I-10 INTEGRATED CORRIDOR MANAGEMENT SYSTEM

CONCEPT OF OPERATIONS

EXECUTIVE SUMMARY

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Prepared for MARICOPA ASSOCIATION of GOVERNMENTS

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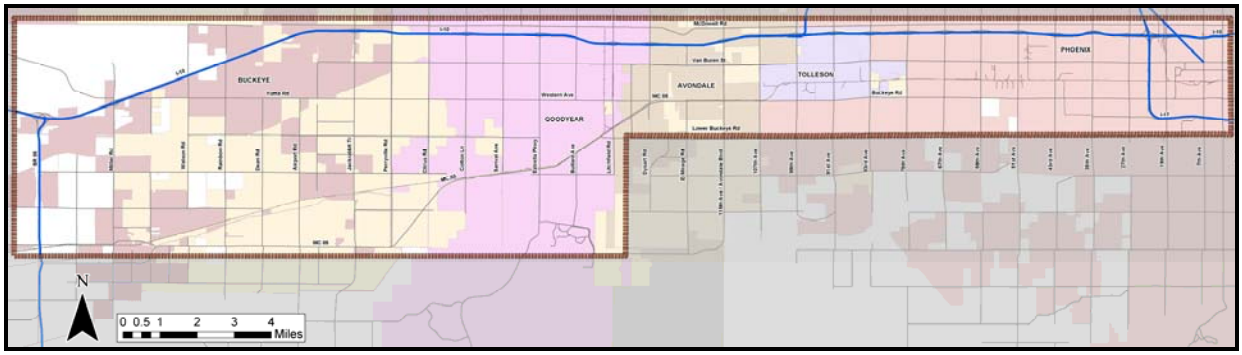
EXECUTIVE SUMMARY

Project Background and Summary

The Maricopa Association of Governments (MAG) has established a regional goal of implementing an Intelligent Transportation System Integrated Corridor Management System (ITS-ICMS) along one or more heavily traveled freeway/arterial corridors in the MAG region. The I-10, Van Buren Street, McDowell Road, and Maricopa County 85 (MC 85) corridor was selected to develop a Concept of Operations for an ICMS for several key reasons:

- It is a vital trucking route that connects Phoenix to the southern California markets, as well as commercial traffic headed east toward Texas and Florida;
- The Arizona Department of Transportation (ADOT) is embarking on a significant capacity enhancement project for I-10 in the Southwest Valley, which will add additional general purpose lanes and high occupancy vehicle (HOV) lanes through this segment of the corridor;
- I-10 serves a wide range of commuter traffic. The cities of Phoenix, Avondale, Goodyear, and Buckeye are experiencing unprecedented growth; in 2020, population in this area is estimated at over 880,000, which is a 270 percent increase; and
- This corridor is a vital link to downtown major event venues, employment centers, and multimodal transfer centers.

MAG and its partners in the I-10 ICMS recognize the importance of swift and collective action to address the congestion problems in the I-10 Corridor – not only for commuters in the ever expanding metropolitan area, but also to maintain efficient movement of goods on this nationally significant transportation facility.



I-10 ICMS Corridor Overview

One of the driving factors for developing the I-10 ICMS Concept of Operations was to take advantage of a competitive federal grant funding opportunity. In April 2007, MAG and its partners submitted applications to be considered for an Urban Partnership Agreement and a federal grant for an Operational Test to Mitigate Congestion (OTMC); both of these opportunities were available from the United States Department of Transportation/Federal Highway Administration as part of the National Congestion Initiative. The initial strategies and concepts developed as part of this Concept of Operations were focused on the timeframes and constraints of the OTMC grant which would potentially provide federal funding to implement high-impact technology and coordination strategies on the transportation networks within the corridor. In

August, 2007, MAG was notified that the I-10 corridor was not selected to receive federal funding. As such, the final recommendations contained in this Concept of Operations were developed based on currently available funding sources and existing regional transportation planning processes.

Goals of the I-10 ICMS

The main objective of the I-10 ICMS Concept of Operations was to facilitate all stakeholders in the region to come together to develop a comprehensive, integrated plan to manage and reduce congestion in the I-10 Corridor. There are seven key goals and objectives for the I-10 ICMS:

Goal 1: Achieve maximum throughput on freeways and arterials in the ICMS operational test area;

Goal 2: Improve safety and mobility by reducing incident response and clearance times on freeways and arterials;

Goal 3: Make efficient use of technologies and resources to manage day-to-day demands and optimize the multi-modal network;

Goal 4: Implement new technologies and systems and integrate with existing agency systems to achieve seamless system operations;

Goal 5: Reduce demand by balancing trips among modes and networks, expanding commute alternative programs, and educating travelers about commute options and alternatives;

Goal 6: Enhance traveler information resources, and promote awareness among the public about travel conditions information that is available to them; and

Goal 7: Leverage investments among modes and agencies to effectively mainstream integrated corridor management approaches.

