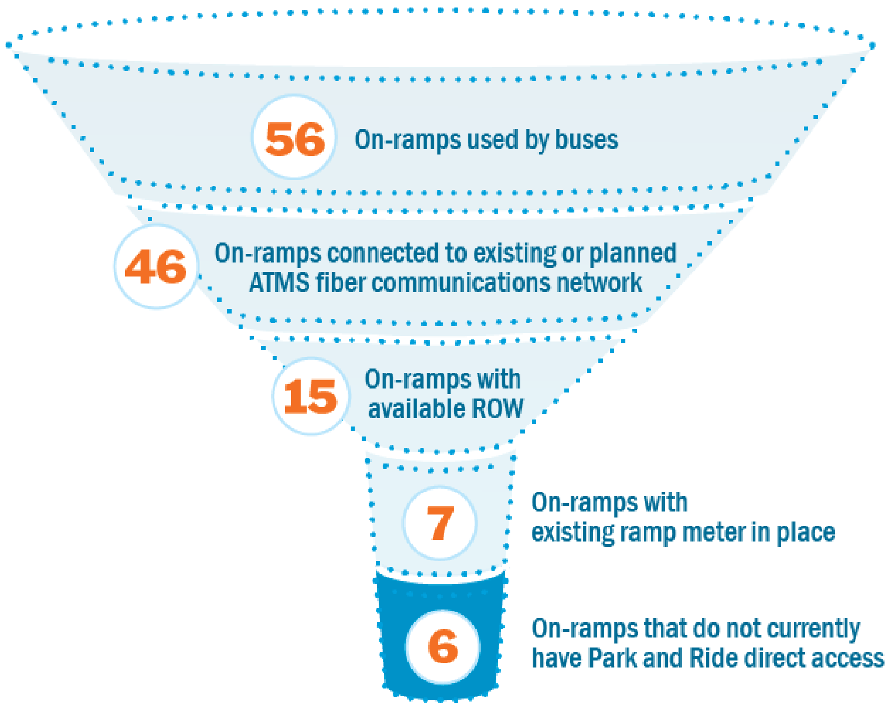


Ramp meter bypass lanes for transit were considered at the following six locations:

1. I-75 S at Jonesboro Road (NB)
2. I-75 N at North Loop (SB)
3. I-75 N at Barrett Parkway (SB)
4. I-575 at SR 92 (SB)
5. SR 400 at Holcomb Bridge Road (SB)
6. SR 400 at Windward Parkway (SB)

These six locations were identified by conducting a thorough screening analysis, as illustrated in **Figure 5.11**. The first screening level identified 56 on-ramps that fall on an existing bus route. The second screening level indicated all the ramps that have the technology in place to operate a bypass lane. There are 46 ramps that are connected to the Advanced Transportation Management System (ATMS) network. The third screening level identified the ramps that have available right-of-way (ROW) for another 12 foot lane (15 ramps). The fourth screening level identified the ramps with an existing ramp meter in place (7 ramps). The fifth and final screening level identified the ramps that do not currently have a bypass lane in place (6 ramps listed above). I-75 South at SR 138 already allows transit vehicles to bypass the ramp meter.

Figure 5.11: Screening Process to Identify Locations for Ramp Meter Bypass Lanes for Transit



5.2.2 Auxiliary Lanes

Auxiliary lanes can be utilized to reduce congestion on existing freeways by reducing some weaving movements and providing additional capacity between interchange ramps. They are often the same width as other freeway lanes and can be used to safely accommodate turning, weaving, slow-traveling trucks, or to improve through-traffic movement. Auxiliary lanes may utilize shoulders as travel lanes to increase operational efficiency as a continuous lane between entrance and exit terminals where interchanges are closely spaced. They also are used to help mitigate specific operational bottlenecks.

With fiscally constrained transportation funding, it is becoming increasingly important for transportation agencies to consider innovative strategies, such as auxiliary lanes utilizing existing shoulders, to maximize investments on existing roadway surfaces. Auxiliary lanes can provide a low-cost alternative to adding an entirely new lane to freeways. Furthermore, auxiliary lanes are a solution to widening the roadway that can be implemented with minimal environmental study, as they can usually be built within existing ROW and with minimal construction impacts.

Figure 5.12 illustrates an example of a potential auxiliary lane utilizing an existing shoulder on SR 400 near the Windward Parkway Park-and-Ride facility.

Figure 5.12: Example of Potential Project for an Auxiliary Lane Utilizing Shoulder

Auxiliary lanes were considered at the following locations:

1. SR 400 from McFarland Road to Peachtree Parkway (NB & SB) (illustrated above)
2. I-285 NW from Paces Ferry Road to S. Cobb Drive (NB & SB)
3. I-85 N from I-85/SR 400 to Buford Connector (SB)
4. I-75 N from SR 5 to SR 120 (NB & SB)
5. I-20 E from Wesley Chapel Road to I-285 E (WB)
6. I-285 E from I-20 to Glenwood Road (NB)
7. I-285 E from Northlake Parkway to I-85 N (NB & SB)
8. I-285 NW at Bolton Road (NB)
9. Buford Connector at Monroe Drive (NB)
10. Buford Connector from Piedmont Road to I-85 (NB)
11. I-285 E from US 78 to Ponce de Leon Avenue (SB)

5.2.3 Collector/Distributor Roads (C/D Roads)

A collector/distributor (C/D) road parallels and connects freeway lanes with frontage roads or entrance ramps. A C/D road is similar to an exit or entrance ramp, but is typically longer and permits drivers to bypass traffic signals at busy intersections. This extra length often allows drivers more distance to merge onto freeways while consolidating the number of entry and exit points along the freeway. Collector/distributor roads can have significant benefits to safety and operations by providing a place for traffic exiting freeway lanes to queue as they wait to access arterial roadways. **Figure 5.13** illustrates what a typical C/D road might look like.

Figure 5.13: Photo of Typical C/D Road[2]

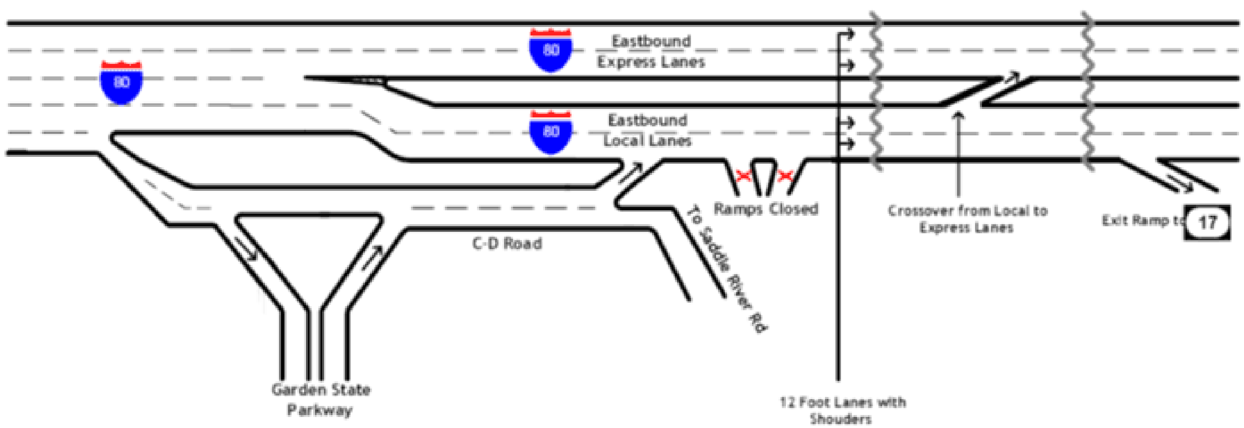


Figure 5.14 illustrates an example of a potential C/D road on I-20. The blue line is the C/D road that combines ramps into a single two-lane exit and a new two-lane C/D road on a new bridge deck over I-285.

[2] *Texas Transportation Institute, KDOT, MARC. I-35 Corridor Optimization Study. 2012.*

Figure 5.14: Example of Potential Collector/Distributor Road Project

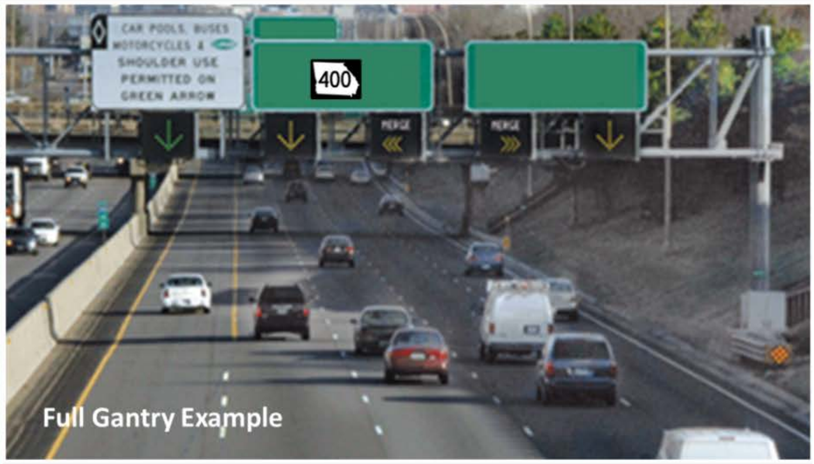
C/D roads were considered at the following locations:

1. I-20 W at I-285 W (EB)
2. I-75 between Northside Drive and Howell Mill Road (NB)
3. I-20 E from Moreland Avenue to Downtown Connector (WB)

5.2.4 Upgrade Signage

Upgrading traffic signs is another way to reduce the negative impacts of ramp congestion on freeways. Active Traffic Management (ATM) signs can help to notify drivers of congestion or incidents ahead. **Figure 5.15** illustrates how signage could be used to calm freeway traffic, thereby effectively reducing the amount of weaving and lane changing that would otherwise occur on freeway lanes.

Figure 5.15: Example of Potential Project to Upgrade Signage Using Signage



Signage upgrade projects were considered at the following locations:

1. SR 400 from Holcomb Bridge Rd. to Abernathy Ave. (SB) (illustrated above)
2. I-285 NW at Cobb Pkwy. (NB)
3. I-285 NW at Paces Ferry Rd. (NB & SB)

5.2.5 Channelization

Channelizing traffic provides a way to reduce the negative impacts of ramp congestion on freeways. Channelization employs the use of secondary roads to pre-separate certain flows of traffic from other traffic lanes. **Figure 5.16** illustrates how channelization, through the use of signage, could be used to organize ramp traffic that will be traveling north on I-75, thereby effectively reducing the amount of weaving and lane changing that would otherwise occur on freeway lanes.

Figure 5.16: Example of Potential Project to Channelize Traffic Using Signage

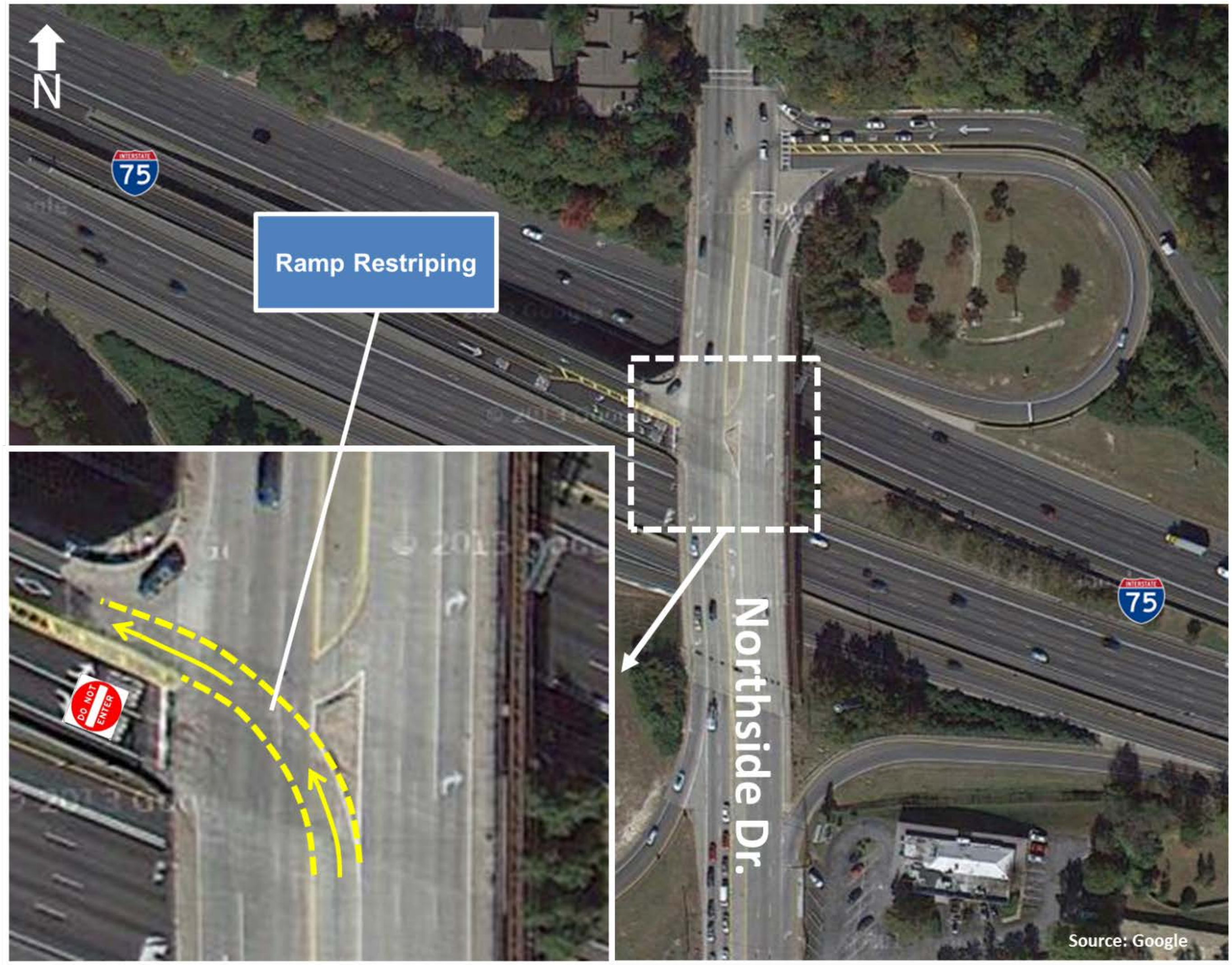
Channelization projects were considered at the following locations:

1. I-285 NW at Cobb Parkway (illustrated above)
2. I-85 N at SR 316

5.2.6 Re-striping

Re-striping is a low-cost operational strategy that can be implemented quickly. There are several locations in the study area where there is available ROW along the road, and simply re-striping lanes can have a profound impact on freeway congestion. One example of a potential re-striping strategy is illustrated in **Figure 5.17.**

Figure 5.17: Example of Potential On-Ramp Re-striping Project



Re-striping projects were considered at the following locations:

1. I-75 Inside at Northside Drive (NB) (illustrated above)
2. I-75 N at North Loop (NB)
3. I-85 Inside at N. Druid Hills Road (NB & SB)
4. Downtown Connector from Freedom Parkway to Pine Street (NB)

5. I-20 W at Thornton Road (EB)
6. I-85 N at I-285 (WB)
7. Downtown Connector at Williams Street (SB)
8. I-85 N at Hamilton Mill Road
9. I-285 S at Moreland Avenue (EB)
10. I-985 at SR 20 (SB)
11. I-285 W at I-20 W (EB & WB)

5.2.7 Ramp Terminal Reconfiguration

Several innovative interchange configurations were considered as part of the OPS. One of these concepts reconfigures ramp terminals as well as the arterial lanes and is called a diverging diamond interchange (DDI). A DDI can be more efficient than other interchange configurations because it reduces the signal phases required to move traffic through the interchange from a three-phase operation to a two-phase operation. The DDI also re-routes traffic so that the left turning and through traffic crosses onto the opposite side of a bridge as it crosses over a freeway. This then allows the left turning traffic to turn unopposed onto a freeway on-ramp. This reconfiguration can significantly improve the safety and flow of traffic through an interchange that experiences heavy left turn traffic. The DDI concept could be constructed without widening the existing bridge structure. **Figure 5.18** illustrates examples of innovative ramp terminal reconfigurations that were considered. The road segments highlighted in red represent irregular traffic movements compared to a typical ramp terminal operation.

