
MAG Regional Concept of Transportation Operations

Guidelines for Regional Transportation
Operations

January 7, 2004



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1. OVERVIEW

The purpose of the Guidelines for Transportation Operations is to assist agencies in implementing the Regional Concept of Transportation Operations (RCTO) project recommendations. These guidelines consider the multi-modal nature of the regional transportation system and incorporate practical transition paths for reaching operational goals.

This document contains agreed procedures to be followed by RCTO Stakeholders in jointly operating and maintaining the surface transportation system in the MAG Region. These guidelines are intended to facilitate coordination of the transportation facility operation, with the objective of improving conditions for travelers.

Table 1-1 illustrates the correlation between the chapters in these Guidelines and the functions identified in the development of the RCTO.

These functions have been categorized as being local, local/regional, and/or regional in nature. **Figure 1-1** illustrates the relationship between the local functions, local/regional functions, and regional functions.

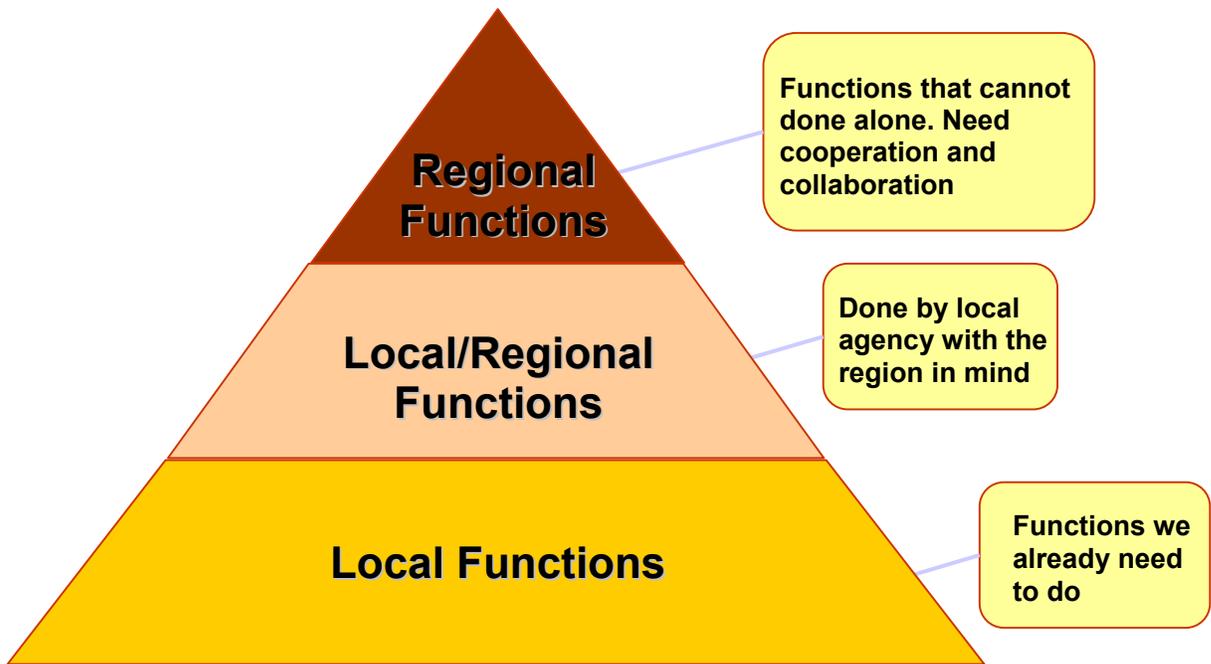


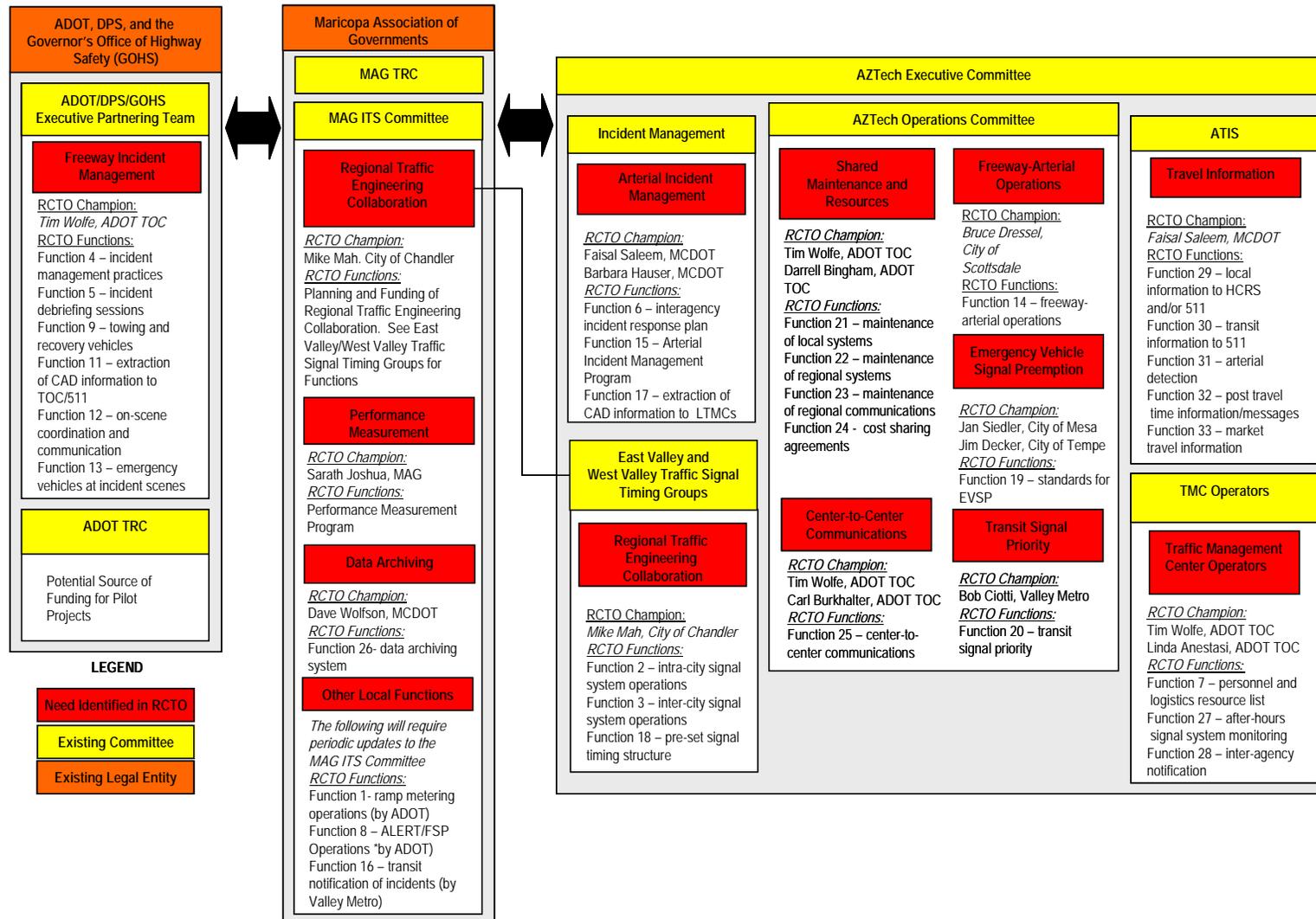
Figure 1-1 – Relationship between Local and Regional Functions

An institutional oversight and scoping framework has been developed to guide the implementation of the functions shown in **Table 1-1**. The relationships between the functions themselves and the individual initiatives within this oversight and scoping framework are shown in **Figure 1-2**.