Existing and Planned Inventory to Support ICMS in the I-10 Corridor

Future operational enhancements in the I-10 corridor to support ICMS will build on the existing systems and infrastructure of the transportation networks – freeway, arterial and transit. ITS infrastructure in this portion of the corridor is currently limited, although arterial management infrastructure continues to be deployed as part of city and county capital improvement programs.

Freeway ITS Infrastructure

ADOT has been operating a freeway management system (FMS) for more than 10 years. Within the I-10 Corridor, the instrumented portions include I-10 west to approximately the SR-101 interchange. This FMS includes: loop detectors for data collection, closed-circuit television (CCTV), ramp meters, dynamic message signs and center-to-field communications. ADOT's Traffic Operations Center is staffed 24/7/365, and provides day-to-day traffic system monitoring and management, event management, traveler information and incident management.

Within the portion of the I-10 ICMS corridor, FMS infrastructure is in place west to 83rd Avenue and additional communications infrastructure is being installed, which will provide fiber along I-10 to the I-10/SR-101 interchange. There is no FMS infrastructure beyond the Loop 101 interchange with the exception of two additional dynamic message signs (DMS) that are being installed west of the SR-101 interchange (99th Avenue, Bullard Avenue). A 2016 FMS project is planned that will instrument the segment of I-10 from 83rd Avenue to Dysart Road. No future phases west of Dysart Road are currently planned.

Arterial Management Systems

The arterial network in the I-10 ICMS project area includes east-west and north-south arterials in seven jurisdictions: Maricopa County; the Cities of Phoenix, Avondale, Goodyear, and Tolleson; Town of Buckeye; ADOT right-of-way. The existing traffic signals in this arterial network are currently operated and maintained by ADOT, Maricopa County Department of Transportation (MCDOT), and the Cities of Phoenix, Goodyear, Avondale, and Tolleson.

Key east-west arterials in the I-10 ICMS project area traverse multiple jurisdictions, and include:

- McDowell Road;
- Van Buren Street;
- Buckeye Road/Western Avenue/Yuma Road; and
- MC 85.

Intersections in the corridor are operated and maintained by ADOT, Maricopa County, and the cities of Phoenix, Goodyear, Avondale, and Tolleson. These jurisdictions currently have communications to and/or between some of their signalized intersections, but not to all intersections.

Avondale currently operates a central signal system which utilizes wireless technology to communicate with approximately 19 intersections. Beyond traffic signals, detection, and four CCTV (in Avondale), there is limited ITS infrastructure, although more is planned in the very near term. Avondale plans to implement a traffic management center (TMC) in the next two to three years; currently, the system is managed from the signal shop.

Goodyear is in the process of procuring a central signal system software, and Capital Improvement Projects to provide a fiber optic backbone and communication to some City of Goodyear intersections are currently underway. Goodyear is planning to implement a TMC within the next two to three years, and is currently developing an ITS Strategic Plan that will map out future ITS projects and priorities.

The Phoenix TMC monitors the City of Phoenix's ITS infrastructure, including the TranSuite traffic signal system, CCTV, video detection, and arterial DMS. At present, there is limited ITS infrastructure on the City of Phoenix arterials in the ICMS corridor area other than traffic signals (the majority of Phoenix's ITS infrastructure is concentrated in the downtown area).

MARICOPA COUNTY is responsible for the MC 85 (Buckeye Road) corridor within the project area. MARICOPA COUNTY currently operates a TMC from which operators can

communicate with and monitor the majority of the signalized intersections under their jurisdiction. From the TMC, Maricopa County also monitors their CCTV images, seven of which are located along MC 85.

Transit Infrastructure

Valley Metro and City of Phoenix Transit provide fixed-route and demand-response services along key arterials throughout the I-10 ICMS area. Express and Rapid routes also utilize arterials as well as the I-10 freeway corridor. Currently, there is not express bus service to the West Valley community of Buckeye. Valley Metro plans to implement the Papago Freeway Connector express service in July 2008, which will include four inbound and four outbound trips each weekday. The Town of Buckeye plans to partner with private sector on a shared-use temporary park and-ride location, which will be implemented with the deployment of the express bus service to Buckeye. The second extension of bus service is Route 17A on McDowell Road from 79th Avenue west, hourly service Monday thru Friday beginning January 2008 and funded by the City of Avondale.