Figure 5.18: Examples of Innovative Ramp Terminal Reconfigurations

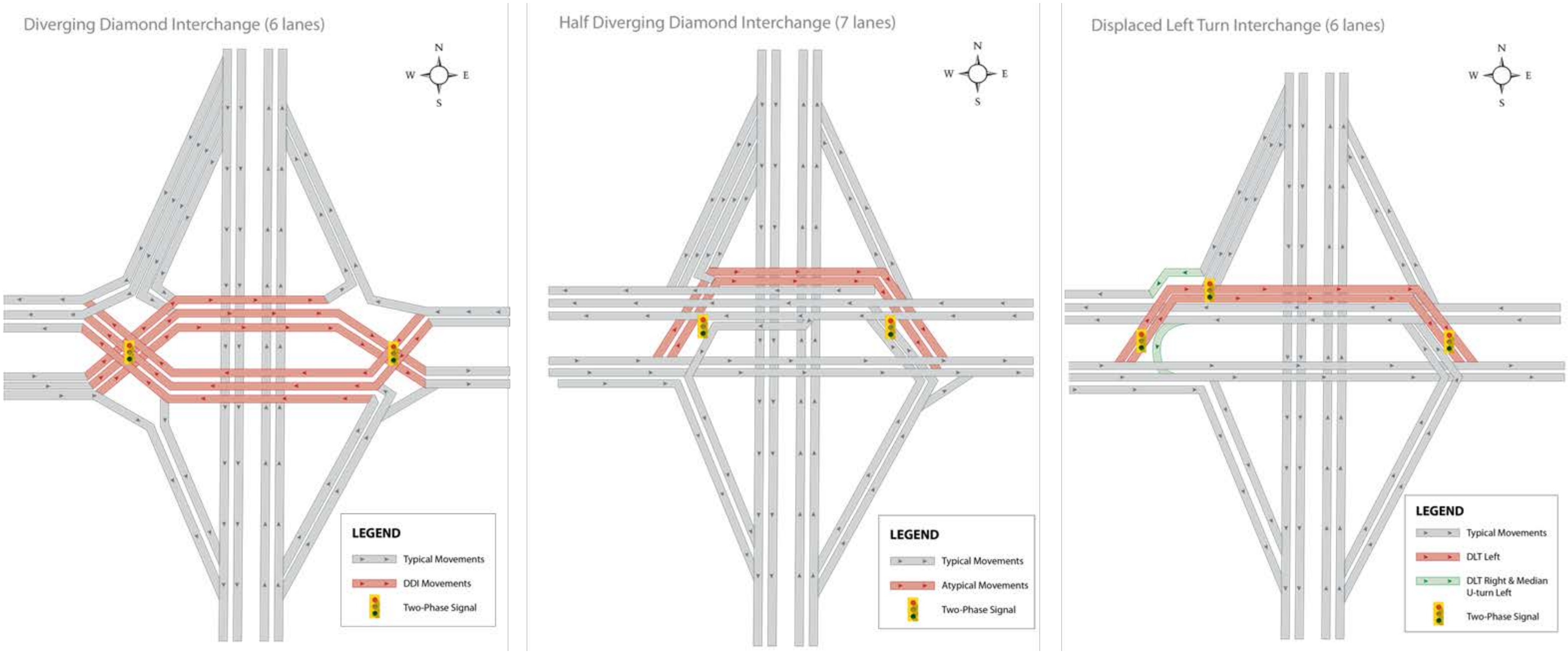
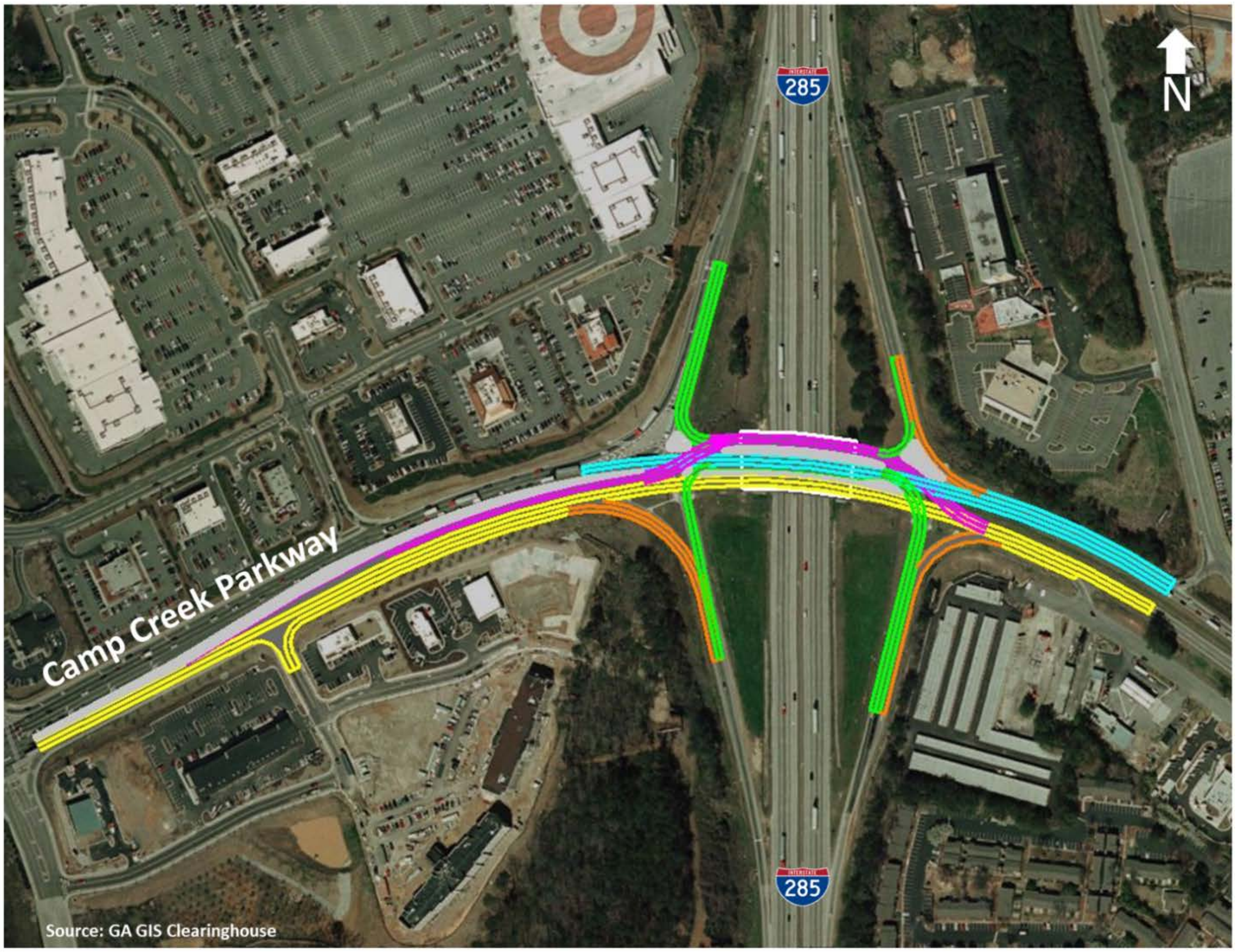


Figure 5.19 illustrates a potential diverging diamond interchange on Camp Creek Parkway at I-285.

Figure 5.19: Example of Potential Ramp Terminal Reconfiguration Project



Ramp terminal reconfiguration projects were considered at the following locations:

1. I-285 SW at Camp Creek Parkway (illustrated above)
2. I-85 Inside at N. Druid Hills Road
3. Downtown Connector from I-20 to International Boulevard (NB)
4. I-285 SW at I-85 S (NB)
5. US 78 at I-285 E (NB)
6. SR 400 at Abernathy Road (SB)
7. SR 400 at Holcomb Bridge Road (SB)
8. I-20 W at Thornton Road

9. Downtown Connecter from Freedom Parkway to I-20 (SB)
10. I-85 N at Beaver Ruin Road
11. SR 400 at Haynes Bridge Road (NB)
12. I-285/85 S at Old National Highway
13. I-75 Inside at Howell Mill Road
14. I-85 S at SR 34 (SB)
15. I-985 at SR 20 (NB)
16. Peachtree Industrial Boulevard at SR 140
17. Downtown Connector at North Avenue (SB)
18. Buford Connector at Monroe Drive (NB)
19. Downtown Connector at Williams Street (SB)
20. I-85 N at Hamilton Mill Road
21. I-985 at SR 20
22. I-85 N at I-285

5.3 SUMMARY OF DEVELOPMENT OF STRATEGIES

The purpose of the operational strategies is to relieve a bottleneck that was identified through analysis or observation. Only strategies that relieved a bottleneck remained a project recommendation after a detailed evaluation of traffic impacts of each strategy was conducted. The details of the strategy evaluation process are expanded upon in Chapter 6.

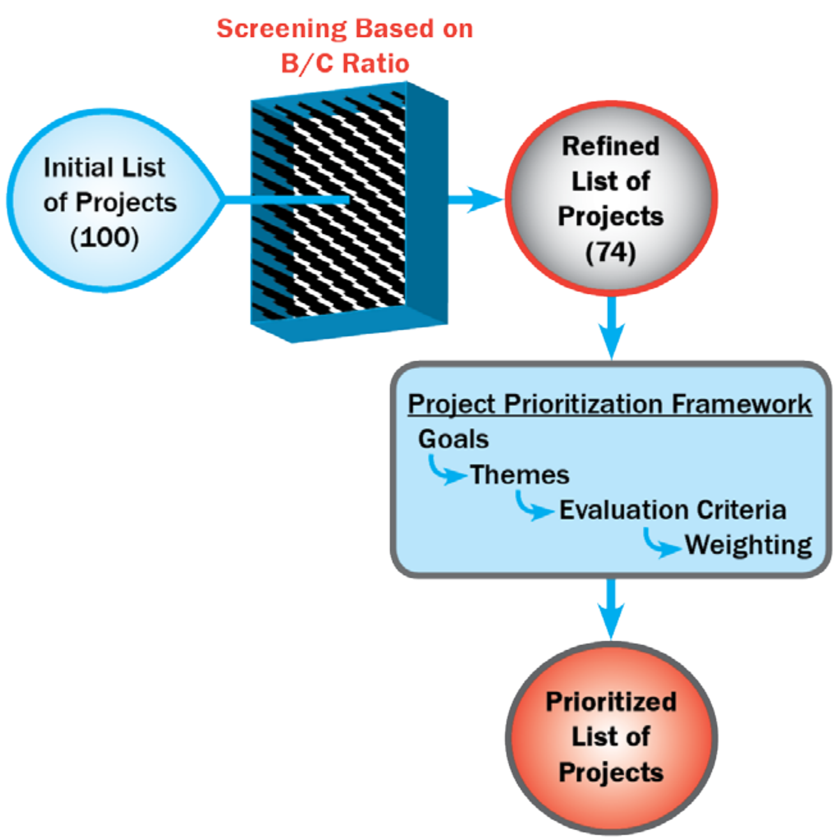
6 EVALUATION OF PROJECTS

Once potential operational projects were identified to address current transportation needs within the study area, they were assessed based on evaluation criteria and the planning themes (discussed in **Section 6.3**) that were consistent with the study goals. This chapter presents an overview of the screening and evaluation framework including goals and themes of this study, the evaluation of the projects as a result of these goals and themes, and the project prioritization process.

6.1 PROJECT SCREENING

A screening of projects was initially conducted based on the Benefit/Cost (B/C) ratio, followed by inputting a refined list of projects into the project evaluation and prioritization framework. The framework used the goals of the OPS to develop planning themes along with evaluation criteria nested within each theme. Scores for each project were then calculated based on the evaluation criteria and by applying weighting factors based on the relative importance of the different themes. The projects were then ranked and prioritized based on the resulting total scores. **Figure 6.1** illustrates the OPS evaluation framework.

Figure 6.1: Project Screening and Evaluation Framework



A screening of all the location-specific operational strategies (i.e., projects) was initially performed to eliminate projects that did not result in an acceptable B/C ratio. It should be noted that several other metrics were used to evaluate projects. However, the B/C ratio was used to remove projects from further consideration as a fatal flaw indicator.

The B/C ratio is an indicator of financial feasibility of a project and is a function of the projected user benefits versus the capital costs. The capital cost was an independent value based on the anticipated construction, ROW, and program costs and is described in detail in **Appendix C**. The B/C ratio was calculated by a spreadsheet tool developed specifically for this study, which is also described in detail in **Appendix C**.

A higher B/C ratio signifies a better performing project versus the cost of delivering that project compared to other projects. Also, a favorable project should increase the overall traffic throughput for the targeted bottleneck location by either improving traffic operations or increasing capacity.

6.1.1 Tools Used to Evaluate Projects

Estimates of increasing traffic throughput and decreasing travel times were performed using a wide spectrum of evaluation tools – from a simple "Lane Volume over Capacity" tool to micro simulation modeling tools. These tools assisted the study team in conducting much of the quantitative analyses. The type of evaluation tool used along specific corridors was determined by the availability of models previously developed for other projects/studies. The four primary evaluation tools used for this study are listed below and are more fully described in the following paragraphs:

- Capacity Analysis for Planning of Junctions (intersection/ interchange evaluation spreadsheet)
- 2010 Highway Capacity Manual/Highway Capacity Software
- CORSIM (FHWA developed micro-simulation model)
- VISSIM (European micro-simulation model)

Outputs from the tools noted above were then used as inputs for the benefits portion of the B/C ratio calculated within the B/C Spreadsheet Tool described in **Section 6.1.1.5**.

6.1.1.1 Capacity Analysis for Planning of Junctions (CAP-X)

The CAP-X software was developed by the U.S. Department of Transportation Federal Highway Administration in partnership with the Transportation Systems Institute at the University of Central Florida, to efficiently evaluate various intersections and interchange alternatives for junctions of two highway facilities. This spreadsheet-based evaluation tool only requires basic geometric and traffic input values to evaluate and compare various at-grade and grade-separated junction configurations. The at-grade intersection types include:

- Conventional
- Quadrant roadway

- Displaced left turn
- Restricted crossing U-turn
- Median U-turn
- Roundabout intersections

The grade-separated interchange types include:

- Traditional diamond
- Partial cloverleaf
- Displaced left turn
- Double crossover diamond
- Single point diamond interchanges

The input data required by this evaluation tool are: the number of through and turning lanes by intersection approach; intersection peak-hour traffic volumes; truck percentages; and traffic growth percentages. The output data from this tool are critical lane volumes and volume-to-capacity ratios for critical conflict areas plus alternative rankings by overall volume-to-capacity ratios. A typical example of the application of this tool was the evaluation of a diverging diamond interchange concept at I-75 and Howell Mill Road. A typical summary report is included in **Appendix C**.

6.1.1.2 2010 Highway Capacity Manual/Highway Capacity Software

The 2010 Highway Capacity Manual (HCM) was developed by the Transportation Research Board of the National Academies. The 2010 Highway Capacity Software (HCS) was developed by McTrans Center as a tool to perform many of the analysis procedures specified in the 2010 HCM. Examples of highway facilities analyzed by these procedures covered in the manual include rural highways, urban highways, and signalized and unsignalized intersections/driveways. Examples of freeway conditions analyzed by these procedures include freeway/ramp segments, ramp merge/diverge areas, weave areas, and major freeway bifurcations.

Examples of the input data required by this evaluation tool for highways/local streets are: the number of through and turning lanes by intersection approach; vertical grades; lane widths; traffic signal operations (timing, phasing, lane assignments, etc.); presence of on-street parking; presence of bus stops; intersection peak hour traffic/pedestrian volumes; truck/heavy vehicle percentages; free flow travel speeds; and intersection arrival types. Examples of the input data required by this evaluation tool for freeways are: the number of lanes by freeway/ramp segment; vertical grades/terrain; lane widths; freeway/ramp peak hour traffic volumes; peak hour factor; truck/heavy vehicle percentages; free flow travel speeds; and population factor.

The manual defines procedures to estimate freeway densities, freeway speeds, intersection delays and level of service for all types of highway/freeway facilities. The majority of these criteria are provided as output by HCS. A typical example of the application of this tool was the evaluation of a ramp reconfiguration concept at I-285 South and I-85 South. A typical summary report is included in **Appendix C**.

6.1.1.3 CORSIM

CORSIM is a traffic micro-simulation software that was developed by the U.S. Department of Transportation Federal Highway Administration to model highways with at-grade intersections and freeways with grade-separated interchanges. This user-friendly software is a very efficient tool to model conventional highways and freeways.

Accurate models can be developed by entering basic roadway geometric information, peak-period traffic volumes, truck/high occupancy vehicle percentages, vehicular travel characteristics, traffic signal timing data, and origin-destination data. Examples of the input data required by this evaluation tool for highways/local streets are: the number of through and turning lanes by intersection approach; vertical grades; lane widths; traffic regulations; traffic signal operations (timing, phasing, lane assignments, etc.); presence of on-street parking; presence of bus stops; intersection peak-hour traffic/pedestrian volumes; truck/heavy vehicle percentages; free flow travel speeds; environmental factors; driver operational characteristics; and vehicular operational characteristics. Examples of the input data required by this evaluation tool for freeways are: the number of lanes by freeway/ramp segment; vertical grades; lane widths; freeway/ramp peak hour traffic volumes; origin/destination data; truck/heavy vehicle percentages; free-flow travel speeds; guide signing placements; driver familiarity/operational characteristics; and vehicular operational characteristics.

The output data from this tool are: traffic volumes; speeds; delays; vehicular density; trips; vehicle miles travelled; vehicle hours travelled; emissions; and intersection queues. For many of these output data, the results are reported by roadway network, segment, or lane. A typical example of the application of this tool was the evaluation of multiple interchange concepts at I-285 and Camp Creek Parkway including two diverging diamond interchange concepts and a modified diverging diamond interchange concept. A typical summary report is included in **Appendix C**.

6.1.1.4 VISSIM

VISSIM is a traffic micro-simulation software that was developed by PTV Group in Europe to model both highways with at-grade intersections and freeways with grade-separated interchanges. This data-intensive software is a very powerful tool to model conventional highways and freeways.

Accurate models can be developed by entering detailed roadway geometric information, traffic volumes, vehicle fleet mix data, vehicular travel characteristics, traffic signal timing data, and origin-destination/route data. VISSIM is well suited to modeling complex highway and freeway networks including roundabouts, continuous flow intersections, double crossover diamond interchanges and collector-distributor freeways. Examples of the input data required by this evaluation tool for highways/local streets are: the number of through and turning lanes by intersection approach; vertical grades; lane widths; traffic regulations; traffic signal operations (timing, phasing, lane assignments, etc.); on-street parking operations; light rail/bus operations; intersection traffic/pedestrian volumes; free flow/reduced travel speeds; environmental factors; driver operational characteristics; and vehicular operational characteristics. Examples of the input data required by this evaluation tool for freeways are: the number of lanes by freeway/ramp segment; vertical grades; lane widths; freeway/ramp traffic volumes; origin/destination data; route data; free-flow travel speeds; driver familiarity/operational characteristics; and vehicular operational characteristics.

The output data from this tool are: traffic volumes; speeds; delays; vehicular density; trips; vehicle miles travelled; vehicle hours travelled; emissions; and intersection queues. For many of these output data, the results are reported by roadway network, segment, or lane. A typical example of the application of this tool was the evaluation of multiple interchange ramp modification concepts along the Downtown Connector (I-75/I-85). A typical summary report is included in **Appendix C**. **Table 6.1** lists the tool used to evaluate each project. **Appendix D** includes a detailed summary of each evaluated OPS project.

Table 6.1: Tool Used to Evaluate Each Project

Location ID	Option	Project	Tool
1	1	I-20 Inside from Moreland Ave. to DT Connector (WB) - Close Capitol Ave. off-ramp	VISSIM
1	2	I-20 Inside from Moreland Ave. to DT Connector (WB) - Close Hill St. off-ramp	VISSIM
1	3	I-20 Inside from Moreland Ave. to DT Connector (WB) - C/D System	VISSIM
2	1	DT Connector from I-20 to International Blvd. (NB) - Close Edgewood Ave. off-ramp	VISSIM
2	2	DT Connector from I-20 to International Blvd. (NB) - Drop mainline lane	VISSIM
2	3	DT Connector from I-20 to International Blvd. (NB) - Close Fulton St. on-ramp	VISSIM
3	1a	DT Connector from Freedom Pkwy. to I-20 (SB) - Close Ellis St. on-ramp	VISSIM
3	1b	DT Connector from Freedom Pkwy. to I-20 (SB) - Close Edgewood Ave. on-ramp	VISSIM
3	2	DT Connector from Freedom Pkwy. to I-20 (SB) - Close MLK Ave. off-ramp	VISSIM
3	3	DT Connector from Freedom Pkwy. to I-20 (SB) - Interchange reconfiguration	VISSIM
4	1	Buford Connector at Monroe Dr. (NB) - Close Monroe St. on-ramp	HCS
4	2	Buford Connector at Monroe Dr. (NB) - Add ramp meter	HCS
4	3	Buford Connector from Monroe Dr. to I-85 (NB) – Auxiliary lane using shoulders	HCS
4	4	Buford Connector at Monroe Dr. (NB) - Add left turn lane to off-ramp	HCS
4	5	Buford Connector from Piedmont Rd. to I-85 (NB) - Auxiliary lane using shoulders	HCS
5	1	I-85 N from I-85/SR 400 to Buford Connector (SB) - Auxiliary lane using shoulders	HCS
6	1	I-75 N from SR 5 to SR 120 (SB) - Auxiliary lane using shoulders	HCS
7	1	I-75 N from SR 120 to SR 5 (NB) - Auxiliary lane using shoulders	HCS
8	1	I-85 N at SR 316 (SB) - Extend HOT lane merge	N/A
9	1	SR 400 from Holcomb Bridge Rd. to Abernathy St. (SB) - Active Traffic Management (full gantry)	N/A
10	1	I-285 NW from S Cobb Dr. to Paces Ferry Rd. (NB) - Auxiliary lane using shoulders	HCS
11	1	I-285 NW from Paces Ferry Rd. to S Cobb Dr. (SB) - Auxiliary lane using shoulders	HCS
12	1	I-75 N at North Loop (NB) - Extend on-ramp	HCS
12	2	I-75 N at North Loop (NB) - Widen on-ramp	HCS
13	1	SR 400 from McFarland Rd. to Peachtree Pkwy. (NB) - Auxiliary lane using shoulders	HCS
14	1	SR 400 from Peachtree Pkwy. to McFarland Rd. (SB) - Auxiliary lane using shoulders	HCS
15	1	I-20 E from Wesley Chapel Rd. to I-285 E (WB) - Auxiliary lane using shoulders	HCS
16	1	I-285 E from I-20 to Glenwood Rd. (NB) - Auxiliary lane using shoulders	HCS
17	1	I-285 E from Northlake Pkwy. to I-85 N (NB) - Auxiliary lane using shoulders	HCS