Table 1-1 – Correlation between Chapters in this document and agreed Operational Functions

Category	Function Description	Chapters →	Section 5: Corridor Management	Section 6: Operations at the Freeway/Arterial Interface	Section 7: Inter- Jurisdictional Signal Coordination	Section 8: Incident Management	Section 9: Information Exchange	Section 10: Regional Maintenance Practices
		Function ↓ Categories						
Freeway Mobility	1. Freeway system ramp metering operations and maintenance	Local/regional		■				
Arterial Mobility	2. Traffic signal systems operations, including the optimization of within-city intersections	Local	■					
	3. Traffic signal operations of cross-border traffic signals and regional arterials	Local/regional	■	■	■			
Freeway Incident Management	4. Develop agency-specific incident management practices that will result in reduced incident clearance times	Local/regional				■		
	5. Participate in incident debriefing sessions after large incidents with representatives of public safety and emergency management	Regional				■		
	6. Develop and maintain an interagency incident response plan	Regional				■		
	7. Develop and maintain a comprehensive personnel and logistics resource list	Regional				■		
	8. Integrate Freeway Service Patrol (FSP) and ADOT ALERT Team Operations	Regional				■		
	9. Improve pre-qualified list of towing and recovery vehicles	Regional				■		
	10. Improve public education of quick clearance laws	Regional				■		
	11. Facilitate agreements between agencies for the extraction of CAD information to travel information services and ADOT TOC	Local/regional				■	■	
	12. Facilitate development of practices for on-scene communication	Regional				■		
	13. Facilitate improvement of best practices for placement of emergency vehicles at incident scenes	Regional				■		
Freeway-Arterial Interface	14. Plan, deploy, operate, and maintain a research freeway-arterial corridor operations pilot project	Regional		■				
Arterial Incident Management	15. Develop, implement, and maintain Arterial Incident Management program	Regional				■		
	16. Facilitate practices for transit operators to notify TCC of incidents, congestion, etc.	Local/regional				■	■	
	17. Facilitate agreements between agencies for extraction of CAD information to Local Traffic Management Centers (LTMCs)	Local/regional				■	■	
	18. Develop regional pre-set signal timing structure and criteria for signal timing plan changes during incidents	Regional	■		■	■		
	19. Develop regionally accepted standard for emergency vehicle signal preemption	Local/regional	■		■	■		
Transit Mobility	20. Plan, deploy, operate, maintain and evaluate a transit signal priority pilot project	Local/regional	■		■			
Maintenance and Reliability	21. Traffic signal systems maintenance and repair, including field devices and central system	Local						■
	22. Maintenance of central control systems, including regional systems housed in the ADOT TOC	Local/regional						■
	23. Maintain regionally significant communications (fiber-optic, other) lines	Regional						■
	24. Develop and maintain cost sharing agreements such as pooled funding, JPAs, manage multi-jurisdictional resources (shared human resources, equipment, etc.)	Regional						■
Multi-agency Coordination	25. Establish center-to-center communications between agencies	Regional					■	
	26. Develop and implement a regional data archiving system	Regional					■	
	27. Facilitate/provide after-hours/extended hours monitoring of traffic signal systems	Regional	■		■		■	
	28. Facilitate practices to notify other agencies of incidents/work zones that may significantly impact traffic	Local/regional					■	
	29. Provide work zone and incident and transit information to HCRS and/or 511	Local/regional					■	
Traveler Information	30. Integrate transit information with travel information services (e.g. Provide AVL data to 511)	Local/regional					■	
	31. Develop practices for collecting information from arterial detectors	Regional					■	
	32. Post travel time information/messages on freeway and arterial VMS and on Internet	Regional	■	■			■	
	33. Market travel information services	Regional	-	-	-	-	-	-
Other	34. Performance measurement	Regional	■	■	■	■	■	■

Regional Concept of Transportation Operations: Oversight and Scoping Framework



LEGEND

- Need Identified in RCTO
- Existing Committee
- Existing Legal Entity

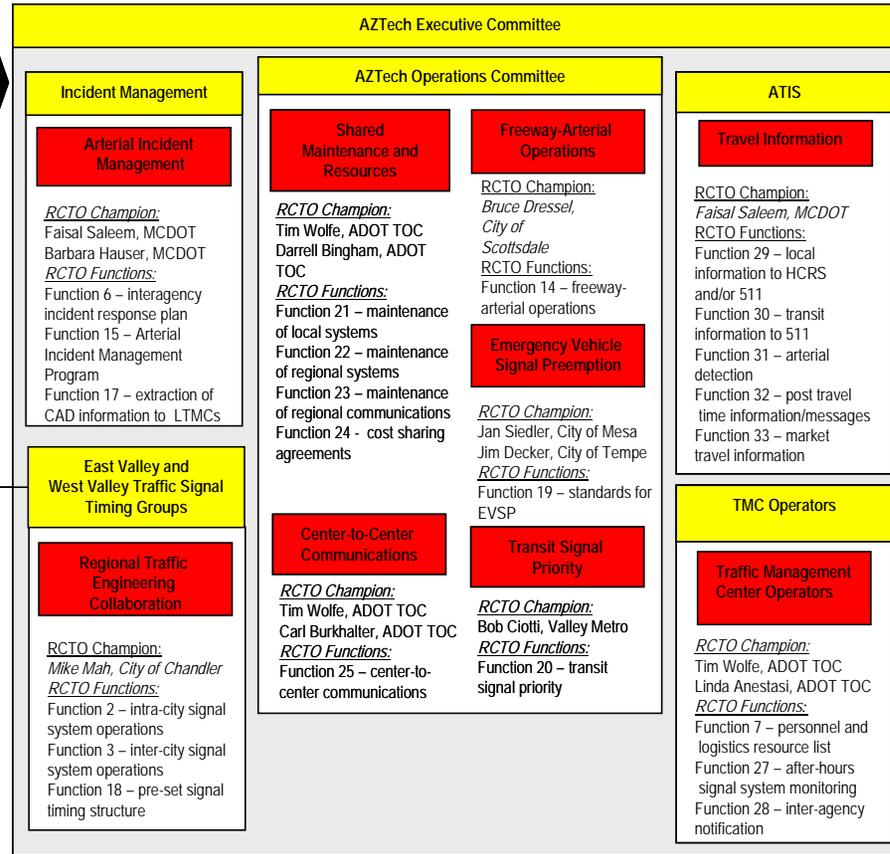
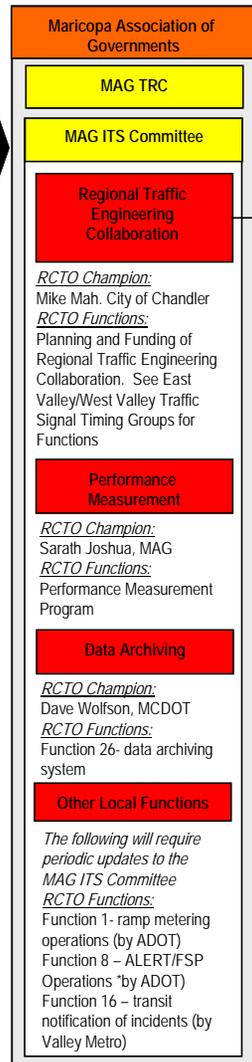


Figure 1-2 – Relationship between Local and Regional Functions

2. MEMORANDUM OF UNDERSTANDING

This section contains the complete text and signature pages of the Regional Concept of Transportation Operations Memorandum of Understanding.

2.1 Introduction

The undersigned agencies have worked together in calendar year 2002 and 2003 to develop a Regional Concept of Transportation Operations. The Regional Concept of Transportation Operations is a regional strategy for achieving improved operations of the surface transportation system. It describes what activities are to be accomplished over the next 3 to 5 years, how they will be accomplished, and the resources required. The Regional Concept of Transportation Operations delineates responsibilities of city, county, and state agencies that, when enacted, will help to make the elements of the surface transportation system work better and together.