Vanpool and rideshare programs are very active in the metropolitan area, and in fact, vanpools are at capacity. Valley Metro currently administers a fleet of over 300 vans for its Vanpool Program (these vanpools operate valleywide). Valley Metro also sponsors ShareTheRide.com to provide the general public an easy and free way to find others in the Valley who are interested in sharing the ride to work in a carpool or vanpool.

Transit in the region has made substantial investments over the last several years to upgrade and expand the systems to support real-time system and vehicle monitoring, communications, dispatch and operations center capabilities, and transit traveler information. Key systems include:

- The Transit Operations and Control Center (OCC) serves as the key dispatch and operations hub for transit operations valleywide. Operators at the OCC view ADOT's CCTV images along freeway corridors to monitor traffic as well as freeway traffic conditions near the park-and-rides.
- Automatic Vehicle Location is deployed on almost the entire fleet, and this is used to monitor transit schedule adherence and provide next-bus arrival times.
- Buses are also equipped with on-board digital video recorders, audible bus stop announcements, automated passenger counters and fare boxes.
- Valley Metro Rail has identified the I-10 corridor (west to the 79th Avenue Park and Ride) as a consideration for a future extension of the Light Rail Transit (LRT). An alternatives analysis is underway and is scheduled for completion in 2008.

Regional Systems and Programs to Support ICMS

There are several key regional systems and programs that are already actively supporting important operational functions and strategies. Although investments in these regional and statewide programs have benefits that go beyond the ICMS corridor area, they provide a vital support function for many of the high-priority operational issues identified by stakeholders during the Concept of Operations development:

Function	Owning Agency/System
Traffic Management and Operations Centers	Arizona DOT (Freeway Management, Statewide Operations) Maricopa County City of Phoenix Valley Metro/City of Phoenix Transit Cities of Avondale and Goodyear (future TMCs)
Incident Management and Response	Arizona DOT ALERT Freeway Response Team Arizona Department of Public Safety Freeway Service Patrol Maricopa County REACT Arterial Incident Response Automated data exchanges between ADOT, Maricopa County and Public Safety for incident data
Traveler Information	ADOT 511 and az511.gov (statewide traveler information) ADOT freeway dynamic message signs MAG and ADOT mobile traveler information portal Transit phone and web traveler information (valleymetro.org) Local media traffic advisory broadcasts Private sector web and wireless traveler information resources
Regional Connectivity and Center-to-Center Communications	Regional Community Network Center-to-Center System (including transportation and public safety)

Issues Affecting ICMS Implementation and Operations

While stakeholders agree there is a strong need to be able to manage and integrate networks within this corridor to optimize operations, safety, and mobility, partner agencies also recognize there are many challenges for ICMS implementation. The success of the I-10 ICMS project depends on the support from the stakeholders and the necessary modifications on practicing operations as well as the reliability of the adopted technologies. As part of the Concept of Operations, potential issues, potential issues are being documented and considered.

These issues span four key focus areas. Chapter 5 of the Concept of Operations documents an expanded list of these issues, which are briefly summarized below:

Institutional issues are part of an on-going process of coordination and collaboration between I-10 Corridor stakeholders.	▪ The Long Range Transportation Plan allocates funding and project priorities for regional agencies, and provides limited flexibility to accelerate or add projects without additional funding. ▪ Getting the right stakeholders into the planning process is a challenge – ICMS will rely on participation from freight, private sector and additional public sector agencies.
Operational issues are practice-related issues that must be resolved prior to system implementation to ensure that the proposed ICMS will be adopted consistently and ultimately improve the overall I-10 Corridor performance. These could include specific procedures or specific system operational issues.	▪ A key focus of the ICMS was looking at east-west alternates to I-10. In order to be effective, the ICMS also needs to consider N/S demands of key arterials, freeway/arterial coordination and increased growth and demand. ▪ Rail freight volumes will continue to increase, and arterial operations need to factor in the operational challenges posed by rail crossings. ▪ There is limited arterial traveler information available to motorists to provide advanced warning of work zones, incidents, or detours. ▪ A key need is data collection, for both the freeway and arterial networks. Real-time data is needed to support active ICMS operations among freeway and arterial management agencies.
Technical issues are known and foreseen issues relating to technology – what is deployed, how to effectively utilize it, challenges with coordinating systems across jurisdictions, as well as system compatibility.	▪ FMS infrastructure is not planned for I-10 west of Loop 101 until 2016 at the earliest. There is a key need to identify alternatives for data collection. ▪ Arterial management systems are also not fully deployed within the corridor. Agencies are phasing in system components as funding permits. ▪ Limited communications infrastructure also limits the ability to monitor and change traffic management strategies to respond to real-time conditions.
Financial issues are also an important consideration for the I-10 ICMS Concept of Operations. Significant enhancements to systems, technologies and ongoing operations within the corridor will require a financial commitment.	▪ The I-10 ICMS was not selected for federal funding. As a result, agencies will need to identify and prioritize high-impact ICMS strategies and implement over time with available regional and local funding and programming processes. ▪ Opportunities to accelerate programmed projects to support ICMS will need to be explored. Partnerships among public agencies as well as public/private partnerships could help to accelerate the timeframe for longer-range projects.

