# Regional Traffic Operations Program
## Concept of Operations

Prepared for Georgia DOT by URS Corporation

# DOCUMENT CONTROL

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# List of Acronyms and Terms

ATIS – Advanced Traveler Information System
ATMS – Advanced Transportation Management Systems
AVLS – Advanced Vehicle Location System
CAD – Computer Aided Dispatch
CATV – Community Access Television
CCTV – Closed Circuit Television
CMS – Changeable Message Sign
DMS – Dynamic Message Sign
DOT – Department of Transportation
EMS – Emergency Medical Services
FHWA – Federal Highway Administration
GDOT– Georgia Department of Transportation
GIS – Geographic Information System
GUI – Graphical User Interface
HAR – Highway Advisory Radio
HAZMAT – Hazardous Materials
ISP – Information Service Provider
IT – Information Technology
ITS – Intelligent Transportation Systems
IVR – Interactive Voice Response
LAN – Local Area Network
LCD – Liquid Crystal Display
MOA – Memorandum of Agreement
MOU – Memorandum of Understanding
MPO – Metropolitan Planning Organization
NWS – National Weather Service
QA/QC – Quality Assurance/Quality Control
RFP – Request for Proposal
RTOP – Regional Traffic Operations Program
SOP – Standard Operating Procedure
TBD – To Be Determined
TCC – Traffic Control Center
TDM – Traffic Demand Management
TIM – Traffic Incident Management
TIP – Transportation Improvement Program
TMC – Transportation Management Center
TOC – Traffic Operation Center
VDS – Video Detection Sensor

# Executive Summary

More than any other traffic control device, traffic signals impact the movement of people and goods on our nation's roadways. These signals, when improperly operated and maintained, result in increased travel times, stops and delays for motorists. In fact, the U.S. Department of Transportation estimates that improper traffic signal timing accounts for 5 to 10 percent of all traffic delay, or 295 million vehicle-hours of delay, along major roadways alone.[1]

In 2007, the National Traffic Signal Report Card documented the current state of traffic signal operations in the United States. Through data voluntarily collected from 417 agencies in 47 states, an overall grade of "D" was given to traffic signal operations in the country.[2] This poor performance clearly indicates there is room for significant improvements in traffic signal operations.


GDOT has long recognized this need to improve the state of traffic signal operations and maintenance in Georgia. Beginning in 2005, GDOT initiated statewide programs to provide for investment in upgrading traffic signal hardware and improving traffic signal operations. These investments were made with the goals of reducing the stops and delays resulting from inefficient signal operations. While these investments have been positive with user cost savings of over $100M, congestion continues to occur on many of Atlanta's major arterials.

In an effort to continue the fight against congestion in the State, GDOT has committed to building upon earlier infrastructure investments by implementing the Regional Traffic Operations Program (RTOP) in the metro Atlanta area. The focus of this program is metro Atlanta since the region, with more than one-half of the State's traffic signals, accounts for 50% of the lane miles traveled in Georgia and 75% of the congestion in the State.

The RTOP is envisioned as a structured program to actively monitor, manage and maintain traffic signals throughout the region. Corridors are selected for the program based upon their significance in moving traffic throughout the region and their current levels of congestion. Once a corridor is selected to participate in the program, a Corridor Manager actively manages the corridor by making regular (at least weekly) field visits to observe and fine-tune operations during the peak periods. As the program progresses, technology enhancements will enable remote monitoring of all corridors from the Georgia DOT Transportation Management Center; thus improving response time to changing conditions. The Corridor Manager also responds to situations such as incidents or special events and provides oversight of traffic signal maintenance.

Through the RTOP, GDOT intends to achieve its vision *"To increase travel throughput by minimizing congestion and reducing delays along regional commuter corridors through improved signal operations".*

[1] "Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2." Report No. ORNL/TM-2004/209. Oak Ridge, TN, USA: U.S. Department of Transportation (U.S. DOT), Oak Ridge National Laboratory, November 2004.
2 2007 National Traffic Signal Report Card, Executive Summary.

# 1 Introduction

This document will serve as the Concept of Operations for the Georgia Department of Transportation (GDOT) Regional Transportation Operations Program (RTOP). The content of this document was developed in accordance with the Federal Highway Administration (FHWA) documents, *Transportation Management Center Concepts of Operations - Implementation Guide* (December 1999) and *Developing and Using a Concept of Operations in Transportation Management Systems, a FHWA Pooled Fund Study* (December 2004).

The RTOP seeks to improve traffic signal operations throughout the Atlanta region by implementing a program of actively managing signal operations on select corridors. The mission of the Program is captured in the Program Mission Statement:

> *To increase travel throughput by minimizing congestion and reducing delays along regional commuter corridors through improved signal operations.*

The RTOP program was formally initiated in the spring of 2010.

## 1.1 Purpose

The purpose of the RTOP Concept of Operations is to provide a clear definition of the objectives of the program and the roles and responsibilities of the parties supporting the program. This document will:

- Recognize the need for a change in signal operations methodology in the Atlanta region;
- Provide an overview of the goals of the RTOP program;
- Document the methodology for selecting corridors to include in the program;
- Provide understanding of stakeholders and the relationship among stakeholders and Georgia DOT; and
- Present the methodology to be used to measure the program's success.

## 1.2 Audience

The RTOP Concept of Operations is directed to participants in the RTOP program and to other agencies which wish to learn more about the program and potentially apply its structure in their jurisdiction. The audience includes the following individuals and groups:

- GDOT Office of Traffic Operations personnel responsible for management and administration of the RTOP program.
- City and county agencies which operate traffic signals under permit to the Department and which participate in the RTOP program.
- GDOT consultant personnel responsible for delivery of the RTOP program.
- Regional stakeholders interested in the goals and objectives of the program.
- Federal, state and local officials and others which are interested in implementing a similar program.