Transportation operations is making the best use of the existing transportation system by providing integrated systems and services that preserve and improve the system's performance in anticipation of or in response to both recurring and non-recurring conditions. Operations include a range of activities including: routine traffic and transit operations, public safety responses, incident management, inclement weather management, network/facility management, planned construction disruptions, and traveler information. While static traffic control devices, such as roadway signs and striping have a significant impact on the performance of the system, and are an essential part of operations addressed elsewhere, they are not considered part of 'operations' in the context of the MAG Regional Concept of Transportation Operations.

The purpose of this Memorandum of Understanding (MOU) is to affirm the MAG member agencies' commitment to partnership in transportation operations. By signing this MOU, agencies are taking a significant step towards increasing the safety and reliability of travel within the MAG region, creating efficiency in the delivery of transportation services and infrastructure and smoothing transitions between city boundaries. MAG Region transportation system managers believe that when appropriate resources and funding levels are made available for operations and management, significant improvements to the transportation system in the MAG Region can be realized. These actions will result in a safer and more effective environment for first responders and transportation operations staff, and will greatly improve the quality of life in the MAG Region.

There is a growing national focus on regional operations cooperation and collaboration. The upcoming federal transportation funding reauthorization bill, entitled Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA), indicates that regional transportation operations collaboration and coordination will likely be added to the list of eligible activities under the Surface Transportation Program, which potentially opens up a new funding source for transportation operations. In addition, development of a regional concept of operations is likely to be necessary for a region to qualify for such funding. The MAG region is well ahead of other U.S. metropolitan areas in development of a regional concept of operations.

This MOU is not a legally binding contract, and does not represent an authorization for funding.

2.2 Mission and Vision of the Regional Concept of Transportation Operations

Vision: A safe, reliable, efficient and seamless surface transportation system for the MAG Region.

Mission: This will be achieved through:

- Identifying and securing funding sources;
- Actively managing and operating multimodal transportation systems;
- A high degree of information sharing, integration and coordination;
- Defining and agreeing to appropriate roles and responsibilities;
- Establishing and implementing applicable policies, procedures, and practices;
- Dedicating and training human resources; and
- Continuous improvement of performance against customer driven indicators.

2.3 Responsibilities of the Undersigned

The undersigned agree to engage in the roles and responsibilities identified in the Regional Concept of Transportation Operations. These roles and responsibilities are identified under the following categories:

- Arterial Mobility;
- Arterial Incident Management;
- Freeway Mobility;
- Freeway Incident Management;
- Operations at the Freeway-Arterial Interface;
- Transit Mobility;
- Maintenance and Reliability;
- Multi-Agency Coordination; and
- Travel Information;
- Performance Measurement.

The undersigned commit, based on available resources, to implement the Regional Concept of Transportation Operations as outlined in the Final Report. Resources required include both personnel and funding for planning, implementation, operations, and maintenance of local and regional transportation systems.

The undersigned will continue to cooperate in the development and implementation of policies and practices to facilitate the above named roles, responsibilities, and functions by participating in oversight and scoping that includes, but is not limited to, the following:

- Regional Transportation Operations Coordination;
- EMS/Public Safety/Transportation Incident Management;
- Freeway-Arterial Coordination;
- Transit Signal Priority;
- Shared Maintenance and Resources;
- Center-to-Center Communications;
- Archived Data;
- Local Traffic Management Centers/ADOT Traffic Operations Center Operators Coordination;
- Travel Information Collection and Dissemination;
- Emergency Vehicle Signal Preemption Standards;

- Regional Traffic Engineering Assistance;
- Education and Outreach; and
- Performance Measurement.

The undersigned will disseminate the information in this MOU and notify all affected employees of the agency's participation in the Regional Concept of Transportation Operations.

2.4 Conclusion

The undersigned agency hereby supports the Regional Concept of Transportation Operations Final Report, dated 2003, and pledges to coordinate and cooperate with the other MAG member agencies that are signatories to this MOU in surface transportation systems operations in the MAG Region to make the elements of the surface transportation system work better and together.

Agency Name: (All MAG member agencies including MAG to sign on individual sheets and then to be added to MOU.)

Signed: _____

Name: _____

Title: _____

Date: _____

On October 22, 2003, the MAG Regional Council unanimously approved the Memorandum of Understanding for the MAG Regional Concept of Transportation Operations.

3. REVISION HISTORY

The purpose of this section is to implement a system to track revisions and changes to the Guidelines. It is anticipated that as the Guidelines are utilized, and as additional needs are realized, modifications will be made to the document. The RCTO stakeholders have agreed that MAG should maintain the contents of this Guidelines document.

The procedures contained within this document may be expanded and altered as conditions and stakeholder needs change. Proposed changes to procedures in the Guidelines should be submitted to the MAG ITS Committee for consideration and incorporation in the Guidelines. When changes are approved, the pages or sections with changes should be distributed to all involved parties through the MAG website.

Table 3-1 is a sample documentation of revision history.

Table 3-1 – Sample Revision History Table

Section	Author	Notes	Date Accepted
5.1.2	Chandler Traffic Engineer	Added section on Emergency Vehicle Preemption Operations to Inter-Jurisdictional Signal Coordination Chapter, replacing pages 7-2 to 7-5	5/15/2004

4. PERSONNEL AND EQUIPMENT CONTACT LIST

This chapter (and all others except for Corridor Management and Operations at the Freeway/Arterial Interface) will initially not be fully developed as part of the RCTO. The intent is that the contents of this section will be developed as part of the activities RCTO Traffic Management Centers Operators Initiative. However, the following suggestions have been included for future chapter development.

This section will contain a list of telephone contact numbers and a catalog of available agency resources to facilitate coordinated inter-agency response. Eventually, the list should identify basic contacts that respond to incidents within a geographic area, and a catalog listing of manuals or guides that will speed response and reduce incident duration by providing responders with a readily available data source.

The emergency contact lists maintained at the ADOT TOC will provide a foundation for this section. The lists maintained at the ADOT TOC include contact information for DPS, statewide emergency maintenance, and statewide construction personnel. A separate binder is maintained for each ADOT district and is not available electronically.

The list developed for this section should include geographic agency responsibilities, radio frequencies, talk groups, primary and back-up phone numbers (pagers and 24-hour contacts), fax numbers, catalog of equipment material, and personnel with special skills. It is anticipated that the list will be web-based, facilitating distribution and regular updates of the list.

Examples of special services or equipment that may help resolve major freeway incidents or transportation emergencies include the following:

- Highway construction, maintenance, and environmental contractors;
- Traffic control contractors, barrier wall suppliers;
- Trucking services, dumps, flatbeds, and roll-off dumpsters;
- Heavy equipment rental, end loaders, cranes, street sweepers;
- Truck tire and heavy equipment repair services;
- Temporary manpower;
- Livestock handling, transportation, and rendering services;
- Sand, soda, lime, and absorbents;
- Special purpose and heavy duty towing and recovery equipment and personnel;
- Transportation Services (bus companies, public transit contacts); and
- Grain loading equipment.

Contact information for the following should be included:

- Arizona Department of Public Safety;
 - FSP;
- Arizona Department of Transportation;
 - Traffic Operations Center
 - ALERT;
 - Emergency Maintenance Operations;
- All MAG Member cities (typical for all cities);

- Traffic Management Center;
- Police Department (non-emergency);
- Fire Department (non-emergency);
- Emergency Maintenance Operations; and
- REACT.

5. CORRIDOR MANAGEMENT

Corridor management generally refers to the management of corridors that either consist of one major arterial and other parallel arterials, or the management of parallel freeway and arterial facilities. Freeway, arterial, transit, and emergency management systems can be coordinated and operated as an integrated system. This involves managing the transportation system as a whole, rather than distinguishing between freeways and arterials. This also includes utilizing transit and emergency management services to improve corridor operations.