Location ID	Option	Project	Tool
18	1	I-285 W at I-20 W (WB) - Add mainline lane	VISSIM
18	2	I-285 W at I-20 W (EB) - Drop mainline lane	VISSIM
19	1	I-85 Inside at N Druid Hills Rd. (SB) - Close access from frontage road	HCS
19	2	I-85 Inside at N Druid Hills Rd. (SB) - Re-stripe on-ramp	HCS
19	3	I-85 Inside at N Druid Hills Rd. (NB) - Re-stripe on-ramp	HCS
19	4	I-85 Inside at N Druid Hills Rd. (Inter.) - Dual left turns restriping	HCS
20	1	I-285 E from I-85 to Northlake Pkwy. (SB) - Auxiliary lane using shoulders	HCS
21	1	I-285 NW at Bolton Rd. (NB) - Add arterial thru lane	HCS
22	1	DT Connector from Freedom Pkwy. to Pine St. (NB) - Auxiliary lane using shoulders	VISSIM
23	1	I-285 SW at I-85 S (NB) - Ramp reconfiguration	HCS
24	1	US 78 at I-285 NB (WB) - Ramp reconfiguration	HCS
25	1	I-75 Inside at Northside Dr. (NB) - HOV on-ramp restriping	N/A
26	1	SR 400 at Abernathy Rd. (SB) - Ramp upgrade	N/A
27	1	SR 400 at Holcomb Bridge Rd. (SB) - Add off-ramp right turn lane arterial thru lane	HCS
28	1	I-20 W at Thornton Rd. (Inter.) – Diverging Diamond Interchange (DDI)	CORSIM
28	2	I-20 W at Thornton Rd. (EB) - Add on-ramp lane	CORSIM
29	1	I-285 SW at Camp Creek Pkwy. (Inter.) - DDI (6-Lane)	CORSIM
29	2	I-285 SW at Camp Creek Pkwy. (Inter.) - Modified displaced left turn	CORSIM
29	3	I-285 SW at Camp Creek Pkwy. (Inter.) - Partial DDI	CORSIM
29	4	I-285 SW at Camp Creek Pkwy. (Inter.) - DDI (5-Lane)	CORSIM
30	1	I-85 N at Indian Trail/Lilburn Rd. (Inter.) – DDI	HCS
30	2	I-85 N at Indian Trail/Lilburn Rd. (NB) – Widen on-ramp	HCS
31	1	I-85 N at Beaver Ruin Rd. (Inter.) – DDI	HCS
31	2	I-85 N at Beaver Ruin Rd. (Inter.) - Partial DDI	HCS
32	1	I-85 N at I-285 (NB) - Interchange reconfiguration	VISSIM
32	2	I-85 N at I-285 (WB) - Interchange restriping	VISSIM
33	1	SR 400 at Haynes Bridge Rd. (NB) - Ramp reconfiguration	HCS
34	1	I-285/85 S at Old National Hwy. (Inter.) – DDI	HCS/CORSIM
34	2	I-285/85 S at Old National Hwy. (Inter.) - Quadrant road and roundabout	HCS/CORSIM
34	3	I-285/85 S at Old National Hwy. (Inter.) – Roundabout	HCS/CORSIM
35	1	I-75 at Howell Mill Rd. (Inter.) – DDI	VISSIM
36	1	I-85 S at SR 34 (SB) - Add right turn lane	HCS
37	1	I-985 at SR 20 (NB) - Ramp upgrade	N/A
38	1	Peachtree Industrial Blvd. at SR 140 (Inter.) – DDI	HCS
39	1	DT Connector at North Ave. (SB) - Add right turn lane	VISSIM
40	1	DT Connector at Williams St. (SB) - Prohibit left turn	VISSIM
40	2	DT Connector at Williams St. (SB) - Right turn restriping	VISSIM

Location ID	Option	Project	Tool
40	3	DT Connector at Williams St. (SB) - Add right turn lane	VISSIM
40	4	DT Connector at Williams St. (SB) - Off-ramp restriping	VISSIM
41	1	I-285 NW at Paces Ferry Rd. (NB/SB) - Ramp meter upgrade	HCS
42	1	Buford Connector at Piedmont Rd. (SB) - Add ramp meter	HCS
42	2	Buford Connector at Armour Dr. (SB) - Add ramp meter	HCS
43	1	I-20 E at I-285 E (WB) - Modify geometrics for trucks	N/A
43	2	I-20 E at I-285 E (WB) - Upgrade signage for trucks	N/A
44	1	I-285 S at I-675 (Inter.) - Upgrade signage for trucks	N/A
45	1	I-75 S at I-285 S (NB/SB) - Upgrade signage for trucks	N/A
46	1	I-75 N from Northside Dr. to Howell Mill Rd. (NB) - C/D System	VISSIM
47	1	I-85 N at Hamilton Mill Rd. (Inter.) - Indirect left turn	CORSIM
47	2	I-85 N at Hamilton Mill Rd. (Inter.) - Quadrant road (no barrier)	CORSIM
47	3	I-85 N at Hamilton Mill Rd. (Inter.) - Quadrant road (with barrier)	CORSIM
47	4	I-85 N at Hamilton Mill Rd. (Inter.) - Ramp relocation	CORSIM
48	1	I-285 E from US 78 to Ponce de Leon Ave. (SB) - Auxiliary lane using shoulders	HCS
49	1	I-75 N at Barrett Pkwy. (SB) - Widen on-ramp	N/A
50	1	SR 400 at Northridge Dr. (SB) - Widen on-ramp	N/A
50	2	SR 400 at Northridge Dr. (NB) - Widen on-ramp	N/A
51	1	I-285 NW at Hollowell Pkwy. (SB) - Widen on-ramp	N/A
52	1	US 78 at Brockett Rd. (WB) - Widen on-ramp	N/A
53	1	US 78 at Mtn. Industrial Blvd. (WB) - Widen on-ramp	N/A
54	1	I-85 N at Chamblee Tucker Rd. (NB) - Widen on-ramp	N/A
55	1	I-285 E Chamblee Tucker Rd. (SB) - Widen on-ramp	N/A
56	1	I-75 N at Delk Rd. (NB) - Widen on-ramp	N/A
57	1	I-75 S at Jonesboro Rd. (NB) - Ramp meter bypass for transit	N/A
58	1	I-75 N at North Loop (SB) - Ramp meter bypass for transit	N/A
59	1	I-285 NW at Cobb Pkwy. (Inter.) - Upgrade directional signage	N/A
60	1	I-75 N at Barrett Pkwy. (SB) - Ramp meter bypass for transit	N/A
61	1	I-575 at SR 92 (SB) - Ramp meter bypass for transit	N/A
62	1	SR 400 at Holcomb Bridge Rd. (SB) - Ramp meter bypass for transit	N/A
63	1	SR 400 at Windward Pkwy. (SB) - Ramp meter bypass for transit	N/A
65	1	I-285 S at Moreland Ave. (EB) – Re-stripe on-ramp	N/A
66	1	I-985 at SR 20 (Inter.) - Partial DDI	CORSIM
66	2	I-985 at SR 20 (SB) - Add off-ramp right turn lane arterial thru lane	CORSIM

** N/A - No analysis was required or available to use for the project based on the type of improvement. Therefore, professional engineering judgment was used to access the benefits.*

6.1.1.5 B/C Ratio Spreadsheet Tool

In this study, the benefits include the estimated dollar value of the savings in travel time for all the vehicles in the project area as a result of the operational improvement, as well as the savings in operating costs for those vehicles. In general, desirable operational projects that have a higher B/C ratio signify a better performing project versus the cost to deliver the project. A B/C ratio of 1.0 or above usually signifies an acceptable project, since the transportation benefits outweigh the costs. These benefits were compared against the total capital costs for the potential improvement. For most transportation investments, costs are incurred in the initial years, while the benefits from the investment accrue over many years into the future. When assessing the costs and benefits of a project, it is necessary to take into account the time value of money by converting the costs and benefits that take place in different years into a common year.

For this study, the project life assumed for all the potential improvements is 20 years, so the benefits were assumed to occur for 20 years. A discount rate[3] was applied and the Net Present Value (NPV) in the opening year was estimated for the future costs as well as the benefits. The B/C ratio was then estimated by dividing the NPV of total benefits in the opening year by the NPV of the capital costs in the opening year and is expressed as:

$$Benefit/Cost = \left(\frac{NPV\ of\ total\ benefits\ in\ the\ opening\ year}{NPV\ of\ total\ costs\ in\ the\ opening\ year}\right)$$

A spreadsheet-based B/C ratio tool was developed for this purpose. This tool takes inputs required to estimate the travel time savings and operating cost savings, as well as the cost input values. The tool estimates the dollar value of the benefits from travel time savings (calculated using the earlier mentioned tools) and operating cost savings for each year in the design life of the improvement. It then calculates the NPV of the benefits and costs in the opening year and estimates the B/C ratio using the equation shown above. The detailed methodology this tool used in computation of the B/C ratio is described in **Appendix C.**

6.1.2 Operational Projects Eliminated as a Result of Screening

The projects that were eliminated from further consideration fell into two categories:

- Eliminated due to a superior competing project
- Eliminated due to a fatal flaw, which may include a poor B/C ratio

Typically, superior competing projects would either provide significantly better traffic operations, would have much lower implementation costs, or would be easier to implement.

Typical fatal flaws encountered during evaluation of some of these operational projects included degraded traffic operations that would result in increased delays; potential, unacceptable impacts to local surface streets or other modes of transportation; or excessive implementation costs.

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[3] Since the benefits and costs occur over different times over the lifespan of the project, adjustments were made according to when they occur. Therefore, future values are discounted to a common year and summed to arrive at the present value in that particular year.

As a result of this initial screening, 26 of the 100 projects were eliminated from further evaluation and are listed in **Table 6.2.**

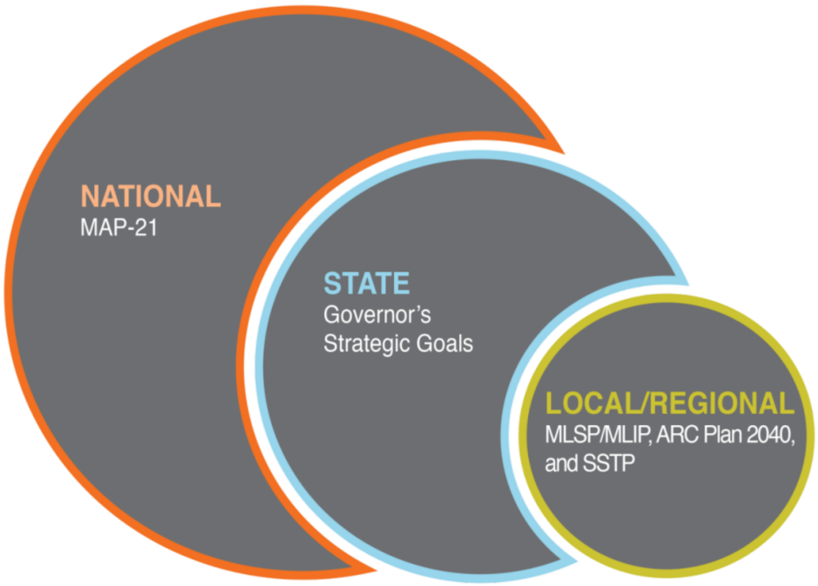
Table 6.2: Operational Projects Eliminated from Further Evaluation

Location ID	Option	Project
1	1	I-20 Inside from Moreland Ave. to DT Connector (WB) - Close Capitol off-ramp
1	2	I-20 Inside from Moreland Ave. to DT Connector (WB) - Close Hill off-ramp
1	3	I-20 Inside from Moreland Ave. to DT Connector (WB) - C/D System
2	1	DT Connector from I-20 to International Blvd. (NB) - Close Edgewood off-ramp
2	2	DT Connector from I-20 to International Blvd. (NB) - Drop mainline lane
4	1	Buford Connector at Monroe Dr. (NB) - Close Monroe on-ramp
4	2	Buford Connector at Monroe Dr. (NB) - Add ramp meter
4	3	Buford Connector from Monroe Dr. to I-85 (NB) - Auxiliary lane using shoulders
19	1	I-85 Inside at N. Druid Hills Rd. (SB) - Close access from frontage road
22	1	DT Connector from Freedom Pkwy. to Pine St. (NB) - Auxiliary lane using shoulders
28	1	I-20 W at Thornton Rd. (Inter.) - DDI
29	1	I-285 SW at Camp Creek Pkwy. (Inter.) - DDI (6-Lane)
29	2	I-285 SW at Camp Creek Pkwy. (Inter.) - Modified displaced left turn
29	3	I-285 SW at Camp Creek Pkwy. (Inter.) - DDI (5-Lane)
30	1	I-85 N at Indian Trail/Lilburn Rd. (Inter.) - DDI
31	1	I-85 N at Beaver Ruin Rd. (Inter.) - DDI
32	1	I-85 N at I-285 (NB) - Interchange reconfiguration
34	1	I-285/85 S at Old National Hwy. (Inter.) - DDI
34	3	I-285/85 S at Old National Hwy. (Inter.) - Roundabout
38	1	Peachtree Industrial Blvd. at SR 140 (Inter.) - DDI
41	1	I-285 NW at Paces Ferry Rd. (NB/SB) - Ramp meter upgrade
42	1	Buford Connector at Piedmont Rd. (SB) - Add ramp meter
46	1	I-75 N from Northside Dr. to Howell Mill Rd. (NB) - C/D System
47	1	I-85 N at Hamilton Mill Rd. (Inter.) - Indirect left turn
47	2	I-85 N at Hamilton Mill Rd. (Inter.) - Quadrant road (no barrier)
47	3	I-85 N at Hamilton Mill Rd. (Inter.) - Quadrant road (with barrier)

6.2 OPS GOALS

All effective transportation projects should align with and seek to accomplish the wider transportation goals of the region, state, and nation (see **Figure 6.2**). The applicable goals for each of these levels, as well as for this study, are described below.

Figure 6.2: OPS Goals



At the Federal level, President Obama signed into law the Moving Ahead for Progress in the 21st Century (MAP-21) transportation bill in July 2012, which included national transportation goals and necessitated consideration of:

- Safety
- Infrastructure condition
- Congestion reduction
- System reliability
- Freight movement and economic vitality
- Environmental sustainability
- Reduced project delivery delays

At the state level in April 2012, Governor Deal released the Governor's Strategic Goals for Georgia, which included a vision of "… a lean and responsive state government that allows communities, individuals and businesses to prosper." Specifically, it envisioned a Georgia that is "educated, mobile, growing, healthy, safe, and fiscally responsible." Several of these attributes are very relevant to transportation and were considered within the goals of the OPS. Transportation mobility was considered to improve the movement of people and goods across and within the state, expanding Georgia's role as a major logistics hub for global commerce and leveraging public-private partnerships to improve intergovernmental cooperation for successful infrastructure development. Economic growth was considered as transportation projects can contribute to job creation and future business growth in the region. Health and safety were considered as transportation projects can provide important access to healthcare and protect the public by providing a safer means of travel that reduces the risk of incidents on Georgia's roads.

At the local or regional level, the Atlanta MPO Regional Transportation Plan (RTP) (PLAN 2040) was reviewed to develop a preliminary list of goals for the OPS. Also, goals were developed from a review of the 2010 Statewide Strategic Transportation Plan (SSTP). These goals are summarized below:

Atlanta MPO Plan 2040 RTP Goals

1. Lead as the global gateway to the South
2. Encourage healthy communities
3. Expand access to community resources

Statewide Strategic Transportation Plan (SSTP) Goals

1. Increase the number of people who can reach a major employment center within 45 minutes
2. Increase the number of people taking reliable trips
3. Reduce the financial burden of wasted hours and fuel caused by traffic congestion
4. Fix bottlenecks
5. Improve interregional and last-mile connectivity

Finally, the goals established in the 2010 Managed Lane System Plan and carried forward in the Managed Lane Implementation Plan and OPS are as follows:

MLSP Goals

1. Protect mobility
2. Maximize person/vehicle throughput
3. Minimize environmental impacts
4. Provide a financially feasible system
5. Design and maintain a flexible infrastructure for varying lane management

All goals, regardless of their source, have some level of commonality. As a result, all goals were integrated into a more robust set of final study goals for both the MLIP and OPS, which are presented here:

1. Improve mobility options available to people and for freight
2. Provide a financially feasible system
3. Improve safety
4. Enhance the inter-regional connectivity and reliability of the transportation system for people and freight, and facilitate economic growth
5. Emphasize the efficiency, operation, and preservation of the existing transportation system while promoting environmental sustainability
6. Reduce project delivery delays

6.3 PLANNING THEMES

Both qualitative and quantitative evaluation factors were established to evaluate potential projects. This section presents the individual criteria within each theme that were used to evaluate and rank the projects. For each criterion, an ordinal rating scheme was developed and used to score a project between 0 and 100 based on its performance for that specific criterion. These scores were used to estimate the total points each project received and then rank-ordered by the total number of points.

The criteria were evaluated for the base year, which was assumed to be 2010. In cases where data was not available for 2010, but was available for adjacent years (2011, 2012, etc.), the adjacent year data was used.

The criteria were categorized into six themes that followed the goals developed through the study process, as noted earlier. They are listed here, in no particular order:

1. Transportation Mobility
2. Financial Feasibility
3. Safety
4. System Connectivity and Economic Growth
5. System Preservation and Environmental Sustainability
6. Project Support and Readiness

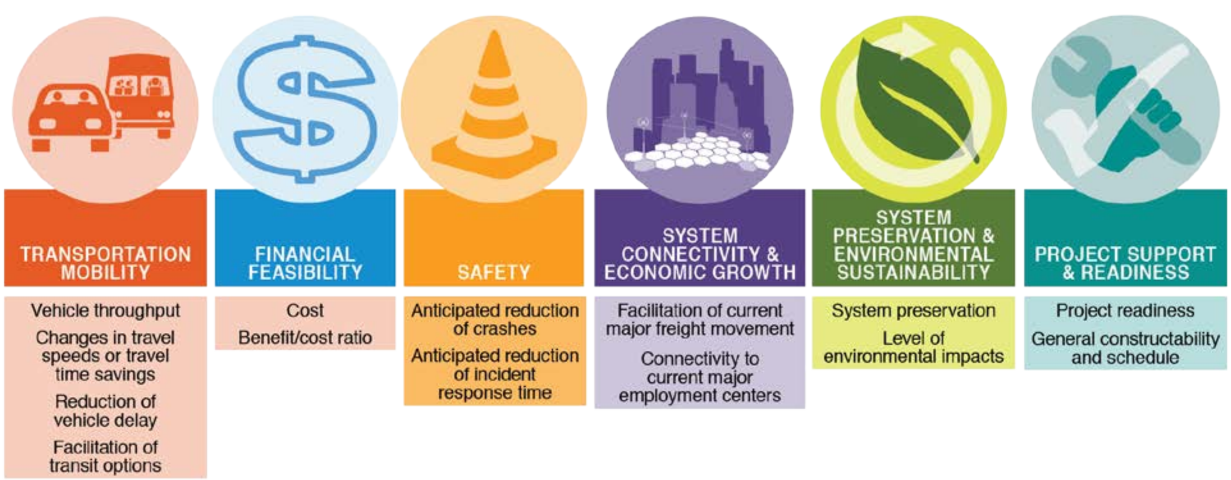
Figure 6.3 demonstrates how many of the goals from the federal, state, and regional level were overlapping and aligned with the six planning themes developed as part of the OPS. **Figure 6.4** lists each of the evaluation criteria that fall within each Planning Theme.