## 1.3 Reference Materials

The RTOP Concept of Operations is based upon other documents and resources which define the approaches to implementing traffic signal and ITS programs in the Atlanta region. These documents include, but are not limited to:

- Atlanta Regional ITS Architecture, July 2004
- NaviGAtor Concept of Operations, August 2007
- National Traffic Signal Report Card, 2007
- MOUs (see Appendix B)

# 2 Current Operational Concept and Need for Change

## 2.1 Current Operational Concept

### 2.1.1 Operations and Maintenance Responsibilities

Maintenance and operations of all freeways and state routes in Georgia is the responsibility of GDOT. On a day-to-day basis, this responsibility is carried out by the GDOT District Offices. The District Office is responsible for maintaining the physical roadway assets (roadway surface, signs and striping, landscape, etc.) as well as operations (access management, safety management, traffic control, incident management, etc.). On the freeway system, the Office of Traffic Operations supplements the activities of the District Offices by supporting the operations of the freeways through the utilization of Intelligent Transportation Systems.

Maintenance and operations of roads other than freeways and state routes is the responsibility of local government agencies. GDOT often supplements the activities of the local agencies by providing support through funding for resurfacing, safety improvements, etc.

Responsibility for maintenance and operations of traffic signals on state routes is often shared between GDOT and local agencies. Operations and maintenance of traffic signals on state routes in Georgia is established by a permit issued by GDOT at the time of the signal installation. Typically, traffic signals on state routes are operated and maintained by the local agencies if the local agencies have the capability to assume this role. In cases where the local agencies do not have the capability to operate and maintain signals, GDOT assumes that responsibility.

Within the Atlanta area, there are over 3,600 traffic signals located on state routes. In most cases, signals on state routes in the Atlanta region are operated and maintained by local agencies. GDOT maintains approximately 575 signals in the Atlanta region, with the majority of those being in unincorporated areas.

The ability of the local agencies to operate and maintain their signals is dependent on the resources assigned to the signal maintenance program. These resources may include human resources responsible for maintenance and operations, equipment for maintenance and upgrades, and other funding sources to provide for outside assistance for maintenance and upgrades. Funding for daily operations and maintenance typically comes through the local agencies' operations and capital budgets.

### 2.1.2 Signal Improvement Programs

In recognition of the need for added investment in signal operations, GDOT has made significant investments statewide in upgrading traffic signal equipment and improved signal operations. Over the last several years, GDOT initiated the following programs:

**Advanced Transportation Controller (ATC)**

In the early 1990's, GDOT recognized the benefits of a standardized statewide hardware and software platform for traffic signals. Prior to this point, there were numerous types of signal controllers throughout the State and the lack of standardization complicated efforts to procure equipment and to

maintain a common platform for all agencies in the State. To address this issue, GDOT began a program to standardize all traffic signal equipment based on the Type 170 standard. In 2002, GDOT formally adopted the next generation 2070/ATC standard and selected a single vendor to provide central office and local controller software statewide.

Recognizing the need to accelerate deployment of the 2070/ATC standard, GDOT initiated the ATC Minor Intersection Upgrade Program to deploy ATC hardware and software. Since this program began, GDOT has placed significant resources in deploying the ATC platform statewide. Efforts include deployment of central software for GDOT Districts and local agencies statewide, training, and upgraded signal controllers at approximately 8,000 intersections throughout Georgia. As a result of these and other efforts, approximately 90+% percent of the signal controllers in the State are now 2070/ATCs.

**Fast Forward Infrastructure Improvements**

In the 2004, Governor Sonny Perdue announced the FAST Forward congestion relief program. This program was developed to make a $15.5 billion investment in transportation over a six year period with a goal of relieving congestion and spurring economic development. A key focus of this program was traffic signal upgrades and synchronization. Through FAST Forward, GDOT invested over $50 million in signal and pedestrian upgrades at over 700 intersections throughout metro Atlanta. Projects included controller/cabinet replacements, LED upgrades, pedestrian upgrades, etc. These efforts supplemented the ATC program by further standardizing signal control equipment throughout metro Atlanta. Upgrades to signal heads and other equipment also resulted in reduced maintenance costs for GDOT and local agencies.

**Metro Atlanta Signal Timing Program**

The Metro Atlanta Signal Timing Program was established in 2005 to build upon previous capital investments by focusing attention on signal timing improvements throughout metro Atlanta. Since the program's initiation, GDOT has retimed over 100 traffic signal systems in the Atlanta region. These efforts documented significant improvements in travel times, reduced stops and delays, and reductions in fuel consumption and emissions. To date, the program has resulted in almost $100M in user cost savings.[3] In addition to GDOT's efforts, several local agencies issued contracts for signal timing improvements.

**Signal Maintenance Contracts**

The Office of Traffic Operations also maintains several signal maintenance contracts to supplement the maintenance activities of GDOT and local agencies. These contracts include:

*Traffic Signal Loop Repair Contracts* – Signal loop replacement locations are identified from GDOT and local agencies. Task orders are issued to contractors to replace defective loops, resulting in less stops and delays.

*Traffic Signal Maintenance Contract* – The Traffic Signal Maintenance Contract is a statewide maintenance program that provides material and labor for signal equipment replacement. This contract is utilized by both GDOT and local agencies.

[3] GDOT Metro Signal Timing Program, Monthly Progress Update, August 2010

*LED Display Upgrades* – Since 2005, GDOT has invested approximately $8.5 million to replace incandescent traffic signals with Light Emitting Diode (LED) technology. LEDs provide vastly improved target value for the driver and significantly reduce power consumption, resulting in improved safety and substantial savings to maintaining agency.

## 2.2 Need for Change

Though the previously described investments have made significant improvements in regional signal operations, several barriers to optimal signal operations remain. These include:

- Routine Maintenance of Equipment – the operating budgets for routine maintenance of signals is insufficient in many agencies. As a result, the capital improvements made by the aforementioned programs can fall into a state of disrepair without adequate investments in ongoing maintenance. Minor equipment failures, such as broken traffic signal detection loops, damaged communications links, and malfunctioning pedestrian push buttons, can have a dramatic impact on the effectiveness of traffic signal timing plans.