Traffic condition data from vehicle detectors, conditions viewed by CCTV, and incident information from CAD systems all provide input into the operation of the freeway, arterial, and transit management systems. For example, transit operators can notify the traffic management centers of abnormally high congestion. Messages can be posted on freeway and arterial Variable Message Signs (VMS) regarding the traffic conditions, while traffic signal timing plans can be modified to accommodate corridor conditions. During incidents, information can be disseminated to motorists resulting in not only less delay to the traveling public, but also safer conditions for emergency personnel.

This section offers guidelines for the regional operation of such corridors. Agencies in the Region have prepared their own operations manuals, policies, and guidelines, which offer good information for this document on Regional Operations Guidelines. Excerpts from several existing documents are used in this text and credit for these efforts is acknowledged in the Work Cited section of this Chapter.

5.1 Performance Measurement

The overall objective of corridor management is to improve the arterial and freeway corridor mobility and this objective will guide the operations activities. Improved arterial mobility will be measured by improvement in arterial travel times. Improved freeway mobility will be measured by improvement in freeway speeds and travel times. **Table 5-1** contains the specific performance measures applicable to arterial and freeway mobility, as outlined in Tech Memo No. 3. This operations guidance is designed to help achieve these improvements.

Table 5-1– Summary of Three-Year and Five-Year Goals, and the associated Performance Measures for Arterial and Freeway Mobility (Corridor Management)

Category	Proposed Measure	Three-Year Goals	Five-Year Goals
Freeway Mobility	Peak/non-peak period average travel speed and travel time by freeway segment	Limit the percent increase in average travel time to less than the percent increase in traffic volume Data will be collected on FMS instrumented freeway sections.	Limit the percent increase in average travel time to less than the percent increase in traffic volume
Arterial Mobility	Peak/non-peak period average travel time by arterial	Limit the percent increase in average travel time to less than the percent increase in traffic volume Data will be collected on five north/south arterials and five east/west arterials. Initially, the selected arterials may include: North/South <ul style="list-style-type: none"> ▪ 59th Avenue ▪ 7th Street ▪ Scottsdale Road ▪ SR87/Arizona Avenue East/West <ul style="list-style-type: none"> ▪ Bell Road/Frank Lloyd Wright Boulevard ▪ Glendale/Lincoln Road ▪ Indian School Road ▪ Baseline Road ▪ Southern Avenue ▪ Chandler Boulevard 	Limit the percent increase in average travel time to less than the percent increase in traffic volume
	Percentage of coordinated traffic signals within a city	Implement signal coordination within a city on 100 percent of the smart corridors	Implement Signal Coordination within a City on 100% of the Smart Corridors
	Percentage of coordinated traffic signals between cities	Implement signal coordination between cities on 100 percent of the smart corridors	Optimize and Coordinate, if beneficial, the Traffic Signals between Cities on 100% of the Smart Corridors

5.2 Operations

This section contains guidelines for the operations and management of regional corridors which may include both arterial and freeway facilities. Included are traffic signal coordination, CCTV monitoring, detector monitoring, ramp metering, VMS messaging, detours and diversions, transit corridors, and emergency vehicle traffic signal preemption on corridors as presented below.

5.2.1 *Traffic Signal Coordination*

This section contains a list of procedures and practices offered to facilitate regional traffic signal coordination. The RCTO Stakeholders have set a goal to coordinate all signals on major arterials within the region. Corridors, as defined above, require a special approach to coordination because they have a regional significance. Some of the practices described below will also apply to the coordination of signals in an agency's own high-priority areas.

5.2.1.1 General Requirements

Traffic signal timing plans should be prepared by the responsible agencies. When a corridor crosses jurisdictional boundaries, traffic signal timing plans should be prepared for the entire corridor as a whole. All agencies responsible for operating signals within the corridor should participate in selecting the parameters governing the plans and should review and approve resulting plans.

All traffic signal timing plans for corridors should be revised at least every two years to reflect changing travel patterns.

When coordination plans or preset traffic signal timing plans for active traffic management are developed by consultant staff, participation in oversight from multiple jurisdictions is encouraged.

At jurisdictional boundaries, coordination plans should account for different clock/offset times in adjacent jurisdictions. Signal timing plans should be exchanged between agencies for all signals within one half-mile of a city/county/state boundary within a given corridor. Any timing changes at these signals should be accompanied by coordination with and notification to adjacent agencies regarding the changes.

5.2.1.2 Normal Operations

Active management of traffic signal timing on corridors is encouraged. This management entails monitoring volumes and speeds on a routine basis. When unusually slow speeds or low volumes are noted, the cause should be investigated. If the condition persists or recurs, and if the cause can be remedied by signal timing, then appropriate changes should be made to the signal timing.

Traffic engineers should contact and work with their counterparts in neighboring jurisdictions on a regular basis. Traffic engineers should share timing parameters with one another that are important to cross-jurisdictional coordination, including cycle lengths and offsets.

Traffic engineers should contact and work with their counterparts at adjacent agencies to ensure that traffic signal controller clocks at signals within one half-mile of each other are periodically reset to a common time reference. For corridors monitored and controlled by a central system, as well as corridors with

no physical interconnection, this can be accomplished by synchronizing each system and controller via a WWV receiver.

5.2.1.3 Incident Management Operations

Corridor traffic signal timing for likely incident conditions and scenarios should be prepared in advance. Simulation of various incident conditions will enable traffic conditions to be changed as input for traffic signal timing analysis. Different traffic signal timing plans should be stored in the traffic signal system database for use when the various incident conditions occur.

A decision support system should be in place to facilitate the selection of traffic signal timing plans to best fit any given scenario. Such a decision support system can be as simple as a table in a notebook of traffic signal timing plans associated with different incident conditions. An example of such a table is shown below:

Street or Freeway	Condition	Location	Traffic Signal Timing Plan
I-17	NB blocked	Between Camelback and Indian School	Plan 12
19th Avenue	Closed	Between Camelback and Indian School	Plan 14

More sophisticated systems can be developed and incorporated into the traffic signal system to enable the system to suggest the traffic signal timing plan to be used.

5.2.2 CCTV Monitoring

This section contains guidelines for use of video cameras.

CCTV cameras exist on many of the regions' corridors. Many are deployed as part of the ADOT Freeway Management System (FMS). Others are being deployed as part of the AZTech™ SMART Corridor program. Still others are being deployed by local jurisdictions, including the cities and the County, to facilitate local traffic management. All of these CCTV cameras can be leveraged to provide regional traffic management capability.

The effective and safe movement of traffic along a corridor depends on the agencies' ability to monitor traffic flow and congestion within the corridor. Since traffic flow can vary and is affected by incidents such as road closures, accidents, and disabled vehicles, the use of camera and video monitoring of traffic improves the information available to the agencies. This information allows for the rapid adjustment of signal timings to reduce traffic congestion or the activation of traffic message signs to advise drivers of congestion or suggest alternate travel routes.

Each agency's operational procedures and privacy policies should be followed in the management of corridors. This operational guidance is intended to address unique corridor management requirements.

Center to center software should continue to provide messaging. This messaging facilitates notification posted from one agency to another when a camera's pan-tilt-zoom functionality

is to be used (as permitted by the owning jurisdiction). The local agency in which the camera resides can override the pan-tilt-zoom actions. Communication is needed between each agency to inform the other of the need to use any given camera.

The ADOT TOC operates on an extended schedule. As a result, ADOT is able to control pan-tilt-zoom functionality of all other jurisdictions' CCTV cameras during off-hours (to be defined for each jurisdiction). Notification will still be posted to the owning organization, but approval is not needed for ADOT to assume control during these hours (as long as ADOT has been assigned off-hour coverage of that jurisdiction's TMC functions). Local jurisdictions must notify ADOT ahead of time when they anticipate requiring the use of CCTV cameras during off-hours (for example, for special events).