Figure 6.3: Alignment of National, State and Local/Regional Goals with Planning Themes

		Transportation mobility	Financial feasibility	Safety	System connectivity & economic growth	System preservation & environmental sustainability	Project support & readiness
NATIONAL	MAP 21	Goals 3 & 4	-	Goal 1	Goals 3 & 5	Goal 6	Goal 7
STATE	Governor's Strategic Goals	Goal 1	Goal 1	Goal 4	Goal 2	-	-
LOCAL/REGIONAL	ARC Plan2040 RTP Goals	Goal 3	Assumed*	Goal 2	Goal 1	Goal 1	Assumed*
LOCAL/REGIONAL	SSTP**	Goals 1, 2, 3 & 4	-	Goal 2	Goals 1, 3 & 5	-	-
LOCAL/REGIONAL	MLSP/MLIP	Goals 1 & 2	Goal 4	-	Goal 2	Goals 3 & 5	-

** Assumed or accounted for as part of the MPO TIP and RTP planning process.*
***Statewide Strategic Transportation Plan (SSTP) in the Atlanta region.*

Figure 6.4: Evaluation Criteria within Each Planning Theme



6.3.1 Planning Theme 1: Transportation Mobility

Planning Theme 1 was used to assess potential improvements that are considered to address an operational deficiency. Four individual evaluation criteria – three quantitative and one qualitative – were included in Theme 1.

6.3.1.1 Vehicle Throughput

Vehicle throughput is the total number of vehicles in all lanes in morning peak hour (a.m.) and afternoon/evening (p.m.) peak hour in the influence area. The influence area is the geographical area in which the vehicles may be affected as a result of any potential operational improvement, which was determined based on the type of improvement and using professional judgment. The vehicle throughput in the influence area was then estimated using the observed counts for the base year 2010.

***Vehicle throughput** is the total number of vehicles in all lanes in morning and evening peak hours.*

Table 6.3: Vehicle Throughput Scoring Scheme (a.m. + p.m. peak hours)

Vehicle Throughput (# of vehicles in a.m. + p.m. peak hours)	Score
0 - 5,000	25
5,000 - 10,000	50
10,000 - 15,000	75
> 15,000	100

The ranking scheme employed for vehicle throughput is presented in **Table 6.3**. Projects in locations with higher vehicle throughput received a higher score than improvements in areas with lower vehicle throughput.

6.3.1.2 Travel Time Savings per Vehicle

As a result of operational improvements, the travel time saved per vehicle was estimated for one hour in the morning (a.m. peak hour) and one hour in the evening (p.m. peak hour).

***Travel time savings per vehicle** is calculated for both a.m. peak and p.m. peak hours and summarized as total travel time saved.*

Table 6.4 : Travel Time Savings Scoring Scheme

Travel Time Savings Per Vehicle (Seconds)	Score
<0	0
0 – 30	25
30 – 60	50
60 – 120	75
> 120	100

The total travel time saved for those vehicles with the Build option, compared to the No-Build option, was estimated using software such as VISSIM, CORSIM, or Highway Capacity Software (HCS), and then divided by the vehicle throughput in those two hours to estimate the savings per vehicle. As indicated in **Table 6.4,** operational improvements that provided higher travel time savings per vehicle received a higher score.

6.3.1.3 Reduction of Vehicle Delay

Reduction of vehicle delay was projected by estimating the total number of daily vehicle-hours saved as a result of the operational improvement. The total vehicle-hours saved with the Build option, compared to the No-Build option, were first estimated for the a.m. and the p.m. peak hours using software such as VISSIM, CORSIM, or HCS. Then, using the daily hours of congestion in the influence area, the daily vehicle-hours saved were estimated.

Table 6.5: Reduction of Vehicle Delay Scoring Scheme

Reduction of Vehicle Delay (Hrs.)	Score
<0	0
0 – 100	25
100 – 300	50
300 – 600	75
> 600	100

It was assumed that the daily savings would occur only during the congested hours. Based on this assumption, the total daily-vehicle hours saved were estimated by multiplying the vehicle-hours saved in a.m. and the p.m. peak hours by half of the daily congestion hours. **Table 6.5** shows the scoring scheme for vehicle delay. Projects that provide a higher reduction of vehicle delay received a higher score.

__Reduction of vehicle delay__ is the daily vehicle-hours saved due to a particular improvement.

6.3.1.4 Facilitation of Transit Options

A qualitative criterion was included under the Transportation Mobility Theme to evaluate whether the potential improvements would facilitate transit options. Transit routes along the limited access facilities within the study area are provided by the following bus operators:

GIS was used to identify projects that __facilitated transit options__ based on their proximity to existing transit routes.

- Georgia Regional Transportation Authority (GRTA)
- Metropolitan Atlanta Rapid Transit Authority (MARTA)
- Cherokee Area Transportation System (CATS)
- Gwinnett County Transit (GCT)
- Cobb Community Transit (CCT)

GIS was used to consider the proximity of the projects to the transit routes in order to decide if they would facilitate additional transit options. All of the potential improvements were assigned a score of either 100 or 0, depending on whether they would or would not facilitate the transit options, respectively.

6.3.2 Planning Theme 2: Financial Feasibility

Planning Theme 2 was used to evaluate the projects based on their financial feasibility.

The total __capital cost__ of a project includes preliminary engineering, right-of-way acquisition, and construction costs; as well as a 30 percent contingency.

6.3.2.1 Capital Cost

Being able to fund the potential project is a critical aspect of the study. As the capital cost of the project increases, the ability to fund it decreases.

Table 6.6 : Capital Cost Scoring Scheme

Capital Cost (2013$)	Score
> $5,000,000	10
$2,500,000 - $5,000,000	20
$1,000,000 - $2,500,000	30
$500,000 - $1,000,000	40
$250,000 - $500,000	60
$100,000 - $250,000	80
$0 - $100,000	100

The total capital cost of the project includes preliminary engineering, ROW acquisition, and construction costs, as well as a 30 percent contingency. More details on capital cost assumptions and estimations are provided in **Appendix E**. **Table 6.6** shows the scoring scheme for cost.

6.3.2.2 Benefit/Cost Ratio

Benefit/Cost (B/C) ratio is an indicator of the anticipated return-on-investment of a project. Desirable operational projects that have a higher B/C ratio signify a better performing project versus the cost to deliver the project. A B/C ratio of 1.0 or above usually signifies an acceptable project since the transportation benefits outweigh the costs. Projects with a B/C less than 1.0 signify a project whose costs outweigh its benefits, while a negative B/C would signify a project which degrades transportation performance compared to a no-build situation. The potential project costs were developed based on the assumptions described previously.

> ***B/C ratio** is an indicator of the anticipated return on investment of a project.*

Table 6.7 : Benefit/Cost Ratio Scoring Scheme

Benefit/Cost Ratio	Score
< 0	0
0 – 1	10
1 – 5	20
5 – 10	30
10 – 30	40
30 – 50	50
50 – 70	60
70 – 90	80
> 90	100

The benefits include the monetized value of the travel time savings and operating costs for all the vehicles. To estimate the B/C ratios, a spreadsheet-based tool was developed and detailed in **Appendix C**.

Table 6.7 shows the scoring scheme for the B/C ratio. Projects with higher B/C ratios received a higher score than projects with lower B/C ratios. It should be noted that since operational projects are typically much lower in cost than major capacity-adding projects, the B/C ratios were much higher.

6.3.3 Planning Theme 3: Safety

Planning Theme 3 was used to identify the potential improvements that are considered to improve highway safety. This theme is important as it impacts the health and welfare of all metro Atlanta freeway highway users. The health of these users can be degraded by injuries resulting from crashes and by the additional air pollution resulting from the higher levels of congestion caused by these crashes. The welfare of highway users can be impacted by the costs incurred from crashes for repairs to damaged property, medical care and lost wages related to injuries. The welfare of other users who are not directly involved in crashes can be impacted by the travel delays and congestion resulting from crashes.

6.3.3.1 Anticipated Reduction of Crashes

> ***Crash reduction** was assumed to occur as a result of a qualitative assessment of the typical impacts of operational projects.*

Using the principles as specified in the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual, qualitative assessments of the potential reduction in crashes were performed for all the improvement alternatives. Crash reduction was assumed to occur as a result of the following:

1. Reduction in freeway congestion
2. Increased capacity of entrance and exit ramps where they access the freeway
3. Increases in weave distance
4. Increases in merge distance
5. Reduction in duration of periods when off-ramp queues back up into the mainline travel lanes and when on-ramp queues back up into the surface street through lanes
6. Variable speed limits and queue warning signs
7. Traveler information/ITS infrastructure enhancements

The potential improvements were categorized with low, moderate, or high scores, depending on their potential to reduce the number of crashes. The scores assigned were 20 for low, 60 for moderate, and 100 for high crash reduction improvements based on metrics from the Highway Safety Manual and professional engineering judgment.

6.3.3.2 Anticipated Reduction of Incident Response Time

> ***Reduction of incident response time** can reduce congestion and secondary crashes due to traffic incidents and also provide for the faster treatment of crash-related injuries.*

The second qualitative criterion considered for safety was reduction in incident response time. Projects that were considered incident response enhancements included those that:

1. Reduced travel times for emergency responders
2. Increased the number of crash investigation sites

The benefits of reduced incident response times include reduced severity and duration of congestion related to crashes and disabled vehicles, a reduced number of secondary crashes that occur in the upstream backup caused by these incidents, and faster treatment of crash-related injuries. The benefits of additional crash investigation sites include the reduction in duration of lane blockage periods by stalled and disabled vehicles, and increased safety of stranded motorists and emergency responders at the incident site. The distance to the next crash investigation site will impact the feasibility of pushing a disabled vehicle from the original incident location to a safer location downstream versus a travel lane or shoulder. More details on the above-mentioned strategies or projects are presented in **Appendix E**. Depending on their potential to reduce response time; each improvement was categorized as a low, moderate, or high benefit project, and received a score of 20, 60, or 100, respectively.

6.3.4 Planning Theme 4: System Connectivity and Economic Growth

Planning Theme 4 was used to identify potential improvements that are generally considered to support connectivity and economic growth.

6.3.4.1 Facilitation of Current Major Freight Movement

A quantitative criterion was included to evaluate projects based on their potential to facilitate the movement of freight traffic. Spatial analysis was done using ArcGIS to evaluate the proximity of the operational improvements to the major truck routes. Truck percentages on those routes were determined using the Atlanta MPO's Plan 2040 travel demand model for the year 2010. An improvement that is closer to a route with a higher truck percentage received a higher score than an improvement that is closer to the route with a lower truck percentage. The ranking scheme for this criterion is shown in **Table 6.8**.

*GIS was used to determine if a project **facilitated major freight movement**. Improvements near major freight routes are expected to have a positive influence on freight movement.*

Table 6.8: Truck Percentage Scoring Scheme

Truck Percent	Score
0 - 10%	20
10% - 25%	60
> 25%	100

6.3.4.2 Connectivity to Current Major Employment Centers

This criterion was used to determine if the potential improvement facilitates connectivity to the major employment centers. Thirteen employments centers, as identified by Atlanta MPO staff, were considered. These centers are:

1. Hartsfield–Jackson Atlanta International Airport
2. Buckhead
3. Cumberland/Galleria
4. Downtown (Atlanta Central Business District)
5. Emory/Centers for Disease Control and Prevention (CDC)
6. Fulton Industrial District
7. Gwinnett Place
8. Midtown Alliance
9. Norcross

10. North Point
11. Perimeter Center
12. Southlake
13. Town Center

A spatial analysis was performed, and the operational improvements were evaluated based on their proximity to the above-mentioned employment centers as well as the employment rates within them. An improvement providing connection to a center with a higher amount of employment received a higher score than one providing connection to a center with a lower amount of employment. Also, an improvement that is closer to an employment center received a higher score than one that is further away from it.

Table 6.9: Effective Employment Scoring Scheme

Effective Employment	Score
0 - 50,000	25
50,000 - 250,000	50
250,000 - 300,000	75
> 300,000	100

An "effective employment" rate was estimated for each improvement, which was based on total employment in all the employment centers for which an improvement provides connection. The employment rate in each employment center was weighted by its distance from the operation improvement. The ranking scheme for this criterion is shown in **Table 6.9.** A potential improvement with higher effective employment received a higher score than the one with lower effective employment.

6.3.5 Planning Theme 5: System Preservation and Environmental Sustainability

Planning Theme 5 was used to identify potential improvements that were considered to better preserve the transportation system and provide environmental sustainability. The terms "system preservation" and "environmental sustainability" are best explained in the extent of changes (or lack thereof) to the existing facility and level of environmental impacts anticipated (level of environmental documentation required). Potential improvements with less environmental impacts received a higher ranking than the ones with more impact.

6.3.5.1 System Preservation

System preservation was evaluated using maps and visual surveys to determine the extent to which potential improvements can be constructed without additional environmental mitigation.

A combination of Google Earth aerial photography, county GIS land-use and property line maps, and the windshield survey (performed as part of this project) were used to determine the extent of the impacts of the potential change(s). The following constraints were studied to determining potential impacts: underpass/overpass width, right-of-way width, concrete/pavement shoulder depth, interchanges, and proximity of adjacent structures. Design minimums were assumed to further limit impacts where possible. By using as much of the existing facility as possible, environmental mitigation needs were reduced.

Once the extents of the impacts were known, the following ranking scale was applied. Limited changes that would remain within the existing facility footprint received a score of 100. A score of 60 was assigned if the area of the required footprint would increase but no additional right-of-way is needed; and a score of 20 was assigned to the improvement if additional right-of-way was anticipated to be required.

Project readiness evaluates the duration required to complete the potential improvement.

6.3.5.2 Environmental Sensitivity

Environmental sensitivity evaluates a potential improvement's impact on environmentally sensitive areas.

A desktop analysis of environmentally sensitive areas, such as wetlands, streams, historical properties, archeological areas, and endangered species, was conducted to determine the potential for fatal flaws.

Google Earth aerial photography was used to locate potential environmentally sensitive areas. Any wooded areas or areas with no development were targeted as potential environmentally sensitive areas and investigated further. Depending on the proximity of these area(s), it was determined if the potential improvement would impact the influence area. The extent of the impacts were then used to determine the level of environmental documentation required to complete the potential improvement. Rankings were then based on the least overall impact and environmental documentation effort. Each potential improvement was categorized as a high, moderate, or low-impact project and received a score of 20, 60, or 100, respectively.

6.3.6 Planning Theme 6: Project Support and Readiness

The main goal of Planning Theme 6 was to determine how quickly the potential improvements could be constructed and put into operation.

6.3.6.1 Project Readiness

Project readiness was evaluated based on the duration required to complete the potential improvement. The following three factors impact the completion timeframe of a potential improvement:

- Extent of required studies (specifically environmental)
- Extent of required design
- Need for ROW acquisition

On-going projects were studied to see if they could be modified to make the proposed changes. When a modifiable project was available, the highest ranking was given. Remaining projects were then separated into three ranking categories based on the extent of engineering required (environmental and design) and the amount of ROW impacts anticipated. Each potential improvement was categorized into high, moderate, or low-duration based on these factors and received a score of 20, 60, or 100, respectively.

6.3.6.2 General Constructability and Schedule

General constructability and schedule measures the potential timeline for implementing a proposed improvement.

The general constructability of a potential improvement is proportional to its overall complexity. Some of the driving factors that dictate the complexity and, therefore, extended construction schedules are as follows:

- Size – The sheer volume of work can dictate a lengthy schedule
- Traffic Maintenance – Anything that requires long-term multiple lane shifts, closed lanes, speed limit reductions, etc., will usually have a lengthy construction schedule
- Bridges (Structures) – Building any form of structures-related work lengthens the schedule
- Environmentally Sensitive Areas – Whenever there are items that construction must avoid, the time needed to complete the task inherently increases. Environmentally sensitive areas were noted elsewhere in this report but also used here in determining construction complexity

Based on professional engineering judgment that considered traffic maintenance and well as constructability, each potential improvement was categorized into high, moderate, or low-construction complexity and received a score of 20, 60, or 100, respectively.

6.4 RANKING OF PROJECTS

The next step involved defining priority schemes by assigning weights to planning themes and individual criterion within them, and then ranking the projects for each scheme.

6.4.1 Priority Weighting Schemes

After each project was scored based on the project evaluation criteria, priority schemes were developed by assigning different weighting factors to individual themes. The purpose of this was to understand the impact of each theme on project rankings and to identify projects that consistently appeared near the top of the rankings, regardless of where the emphasis was placed.

Nine priority weighting schemes were developed:

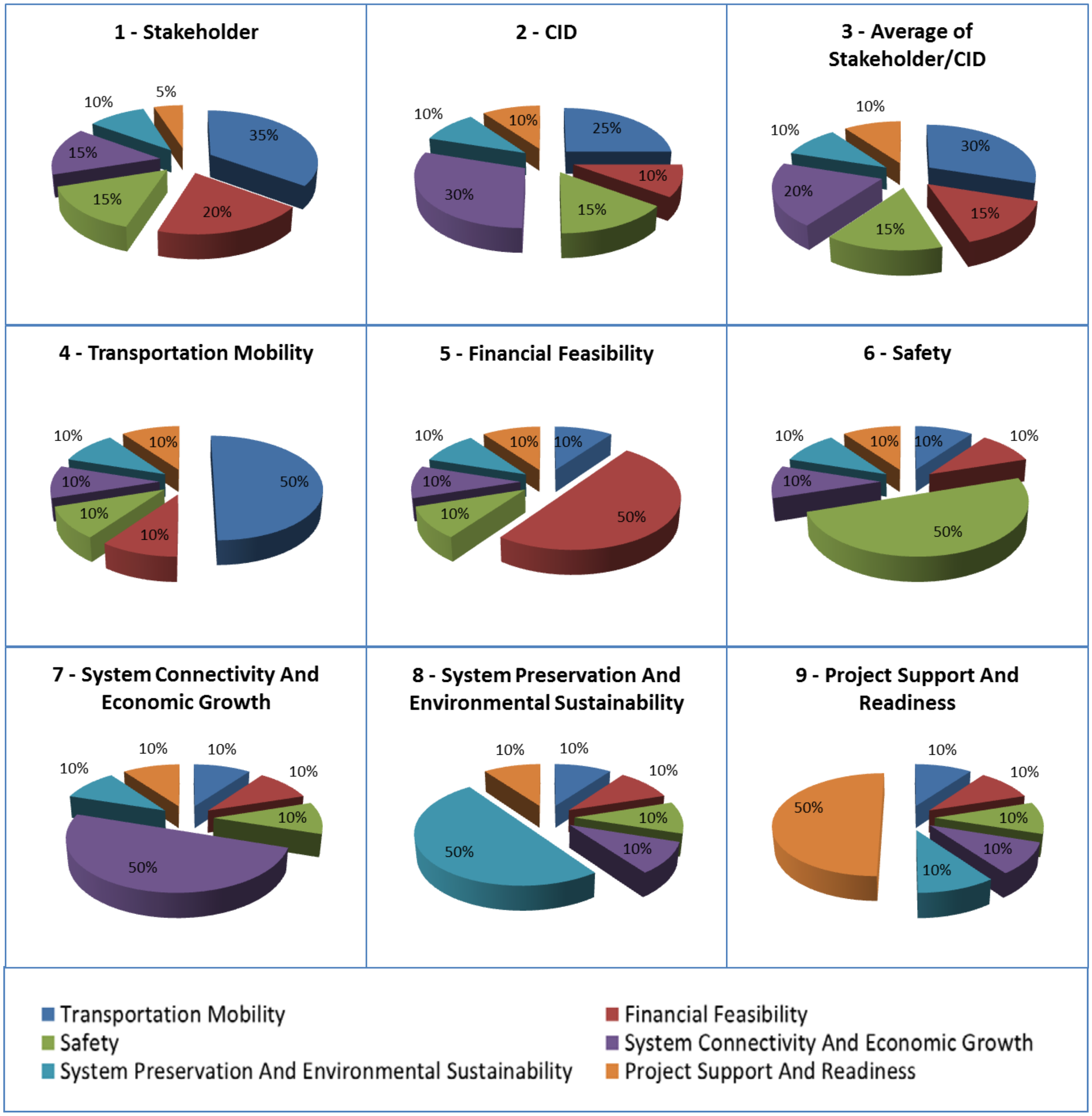
- Scheme 1: Stakeholder Weighting
- Scheme 2: Community Improvement District (CID) Weighting
- Scheme 3: Average of Stakeholder/CID Weighting
- Scheme 4: Transportation Mobility Weighting
- Scheme 5: Financial Feasibility Weighting
- Scheme 6: Safety Weighting
- Scheme 7: System Connectivity And Economic Growth Weighting
- Scheme 8: System Preservation And Environmental Sustainability Weighting
- Scheme 9: Project Support And Readiness Weighting

For schemes 1 and 2, the weights of the themes were based on the meeting with the stakeholders on September 9, 2013, and with the CIDs on September 16, 2013. The stakeholders and the CID representatives were presented with the planning themes and evaluation criteria, and each of them was asked to select the themes they considered most important to evaluate the projects by concentrating their dot stickers on one or more themes on the board (see photo). Based on the total stickers each theme received, a percentage weight was assigned to it.