- Active Management of Signals – although advancements in technology have improved the ability of traffic signals to adapt to changing conditions, human interaction is needed to routinely monitor and adjust the operations of signals. Changing traffic patterns, incidents and special events are all reasons that agencies should actively monitor and adjust their signals on a continuous basis. However, due to limited resources and other priorities, many agencies in metro Atlanta do not have staff dedicated to active management.

- Cross Jurisdictional Coordination – most all major arterials in the region cross one or more jurisdictional boundaries. While investments in technology have improved the feasibility of cross jurisdictional coordination, agencies are confined to operating and maintaining only the signals in their jurisdiction. As a result, there are often inconsistencies in operating plans across jurisdictional boundaries.

While the significant investments made by GDOT in signal improvement programs have made a positive impact, GDOT recognizes that ongoing, long term investments must be made to overcome the current barriers to efficient operations. With a resolve to overcome these barriers and take operations to a new level of efficiency, GDOT established the Regional Traffic Operations Program (RTOP).

# 3 RTOP System Concept

## 3.1 RTOP Overview

The RTOP was created to invest resources in improving traffic signal operations on major arterials in the Atlanta region by breaking down many of the barriers to efficient signal operations. This will be accomplished by establishing a team of dedicated professionals to focus solely on signal operations and maintenance on these major corridors. Through cooperation with local agencies, GDOT intends to continually invest resources to improve traffic signal operations and maintenance on priority corridors throughout the region.

## 3.2 RTOP Mission

The mission of the RTOP is "*To increase travel throughput by minimizing congestion and reducing delays along regional commuter corridors through improved signal operations".* The RTOP mission will be accomplished by establishing a list of priority corridors and assigning the necessary resources to operate and maintain the signals on those corridors at the optimum level of efficiency. This will be accomplished through close coordination between GDOT and the local agencies responsible for signal operations and maintenance.

## 3.3 Establishment of Priority Corridors

The first step in delivering the RTOP was to establish the corridors which would be the focus of the program. At a high level, GDOT wanted to focus on corridors of regional significance, meaning those corridors that carry high volumes of vehicles and which experience recurring congestion. A secondary focus was to include corridors that were important to mobility throughout the region. While not a minimum criteria, it was anticipated that many of the corridors would cross multiple jurisdictions.

To establish the corridors, GDOT assembled an internal team from the Offices of Traffic Operations and Planning to determine candidate corridors. This team went through a 3-phase process highlighted in Table 3.1:

**Table 3.1 – Evaluation Approach**

| Phase | Evaluation Approach | Results |
|---|---|---|
| 1 | • Qualitative evaluation of the region<br>• Review of the Atlanta Regional Commission Congestion Management Plan<br>• Review of SkyComp congestion data | 10 corridors<br>751 signals<br>16 counties |
| 2 | • Refined corridors based on operational considerations, traffic volumes and lane configurations<br>• Solicited and considered stakeholder input | 15 corridors<br>816 signals<br>13 counties |
| 3 | • Prioritized corridors into groups | Figure 3.1, page 9 |

The first step of this process was to perform a high level analysis of the region and identify an unconstrained list of candidate corridors. Using previously developed planning documents, studies and operational experience, the team developed a list of 10 corridors (approximately 750 signals). During the second step, the team gathered additional stakeholder input and performed a more in-depth analysis to consider actual corridor operations, logical start and end points, etc. Through this analysis, several corridors were added, while others were deleted. As a result, a final list of 15 corridors was developed. Once the list was finalized, the corridors were prioritized based on need. Figure 3.1 presents a map of the finalized list of corridors. Additional details on these corridors can be found in the Appendix.