All cameras should be programmed with pre-established viewing pre-sets as approved by the local agency. Some pre-sets should be selected to cover corridor issues when they differ from local agency issues. When staff is not manually controlling the cameras, the cameras should rest in a pre-set position.

Authorized staff may use pan, zoom, tilt, and/or illumination capabilities to view only those areas within the road right-of-way, or other public areas that may have an effect on traffic flow.

Cameras should be operated in such a manner that they are not likely to view a private location, condition or activity.

Video images may be shared with the Police and Fire Departments only for response to incidents, accidents, and other emergencies involving public safety.

5.2.3 *Detector Monitoring*

General guidelines for using corridor detector data are offered in this section.

Data collected from arterial and freeway detector stations is necessary for regional corridor management. Detectors provide data for traffic management, traffic operations performance measures, identifying incidents, determining the location and severity of congestion, providing traveler information, and for transportation planning. As a result, detector data should be used whenever possible.

- Detector monitoring serves several purposes including: monitoring traffic operations, detecting incidents, monitoring incident clearance, and supporting the implementation of control strategies.
- Detector data should be used to trigger alarms for different levels of unplanned congestion. When available, automated alarms should be used in concert with CCTV monitoring and active timing plan management to attend to unplanned congestion events. When automated alarms are not available, system operators should monitor detector data, however it is presented, to determine when volumes and speeds drop below normal conditions. When these conditions are identified, visual confirmation of the conditions should be made with CCTV when available. Appropriate changes should be made in the traffic signal timing or ramp metering timing to alleviate the operational problem that exists. Information regarding significant slow-downs and congestion areas should be disseminated to traveler information services.
- Historical records of detector data should be analyzed to identify recurring operational problems that need to be addressed. Analysis of the detector data may identify a need to modify the traffic signal timing or ramp metering timing at particular locations.

Analysis of the detector data may also identify other changes that may need to be made including geometric changes, lane assignment changes, etc.

- All detector data should be provided in real-time to the Regional Archived Data Server for performance measurement, future analysis and research.

5.2.4 VMS Messaging

This section offers guidelines for the posting of messages on VMS. The City of Phoenix Guidelines for Variable Message Sign Usage and the ADOT TOC Operations Manual were used for this section. This section includes discussions on the following:

- General VMS Operation Guidelines, including operation for traffic restrictions, road closures, incidents, construction, special events, testing;
- Deploying VMS Messages; and
- VMS System Priorities.

In order to keep posted VMS information accurate, and up-to-date, System Operators must determine the validity and relevance of information to be posted. The System Operators must use care to determine the appropriateness of the message and determine a suitable duration for the message displayed.

The nature of VMS usage must never cause citizens to avoid or tune out future messages. Trite messages or any non-traffic related message should be avoided. The default message will be blank.

The VMS will not be used for gain or notoriety based on commercial, religious, ethnic, moral, gender, political or other unsuitable purposes, and references to such will not be used.

A VMS usage log should be maintained. Entries should include the VMS location, VMS Operator, date, time, message, and duration of the message.

5.2.4.1 General Guidelines

The manner in which a VMS is used will vary depending on the nature of the associated road or traffic condition. Various categories of road and traffic conditions are described below, along with specific information on the appropriate use of the VMS.

Traffic Restrictions

A VMS should be used for warning of traffic restrictions. This refers to the short-term closure of one or more traffic lanes. These restrictions may be planned or unplanned, short or medium duration, specific or general. The restriction may be due to construction, maintenance, or an incident on the roadway.

Road Closures

A VMS should be used for warning of emergency or scheduled road closures. Usually, the messages will contain alternate route information and serve as a pre-warning of the event.

Incidents

A VMS should be used for warning of emergency or scheduled road closures. An incident is an event on a roadway that results in the disruption of traffic. An incident can be a vehicular accident, spillage or material in the roadway, mechanical failure of the roadway, downed power line, etc. Qualified personnel must closely monitor the use of VMS for incident management.

Construction and Maintenance Information

The VMS system can be an effective supplement to construction traffic control. This type of use can inform motorist of construction work in roadway ahead.

Special Event Messages

The VMS may be used to help manage roadway traffic destined for high impact events. Special event-related VMS messages should be coordinated with VMS System Operators in the TMC prior to the event. Message information will be limited to event-related traffic information.

Travel time information

The approach being formulated by ADOT and AZTech through a pilot project on I-17 will be incorporated into the Guidelines upon completion of the project.

Test Messages

Test messages will be used to assure correct operations of a sign. It is vital that test messages not misdirect traffic. “Non-message” formats will be used. Acceptable test messages would include “test message”, or “test”. It will occasionally be necessary to perform limited nighttime testing. Generally, test messages will not be “on and flashing” during nighttime hours.

5.2.4.2 Deploying VMS Messages

VMS should be used for incidents only if they are visually confirmed or when requested by law enforcement agencies, or other emergency management groups such as fire departments.

Every effort should be made by agencies to inform the TMC of an incident or accident within the first minutes of the event, after life-saving and other safety measures have been considered.

Pre-programmed messages should be available to be used and deployed quickly. Depending on the situation, detailed messages can be created, edited, and displayed. Detailed messages describe the general nature of the situation and associated traffic impact

Messages should be removed once the incident is no longer blocking or restricting traffic. The TMC expects and needs good communication with those desiring to have use of the sign for traffic control. To preserve good credibility, messages should end as soon as possible after the traffic impact is gone.

The use of specific alternate routes should be avoided, unless arrangements have been made to handle the increased traffic volume on a specific route. It has been

found that when drivers choose their own alternate routes, the traffic disperses more effectively.

Messages describing severe incident-related traffic conditions may be continued at the discretion of the TMC. VMS should not be used to describe recurring congestion, except to provide travel time information.

5.2.4.3 VMS System Priorities

1) Safety Related: The first priority is safety. Any message directly related to a specific safety incident is given first priority for deployment. Examples: an emergency closure of a major roadway, a dangerous situation such as a fire, flood, or hazardous material spill.

2) Roadway Closures: The second VMS priority relates to an active road or ramp closure, regardless of the reason. This information directly affects the route a driver would take and would be caused by an accident or construction

3) Minor Traffic Impacts: The third priority is information on minor traffic impacts such as lane closures, or blocking incidents, causing minor delay.

4) Pre-Warnings: The fourth priority is for planned, major closures that will totally block or substantially restrict traffic flow on a road or highway.

5) Travel Time: Priority for travel time information will be established upon completion of the I-17 travel time pilot project.

5.2.5 Travel Information and HCRS

The availability of arterial travel information will become a significant element of the Arizona 511 travel information system. A critical link to the 511 system is provided by the Arizona Highway Condition and Reporting System (HCRS). Local agencies should input information about construction locations, traffic-related maintenance activities, weather related road closures, and traffic incident information into the HCRS.

5.2.6 Detours and Diversions

This section offers guidelines for use when detours and diversions are required. Detours off of freeways and onto arterials, detours from arterials to freeways, and detours from arterials to arterials in a neighboring jurisdiction are addressed. An approved detour map should be maintained on the MAG website, allowing available/desirable detour routes to be identified by the cities, county and State. Eventually, this map should be integrated with real-time traffic conditions and road closures/restrictions.

5.2.6.1 Detours off of Freeways

All jurisdictions that might be impacted must be immediately notified when a detour of freeway traffic is directed on to their facilities.

VMS in the vicinity (in advance of a detour) should be used to convey pertinent information regarding the detour and associated non-recurring impacts (congestion due to detour).