ICMS Operations Procedures and Guidelines

Existing Operational Procedures

To date, there is a limited number of formal operational procedures or policies in place for traffic management within the selected ICMS Corridor. Local agencies recognize that as system and network operations become increasingly interjurisdictional, there is a stronger need for more formal operational procedures to be developed and agreed to by partners.

As part of the 2003 Regional Concept of Transportation Operations, MAG initiated the development of procedures for Corridor Management and Freeway and Arterial Coordination. The intent was that these documented procedures would evolve over time. The informal regional operations collaboration named AZTech, has also developed guidelines and procedures for the operation of CCTV, DMS systems and center-to-center communications. Maricopa County and partners in the northwest valley have developed an operations plan for Bell Road, which includes shared use and joint operations among Maricopa County, Peoria and Surprise of some devices along that corridor. Individual agencies typically maintain and update procedures for their respective systems.

Incident management and response agencies have well-developed procedures and guidelines; these are typically developed and agreed to by multiple partners, and are well documented and utilized.

One of the better defined operational procedure/plan in the Southwest Valley is the plan developed for special event traffic management at the Phoenix International Raceway. This Plan has been evolving over the last several years, and is reviewed and updated following each major event at Phoenix International Raceway (PIR). Key elements of the plan include pre-event coordination, event ingress and egress, system operations during the event, incident management, traveler information, and partner roles and responsibilities.

Recommended Operational Procedures and Guidelines to Support ICMS

The ICMS Concept of Operations identified recommended procedures, roles and responsibilities for the partner agencies within the corridor under a variety of different scenarios. These recommended procedures were intended to be high-level, yet illustrate specific actions and responsibilities that agencies would carry out during different events on the networks – such as implementing detours, communicating with other agencies, providing information to motorists, and other key functions.

Scenarios included:

- Day-to-day “typical” operations;
- Incidents on I-10 and on arterials;
- Work zones on the freeway and on arterials; and
- Special events.

For each scenario, recommended operational strategies, specific operational actions by agencies, and critical dependencies were identified. Due to the limited ITS infrastructure currently in the I-10 corridor area, the majority of the operational procedures in the near-

term focus on enhanced coordination among agencies, and factor in the limited automated information sharing capability. As systems are deployed and center-to-center connections are established over time, this will foster an increased capability for agencies to be able to monitor and alter traffic management strategies in real-time and in response to real-time traffic conditions. It will also enhance agencies' abilities to communicate and share information with partners to support more coordinated regional strategies. For each of the scenarios, potential 'future' strategies and procedures were identified that would build on the increased infrastructure and connectivity.

Implementation Concepts and Recommended Next Steps

As the I-10 ICMS evolved, it became clear that federal grant funds would not be available to this region to support the ICMS strategies and systems identified by stakeholders. As a result, the Concept of Operations needed to focus on recommending high-priority projects that could be implemented over time with available local and regional funds and programming processes.

Implementing ICMS strategies in the I-10 corridor will require an incremental phased approach over several years. Arterial traffic management agencies, including Phoenix, Avondale, Goodyear, Buckeye and Maricopa County all have at least one project in the next TIP programming cycle that will support the goals of ICMS. Both MAG and the AZTech operations collaboration have initiated key regional initiatives aimed at enhancing signal coordination, arterial traveler information, and agency information exchanges; although these are more regional in nature, they are definitely in line with ICMS goals and objectives, and will serve to enhance the overall strategy within the corridor.