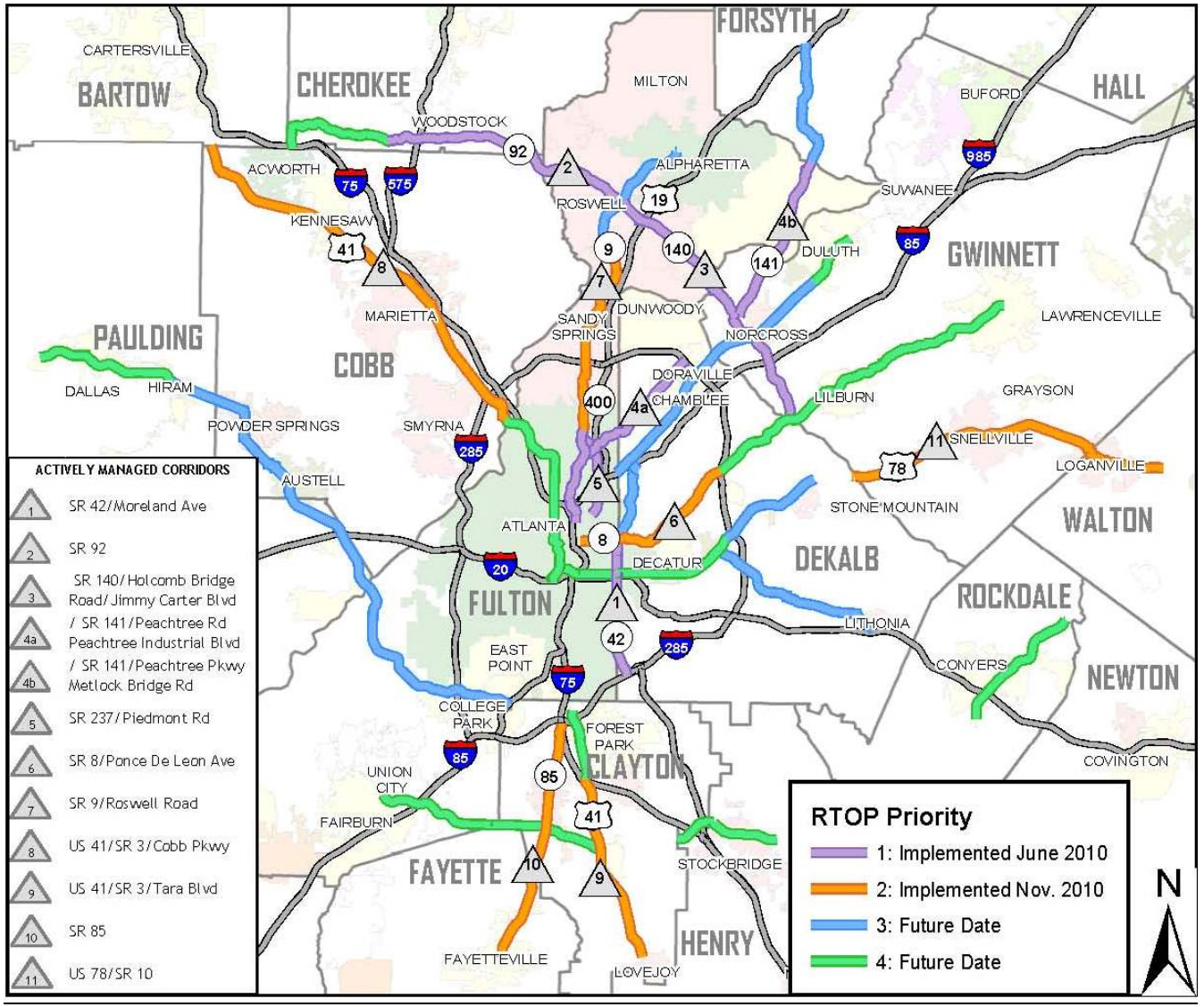


**Figure 3.1 - Map of Prioritized Routes for RTOP**

## 3.4 Operational Concept

The Operational Concept of the RTOP is to establish a partnership between GDOT and local government agencies to collectively operate and manage traffic signal systems. Through the RTOP, GDOT will supplement local agency resources by providing personnel to evaluate the operations and maintenance of the signal systems, develop and implement strategies for improvements, and to provide ongoing support focused on optimizing operations. To be successful, this concept requires commitment from all parties involved.

As the agency ultimately responsible for traffic operations along state routes, GDOT intends to take a leadership role in implementing the program. In this capacity, GDOT will provide overall program management and will dedicate the resources required to implement the program. Local agencies are expected to support the program. This level of support may vary from agency to agency, depending upon the agency's available resources.

The following sections describe the operational concept in detail.

### 3.4.1 Program Management

To manage this program, GDOT established a Regional Traffic Operations Program Manager to execute all aspects of the program. The RTOP Manager is located within the Office of Traffic Operations and reports directly to the State Traffic Operations Engineer. The RTOP Manager is responsible for overall program management, allocation of resources and coordination with local government agencies. Other GDOT staff will support the program from time to time by providing expert advice, procurement support and other services as requested by the RTOP Manager.

Implementation of the RTOP requires significant human resources to provide program planning, field operations support and field maintenance activities. GDOT has limited internal resources to execute the RTOP, so a consultant team was selected to provide program support. The consultant team will provide program planning support, signal timing engineers and technicians to support field operations, and signal maintenance contractors to provide maintenance support. The consultant team was selected through a competitive procurement process and began work in June 2010.

A key component of the consultant team approach is to assign a Corridor Manager to each corridor (or sub-system as applicable). The Corridor Manager has the overall responsibility for managing day-to-day operations on his individual corridor and will be the primary interface between GDOT and the local agency. Corridor Managers are empowered by GDOT to make day-to-day decisions on active management strategies by developing and implementing signal timing changes, and providing maintenance support.

### 3.4.2 Program Components

The RTOP program will have five primary components. Each of these five program components are described below, with detailed descriptions of individual team member roles being described in Table 3.3.

### 1. System Evaluation and Baseline

Once a corridor has been assigned to a Corridor Manager, the Corridor Manager is responsible for conducting an initial analysis of the system. During this analysis, the Corridor Manager will closely coordinate with the local agency to become familiar with the system hardware and operations and to collect data needed to support future activities. The Corridor Manger will also evaluate the current maintenance and operational status of the system and make recommendations to the Program Manager for future system improvements. At the conclusion of this phase, the Corridor Manager should be intimately familiar with the system.

### 2. Active Management

Active management consists of daily activities to support the efficient operations and maintenance of the system. Corridor Managers will perform regular reviews of the system operations by conducting field visits to review the status of system operations and maintenance, and to make real-time adjustments to address operational deficiencies. Corridor Managers, through cooperation with local agencies, will also be responsible for identifying special events and implementing signal timing changes to address their impacts. Corridor Managers also coordinate with active construction projects to update timing to address any change in operations due to construction. The frequency of field visits is dynamic, depending on the variability of traffic, reliability of hardware, and frequency of incidents and/or special events.

### 3. System Maintenance

To maintain optimum operational efficiency, all system components must be properly maintained. As part of their routine duties, each Corridor Manager is responsible for making a periodic check of the system hardware to verify it is operating correctly. When deficiencies are found, the Corridor Manager will immediately make minor repairs when logical to do so. Major repairs, such as those requiring additional equipment, resources, lane closures, etc. will be documented and addressed by the local agency or signal maintenance contractors managed by the consultant team. The Corridor Manger will track reported major repairs until they are completed, and will adjust signal timings if necessary to improve operations in the interim.

### 4. Operations Improvements

Throughout the course of normal operations, the Corridor Managers should identify improvements that could be implemented by upgrading system hardware, installing more advanced equipment, etc. The goal of these operations improvements is to make investments in addressing any items affecting the optimum operations of the system. These investments may include repair and/or replacement of system hardware; installation of advanced hardware and/or software; or improvements to physical infrastructure (signing and marking, turn lane or radius improvements, etc.).

### 5. Performance Monitoring

Monitoring system performance is necessary to identify systems in need of improvement and to quantify the results of the investments made in RTOP. The first component of performance monitoring is the implementation of a performance management strategy on a corridor-by-corridor basis. This strategy will typically include implementation of methods (manual or automated) to collect data on the

system's operational performance. Careful analysis of this data will result in the identification of the systems needing improvement.

The second component of performance monitoring is the development and distribution of performance measure reports. The purpose of these reports is to document the activities completed under the program and the resulting benefits to the traveling public. Field data will be collected, analyzed and presented in regular reports provided to GDOT and local agencies.