ADOT should notify city(s) adjacent to freeway closure/detour prior to detour being implemented. Adjustments to traffic signal timing on arterials should be

reviewed and adjusted as necessary to accommodate the additional traffic resulting from the detour.

ALERT/FSP/REACT should be called upon to assist with detours on and off freeways.

5.2.6.2 Detours off of Arterials onto Freeways

ADOT should be immediately informed when vehicles are detoured off of arterials onto freeways. Requests should be directed to ADOT to increase ramp metering rates when a detour is necessary onto freeways.

Adjustments to traffic signal timing on alternate arterial routes should be reviewed and adjusted as necessary.

ALERT/FSP/REACT should be called upon to assist with detours on and off freeways.

5.2.6.3 Detours off of Arterials onto Arterials in Other Jurisdictions

Neighboring jurisdictions should be immediately informed, and consulted if possible, prior to detouring traffic.

Adjustments to traffic signal timing on alternate arterials should be reviewed and adjusted as necessary

The incident necessitating the detour/diversion should be entered into the HCRS to provide information to adjacent agencies and for travel information dissemination (through 511 and both public and private sector websites, for example).

5.2.7 *Transit Corridors*

Content for this section will be developed in the future. If available, proposed operational plans and procedures should be included in this section; however, at present, only maps of the proposed BRT and LRT corridors will be included.

- BRT;
- LRT; and
- Transit Priority.

5.2.8 *Emergency Vehicle Traffic Signal Preemption on Corridors*

This section is a placeholder for future emergency vehicle traffic signal preemption standards. The intent is that the contents of this section will be developed as part of the activities of the RCTO Emergency Vehicle Traffic Signal Preemption Initiative.

5.3 Work Cited

Excerpts from the following documents were cited in the Section 5.

ADOT Operations Manual, October 1998, Lima & Associates et al.

City of Phoenix Guidelines for Variable Message Sign Usage

City Of Chandler Policy On Use Of Camera And Video Technology For The Purposes Of Traffic Monitoring

6. OPERATIONS AT THE FREEWAY/ARTERIAL INTERFACE

Seamless operations at the freeway/arterial interface (e.g. traffic interchanges) are critical to efficient operations of the arterial and freeway networks. Freeway access (on-ramps) should be managed in such a manner that effectively facilitates freeway corridor movement, accommodates the need for local access to the freeway, and accommodates traffic flow on crossing arterials.

This section establishes operational objectives and provides guidelines for the operations of traffic signals and ramp meters at freeway/arterial interface areas.

6.1 Performance Measurement

Improvements in freeway-arterial interface operation will be measured by the number of corridors in which there are coordinated freeway-arterial operations, as shown in **Table 6-1**, below. The findings and recommendations of the Freeway/Arterial Interface Pilot Project will be included.

Table 6-1– Summary of Three-Year and Five-Year Goals, and the Associated Performance Measure for the Freeway-Arterial Interface

Category	Proposed Measure	Three-Year Goals	Five-Year Goals
Freeway-Arterial Interface Operations	Coordinated freeway-arterial operations evaluation study, which includes a measure of travel time	Establish coordinated freeway-arterial corridor operations on one corridor	Establish coordinated freeway-arterial corridor operations on three corridors

6.2 Operations

6.2.1 Ramp Metering and Traffic Signal Timing – Normal Operation

The operation of ramp metering signals and traffic interchange traffic signals should be guided by the following principles:

- Queues from metered entrance ramps should not unduly impede operation of intersecting arterials or block access to private property along the intersecting arterial.
- Queues on exit ramps should be managed so as to not back up onto the mainline of the freeway.
- Development of traffic signal timing for the ramp/arterial intersection should be undertaken jointly by the State and the local agency responsible for the traffic signal operation on the arterial.
- Traffic signal timing at the traffic interchange signal and the adjacent arterial traffic signals should be developed in concert with the ramp metering rates using traffic simulation tools. Left turn phases and right turn overlaps onto the ramp should be timed so as to not overload the ramp meter. Right turn overlaps from the exit ramp should be used to reduce the queue buildup on the exit ramp.
- Predetermined ramp metering rates and traffic signal timings should be used for day-to-day operations. The State and the local agency should agree to operate the ramp meter signal and the traffic signal on the predetermined timing plan at specified times to provide coordinated operation.
- The advanced queue detectors on the entrance ramps should be utilized to alter the ramp metering rate to minimize queue development on the arterial.
- If queues at metered on-ramps cannot be accommodated, congestion should be allowed to build on the freeway and arterial in an equitable manner.

6.2.2 Ramp Metering and Traffic Signal Timing – Incident Management Operation

- Corridor traffic signal timing for likely incident conditions and scenarios should be prepared in advance. Simulation of various incident conditions will enable traffic conditions to be changed as input for traffic signal timing analysis. Different traffic signal timing plans should be stored in the traffic signal system database for use when the various incident conditions occur.
- In the event of a freeway closure and the diversion of unusual traffic volumes into the traffic interchange signal, a predetermined traffic signal timing plan should be initiated to accommodate the exit ramp volumes.
- Video cameras in the vicinity of the traffic interchange should be used to visually monitor the operation of the traffic signal and the freeway/arterial interface. Manual changes in the traffic signal timing should be made as appropriate if the predetermined timing needs adjustment.
- The ramp metering rates at the entrance ramps downstream of a freeway closure should be maximized or the meter turned off to accommodate entering traffic (including traffic diverted around the closed portion of the freeway). The traffic signal timing of the traffic interchange signal should be set to accommodate any unusual traffic patterns due to diversions around the closed portion of the freeway.

6.2.3 Incident Notification Procedures

This section offers notification guidelines for unplanned incidents or unusually high levels of congestion at freeway/arterial interface areas.

- The contact person that would address freeway/arterial interface issues for the State and local agencies should be identified in advance along with their contact information.
- Known problematic freeway/arterial interfaces should be monitored regularly to assess their operational efficiency. A representative from the agency with the best monitoring capability for a given intersection should be “assigned” responsibility for monitoring the operation. This monitoring could be performed with detectors, video cameras, or on-site visits.
- If either the State or the local agency receives notice that a freeway/arterial interface is not working satisfactorily, they should notify the other by phone. Representatives from the two agencies should meet and develop and implement a strategy to address the issue.

Table 6-2 provides the primary and secondary contacts for notification of incidents and other problems on freeways and arterials. As additional agencies begin operating traffic management centers, the list will be updated accordingly, or as contact information changes.

In order to assist in the identification of the appropriate individual to contact should abnormal conditions arise at the freeway/arterial interface and interchange areas, a listing of freeway interchanges, and the operating jurisdiction is shown in **Table 6-3**.