The weights of the themes in Scenario 3 were estimated by combining the votes (i.e. stickers) from the stakeholder and CID meetings, and calculating the aggregated percentage for each theme. Scenarios 4 through 9 focused on one of each of the six themes. Hence, in all these 6 scenarios, 50 percent weight was assigned to the main theme and 10 percent to each of the remaining themes.

The weighting factor, in percentage, for each theme in each scheme is shown in the pie charts in **Figure 6.5**.

Figure 6.5: Weight Assigned to Each Theme by Priority Scheme



The next step was to establish the rankings of the projects based on the total points they received. The weighted score of individual evaluation criterion for a project was estimated by multiplying the score of that project with the weights of the respective project and the theme. The total points each project received were then estimated by summing up the weighted scores of all the evaluation criteria. The weights of individual evaluation criterion within each theme were kept equal. For example, each measure of transportation mobility – vehicle throughput, travel time savings, reduction of vehicle delay and facilitation of transit options – received a weight of 25 percent. The project that received the maximum points received the highest ranking.

While the priority rankings were based on the qualitative and quantitative criteria discussed previously, it should be noted that the scores are not meant to be the final decision on whether a project should be implemented. Rather, they reflect the prioritization ranking of each project within the study area under different schemes and weighting factors. They provide input and guidance for planners and decision-makers.

A table showing project rankings from all nine priority weighting schemes is presented in **Appendix C.** Overall, no matter what weighting scheme was used, the best performing projects consistently rose to the top of the priority list. For the final set of recommendations, it was decided to give more emphasis to the stakeholder and CID inputs. Therefore, Scheme 3, a combination of stakeholder and CID input, was selected to provide the final rankings for the operational projects.

6.4.2 Project Prioritization Spreadsheet Tool

A spreadsheet-based project prioritization tool was developed to evaluate and rank the projects. The inputs required are the values of each individual evaluation criterion in each theme for every project. The ranking scheme was implemented to convert each of these values (provided in the scoring schemes in **Tables 6.3 to 6.9**) to a score between 0 and 100. Once the scores were established, the user had the flexibility of choosing one of the schemes described previously. Once the scheme was chosen, the score was multiplied by the weight of the theme that the criterion belonged to, and the weight within the theme. The weighted scores for all the evaluation criteria were summed up to estimate the total points, which were used to rank the projects.

The tool also had the flexibility of defining a new scheme (in addition to the predefined nine schemes) with new weights. It also allowed the user to select multiple schemes and provide rankings based on the aggregated results. **Appendix C** shows the equations and percentages used by the tool to estimate rankings, followed by tables with ranking results based on different priority weighting scheme selections.

This project prioritization tool was used in the development of the OPS recommendations, which is further discussed in Chapter 7.

7 FINAL RECOMMENDATIONS

This chapter documents the final recommendations for the OPS. Final recommendations were grouped into system-wide recommendations that could be implemented throughout the Metro Atlanta study area, as well as location-specific recommendations that correlate to an exact location for a specific operational transportation improvement.

7.1 LOCATION-SPECIFIC PROJECT RECOMMENDATIONS

All 74 projects that went through the prioritization process in Chapter 6 are recommended for implementation. The prioritization rankings from all the schemes were reviewed carefully and it was found that the project rankings did not vary considerably based on the various weighting schemes, as the same projects continued to score the highest. However, Scheme 3, which was developed based on the weights obtained from the input of the stakeholders and CIDs, was used to calculate the final ranking included in **Table 7.1**.

Table 7.1: Recommended Operational Projects and Ranking Based on Scheme 3[4]

Location ID[5]	Option	Location & Strategy	Rank[6]	Total Capital Cost
19	4	I-85 Inside at N. Druid Hills Rd. (Interchange) - Dual left turns restriping	1	$ 577,590
65	2	I-985 at SR 20 (SB) - Add off-ramp right turn lane arterial thru lane	2	$ 893,555
19	3	I-85 Inside at N. Druid Hills Rd. (NB) - Re-stripe on-ramp	3	$ 997,425
47	4	I-85 N at Hamilton Mill Rd. (Interchange) - Ramp relocation	4	$10,259,080
3	3	DT Connector from Freedom Pkwy. to I-20 (SB) - Interchange reconfiguration	5	$ 1,666,600
3	2	*DT Connector from Freedom Pkwy. to I-20 (SB) - Close MLK Ave. off-ramp during peak period*	*6*	*$ 493,545*
3	1b	*DT Connector from Freedom Pkwy. to I-20 (SB) - Close Edgewood Ave. on-ramp during peak period*	*7*	*$ 256,295*
2	3	*DT Connector from I-20 to International Blvd. (NB) - Close Fulton St. on-ramp during peak period*	*8*	*$ 482,950*

[4] *Italic text indicates ramp closing for future considerations.*

[5] *Project ID number includes the number of the location followed by the option number, as multiple options were considered at the same location.*

[6] *Projects with the same ranking numbers had a tied project score.*

Location ID[5]	Option	Location & Strategy	Rank[6]	Total Capital Cost
3	*1a*	*DT Connector from Freedom Pkwy. to I-20 (SB) - Close Ellis St. on-ramp during peak period*	*8*	*$ 256,295*
45	1	I-75 S at I-285 S (NB/SB) - Upgrade signage for trucks	10	$ 17,550
5	1	I-85 N from I-85/SR 400 to Buford Connector (SB) - Auxiliary lane using shoulder	11	$ 1,319,032
40	3	DT Connector at Williams St. (SB) - Add right turn lane	12	$ 92,918
43	2	I-20 E at I-285 E (WB) - Upgrade signage for trucks	13	$ 8,775
44	1	I-285 S at I-675 (Interchange) - Upgrade signage for trucks	13	$ 17,550
32	2	I-85 N at I-285 (WB) - Interchange restriping	15	$ 459,160
65	1	I-985 at SR 20 (Interchange) - Partial DDI	16	$13,939,250
36	1	I-85 S at SR 34 (SB) - Add right turn lane	17	$ 1,317,550
25	1	I-75 Inside at Northside Dr. (NB) - HOV on-ramp restriping	18	$ 9,945
30	2	I-85 N at Indian Trail/Lilburn Rd. (NB) - On-ramp widening	19	$ 170,170
29	3	I-285 SW at Camp Creek Pkwy. (Interchange) - Partial DDI	20	$ 7,999,745
39	1	DT Connector at North Ave. (SB) - Add right turn lane	21	$ 873,860
40	4	DT Connector at Williams St. (SB) - Off-ramp restriping	21	$ 92,918
7	1	I-75 N from SR 120 to SR 5 (NB) - Auxiliary lane using shoulder	23	$ 4,368,975
40	2	DT Connector at Williams St. (SB) - Right turn restriping	24	$ 125,320
26	1	SR 400 at Abernathy Rd. (SB) - Ramp upgrade	25	$ 951,083
17	1	I-285 E from Northlake Pkwy. to I-85 N (NB) - Auxiliary lane using shoulder	26	$ 5,980,975
6	1	I-75 N from SR 5 to SR 120 (SB) - Auxiliary lane using shoulder	27	$ 4,341,025
18	1	I-285 W at I-20 W (WB) - Add mainline lane	28	$ 3,864,055
4	4	Buford Connector at Monroe Dr. (NB) - Add left turn lane to off-ramp	29	$ 967,590
49	1	I-75 N at Barrett Pkwy. (SB) - Ramp widening	29	$ 896,220
16	1	I-285 E from I-20 to Glenwood Rd. (NB) - Auxiliary lane using shoulder	31	$ 2,286,960
37	1	I-985 at SR 20 (NB) - Ramp upgrade	32	$ 594,880

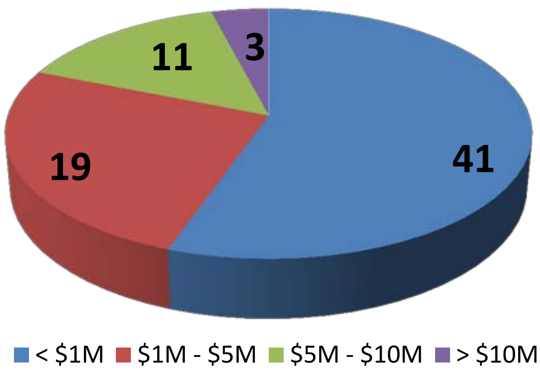
Location ID[5]	Option	Location & Strategy	Rank[6]	Total Capital Cost
40	1	DT Connector at Williams St. (SB) - Prohibit left turn	32	$ 121,388
64	1	I-285 S at Moreland Ave. (EB) - On-ramp restriping	34	$ 2,224,040
12	1	I-75 N at North Loop (NB) - Extend on-ramp	35	$ 884,195
8	1	I-85 N at SR 316 (SB) - Extend HOT lane merge	36	$ 1,683,435
24	1	US 78 at I-285 NB (WB) - Ramp reconfiguration	37	$ 971,386
20	1	I-285 E from I-85 to Northlake Pkwy. (SB) - Auxiliary lane using shoulder	38	$ 4,993,430
42	2	Buford Connector at Armour Dr. (SB) - Add ramp meter	39	$ 55,445
15	1	I-20 E from Wesley Chapel Rd. to I-285 E (WB) - Auxiliary lane using shoulder	40	$ 2,081,235
18	2	I-285 W at I-20 W (EB) - Drop mainline lane	40	$ 7,711,470
43	1	I-20 E at I-285 E (WB) - Modify geometrics for trucks	42	$ 358,839
33	1	SR 400 at Haynes Bridge Rd. (NB) - Ramp reconfiguration	43	$ 5,502,662
4	5	Buford Connector from Piedmont Rd. to I-85 (NB) - Auxiliary lane using shoulder	44	$ 5,738,917
28	2	I-20 W at Thornton Rd. (EB) - Add on-ramp lane	45	$ 3,022,500
54	1	I-85 N at Chamblee Tucker Rd. (NB) - On-ramp widening	46	$ 1,125,540
12	2	I-75 N at North Loop (NB) - On-ramp widening	47	$ 1,276,795
19	2	I-85 Inside at N Druid Hills Rd. (SB) - Off-ramp restriping	48	$ 318,955
50	1	SR 400 at Northridge Dr. (SB) - On-ramp widening	48	$ 402,610
50	2	SR 400 at Northridge Dr. (NB) - On-ramp widening	48	$ 411,970
56	1	I-75 N at Delk Rd. (NB) - On-ramp widening	48	$ 589,745
58	1	I-75 N at North Loop (SB) - Ramp meter bypass for transit	48	$ 639,860
59	1	I-285 NW at Cobb Pkwy. (Interchange) - Upgrade directional signage	48	$ 242,320
60	1	I-75 N at Barrett Pkwy. (SB) - Ramp meter bypass for transit	48	$ 859,885
57	1	I-75 S at Jonesboro Rd. (NB) - Ramp meter bypass for transit	55	$ 1,309,230
61	1	I-575 at SR 92 (SB) - Ramp meter bypass for transit	56	$ 209,040
23	1	I-285 SW at I-85 S (NB) - Ramp reconfiguration	57	$ 937,079

Location ID[5]	Option	Location & Strategy	Rank[6]	Total Capital Cost
63	1	SR 400 at Windward Pkwy. (SB) - Ramp meter bypass for transit	58	$ 628,095
27	1	SR 400 at Holcomb Bridge Rd. (SB) - Add off-ramp right turn lane arterial thru lane	59	$ 837,070
62	1	SR 400 at Holcomb Bridge Rd. (SB) - Ramp meter bypass for transit	59	$ 577,785
9	1	SR 400 from Holcomb Bridge Rd. to Abernathy Rd. (SB) - Active Traffic Management (full gantry)	61	$ 1,973,400
52	1	US 78 at Brockett Rd. (WB) - On-ramp widening	62	$ 385,645
53	1	US 78 at Mtn. Industrial Blvd. (WB) - On-ramp widening	62	$ 383,630
14	1	SR 400 from Peachtree Pkwy. to McFarland Rd. (SB) - Auxiliary lane using shoulder	64	$ 6,643,000
51	1	I-285 NW at Hollowell Pkwy. (SB) - On-ramp widening	65	$ 327,571
10	1	I-285 NW from S Cobb Dr. to Paces Ferry Rd. (NB) - Auxiliary lane using shoulder	66	$ 6,912,230
11	1	I-285 NW from Paces Ferry Rd. to S Cobb Dr. (SB) - Auxiliary lane using shoulder	66	$ 6,912,230
31	2	I-85 N at Beaver Ruin Rd. (Interchange) - Partial DDI	68	$ 8,036,470
35	1	I-75 at Howell Mill Rd. (Interchange) - DDI	69	$ 7,310,550
55	1	I-285 E at Chamblee Tucker Rd. (SB) - On-ramp widening	70	$ 2,851,160
48	1	I-285 E from US 78 to Ponce de Leon Ave. (SB) - Auxiliary lane using shoulder	71	$ 2,063,360
13	1	SR 400 from McFarland Rd. to Peachtree Pkwy. (NB) - Auxiliary lane using shoulder	72	$ 6,643,000
34	2	I-285/85 S at Old National Hwy. (Interchange) - Quadrant road and roundabout	73	$16,819,725
21	1	I-285 NW at Bolton Rd. (NB) - Add arterial thru lane	74	$ 1,746,914
		TOTAL		**$ 179,555,733**

It should be noted that although multiple projects were evaluated at the same location in some instances, some projects that were evaluated could negate the other (i.e. either/or). Any projects recommended in **Table 7.1** above can be implemented independently of one another. In other words, they can be done collectively or independently. The exceptions include dynamic ramp closures that would require further analysis to determine which ramps might be closed at the same time, and ramp widening recommendations that may coincide with ramp meter bypass or DDI projects. It should also be noted that operational projects may have additional impacts in instances where they are recommended on the same corridor as a managed lane recommendation.

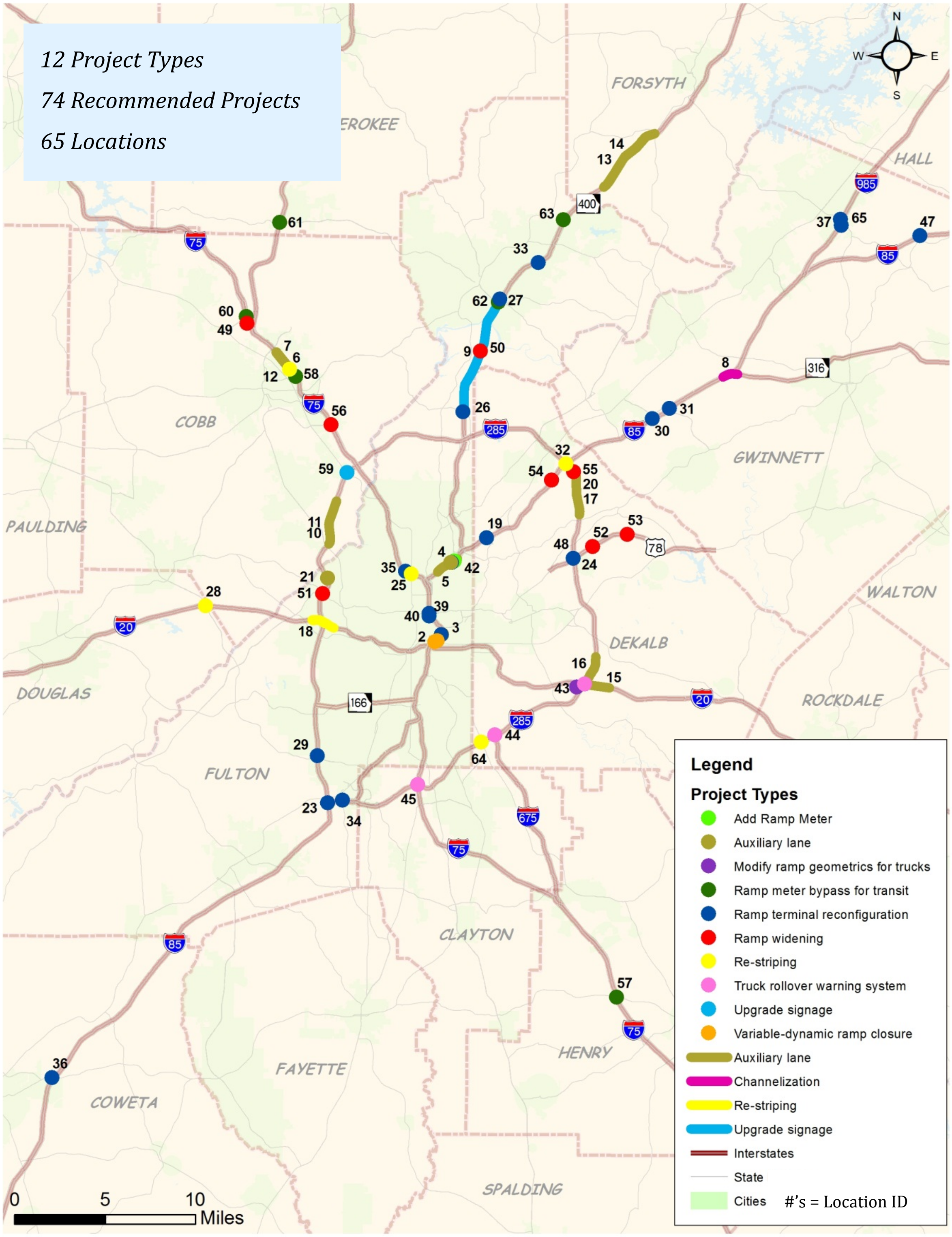
The OPS recognizes that although ramp closings during the peak period may improve freeway operations, additional traffic operations and signal analysis on the surrounding surface streets should be conducted prior to implementing any ramp closings. The location of each of these ramp closing projects is described in detail in **Appendix D**.

Figure 7.1: Number of Recommended Projects by Cost Range



The 74 recommended projects were organized by capital cost range into four categories: less than $1 million, $1 - $5 million, $5 - $10 million, and more than $10 million, as indicated in **Figure 7.1**. Locations of each of the recommended projects are illustrated in **Figure 7.2** and numbered to correspond to **Table 7.1**. Project sheets that document all projects considered and recommended along each corridor as part of both the OPS and the coordinated MLIP are included in **Appendix D**.