### 3.4.3 Roles of GDOT, Consultant and Local Agency

To be successful, the RTOP must be a collaborative effort between GDOT and the local agencies which have operations and maintenance responsibility for the signals in the program. Early in the development of the RTOP, it was recognized that the local agencies have differing levels of resources and abilities to support the program. Several agencies were already doing an excellent job of operating and maintaining their signals and wished to continue in this role, while other agencies had fewer resources to apply. Those agencies with fewer resources are more dependent upon GDOT to supplement their program.

GDOT recognizes the desire of the agencies to participate in the program at varying levels, as such two levels of participation were developed:

***GDOT Lead*** – on systems where GDOT is designated as the lead agency, GDOT will have the responsibility of operations and maintenance of the system. This includes performing system evaluations, performing real-time observations and making timing adjustments, performing hardware upgrades and conducting system maintenance. The local agency will remain responsible for all emergency response and major system repairs.

***Local Lead*** – on systems where the local government is designated as the lead agency, the local agency will continue to assume full responsibility for operations and maintenance of the system. GDOT will assign a Corridor Manager, who will perform routine analysis of system operations and make routine adjustments to signal timing. However, on local lead systems, any changes to system operations or hardware will be reviewed with the local agency prior to implementation.

Further clarification of these two approaches is provided in the table below.

**Table 3.2 – Agency Responsibilities**

| Program Component | GDOT Lead | | Local Lead | |
|---|---|---|---|---|
| | GDOT | Local | GDOT | Local |
| Corridor Signal Timing | X | | X | |
| Timing Adjustments | X | | | X* |
| Maintenance | X | | | X |
| After Hours/Emergency Response | | X | | X |
| Detector, Communication, and Surveillance Repair | X | | X | |
| Peak Hour Management and Monitoring | X | | | X |
| Major Repairs | | X | | X |

*Subject to GDOT Approval

**Table 3.3 – Team Roles**

| | | RTOP Manager | Program Manager | Corridor Manager | Local Agency | |
|---|---|---|---|---|---|---|
| | | | | | GDOT Lead | Local Lead |
| **System Evaluation and Baseline** | **Kickoff meeting with local agency** | ▪ Make initial contact with local agency<br>▪ Attend kickoff meeting | ▪ Attend kickoff meeting | ▪ Conduct kickoff meeting with agency<br>▪ Establish management and communications protocols | ▪ Provide initial feedback on corridor condition<br>▪ Communicate program approach to local agency staff<br>▪ Provide supporting documentation for inventory | ▪ Same as GDOT Lead |
| | **Initial system maintenance and operational evaluation** | ▪ Review reports furnished by Program Manager | ▪ Collect, review and archive inventory<br>▪ Provide summary data to RTOP Manager | ▪ Conduct field inventory<br>– Controller & cabinet hardware/software<br>– Historical counts<br>– Intersection design<br>– Obtain or establish signal permit<br>– Planned projects/construction<br>– Planned special events<br>▪ Prepare inventory data and submit to Program Manager | ▪ Support data collection as needed | ▪ Same as GDOT Lead |
| | **Baseline operations** | | ▪ Document changes to initial signal timing | ▪ Using information from initial system evaluation, update existing signal timing plans | ▪ Provide input on initial signal timing plan updates | ▪ Implement signal timing updates based on Corridor Manager's recommendations or approve Corridor Manger to implement. |
| | **Maintenance recommendations** | ▪ Approve and make comments on suggested recommendations made by Program Manager | ▪ Compile and prioritize recommendations made by Corridor Managers | ▪ Develop recommendations for maintenance repairs for corridors<br>▪ Review recommendations with local agencies | ▪ Advise Corridor Manager of known maintenance issues and recurring problems | ▪ Work with Corridor Manager to identify maintenance issues and to develop a corrective action plan<br>▪ Provide a plan/schedule for addressing maintenance requirements |
| | **System surveillance, monitoring and operational improvement recommendations** | ▪ Review and approve recommendations | ▪ Summarize recommendations and submit to RTOP Manager for approval | ▪ Develop recommendations for system enhancements that could improve operational performance | ▪ Provide input into needed recommendations<br>▪ Review final recommendations and consult with RTOP Manager on implementation strategy | ▪ Same as GDOT Lead |

| | | RTOP Manager | Program Manager | Corridor Manager | Local Agency | |
|---|---|---|---|---|---|---|
| | | | | | GDOT Lead | Local Lead |
| **Active Management** | **Field reviews and remote monitoring** | ▪ Periodically review corridor operations<br>▪ Liaise with local agency | ▪ Receive complaints and assign to Corridor Manager | ▪ Monitor corridor operations and update timing on a regular basis<br>▪ Identify equipment failures and initiate repairs<br>▪ Identify needs for changes to improve corridor operations<br>– Phasing changes<br>– New timing plans<br>▪ Maintain permits | ▪ Review and approve all changes to signal timing and operational strategies<br>▪ Provide feedback on system operations | ▪ Review all changes to signal timing and operational strategies prior to or shortly after implementation with the Corridor Manager<br>▪ Remotely monitor the corridor during peak commuter travel times |
| | **Respond to trouble calls and requests** | ▪ Advise Corridor Manager of any trouble calls or maintenance requests received from local agency or general public | ▪ Advise Corridor Manager of any trouble calls or maintenance requests received from local agency or general public | ▪ Respond to trouble calls and maintenance requests<br>▪ Initiate timing changes or minor repairs in response to request<br>▪ Respond to trouble calls involving emergency conditions and after hours<br>▪ Notify local agency of emergency conditions or major repairs | ▪ Coordinate with Corridor Manager and contractor as needed on minor repairs | ▪ Initiate repairs of problems identified by Corridor Manager |
| | **Monitoring and management of incidents and special events** | ▪ Advise Program Manager and Corridor Manager of planned special events<br>▪ Assist in coordinating response to major events with local agency | ▪ Advise Corridor Manager of planned special events<br>▪ Assist in coordinating response to major events with local agency | ▪ Initiate special timing plans for planned special events and holidays<br>▪ Provide on-site management during planned special events<br>▪ Respond to unplanned events | ▪ Identify potential events which may impact signal operations and alert Corridor Manager | ▪ Identify potential events which may impact signal operations and alert Corridor Manager<br>▪ Collaborate with Corridor Manager to develop and implement strategies to manage incidents and special events |
| | **Monitoring of construction and coordination with contractors** | ▪ Alert Program Manager and Corridor Manager of construction projects | ▪ Advise Corridor Manager of construction projects | ▪ Communicate with Contractor regarding construction project schedule and expected impacts<br>▪ Initiate special timing plans to mitigate impacts of construction and any new lane configuration | ▪ Identify potential projects which may impact signal operations and alert Corridor Manager | ▪ Identify potential projects which may impact signal operations and alert Corridor Manager<br>▪ Collaborate with Corridor Manager to develop and implement strategies to mitigate impacts of construction and any new lane configuration |