Table 6-2 – Traffic Management Center Contact Information (as of 1/7/04)

	ADOT	Chandler	Gilbert	Glendale	Goodyear	MCDOT	Mesa	Peoria	Phoenix	Scottsdale	Surprise	Tempe
TMC Address	ADOT TOC 2302 W. Durango, Phoenix, AZ 85009	215 E. Buffalo Chandler, AZ 85225	Traffic Operations 1025 S Gilbert Gilbert, AZ 85296	9658 N. 59 th Ave Glendale, AZ 85301	200 S. Calle del Pueblo Goodyear, AZ	2901 W. Durango Phoenix, AZ 85009	320 E. 6th Street, Mesa, AZ 85201	Traffic Eng. 8401 W. Monroe Room 201 Peoria, AZ 85345	200 West Washington St., 6 th Floor, Phoenix, AZ 85003	7447 E. Indian School Rd, # 205 Scottsdale, AZ	Traffic Eng. 12425 W. Bell Road Suite B-205 Surprise, AZ 85374	Traffic Operations 945 W Rio Saldo Pkwy, Tempe, AZ 85281
Business Hours												
Hours Open	24 hr/7	6A-2P		TBD		6A-4P	7A-5:30 P	8A-5P		6A-6P M-F	8 A – 5 P	
TMC Phone	602-712-6988	480-782-3471	480-503-6933	623-930-2940		602-506-6063	480-644-3122	623-773-7602	602-262-4691	480-312-4325	623-583-6025	480-350-8320
Contact Name	Linda Anestasi	Ben McCawley	Mike Sutton	Debbie Burdette	Don French	Ray Dominguez	Jan Siedler	Ron Amaya	Joel Havris	Steve Ramsey	Gabe Gonzalez	Jim Decker L. Aguilar
Office	602-712-6591	480-782-3471	480-503-6933	623-930-2940		602-506-6063		623-773-7602	602-262-4691	480-312-7935	623-826-2329	480-350-8284
Pager						602-205-9243						
E-Mail		ben.mccawley@ ci.chandler.az.us	mikes@ ci.gilbert.az.us	Dburdette@ ci.glendale.az.us		Raydominguez@ mail.maricopa.gov	jan.siedler@ cityofmesa.org	RonaldA@ peoriaaz.com	Joel.havris@ phoenix.gov	sram@ ci.scottsdale.az.us	gabriel.gonzalez@ surpriseaz.com	Jim_Decker@ tempe.gov
After Hours												
1st Contact		Ben McCawley		Debbie Burdette		Ray Dominguez		Peoria Police		Steve Ramsey	Gabe Gonzalez	
Pager						602-205-9243		623-773-7061			623-826-2329	
E-Mail		ben.mccawley@ci.c handler.az.us		dburdette@ci.glend ale.az.us		Raydominguez@m ail.maricopa.gov				sram@ci.scottsdale .az.us		
2nd Contact		Mike Mah				Barbara Hauser		Bill Elfitz		None		
Home												
Pager						602-201-3924						
E-Mail		mike.mah@ci.chan dler.az.us				barbarahauser@ma il.maricopa.gov						

Table 6-3 – Traffic Signals at Freeway/Arterial Interface and Operating Agency

City	Freeway	Location of Signalized Freeway Interchange	Operating Agency
Apache Junction	US-60	Ironwood	ADOT
		SR-88/Idaho	ADOT
Avondale	I-10	115th Avenue	ADOT
		Dysart Road	ADOT
Buckeye	I-10	Watson Road	ADOT
		Verrado Way (Buckeye Airport Road)	ADOT
Chandler	I-10	Ray Road	ADOT
		Chandler Blvd	ADOT
	L-101	Ray Road	Chandler
		Chandler Blvd	Chandler
		Frye	Chandler
	L-202	McClintock	Chandler
		Kyrene	Chandler
L-101/202/Price Interchange		Chandler	
Gila River Reservation	I-10	Queen Creek Road	ADOT
		Riggs Road (East TI)	ADOT
		Riggs Road (West TI)	ADOT
Glendale	L-101	Camelback Road NW	ADOT
		Bell Road	ADOT
		Union Hills	ADOT
		75th Avenue	ADOT
		67th Avenue	ADOT
		59th Avenue	ADOT
Goodyear	I-10	Litchfield Road	Goodyear
Maricopa County	I-17	Pinnacle Peak W	ADOT
		Daisy Mountain Drive	ADOT
		Anthem Way	ADOT
	L-101	Glendale Avenue	ADOT
L-202	Power Road (Future)	MCDOT	
Mesa	US-60	Dobson Road	Mesa
		Alma School Road	Mesa
		Country Club	Mesa
		Mesa Drive	Mesa
		Stapley Drive	Mesa

Table 6-3 – Traffic Signals at Freeway/Arterial Interface and Operating Agency (continued)

City	Freeway	Location of Signalized Freeway Interchange	Operating Agency
Mesa (continued)	US-60 (continued)	Gilbert Road	Mesa
		Val Vista Drive	Mesa
		Greenfield Road (NORTH)	Mesa
		Greenfield Road (SOUTH)	Mesa
		Higley Road	Mesa
		Superstition Springs	Mesa
		Power Road	Mesa
		Sossaman	ADOT
		Ellsworth	ADOT
		Crismon	ADOT
		Signal Butte	ADOT
	L-202	Dobson	ADOT
		Alma School	ADOT
		McKellips	ADOT
		Country Club	ADOT
		Gilbert Road	Mesa
		McDowell Road	Mesa
		Val Vista Drive	Mesa
		Greenfield Road	Mesa
Higley Road	Mesa		
Peoria	L-101	Northern	ADOT
		Olive	ADOT
		Peoria	ADOT
		Grand Avenue	ADOT
		Thunderbird	ADOT
Phoenix	I-10	83rd Avenue	ADOT
		75th Avenue	ADOT
		67th Avenue	ADOT
		59th Avenue	ADOT
		51st Avenue	ADOT
		43rd Avenue	ADOT
		35th Avenue	ADOT
		27th Avenue	ADOT
		19th Avenue	ADOT
		7th Avenue	ADOT
		7th Street	ADOT

Table 6-3 – Traffic Signals at Freeway/Arterial Interface and Operating Agency (continued)

City	Freeway	Location of Signalized Freeway Interchange	Operating Agency
Phoenix (continued)	I-10 (continued)	3rd Street	Phoenix
		5th Street	Phoenix
		3rd Avenue	Phoenix
		16th Street	ADOT
		Washington	ADOT
		Jefferson	ADOT
		Buckeye	ADOT
		24th Street	ADOT
		32nd Street/University	ADOT
		40th Street	ADOT
	I-17	16th Street	ADOT
		7th Street	ADOT
		Central	ADOT
		7th Avenue	ADOT
		19th Avenue	ADOT
		SR-85 (Buckeye Road)	ADOT
		Grant	ADOT
		Jefferson	ADOT
		Adams	ADOT
		VanBuren	ADOT
		McDowell	ADOT
		Thomas	ADOT
		Indian School	ADOT
		Camelback	ADOT
		Bethany Home	ADOT
		Glendale	ADOT
		Northern	ADOT
		Dunlap	ADOT
		Peoria	ADOT
		Cactus	ADOT
Thunderbird	ADOT		
Greenway	ADOT		
Bell Road W	ADOT		
Bell Road E	ADOT		
Union Hills	ADOT		

Table 6-3 – Traffic Signals at Freeway/Arterial Interface and Operating Agency (continued)

City	Freeway	Location of Signalized Freeway Interchange	Operating Agency	
Phoenix (continued)	I-17 (continued)	Utopia/Yorkshire	ADOT	
		Rose Garden	ADOT	
		Deer Valley	ADOT	
	SR-51	McDowell Road	Phoenix	
		Thomas Road	Phoenix	
		Indian School Road	Phoenix	
		Highland Avenue	Phoenix	
		Colter	Phoenix	
		Bethany Home Road	Phoenix	
		Glendale Avenue	Phoenix	
		Northern Avenue	Phoenix	
		32nd Street	Phoenix	
		Shea Blvd	Phoenix	
		Cactus Blvd	Phoenix	
		Thunderbird	Phoenix	
		Greenway Road	Phoenix	
		Bell Road	Phoenix	
		Union Hills Road	Phoenix	
		L-101	McDowell Road	Phoenix
			Thomas Road	Phoenix
	Indian School Road		Phoenix	
	51st Avenue		Phoenix	
	35th Avenue		Phoenix	
	31st Avenue		Phoenix	
	27th Avenue		Phoenix	
	23rd Avenue		Phoenix	
	15th Avenue		Phoenix	
	7th Street		Phoenix	
	16th Street		Phoenix	
	Tatum Blvd		Phoenix	
	56th Street	Phoenix		
	SR-143	Washington	ADOT	
	SR-153	University	ADOT	
L-202	24th Street	ADOT		
	32nd Street	ADOT		
	40th Street	ADOT		