As the region develops plans for future transportation system improvements through TIP programming cycles, the intent of the recommendations is to summarize ICMS initiatives that should be pursued, including opportunities for agencies to partner on joint projects. MAG also carries out an annual Traffic Signal Optimization Program (TSOP), whereby agencies can apply for funds to enhance signal operations along a particular corridor. It is important to note that this Concept of Operations is not intending to serve as a deployment plan; however, through the discussions to develop the Concept of Operations for ICMS, key priorities have emerged. Despite the fact that significant federal funds will not likely be received, agencies can still move forward with incremental enhancements that will ultimately support the broader ICMS goals.

Near-term recommended projects and programs are shown below. Near term refers to projects that should be pursued or accelerated in the 2008-2013 timeframe, including potential projects to be submitted for the 2013 TIP programming cycle:

Near-Term ICMS Recommendations – 2008 to 2013

Project Name/Description	Agency	Cost Estimate	Timeframe	Notes
Alternate Route Guide	Joint Project – Avondale, Goodyear, Phoenix, MARICOPA COUNTY; will also involve	75-100k	2008	Price may vary based on area covered and data available. MARICOPA COUNTY previously prepared an Alternate Route Guide for Bell Road between 183rd Avenue and 83rd Avenue (approx. 12.5 miles) for 60k in

	ADOT and Buckeye			2006.

Near-Term ICMS Recommendations – 2008 to 2013 (continued)

Project Name/Description	Agency	Cost Estimate	Timeframe	Notes
TSOP – City of Avondale	Avondale	$20-30K per project annually	2008 2009 2012	Identify key corridors for TSOP coordination. Joint project with McDowell
TSOP – City of Goodyear	Goodyear	$20-30K per project annually	2008 2009 2012	Identify key corridors in Goodyear
TSOP – City of Phoenix	Phoenix	$20-30K per project annually	2008 2009 2012	Identify key corridors in Phoenix in the ICMS corridor area. Emphasis on McDowell Road
TSOP – Maricopa County	Maricopa County	$20-30K per project annually	2009 2012	Update to coordination timing on MC 85
McDowell Road CCTV	Avondale, Goodyear and Phoenix	$2.5-5k per location for install	2012 and 2013	Installation and communication to camera could also be incorporated to traffic signal design/construction
RCN Expansion to include Goodyear and Avondale	Joint project – Goodyear, ADOT and Avondale	$1.75M	2013	Expand RCN to include Goodyear and Avondale TMCs. Both should be complete. Could potentially be accelerated if close-out funds are available. Fiber for this phase could be utilized for FMS expansion west of Loop 101.
Arterial DMS – McDowell, potentially other locations (including N/S arterials)	Avondale, Goodyear and Phoenix	$125k per install	2013	Cost is construction cost. Design costs will vary based on funding source.
McDowell Road and Van Buren Communications Infrastructure	Phoenix		2008	Phoenix has a programmed project to widen McDowell between 83rd and 75th Avenues, as well as Van Buren from 67th to 75th Avenues. Recommend installing communications and detection as part of this widening, if not already planned.
Analysis of Data Collection Options for Freeways and Arterials	MAG	$75K	2009	Recommend conducting a comprehensive analysis of data collection options for freeway and arterials. In the event that FMS is not deployed with detection, look at alternatives for private sector or non-infrastructure based strategies.
Multi-agency ICMS Operations Plan	MARICOPA COUNTY ADOT Goodyear Avondale Buckeye	$50K	2013	A detailed operations plan will require that additional devices be in place. It is recommended that the Operations Plan be developed following additional deployment.

	Phoenix			

Longer term project recommendations are also included (2014 and beyond), with a specific focus on FMS deployment and arterial ITS infrastructure. With these priorities identified, agencies can begin planning ahead for the next round of programming.

Longer Term ICMS Recommendations – 2014 and Beyond

Project Name/Description	Agency	Cost Estimate	Timeframe	Notes
Phase 17 FMS on I-10, 99th Avenue to Dysart	ADOT	$5M	2016	Assumes conduit installed as part of I-10 widening. Phase 17 is part of the current FMS plan.
Future phase FMS on I-10, Dysart to Citrus	ADOT	$8M	2018	Assumes no conduit installed in this segment
Additional ITS Devices on arterials (CCTV, DMS).	Avondale Goodyear Phoenix Maricopa County Buckeye	Varies	2014 2015 2016 2018	Avondale and Goodyear will be defining project priorities through their strategic plans.
24/7 TMC at Maricopa County to serve as after-hours back-up for cities	Maricopa County	$125K annually	2014	Cost is for 2 additional staff to cover expanded hours.