| | | RTOP Manager | Program Manager | Corridor Manager | Local Agency | |
|---|---|---|---|---|---|---|
| | | | | | GDOT Lead | Local Lead |
| **System Maintenance** | **Issue reporting, tracking and management** | ▪ Review and approve methods and format of reporting<br>▪ Issue requirements and goals for responsiveness and functionality | ▪ Implement and maintain issue reporting, tracking and management system<br>▪ Receive maintenance requests and issue work order to contractors | ▪ Develop reports indicating system functionality and work orders to repair system components that are not functioning<br>▪ Notify local agency of issues that cannot be resolved by the program | ▪ Participate in development of issue tracking mechanism | ▪ Participate in development of issue tracking mechanism<br>▪ Request Corridor Manager to repair communications, detection and surveillance (ifLocal Agency is unable to repair in a timely manner) |
| | **Maintenance** | ▪ Review and approve forms and procedures proposed by Program Manager | ▪ Prepare and maintain forms and procedures for preventative maintenance<br>▪ Direct preventative maintenance efforts with Traffic Signal Technicians<br>▪ Procure materials from GDOT for preventative maintenance tasks | ▪ Provide oversight of maintenance repairs | ▪ Provide emergency response maintenance (indication failures, flash, knockdowns, etc.) | ▪ Provide emergency response maintenance (indication failures, flash, knockdowns, etc.)<br>▪ Perform routine maintenance<br>▪ Perform preventative maintenance |
| **Operations Improvements** | **Regional monitoring and management system implementation** | ▪ Review and approve plan for monitoring and system design | ▪ Prepare plan for monitoring and system design | ▪ Provide input to Program Manager as requested | ▪ Provide input to RTOP and Program Manager in order have local agency perspective in design of system and selection of monitoring plan | ▪ Same as GDOT Lead |
| | **Equipment Upgrades** | ▪ Review recommendations for new equipment<br>– Authorize upgrades under project<br>– Negotiate upgrades through other methods | ▪ Review and prioritize recommendations for new field equipment | ▪ Develop recommendations for signal equipment and communications upgrades which improve system operations and performance<br>▪ Develop work order for signal upgrades | ▪ Perform signal upgrades with cooperation of local agency | ▪ Assist GDOT as needed |
| | **Operational and safety upgrades** | ▪ Review and approve plans for recommended operational improvements<br>▪ Where appropriate, initiate improvements through GDOT programs | ▪ Summarize recommendations and submit to RTOP Manager for approval | ▪ Develop recommendations for operational improvements (signing, striping, etc.)<br>▪ Maintain plan to improve operations along corridor | ▪ Cooperate with GDOT on making improvements<br>▪ Inform Corridor Manager of upcoming capital or operational projects that will impact corridor operations | ▪ Same as GDOT Lead<br>▪ Inform Corridor Manager of upcoming capital or operational projects that will impact corridor operations |

| | | RTOP Manager | Program Manager | Corridor Manager | Local Agency | |
|---|---|---|---|---|---|---|
| | | | | | GDOT Lead | Local Lead |
| **Performance Monitoring** | **Establish performance monitoring and management system** | ▪ Review and approve performance measure strategies<br>▪ Identify performance measures to be tracked | ▪ Plan, develop and implement system to capture performance measure data<br>▪ Coordinate data collection with Corridor Manager and subconsultants | ▪ Develop recommendations for performance management strategy on a corridor-by-corridor basis<br>▪ Collect performance measurement data and report to Program Manager | ▪ Track measures of effectiveness as outlined in the MOU | ▪ Track measures of effectiveness as outlined in the MOU |
| | **Produce performance measure reports** | ▪ Distribute performance measure reports to GDOT management and other stakeholders | ▪ Manage production and distribution of performance measure reports<br>▪ Compile reports from Corridor Managers | ▪ Develop recommendations for performance management strategy on a corridor-by-corridor basis<br>▪ Collect performance data from Local Lead agencies<br>▪ Compile and summarize inventory of functioning and non-functioning detection, communications and surveillance devices | ▪ Update the Corridor Manager on any repairs to detections and communications issues<br>▪ Review and provide comment on reports | ▪ Provide performance data to Corridor Managers |

# 4 Performance Management

GDOT is making a significant investment in the RTOP program with the goal of increasing travel throughput by minimizing congestion and reducing delays along the corridors included in the RTOP. In order to maintain continued support for the RTOP, it is important to define the effectiveness of the program through the use of performance measures. Performance measures will serve as the basis of measuring progress towards meeting the program mission. Performance measurement for the RTOP will generally fall into two categories – output and outcome measures. These categories are further defined below.