Table 6-3 – Traffic Signals at Freeway/Arterial Interface and Operating Agency (continued)

City	Freeway	Location of Signalized Freeway Interchange	Operating Agency
Phoenix (continued)	L-202 (continued)	44th Street	ADOT
		52nd Street	ADOT
		Van Buren Street	ADOT
Salt River Reservation	L-101	90th Street	ADOT
		Via de Ventura	ADOT
		Indian Bend	ADOT
		McDonald	ADOT
		Chaparral	ADOT
		Indian School	ADOT
		Thomas	ADOT
		McDowell	ADOT
		McKellips	ADOT
Scottsdale	L-101	Shea Blvd	Scottsdale
		Cactus Road	Scottsdale
		Raintree Drive	Scottsdale
		Frank Lloyd Wright Blvd	Scottsdale
		Bell Road	Scottsdale
		Princess Dr/Pima Road	Scottsdale
		Hayden Road	Scottsdale
		Scottsdale Road	Scottsdale
Tempe	I-10	Warner Road	ADOT
		Elliot Road	Tempe
		Baseline Road	Tempe
		Broadway Road (off-ramp 52 nd St, NB)	Tempe
		Broadway Road (off-ramp 48 th St, EB)	Tempe
		Broadway Road (on-ramp I-10, SB)	Tempe
	US-60	Priest Drive	Tempe
		Mill Avenue	Tempe
		Rural Road	Tempe
		McClintock Drive	Tempe
	L-101	Rio Salado Parkway	Tempe
		University Drive	Tempe
		Apache Boulevard	Tempe
		Broadway Road	Tempe
		Southern Avenue	Tempe
Baseline Road		Tempe	

Table 6-3 – Traffic Signals at Freeway/Arterial Interface and Operating Agency (continued)

City	Freeway	Location of Signalized Freeway Interchange	Operating Agency
Tempe (continued)	L-101 (continued)	Guadalupe Road	Tempe
		Elliot Road	Tempe
		Warner Road	Tempe
	SR-143	University	ADOT
	L-202	Priest Drive	Tempe
		Rural Road	Tempe
McClintock Drive		Tempe	
Tolleson	I-10	107th Avenue	ADOT
		99th Avenue	ADOT
		91st Avenue	ADOT
		107th Avenue	ADOT

7. INTER-JURISDICTIONAL SIGNAL COORDINATION

This chapter will contain guidelines and procedures for the facilitation of coordinated inter-jurisdictional traffic signals. Specifically, operations of signals near jurisdictional boundaries (1/4-mile or less separation between signals), including State-operated or County-operated traffic signals, will be addressed.

The intent is that the contents of this section will be developed as part of RCTO Regional Traffic Engineering Initiative.

7.1 Performance Measurement

7.2 Frequency of Signal Timing Updates

7.3 Operations

7.3.1 *Requests for Adjustments*

7.3.2 *Criteria for Restoring Original Plans*

7.3.3 *Timing/Coordination Parameters*

- East Valley Signal Coordination Plans
- West Valley Signal Coordination Plans
- ADOT Signals
- Special Event Coordination Plans

7.3.4 *Signal Timing During Incidents*

7.3.5 *Traffic Responsive Timing*

- Thresholds
- Parameters

7.3.6 *Emergency Vehicle Preemption*

7.3.7 *Transit Signal Priority*

8. INCIDENT MANAGEMENT

Local and Regional Traffic Management Centers can facilitate the coordinated response to incidents. The ADOT Traffic Operations Center is primarily responsible for facilitating the coordinated response of public safety agencies with transportation agencies during freeway incidents. However, freeway incidents may require action by not only ADOT, by also by local traffic management centers. The local traffic management centers are primarily responsible for coordinated incident response on arterials. This chapter will contain procedures that local and regional transportation operators should follow in responding to incidents on the entire roadway network.

This chapter is not intended to replace local agencies documents (for example, the ADOT TOC Operators Manual), but will outline how local transportation can work in concert with other agencies to facilitate incident response. The chapter will also highlight the role of ALERT/FSP and REACT in responding to incidents.

The intent is that the development of the contents of this section will be part of the RCTO Arterial and Freeway Incident Management Initiatives.

8.1 Performance Measurement

8.2 Operations

- Minor Obstructions
- Minor Accidents
- Injury Accidents
- Fatal Accidents
- ADOT Level 1, 2 and 3 Incident Paging
- Hazardous Materials
- Area or Road Closures

8.3 Mass Evacuation

8.4 Fire, Police Incidents

8.5 Planned Closures

8.6 Post-Incident Debriefing Session

9. INFORMATION EXCHANGE

This section will contain procedures and guidelines for the exchange of information and data.

The intent is that the development of the contents of this section will be part of the activities of the RCTO Traveler Information, Regional Traffic Engineering and Collaboration, and Arterial Incident Management Initiatives.

Also contained within this chapter are guidelines for the permissible use of the data from other agencies.

Each agency should make available to other agencies any information that may be useful in coordinating the operation and maintenance of transportation system facilities. This information might include, but not be limited to:

- Signal status;
- Detector status;
- Timing plans;
- Video images;
- Incident information and status;
- Work zone information and status; and
- Traffic counts.

9.1 Performance Measurement

9.2 Operations

- CCTV Monitoring
- VMS Control and Monitoring (incl. AMBER Alerts)
- Regional Data Archiving
- 24/7 Signal Monitoring
- Incident and Work Zone Notifications

9.3 List of Information Needed for Traffic Management

9.4 List of Information Needed for Travel Information

The intent is that the development of the contents of this section will be part of the activities of the RCTO Traveler Information, Regional Traffic Engineering and Collaboration, and Arterial Incident Management Initiatives.

9.5 Computer Aided Dispatch Information

The intent is that the development of the contents of this section will be part of the activities of the RCTO Arterial and Freeway Incident Management Initiatives.

9.5.1 Public Safety

9.5.2 *ALERT/FSP/REACT*

9.5.3 *Other AVL*

- Transit Vehicles
- Maintenance Vehicles

9.6 Regional Archived Data System

The intent is that the development of the contents of this section will be part of the activities of the RCTO Data Archiving Initiative.

9.6.1 *Arterial Detector Data*

- Collection
- Dissemination

9.6.2 *Freeway Detector Data*

- Collection
- Dissemination

9.6.3 *Other Data (To be listed)*

- Collection
- Dissemination

10. REGIONAL MAINTENANCE PRACTICES

This section will contain guidelines and agreements for the maintenance of regional operations infrastructure (including ITS, signal systems, and telecommunications equipment). This section will also contain joint-agency procurement agreements, if applicable, and suggestions for sharing maintenance resources across jurisdictional boundaries.

The intent is that the contents of this section will be developed as part of the activities of the RCTO Shared Maintenance and Resources Initiative.

10.1 Performance Measurement

10.2 Maintenance Practices

10.2.1 Field Devices and Controllers

10.2.2 Telecommunications

10.2.3 Central Equipment and Software

10.3 System Recovery

System failures are inevitable. Weather conditions, accidents, and other incidents will cause power outages or damage to transportation system field elements (e.g. traffic signals, downed power poles, etc.). This section will address procedures for system recovery of regionally significant transportation systems.

10.3.1 Recovery from weather-related failures and outages

This section will describe system recover procedures for failures and outages that are caused by inclement weather (e.g. monsoon, lightning, dust storms).

10.3.2 Recovery from incident/accident-related failures

This section will describe system recovery procedures for failures and outages caused by accident and incidents (e.g. down signal).

10.4 Joint-Agency Procurement and Maintenance Agreements

10.5 Sharing of Maintenance Resources across Jurisdictional Boundaries

APPENDICES

Appendices will be included per chapter.