Figure 7.2: Recommended Projects Map



7.2 SYSTEM-WIDE STRATEGY RECOMMENDATIONS

For all of the study corridors, ten system-wide operational strategies were developed and considered for implementation across the region. **Table 7.2** below illustrates the ten system-wide strategies being recommended for implementation by GDOT's Operations Department. These system-wide strategies were considered throughout the entire study area in some capacity to expand existing transportation infrastructure, remove traffic restrictions, or improve existing roadside technologies. Each of the recommended system-wide strategies is discussed in more detail in the following sections.

Table 7.2: System-wide Operational Strategies

System-wide Operational Recommendations
ITS Infrastructure Expansion (Support Infrastructure)
Upgrade of Existing ITS Infrastructure Technology
Additional Crash Investigation Site Implementation
Ramp Meter Operational Modifications
Towing and Recovery Incentive Program (TRIP) Expansion
Highway Emergency Response Operators (HERO) Expansion
Atlanta Regional Commission Transportation Demand Management Plan
Truck Lane Restriction Modifications
Advanced Queue Warning Signing Implementation
Variable Speed Limit Signing Implementation

7.2.1 Intelligent Transportation Systems (ITS) Infrastructure Expansion

ITS infrastructure includes closed circuit television (CCTV) cameras, vehicle detection, changeable message signs, and fiber optic cables and conduits. ITS infrastructure provides GDOT the ability to implement a variety of ITS improvements and traffic monitoring along limited-access facilities in the Atlanta region.

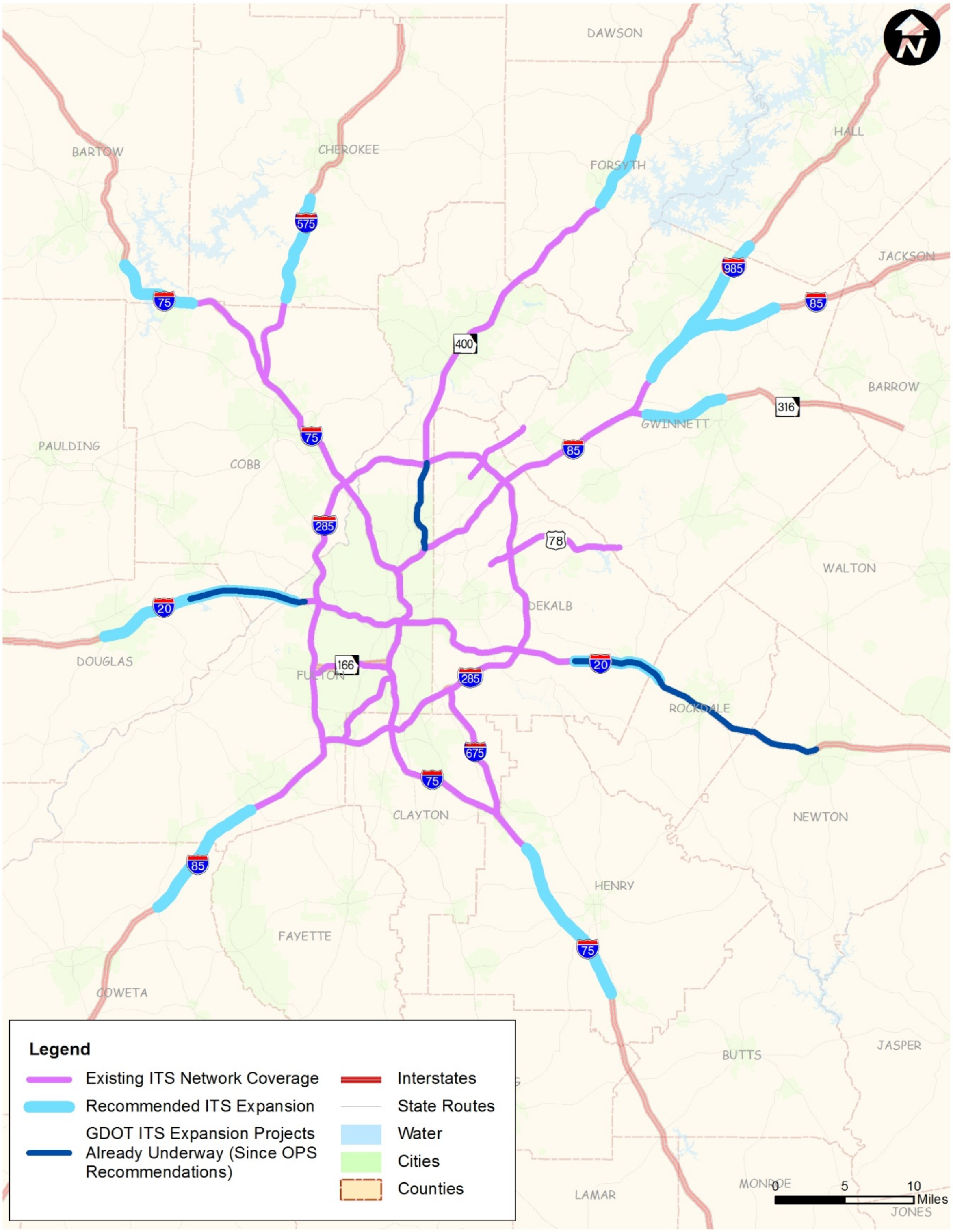
The OPS recommended expanding the existing ITS infrastructure to include all limited-access facilities in Metro Atlanta. These included the following segments:

- I-85 North from north of Old Peachtree Road (Exit 109) to Hamilton Mill Road (Exit 120)
- I-985 from I-85 to SR 347 (Exit 8)
- SR 400 from SR 20 (Exit 14) to Keith Bridge Road (Exit 17)
- I-75 North from SR 92 (Exit 277) to Old Allatoona Road (Exit 283)
- I-575 from SR 92 (Exit 7) to Holly Springs Parkway (Exit 14)
- I-20 West from east of Fulton Industrial Boulevard (Exit 49) to SR 5 (Exit 34)

- I-20 East from Panola Road (Exit 71) to Sigman Road (Exit 78)
- I-75 South from south of Hudson Bridge Road (Exit 224) to Bill Gardner Parkway (Exit 212)
- I-85 South from SR 74 (Exit 61) to SR 154 (Exit 51)
- SR 316 from Herrington Road to SR 20

When the OPS was initiated, the GDOT ITS infrastructure network did not include all of the limited-access facilities in Atlanta. But, as of August 2014, the GDOT ITS coverage area has been expanded in several locations that coincide with OPS recommendations. Therefore, several of the OPS recommendations above may already be moving forward for expansion under GDOT's ongoing expansion efforts, as both initiatives are being completed simultaneously. The current ITS coverage map for Metro Atlanta is illustrated in **Figure 7.3**.

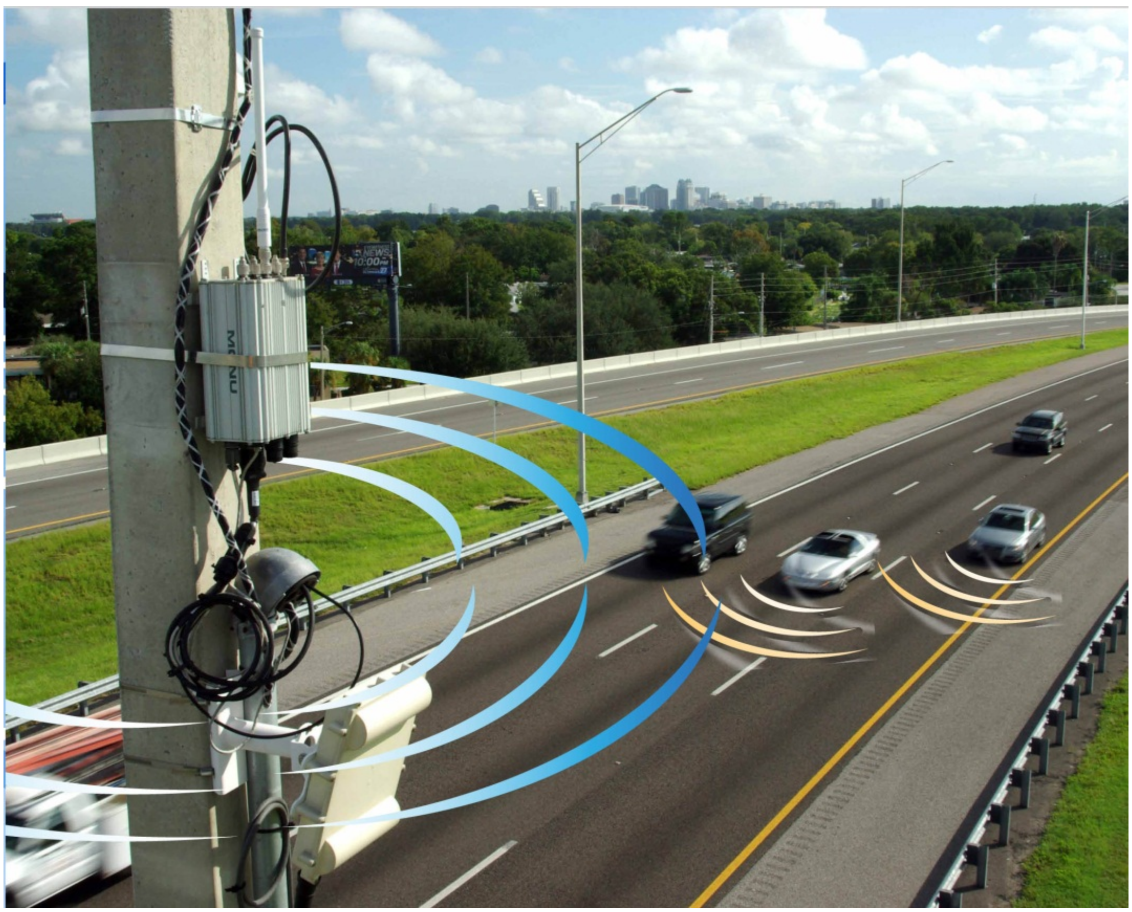
Figure 7.3: Metro Atlanta ITS Coverage Area



7.2.2 Upgrade Existing ITS Infrastructure Technology

This strategy would upgrade ITS technology to include connected vehicle roadside units on limited-access facilities. Connected vehicle roadside units would provide two-way communications of real-time traffic information to vehicles that are equipped with connected vehicle receivers. According to the consulting firm, Machina Research, approximately 10 percent of vehicles have built-in connectivity today and the number is expected to rise to more than 90 percent by 2020. This advanced technology would enhance safety and traffic operations by permitting motorists to react more quickly to upstream events/incidents. An example of roadside ITS infrastructure is illustrated in **Figure 7.4** below. Additional information on future considerations as it relates to connected vehicles is provided later in this chapter.

Figure 7.4: Roadside ITS Infrastructure



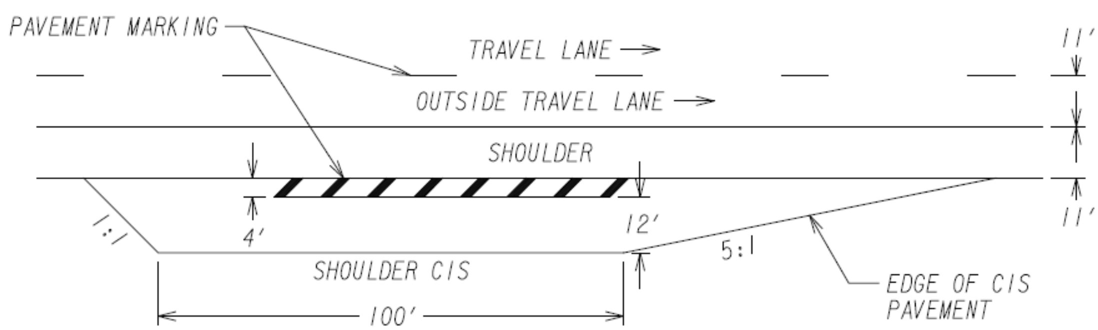
Source: Florida DOT. http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Deploy/CV/Connected_Vehicles-WC.shtm

7.2.3 Additional Crash Investigation Site Implementation

Crash investigation sites (CIS) are created in an effort to provide protection to motorists involved in an incident and law enforcement personnel who are onsite to investigate. They are intended to reduce on-looker delays, and minimize congestion following a traffic incident. The basic design elements of CIS include signing and marking, site access, security, capacity, and communication.

Crash investigation sites, in support of the hard-shoulder running, are currently being utilized every half mile along SR 400 (from the Downtown Connector to Exit 11) and are approximately 70-100 feet long by 14 feet wide. Stakeholder outreach with GDOT HERO operators suggested that CIS placement is very important (e.g. before and after long bridge structures), as well as the length of the CIS in order to accommodate large trucks and vehicles with trailers. The OPS analysis recommended that CIS along SR 400 be improved upon and applied to other corridors throughout the study area, particularly in conjunction with potential auxiliary lanes using shoulders. It is recommended that CIS should be located were adequate shoulders are not provided and should be a minimum of 100 feet in length and 14 feet in width. The layout of a recommended CIS is illustrated in **Figure 7.5**.

Figure 7.5: Typical Crash Investigation Site Layout



7.2.4 Ramp Meter Operation Modifications

Figure 7.6: Two Cars Per Green Sign

In total, the Atlanta region has approximately 160 ramp meters. A majority of those are single-lane ramps with a single meter for the lane. One recommendation of this study is to consider modifying existing single-lane ramp meters to permit two cars per green at locations where widening to two lanes on the ramp is not practical and where queues frequently back up onto the intersecting local street(s). Additionally, this strategy can be used to mitigate the need to temporarily shut off ramp meters when triggered by spillbacks onto the arterial network and still maintain the objectives along the mainline. **Figure 7.6** provides an example of a "two cars per green" sign.

7.2.5 Towing and Recovery Incentive Program (TRIP) Expansion

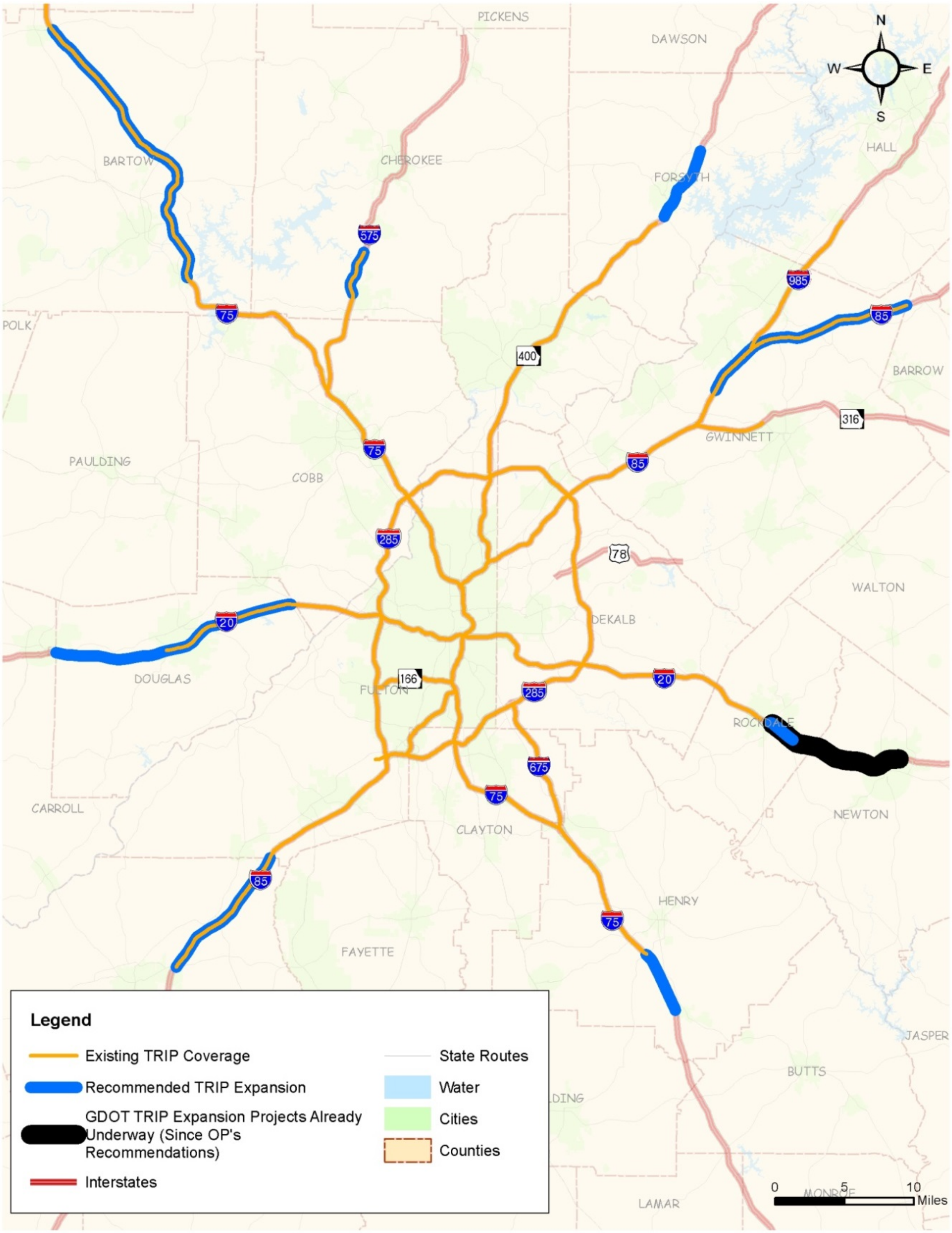
Georgia's Towing and Recovery Incentive Program (TRIP) was implemented in metro Atlanta to facilitate improved management of large-scale commercial vehicle incidents. TRIP encourages the quick, safe clearance of these incidents by paying performance incentives to highly-skilled, TRIP-certified towing and recovery companies for clearing wrecks within established clearance goals.[7] The OPS recommendations for this strategy include expanding the limit of the TRIP contracts to include the following areas:

- I-75 North from Old Allatoona Road (Exit 283) to GA 140 Adairsville (Exit 306)
- I-575 from Towne Lake Parkway (Exit 8) to Sixes Road (Exit 11)
- I-85 North from north of Old Peachtree Road (Exit 109) to Gwinnett/Barrow County Line
- I-20 East from SR 20/SR 138 (Exit 82) to SR 162 (Exit 84)
- I-20 West from SR 6 (Exit 44) to Liberty Road (Exit 26)
- I-75 South from SR 155 (Exit 216) to Bill Gardner Parkway (Exit 212)
- I-85 South from Coweta/Fulton County line (Mile Marker 56.3) to SR 34 (Exit 47)
- SR 400 from SR 20 (Exit 14) to SR 306 (Exit 17)

Similar to the GDOT ITS coverage area, the TRIP coverage area was updated in August 2014. Once again, several of the OPS recommendations above may overlap with completed expansion efforts as both initiatives were being completed simultaneously. The current TRIP coverage map for metro Atlanta is illustrated in **Figure 7.7**.

[7] *Metro Atlanta TIME Task Force. Accessed online at: http://www.timetaskforce.com/index.php/time-initiatives*

Figure 7.7 : TRIP Wrecker Service Coverage Map



7.2.6 Highway Emergency Response Operator (HERO) Expansion

Georgia Department of Transportation HERO

GDOT employs Highway Emergency Response Operator (HERO) units that are dispatched to traffic-related incidents with the primary duty to clear roads, so that a consistent traffic flow is restored. HERO units also change flat tires, jump-start dead batteries, provide transport for motorists to safe areas, and administer first aid; among numerous other services to the motoring public.