## 4.1 Output Measures

Output measures are focused on the performance of particular aspects of the program and typically seek to measure individual actions or performance of one element of the system. For instance, output measures would include performance of the field equipment and can be used as an indicator of the effectiveness and efficiency of the field operations. Output measures do not directly measure the system throughput, but rather serve as a measure of how effectively the system is being maintained and how quickly problems are addressed. By maintaining system hardware and quickly responding to customer complaints, optimum system performance is achieved.

| Measure | Goal |
|---|---|
| Vehicle Detection Devices | >95% operational |
| Pedestrian Detection Devices | >95% operational |
| Complaint Response Time | <24 hours |
| Proactive Identification of Equipment Malfunctions | >70% of malfunctions detected by Corridor Managers |

## 4.2 Outcome Measures

Outcome measures are focused on the overall effectiveness of the program. As opposed to output measures, outcome measures seek to serve as an indicator of the progress the program makes towards meeting its mission of improving system throughput. Outcome measures also gauge customer satisfaction, which is an important measure in maintaining support for the RTOP investment.

| Measure | Goal |
|---|---|
| Complaint Response Time | <24 hours |
| Travel Times (twice per year per corridor) | Improvement over baseline measurement and no increase in subsequent periods |
| Throughput | Increase in volumes less than percent increase in stops and delay |
| Customer Satisfaction Surveys | TBD (specific goals will be developed during survey design) |
| Travel Time Reliability | TBD |
| Queue Studies | Qualitative evaluation of the impact of the program on side street queues and delays |

# 5 Operational Scenarios

These scenarios demonstrate how the RTOP can function in typical situations.

## 5.1 Construction/Incident Scenario

*In this scenario, there is a water main break which causes a major disruption to traffic along a state route.*

At around 1:30 on a Wednesday afternoon, a water main breaks along Piedmont Road at its intersection with Lindbergh Drive in the City of Atlanta. City of Atlanta police respond to the incident and find that a significant amount of water is leaking from the main resulting in a small sinkhole under the right lane northbound. The sinkhole has made the pavement under the right lane unstable and unsafe for vehicular travel.

After responding to the incident, the Atlanta Police contact the GDOT TMC to alert them of the situation. The Atlanta Police advise GDOT that the City of Atlanta Department of Watershed Management is responding to the scene and requests support from GDOT to provide traffic control and pavement repair. GDOT TMC operators locate the scene on a CCTV camera and contact GDOT District 7 Maintenance forces to respond.

Given the time of day, traffic is relatively light and only minor backups are occurring. However, TMC personnel recognize that the incident will continue through the rush hour severely affecting northbound commuter traffic on Piedmont Road. TMC operators enter the incident into the Navigator system and post messages on I-85 northbound and southbound advising motorists of the incident.

The GDOT RTOP Manager receives notification of the incident from GDOT TMC operations. He immediately contacts the RTOP Program Manager and Corridor Manager to advise each of the situation. The RTOP Corridor Manager responds to the incident at 3:00 p.m. In assessing the situation, the RTOP Corridor Manager sees that one of three northbound lanes on Piedmont Road is blocked and emergency vehicles are causing rubbernecking in the area.

Using his prior knowledge of the operations along the corridor, the RTOP Corridor Manager determines that the PM rush hour traffic will be affected by the lane restrictions. To address the situation, he decides to add time to the Piedmont Road splits to give additional time to the northbound movement. The Corridor Manager recognizes that the increased split on Piedmont Road has to come from the side street (Lindbergh Drive), but understands the importance of maintaining flow on the mainline.

After the split changes are made, the Corridor Manager observes traffic through the rush hour. Due to the change in split times, offsets are affected at adjacent intersections. The Corridor Manager observes traffic flow and makes minor offset changes at adjacent signals to accommodate the changed splits.

On the day following the incident, the Corridor Manager meets with the RTOP Manager and Program Manager to discuss the situation. After consultation with District 7, they find that the pavement repairs will be made over the weekend and the lanes will be reopened to traffic on Sunday evening. Weekend traffic is expected to be light and no special events are expected along the corridor, so a decision is made to not change the weekend plans. Instead, the RTOP Manager consults with the City of Atlanta

and GDOT TMC and asks that they monitor operations via CCTV and contact the Corridor Manager if significant backups occur.

The Corridor Manager revisits the intersection on Thursday and Friday afternoons to continue to monitor operations. Minor split and offsets changes are made to continue to adjust to the traffic demands.

On Sunday afternoon, the Corridor Manager visits the site. After consultation with on-site maintenance personnel, he determines that the lanes will be re-opened Sunday evening. The Corridor Manager then downloads the original timing plans into the system in expectation of normal traffic flows on Monday.

## 5.2 Incident/Detour Scenario

*In this scenario, there is a freeway incident which causes a closure and results in a detour of traffic to a state route.*

At approximately 4:00 AM on a Friday, 911 operators receive several calls regarding an incident on southbound I-75 south of the SR 92 interchange in Cobb County. The police respond to the call and find the mangled remains of a Honda Accord and tanker truck blocking the outside lane.

After successfully freeing the drivers from the vehicles, an officer notices contaminants beginning to leak onto the roadway from the tanker truck. The commanding officer contacts emergency management officials to request HAZMAT support to assess and clean up the spill. A HAZMAT team arrives at 4:45 A.M. and determines that all southbound lanes have to be closed until cleanup is complete sometime during the early afternoon thus affecting the morning commute.

The GDOT TMC is contacted to determine a viable detour route which will be least disruptive to the morning commute. Based on anticipated volumes and proximity to the SR 92 interchange, TMC personnel propose the following detour route: SR 92 westbound to US 41 southbound to Barrett Parkway to I-75.

Since US 41 is among the actively managed corridors of the RTOP program, the GDOT TMC notifies the RTOP Corridor Manager of the proposed detour plan. The RTOP Corridor Manager immediately notifies all of the agencies impacted by the detour and communicates the proposed plan to mitigate the anticipated volume increases. The RTOP manager arrives at the corridor at 6:00 A.M. where he implements the proposed mitigation plan, which includes changes to intersection splits and offsets beginning at the intersection of SR 92 and the I-75 interchange and ending at the intersection of Barrett Parkway and the I-75 interchange creating a southbound “flush” of the detoured traffic. The Corridor Manager changes the offsets to provide 100% progression in the southbound direction along US 41 and increases the split times for the southbound phases. Once the cleanup is complete and I-75 southbound is reopened, the RTOP corridor reverts to the normal plan and monitors the corridor to ensure normal operation is restored.

## 5.3 Detection Failure Scenario

*In this scenario, there is a dense fog in a low area affecting the video detection at an intersection along a State Route.*

At around 6:00 AM on a Tuesday morning, the RTOP Corridor Manager actively managing the SR 92 corridor notices vehicles in the left turn lanes on SR 92 and on Sandy Plains Road are not being serviced. The Corridor Manager proceeds to the traffic signal cabinet, checks the equipment and database to ensure that the video detection is working properly and assigned to the correct outputs.

While at the cabinet the Corridor Manager notices all phases are being serviced and verifies that the detection equipment is working properly. The Corridor Manager continues along the corridor verifying that traffic is moving efficiently throughout the system. On his return run, the Corridor Manager observes vehicle congestion worsening as he approaches the Sandy Plains Road intersection. Thinking there may be an incident impeding traffic the Corridor Manger approaches the intersection with caution. However, as he nears the intersection he notices vehicles spilling back from the left turn lanes on SR 92 into the through lanes thus impeding the through movement and therefore reducing the capacity and efficiency of the system.

The Corridor Manager immediately proceeds to the traffic signal cabinet to check on the status of the video detection and notices that as a result of the dense fog, the video detection is not consistently detecting vehicles in the left turn lanes. To mitigate the detection issue, the Corridor Manager manually places a recall on the left turn phases which will result in a green phase for the left turns. Additionally, the Corridor Manager places a temporary hold on the left turn phase green to clear left turning vehicles spilling back into the through lanes. Once the left turn vehicle queues have been cleared, the Corridor Manager removes the hold on the left turn phase and places a temporary hold on the through vehicle phase to reduce the through congestion to levels which are typical during the morning commute. The temporary hold on the through green is removed and the intersection is monitored for several cycles to ensure all phases are being called. The Corridor Manager continues the normal monitoring of the corridor and removes the constant call on the left turn phases once the fog has lifted and detection is operating properly.

# 6 Appendix

## Appendix A

| | Route | Begin | End | # of Signals | Counties |
|---|---|---|---|---|---|
| **Priority Group 1** | SR 140/Holcomb Bridge Rd/ Jimmy Carter Blvd | SR 9/Alpharetta Hwy | I-85 | 38 | Fulton, Gwinnett |
| | US 78/SR 10 | E Park Place (End of Freeway Section) | SR 124/Scenic Hwy | 15 | Gwinnett |
| | SR 141/Peachtree Rd/ Peachtree Industrial Blvd/ Peachtree Pkwy/ Medlock Bridge Rd | SR 9/Roswell Rd | Deerlake Dr | 65 | Fulton, DeKalb, Gwinnett, Forsyth |
| | SR 92 | Downsby Ln | SR 9/Alpharetta Hwy | 35 | Cherokee, Fulton |
| | SR 42/Moreland Ave | I-285 (South Side) | SR 8/Ponce De Leon | 28 | Fulton, DeKalb |
| | SR 237/Piedmont Rd | Monroe Dr | SR 9/Roswell Rd | 21 | Fulton |
| **Priority Group 2** | SR 8/Ponce De Leon | Juniper St | Montreal Rd | 39 | Fulton, DeKalb |
| | SR 85 | Grady Ave | I-75 | 35 | Fayette, Clayton |
| | US 41/SR 3/Tara Blvd | Lovejoy Rd | Morrow Rd | 24 | Clayton |
| | SR 9/Roswell Rd | Deering Rd | Azalea Dr | 59 | Fulton |
| | US 41/SR 3/Cobb Pkwy | Howell Mill Rd | Lake Acworth Dr | 66 | Cobb |
| **Priority Group 3** | SR 6/Camp Creek Pkwy/ Thorton Rd | Conley Rd | Pace Rd | 48 | Fulton, Douglas, Cobb, Paulding |
| | SR 42/Briarcliff Rd, N Druid Hills Rd | SR 8/Ponce De Leon | Sheridan Rd | 16 | Fulton, DeKalb |
| | SR 9/Roswell Rd | Azalea Dr | Mayfield Rd | 20 | Fulton |
| | SR 141/Medlock Bridge Rd/ Peachtree Pkwy | Laurel Springs Pkwy | SR 9/Atlanta Hwy | 11 | Forsyth |
| | SR 10/Memorial Dr | Mountain Dr | Goldsmith Rd | 21 | DeKalb |
| | US 78/SR 10/Athens Hwy | Henry Clower Blvd | Main St | 11 | Gwinnett, Walton |
| | SR 13/Buford Hwy | Sidney Marcus Blvd | Pleasant Hill Rd | 44 | Fulton, DeKalb, Gwinnett |
| | SR 12/Covington Hwy | SE 154/Memorial Dr | Evans Mill Rd | 19 | DeKalb |
| **Priority Group 4** | SR 138 | Jonesboro Rd | Boar Tusk Rd | 48 | Fulton, Clayton, Henry, Rockdale |
| | SR 8/Lawrenceville Hwy | Northlake Pkwy | Johnson Rd | 36 | DeKalb, Gwinnett |
| | US 41/SR 3/Metropolitan Pkwy/Northside Dr/Dixie Hwy | Johnson Rd | Moores Mill Rd | 39 | Clayton, Fulton |
| | SR 154/Memorial Dr | Prior St | Mountain Dr | 40 | Fulton, DeKalb |
| | SR 92 | I-75 | Concord Ln | 10 | Cobb, Cherokee |
| | SR 6/Jimmy Campbell Pkwy | Atlanta Hwy | Buchanan Hwy | 8 | Paulding |
| | SR 9/Spring/W. Peachtree | Techwood Dr | Buford Connector | 16 | Fulton |
| | SR 10/Lawrenceville Hwy | Cown Dr | Bay Creek Church Rd | 5 | Walton |
| | SR 13/Buford Hwy | Pleasant Hill Rd | Old Peachtree Rd | 3 | Gwinnett |

# Appendix B

Insert MOUs