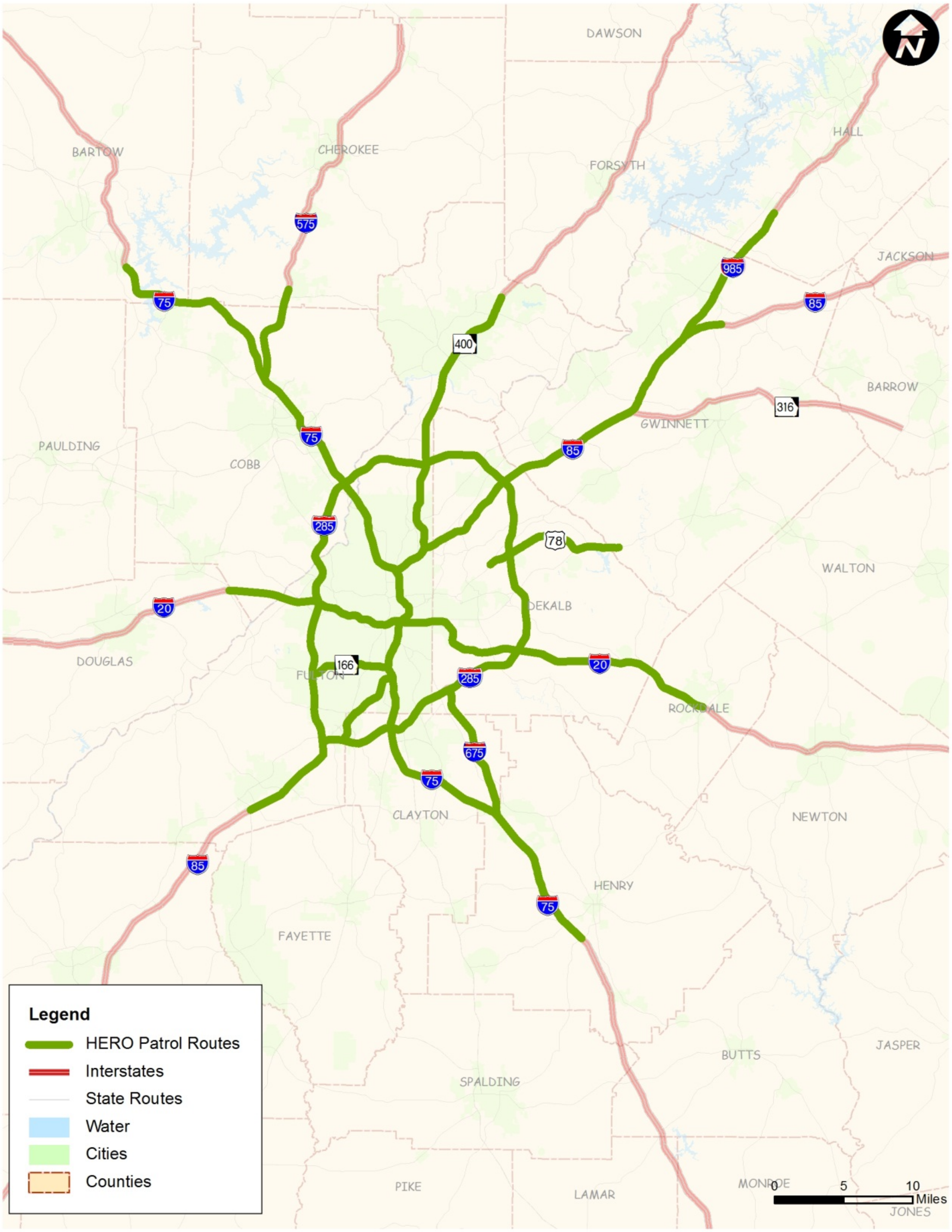
Currently, HERO units patrol 310 miles on 31 routes on metro Atlanta freeways and are available to respond to traffic incidents 24 hours a day. The current average response time for HERO units is 13 minutes. The geographic coverage provided by the HERO units is on limited access freeways in the metro Atlanta region. However, expanding the number of HERO units operating during the peak-hour shifts could reduce average automobile incident response times to less than 10 minutes. GDOT is currently exploring options to add resources to corridors with the highest incident rates.

Source: GDOT Average HERO Response Time

The HERO unit coverage area is illustrated in **Figure 7.8**. HEROs currently patrol the following metro Atlanta freeways:

- I-20 between Thornton Road (Exit 44) and SR20/SR138/Stockbridge Highway (Exit 82)
- I-75 between SR 155 (Exit 216) and Emerson-Allatoona Road (Exit 283)
- I-85 between SR 74/Senoia Road (Exit 61) and SR 20 (Exit 115)
- I-285 between Washington Road (Exit 1) and Old National Highway (Exit 62)
- I-575 between Barrett Parkway (Exit 1) and Towne Lake Parkway (Exit 8)
- I-675 between I-75 and I-285
- I-985 between I-85 and Spout Springs Road/Flowery Branch Road (Exit 12)
- SR 166/Langford Parkway between I-285 and I-75/85
- US 78 between Valley Brook Road/N. Druid Hills Road (Exit 1) and West Park Place Boulevard (Exit 9)
- SR 400 between Sidney Marcus Boulevard/Piedmont Road (Exit 1) and Windward Parkway (Exit 11)

Figure 7.8: HERO Unit Service Area[8]



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8 http://www.511ga.org/static/hero.html

7.2.7 Transportation Demand Management

It is important that the OPS supports and coordinates with other regional transportation planning efforts. The Atlanta MPO's Transportation Demand Management (TDM) Plan, completed in 2013, recommends cost-effective improvements that integrate management and operations with TDM to support livability and sustainability initiatives. These include infrastructure and capital investments for bicycle and pedestrians, Complete Streets, network connections, transit access, roundabouts, and parking management. These initiatives are also consistent with GDOT policies. The OPS, in coordination with the MLIP and GDOT's Georgia Commute Options program, recommends a coordinated TDM strategy for linking express bus service, local transit, vanpools, managed lanes, and Park and Ride lots to provide better connections and enhanced mobility for metro Atlanta.

GEORGIACOMMUTEOPTIONS

7.2.8 Truck Lane Restriction Modifications

Figure 7.9: Atlanta Truck Lane Restriction Signage Example[9]

This strategy would require modification and/or elimination of truck lane restrictions on metro Atlanta freeways where these restrictions may negatively impact traffic operations. Currently, trucks are restricted from traveling inside the I-285 perimeter (see **Figure 7.9**). On I-285 and facilities outside of the perimeter, trucks are typically restricted from the two left lanes. Sometimes, this can be a burden for traffic weaving from freeway lanes to/from adjacent ramps due to the "wall of trucks." GDOT Traffic Operations recently conducted a pilot project along I-75 South northbound that added signs encouraging trucks to use the middle lanes. One recommendation of the OPS is to reevaluate the truck restrictions along I-285 to enhance the operations of vehicles entering and exiting the facility at system-to-system interchanges. Additionally, there are operational issues along northbound I-75 approaching I-575 associated with trucks continuing northbound. It is recommended that the truck lane restriction be moved further south to allow trucks more time to change lanes and improve the traffic flow.

[9] *Aaroads.com*

7.2.9 Advance Queue Warning Sign Implementation

Figure 7.10: Advance Queue Warning Example[10]

This strategy calls for implementation of advanced queue warning signs in conjunction with any installation of overhead changeable message signs that indicate advisory speeds and lane assignments (see Minnesota example in **Figure 7.10**). This advanced technology would enhance safety and traffic operations by permitting motorists to gradually reduce speed in advance of arriving at the line of queued vehicles resulting from the shock wave caused by downstream events/incidents. Advance queue warning signs should be implemented in coordination with the variable speed recommendations provided in the next section.

7.2.10 Variable Speed Limit Sign Implementation

Figure 7.11: Variable Speed Limit Sign Example

This strategy involves implementation of variable speed limit signs that change based on real-time, traffic conditions on congested, limited-access facilities. This strategy is most effective by utilizing an overhead, changeable message sign displaying variable speed limits. Similar to the above Advanced Queue Warning Signs, this advanced technology would enhance safety and traffic operations by permitting motorists to gradually reduce speed in advance of arriving at the line of queued vehicles resulting from the shock wave caused by downstream events/incidents. Speed limits can also be reduced to respond to inclement weather conditions and road construction activities. Variable speed limit signs should be implemented anywhere freeway speeds are posted less than 65 mph, which includes I-75 North and South, I-85

[10] Mn/DOT Smart Lanes: http://www.dot.state.mn.us/smartlanes/

South, and I-20 East and West. It should be noted that in October 2014, GDOT implemented the first phase of variable speed limit signs along 36 miles of I-285 Top End (see **Figure 7.11**), north of the I-20 interchanges to help improve safety and relieve congestion. While these speed signs are posted along the inside and outside shoulders of I-285, it is recommended that full-span gantries be used in the future to fully support advance queue warning signs and provide the ability to actively manage the study corridors.

7.3 FUTURE TECHNOLOGY CONSIDERATIONS

The OPS has identified several future technologies that should be considered by GDOT and its partnering agencies in the future. These include traveler information systems and other vehicle technologies and infrastructure. Moving forward, GDOT will take into consideration these emerging technologies and how they may complement existing roadway technologies to facilitate the efficient movement of people and goods throughout metro Atlanta. Furthermore, these technologies could significantly impact infrastructure capacity and planning needs in the long term.

7.3.1 Traveler Information Systems

Traveler information systems are a well-established technology used to inform drivers on current roadway conditions including delays, incidents, weather-related messages, travel times, emergency alerts, and alternate routes. Providing this information to drivers before and during trips allows them to make more effective travel decisions about changing routes, modes, departure times, or even destinations. More informed drivers result in more efficiently utilized roadway capacity. This means less gridlock and better traffic flow.

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Travel information is generated by sensors reporting to a traffic management center, through private entities using data from in-vehicle location devices, or from smart phones communicating location and speed. This information is then disseminated via traditional broadcast media, internet, mobile devices, or roadside messaging through programs such as Georgia 511. Personalized travel messages and alerts enable individuals to get trip-specific information on demand, or have it pushed to them via email or text message subscription services. Once familiar with these services, nearly 80 percent of drivers use traveler information to make daily decisions about route or departure time.[11]

[11] *Oregon DOT. OR 217 Traveler Information Project Briefing Paper. Located online at: ftp://ftp.odot.state.or.us/region1/MajorProjects/ATM/DEA/draft_briefing_paper/draft%20guidelines/draft%20strategies/traveler.pdf*

7.3.2 Connected Vehicles

Figure 7.12: Example of a Self-driving Google Vehicle

Connected vehicle research covers a spectrum of technological systems, the most familiar of which are the in-vehicle collision avoidance systems starting to emerge in many new cars and commercial vehicles. Research into vehicle connectivity includes vehicles communicating with each other or with infrastructure. This is accomplished through well-defined groupings of technologies that, when combined in an integrated technological platform, can address all facets of system operations: safety, stability, interoperability, and reliability. **Figure 7.12** is an example of a self-driving Google vehicle.

Source: http://www.google.com/about/careers/lifeatgoogle/self-driving-car-test-steve-mahan.html

Side collision warning systems can be installed on commercial vehicles to enhance safety during lane changes or merging situations. The system monitors the lanes adjacent to a vehicle to detect moving and stationary objects located within the vehicle's side blind spots using ultrasonic or radar detection technology. The warning systems provide visual and/or audible alerts to warn drivers when objects are detected. Some systems indicate the distance from a detected object on a digital display installed either in or on the dashboard. Other systems provide visual indicators or lights on the vehicle side mirrors when an object is detected alongside the vehicle.

Other safety technologies, along with travel information technologies, can be incorporated as part of a connected commercial vehicle system. These systems are designed to provide professional drivers with real-time information that is delivered in-cab among many formats such as via cell phone, laptop, or other mobile Internet or on-board devices. Applications for these systems could include curve speed warnings when the vehicle exceeds the recommended speed, overheight warnings when low vertical clearances exist on the current travel route, an advisory system that warns drivers of potentially dangerous locations with high rates of commercial vehicle crashes, and travel-time estimates based on real-time traffic conditions and work zone locations.

Connected vehicles have the potential for profound impacts on the future transportation infrastructure. As operating conditions of vehicles are vastly improved, there could be less need for speed limits, traffic signals, or even steering wheels. Street lights and other similar traffic infrastructure could be completely eliminated. *Forbes* magazine estimated that connected vehicle technologies could provide a nearly two trillion dollar savings in annual Gross Domestic Product (GDP).

8 NEXT STEPS

This chapter outlines the next steps that should be taken to continue the momentum of the OPS in order to implement recommended projects. The following sections document potential funding sources as well as implementation strategies.

8.1 POTENTIAL FUNDING SOURCES

The key outcome of the OPS is to implement low-cost operational improvements by inserting them as programmed projects into GDOT's Statewide Transportation Improvement Program (STIP). The STIP is a four-year, fiscally constrained programming document for expenditures of State and Federal transportation funds. It identifies priorities for planning, design, ROW, and construction of transportation projects throughout the State.

Obtaining funds for projects is a two-part process. First, there is the need to know what funding resources are available and what projects are well-matched to the criteria for each funding resource. The second is to request funds from partnering agencies or within GDOT from the appropriate funding sources.

The following sections provide a high-level summary of the available funding sources and which ones may be applicable to funding OPS project recommendations.

8.1.1 Federal Funding Sources

A considerable amount of the funding for the construction, improvement, operation, and maintenance of transportation infrastructure comes from monies distributed by the Federal Government through Moving Ahead for Progress in the 21st Century (MAP-21).

The MAP-21 legislation provides revenue sources through many programs, including:

- *National Highway Performance Program (NHPP)*
- *Surface Transportation Program (STP)*
- *Transportation Alternatives Program (TAP)*
- *Congestion Mitigation and Air Quality Improvement (CMAQ) Program*
- *Highway Safety Improvement Program (HSIP), including Railway-Highway Crossings (set-aside from HSIP)*
- *Section 5307 – Urbanized Area Formula Program*
- *Section 5309 – Bus and Bus Related Facilities Program*
- *Transportation Investment Generating Economic Recovery (TIGER) Program*
- *Financing options, such as Grant Anticipation Revenue Vehicle (GARVEE) bonds and Transportation Infrastructure Finance and Innovation Act (TIFIA) loans*

Further detail on each federal funding category is provided below.

8.1.1.1 National Highway Performance Program (NHPP)

Under MAP-21, the enhanced National Highway System (NHS) combines the previous NHS, Interstate Maintenance and Highway Bridge programs and is composed of the interstate system, all principal arterials (including some not previously designated as part of the NHS) and border crossings on those routes; highways that provide motor vehicle access between the NHS and major intermodal transportation facilities; and the network of highways important to U.S. strategic defense (STRAHNET) and its connectors to major military installations. **All of the OPS study recommendations are located along NHS corridors and are therefore eligible for NHPP funding.** The NHPP consists of $21.9 billion authorized in 2014 (nationally) to support the condition and performance of the NHS through the construction of new facilities, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress in achieving performance targets established in a state's asset management plan. After Congestion Mitigation and Air Quality Improvement Program (CMAQ) and Metropolitan Planning Program funds are determined, a state's NHPP funds represent 63.7 percent of the remaining apportionment.

8.1.1.2 Surface Transportation Program (STP)

MAP-21 continues the STP, providing an annual national average of $10 billion in flexible funding that may be used by states and municipalities for projects on any federal-aid highway (including the NHS), bridge projects on any public road, high accident/high congestion intersections, transit capital projects, and intracity and intercity bus terminals and facilities. **All of the projects recommended by the OPS fall on NHS corridors, and many are located in high-accident and/or highly congested areas or intersections.** Funds are distributed among the states based on lane-miles of federal-aid highways, total vehicle-miles traveled on those federal-aid highways, and estimated contributions to the Highway Account of the Highway Trust Fund. Each state must set aside a portion of their STP funds (10 percent or the amount set aside in 2005, whichever is greater) for transportation enhancement activities.

Lump sum funds are set aside from a portion of GDOT's Statewide Transportation Improvement Program (STIP), and are available for funding maintenance, safety, preliminary engineering, ROW acquisitions, signal optimization, and low-impact bridge projects, among others. The lump sum program is intended to give GDOT the flexibility to address projects of an immediate need while fulfilling the requirements of the STIP. Projects qualify for lump sum "banks" by using a population-based formula during each annual Transportation Improvement Program (TIP) process; each receives funds to allow for more routine or minor projects to be authorized without the need for administrative actions by the MPO.

8.1.1.3 Transportation Alternatives Program (TAP)

MAP-21 established a new program to provide funding for a variety of alternative transportation projects, including many that were previously eligible under separately funded programs. The Transportation Alternatives Program (TAP) replaced funding from several earlier programs, including Transportation Enhancements (TE), Recreational Trails, and Safe Routes to School, consolidating them into a single funding source. The program provides for the implementation of a variety of non-traditional projects, with examples ranging from the restoration of historic transportation facilities, to bicycle and pedestrian facilities, landscaping and scenic beautification, and mitigation of water pollution from highway runoff.

To be eligible for funding, TAP projects must be sponsored by a governmental body (such as local governments, regional transportation authorities, transit agencies, and school districts) and upon selection, the project must be included in the TIP. **It is not anticipated that OPS projects will be eligible for TAP funds.**

8.1.1.4 Congestion Mitigation and Air Quality Improvement Program (CMAQ)

Money for this program comes from the Federal Government and is allocated to states based on the population living within ozone and carbon monoxide non-attainment areas and the relative severity of the regions' air quality problems. The metro Atlanta region that is included in the OPS study area is designated as an ozone nonattainment area. Under the CMAQ program, the project sponsor is required to match 20 percent of the cost, and the remaining 80 percent will be covered by designated federal funds (CMAQ) administered through the State. FHWA requires a demonstration of emissions benefits that will come from implementation of the project.

For the metro Atlanta area, the Atlanta MPO issues a call for CMAQ projects where project sponsors must indicate the emission benefits for their respective projects. **It is anticipated that many of the OPS projects will be eligible for CMAQ funds.** Projects are selected by the Atlanta MPO along with GDOT, the Georgia Environmental Protection Division (EPD), and the Georgia Regional Transit Authority (GRTA).

8.1.1.5 Highway Safety Improvement Program (HSIP)

MAP-21 continues the Highway Safety Improvement Program (HSIP) to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. Each state is required to identify key safety problems, establish their severity, and adopt goals to maximize safety using the safety data system. States are required to develop a Strategic Highway Safety Plan (SHSP) that lays out strategies to address the safety problems identified. A highway safety improvement project is any strategy, activity, or project on a public road that is consistent with the SHSP and corrects or improves a hazardous road location or feature, or addresses a highway safety problem. **It is anticipated that most of the projects recommended by the OPS are located in high accident and/or highly congested areas and will be eligible for these funds.**

8.1.1.6 Section 5307 - Urbanized Area Formula Program

This program (49 U.S.C. 5307) makes federal resources available to urbanized areas, and to governors for transit capital and operating assistance in urbanized areas, for transportation-related planning. Eligible purposes include: planning, engineering design, and evaluation of transit projects and other technical transportation-related studies; capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment, and construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including those for rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software. All preventive maintenance and some ADA complementary paratransit service are considered capital costs. **It is anticipated that some of the OPS projects that specifically benefit transit, such as the ramp meter bypass lanes for transit, might be eligible for Section 5307 funds.**

8.1.1.7 Section 5309 – Bus and Bus-Related Facilities Program

The transit capital investment program (49 U.S.C. 5309) provides capital assistance for three primary activities: new and replacement buses and facilities; modernization of existing rail systems; and new fixed guideway systems. Eligible purposes are: acquisition of buses for fleet and service expansion, bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations, acquisition of replacement vehicles, bus rebuilds, bus preventive maintenance, passenger amenities such as passenger shelters and bus stop signs, accessory and miscellaneous equipment such as mobile radio units, supervisory vehicles, fare boxes, computers, shop and garage equipment, and costs incurred in arranging innovative financing for eligible projects. **It is anticipated that some of the OPS projects that specifically benefit transit, such as the ramp meter bypass lanes for transit which are recommended near park-and-ride lots in many instances, might be eligible for Section 5309 funds.**

8.1.1.8 Transportation Investment Generating Economic Recovery (TIGER) Grants

TIGER grants provide opportunities for DOTs to invest in road, rail, transit, and port projects that are intended to achieve critical national objectives. TIGER grants enable DOTs to examine a broad array of projects to ensure that taxpayers are getting the highest value for every dollar invested. Since 2009, Congress has dedicated more than $4.1 billion to fund projects that have a significant impact on the nation, a region, or a metropolitan area. **It is anticipated that several OPS projects will be eligible for TIGER grants.**

8.1.1.9 Federal Financing Options

In addition to the above funding sources that provide federal matching funds for transportation projects, there are also financing options available, which must be repaid. Federal financing options include Grant Application Revenue Vehicle (GARVEE) bonds and Transportation Infrastructure Finance and Innovation Act (TIFIA) loans.

GARVEE bonds are state-issued bonds repayable with future federal aid. GARVEE bonds allow agencies to select and designate projects to be funded for accelerated construction from bond proceeds that are approved by FHWA and the Regional Transportation Planning Agency (i.e. the Atlanta MPO). This funding source is generally applied to Federal-aid debt-financed projects – usually larger highway or transit projects – that merit borrowing rather than pay-as-you-go grant funding when the costs of delay outweigh the costs of financing, or other funding streams are limited. **Although financing the OPS projects may not be likely due to the lower cost of these projects, it is anticipated that many OPS projects will be eligible for GARVEE bonds.**

TIFIA provides federal credit assistance to major transportation investments of critical national or regional importance, such as intermodal facilities, border crossing infrastructure, expansion of multi-state highway trade corridors, and other investments with regional and national benefits. The TIFIA credit program is designed to fill market gaps and leverage substantial private co-investment by providing supplemental and subordinate capital. TIFIA funding is used on projects of $10 million or larger. **Although a few of the OPS projects are eligible for TIFIA loans, it is not anticipated that GDOT will finance these lower-cost projects.**

8.1.2 State Funding Sources

State funding sources also contribute to transportation improvement projects in metro Atlanta.

State funding sources include:

- *The GDOT Operational Improvement Program*
- *STIP/TIP Lump Sum Funding*
- *Highway Safety Fund*
- *General Obligation (GO) Bonds*
- *Georgia Transportation Infrastructure Bank (GTIB)*

Further detail on each is provided below.

8.1.2.1 GDOT Operational Improvement Program

The GDOT Operational Improvement Program provides lump sum funding for "quick fix" projects that improve traffic operations for a low cost (typically <$1 million). Most quick fix projects consist mainly of geometric improvements to existing interchanges, freeway ramps or minor ITS projects on state routes. Approximately $12 million is approved annually (10-20 projects) by GDOT's Operational Improvement Committee, which encourages innovative intersection design alternatives with minimal utility or ROW impacts and a construction schedule between six to 18 months. **A majority of OPS projects are eligible for operational improvement program funding.**

8.1.2.2 General Obligation (GO) Bonds

General obligation (GO) bonds allow all state agencies and authorities to acquire, construct, develop, extend, enlarge, or improve land, waters, property, highways, buildings, structures, equipment, or facilities of the state. Georgia's GO bonds are issued under a three-year spend down rule, which means that projects funded with GO bonds are expected to be completed within three years. **It is anticipated that many OPS projects are eligible for General Obligation bond funding.**

8.1.2.3 Georgia Transportation Infrastructure Bank (GTIB) Program

The Georgia Transportation Infrastructure Bank (GTIB) program gives states the capacity to increase the efficiency of their transportation investment and significantly leverage federal resources by attracting non-federal public and private investment. The program provides greater flexibility to states by allowing other types of project assistance in addition to grant assistance. GTIB-eligible projects are currently restricted to those roadway projects that satisfy the requirements of being motor-fuel tax eligible. Transit and airport projects are currently ineligible for GTIB assistance due to the fact that the primary GTIB funding is from motor fuel tax. **It is anticipated that most of the OPS projects are eligible for GTIB funds, with the potential exception of some OPS projects that primarily benefit transit, such as ramp meter bypass lanes.**

8.1.3 Local Funding Sources

The local share for funding transportation projects can come from a variety of sources. Local shares are normally made in the form of cash; however, in some cases the local share can be made in the form of in-kind services or contributions (e.g. use of local forces for grading or utility relocation, ROW donations, etc.). Typically, local share comes from three main sources: general fund, ad valorem taxes (property taxes), or sales taxes dedicated specifically for transportation improvements. For capital expenses, general revenue or capital improvement bonds may be considered as a local share source.

Potential funding sources at the local level include:

- *Special Purpose Local Option Sales Taxes (SPLOST)*
- *Impact Fees*
- *Community Improvement Districts (CID)*
- *Special Assessment Districts (SAD)*
- *Tax Allocation Districts (TAD)*

Further detail is provided below.

8.1.3.1 SPLOST Programs

Increasingly, counties in Georgia have enacted Special Purpose Local Option Sales Taxes (SPLOST) to fund specifically identified capital projects. Like the regional TIA funding tool, SPLOST taxes require voter approval and are time-limited. SPLOST funds can be used for transportation projects, including matching federal and/or state transportation funds. Cities and counties may also use Local Option Sales Taxes (LOST) for transportation purposes, including providing local matching funds for GDOT projects. **GDOT will provide the list of recommended OPS projects to each of the MPO's for them to determine if it would be appropriate to use current or future SPLOST funds to assist with funding.**

8.1.3.2 Impact Fees

Municipalities collect impact fees from developers to pay for the proportionate share of the cost of street improvements that reasonably related to the service demands and needs of the project within a defined service area.

In May 2007, the Governor signed the Georgia Development Impact Fee Law, which was House Bill 232 that amended Title 36 of the Official Code of Georgia as it relates to the collection of development impact fees. The changes modify the definition of eligible project improvements such that:

> *"The character of the improvement shall control a determination of whether an improvement is a project improvement [to be funded by a developer] or system improvement [to be funded by sources other than impact fees] and the physical location of the improvement on site or off*

site shall not be considered determinative of whether an improvement is a project improvement or a system improvement. If an improvement or facility provides or will provide more than incidental service or facilitates capacity to persons other than users or occupants of a particular [development] project, the improvement or facility is a system improvement. No improvement or facility included in a plan for public facilities approved by the governing body of the municipality or county shall be considered a project improvement."

The law goes on to further define eligible project improvements as "roads, streets, and bridges, including rights-of-way, traffic signals, landscaping, and any local components of state or federal highways."

Many of the OPS projects would fit the types of projects that are funded by impact fees. Should any counties be interested in pursuing impact fees further as a potential funding source, the county or local jurisdiction would need to conduct a more detailed traffic impact analysis to determine the impact of a development on the transportation system in the area. It should also be noted that given the intent of the study to identify projects for implementation within six months to five years, the OPS identified needs based on existing conditions and did not account for future development.

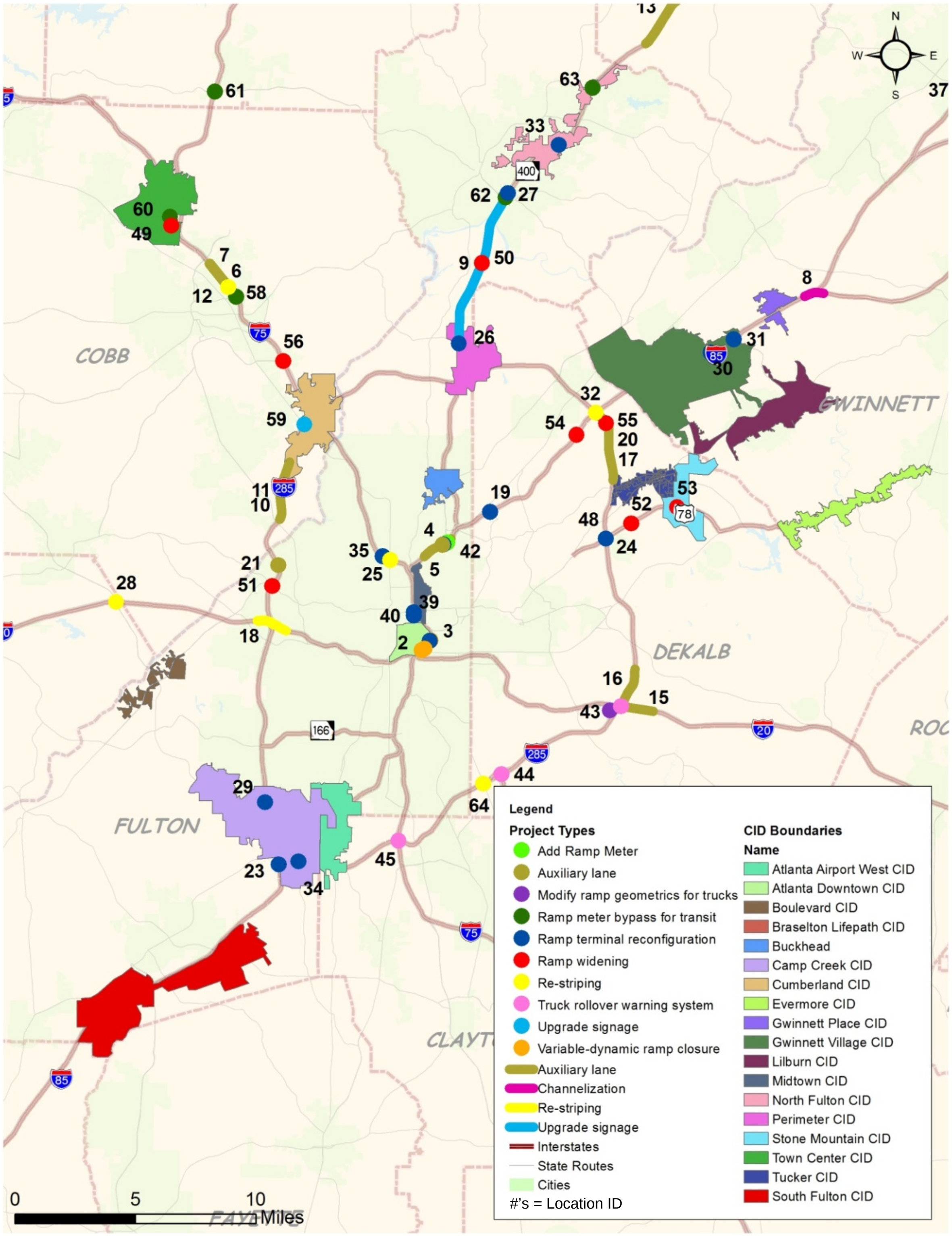
8.1.3.3 Community Improvement Districts (CID)

A CID is a special district in which commercial property owners pay a self-imposed tax for funding certain governmental services, including street and road construction and maintenance, parks and recreation, storm water and sewage systems, water systems, public transportation systems, and other services and facilities. The mission of a CID is to leverage local tax dollars with city, state, and federal grants to attract new investment in a designated area and promote sustainable, livable growth. The administrative body of the CID may levy taxes, fees and assessments on non-residential properties within the CID, not to exceed 2.5 percent of the assessed value of the property. There are 18 CIDs located in the OPS study area. They are illustrated in **Figure 8.1**, along with the recommended OPS projects. **Approximately 25 recommended projects fall within a CID boundary, and several others could facilitate the efficient movement of vehicles into and out of the CIDs.** Furthermore, as indicated in Chapter 3, a CID Committee was formed at the beginning of this study to work collaboratively with the CIDs to assist with determining needs and potential solutions (i.e. projects) in or near the CIDs.

8.1.3.4 Tax Allocation Districts (TAD)

A Tax Allocation District (TAD) funds infrastructure projects in a targeted growing area with specific boundaries that are legally defined. A TAD finances projects by issuing bonds that are repaid in the future from increases in property tax revenue, also known as tax increment financing (TIF). A linkage is created in that the infrastructure spurs an increase in tax-paying businesses, as well as residential and overall land development. TAD funds can be used for grants for construction of new buildings, public works improvements, building renovation or rehabilitation, acquisition of equipment, or clearing and grading of land. Ten TADs have been established in Metro Atlanta including: the Atlanta Beltline, Atlantic Station, Campbellton Road, Eastside, Hollowell/ML King, Metropolitan Parkway, Perry Bolton, Princeton Lakes, Stadium Area, and Westside. **Given the nature of the OPS projects, it is not anticipated that TAD funds will be available to assist with implementing the OPS projects.**

Figure 8.1 : OPS Projects Located In or Near CIDs



8.1.3.5 Special Assessment Districts (SAD)

Special Assessment Districts (SADs) are areas where property owners gain some special benefit from a public improvement. Within the boundaries of the SAD, property owners are assessed a portion of the cost related to the special benefit, which accrues to their property as a result of the improvement. Special assessment districts collect tax dollars in much the same way as a CID; however, taxes are levied on both commercial and residential property owners. The money is typically collected and distributed within the district by the municipality. Special assessments are typically used to finance improvements, such as street construction, street lighting, sewer and water infrastructure, or transit infrastructure. This may be a viable option for raising dollars for local projects along a corridor. **It is anticipated that SAD funds may be available to assist with implementing those OPS projects that may be located within these districts, especially those that benefit transit, such as ramp meter bypass lanes.**

Community Improvement Districts (CID), Tax Allocation Districts (TAD), and Special Assessment Districts (SAD) are similar but each is slightly unique.

CIDs may only be established to levy taxes on non-residential properties, while SADs may be established to levy taxes on both commercial and residential property owners. TADs are established to utilize TIF, which finances initial redevelopment costs by monetizing future increases in property taxes.

8.1.3.6 Transportation Investment Act (TIA) of 2010

In 2010, the Georgia legislature passed a transportation funding bill that allowed voters to decide on a one-percent, 10-year, regional sales tax for all types of transportation improvement projects. It established 12 regional special tax districts that correspond to the regional commission boundaries.

A regional roundtable was created for the ARC region to develop a project list as part of the regional referendum in 2012. In the metro Atlanta area, 15 percent of the funds raised in the region would be used for local transportation projects and would be allocated to cities and counties based on a formula of 1/5 population and 4/5 centerline road miles. Ultimately, voters did not approve the referendum in the Atlanta region and municipalities will be unable to capitalize on a 10-percent match for all future local maintenance and state aid funding from DOT. **Therefore, TIA funds are not currently available for OPS projects.** However, similar legislation is being considered that may allow two or more counties to join together to introduce a penny or partial penny tax to fund future transportation projects.

8.1.4 Summary of Eligible Funding Sources for OPS Projects

Table 8.1 summarizes the anticipated funding sources that the recommended OPS projects may be eligible for. Several categories not previously discussed are included in the table below to assist with providing a comprehensive list. However, the OPS projects are clearly ineligible for these additional funding categories.

Table 8.1: Summary of Funding Sources for OPS Projects

FUNDING SOURCE	Eligible	Ineligible
Federal		
• National Highway Performance Program (NHPP)	✓	
• Surface Transportation Program (STP)	✓	
• Transportation Alternatives Program (TAP)		✗
• Congestion Mitigation and Air Quality Improvement Program (CMAQ)	✓	
• Highway Safety Improvement Program (HSIP)	✓	
• Urbanized Area Formula Program	✓	
• Bus and Bus Related Facilities Program	✓	
• Transportation Investment Generating Economic Recovery (TIGER)	✓	
• Federal Lands Access Program		✗
• Technology and Innovation Deployment Program		✗
• Federal Lands Transportation Program		✗
• Future Strategic Highway Research Program		✗
• Tribal Transportation Program		✗
State		
• GDOT Operational Improvement Program (Quick Program)	✓	
• STIP/TIP Lump Sum Funding	✓	
• Highway Safety Fund	✓	
• General Obligation (GO) Bonds	✓	
• Georgia Transportation Infrastructure Bank (GTIB)	✓	
Local		
• Special Purpose Local Option Sales Taxes (SPLOST)	✓	
• Impact Fees	✓	
• Community Improvement Districts (CID)	✓	
• Special Assessment District (SAD)	✓	
• Tax Allocation Districts (TAD)		✗
• Transportation Investment Act (TIA)		✗

8.2 IMPLEMENTATION

The OPS recommended many operational projects that could mitigate transportation bottlenecks throughout metro Atlanta. The goal was to recommend implementable projects that required minimal engineering, ROW, or environmental consideration so they could be implemented within a relatively short (six months to five year) timeframe.

8.2.1 Roles, Responsibilities, and Next Steps

Although the OPS was initiated by GDOT, the continued coordination of multiple agencies, internally and across agencies, will be required. The roles and responsibilities, as well as next steps that are anticipated, are as follows:

1. **GDOT Division of Planning** has provided the complete list of recommended OPS projects to the GDOT's State Traffic Operations Engineer.
2. **GDOT Traffic Operations Department** has been evaluating the projects further, where necessary, to finalize the scope of the projects and move toward implementation.
3. For those projects being considered for GDOT's QUICK program funding, which many from the OPS are, once the project has been recognized, evaluated, and determined to be viable by the State Traffic Operations Engineer, it is presented to **GDOT's Operational Improvement Committee** for approval.
4. Upon approval by the GDOT Operational Improvement Committee, projects to be implemented with GDOT's QUICK program funding may proceed. QUICK projects are expected to require minimal preliminary engineering and often do not require additional ROW and therefore can proceed to construction.
5. For larger scale projects, **GDOT's Division of Planning** and **Traffic Operations Department** will coordinate with the **Atlanta MPO** to determine if these projects should be included in the MPO's RTP and TIP. Additionally, it will be the responsibility of the **local jurisdictions** to advance many of the OPS recommendations should they deem them appropriate.

8.2.2 Atlanta MPO Regional Transportation Plan Coordination

The Atlanta MPO, in coordination with GDOT, is responsible for conducting transportation planning for the 18-county region of metro Atlanta. The product of these planning efforts is the recently updated 2040 Regional Transportation Plan (RTP), entitled *PLAN 2040*, and the associated four-year Transportation Improvement Program (TIP). Currently, there are 29 planned and programmed operational improvements already identified prior to the OPS (outlined in Chapter 4) with a dedicated funding source established that are located in the OPS study area. Moving forward, it is important to continue to coordinate with the Atlanta MPO when programming operational project recommendations from this study into the TIP.

8.2.3 Progress to Date

There are several recommended operational projects that have already been fast-tracked for implementation. One example of this is at I-285 and Camp Creek Parkway, where the OPS recommended an interchange reconfiguration to a Diverging Diamond Interchange (DDI). The

Camp Creek CID, in coordination with GDOT, applied for CMAQ funds distributed by the Atlanta MPO and was granted a portion of the project cost. The Camp Creek CID has also committed to contributing additional funds to assist with moving the project forward.

Several other OPS-recommended projects have been presented and approved by GDOT's Operational Improvement Committee to use QUICK program funding. These projects include:

- ✓ ID #4: Buford Connector at Monroe Drive
- ✓ ID #50: SR 400 at Northridge Drive
- ✓ ID #51: I-285 at DL Hollowell Parkway
- ✓ ID #52: US 78 at Brockett Road
- ✓ ID #53: US 78 at Stone Mountain Boulevard
- ✓ ID #19: I-85 SB at N Druid Hills Road

GDOT's Traffic Operations Department is currently coordinating with the GDOT Districts to determine what the next group of projects will be to move forward for QUICK program funding.