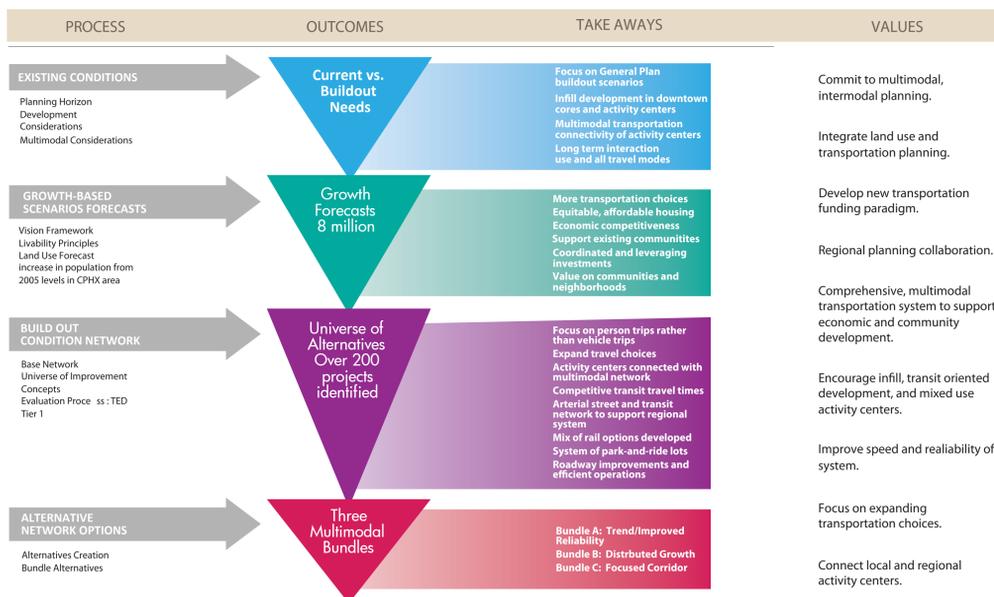
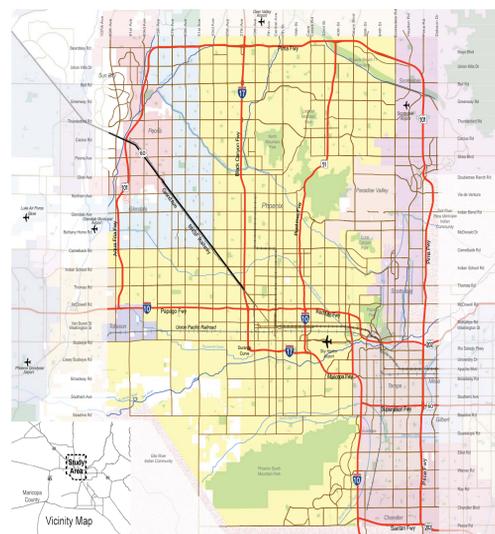


# VALUES MAP



# STUDY AREA



# Central Phoenix Transportation Framework Study

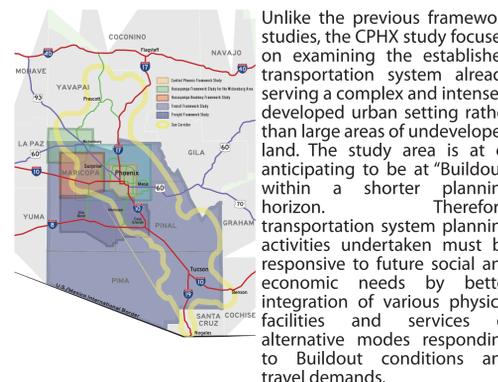


- Freeway Network
- Rail Network
- Sustainability and Livability
- Commercial Vehicle Movements
- Intelligent Transportation Systems
- Bike and Pedestrian Movements

## STUDY OVERVIEW

The Central Phoenix Transportation Framework Study (CPHX) was undertaken as one study in a series of Statewide Transportation Framework Studies conducted in conjunction with the Building a Quality Arizona (bqAZ) process. The intent of these framework studies is to:

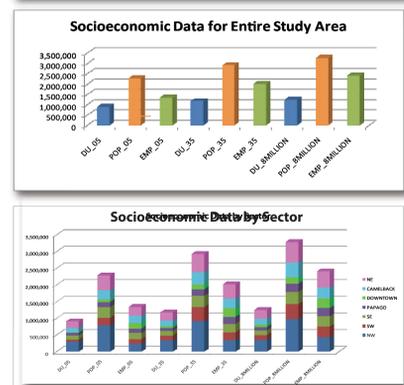
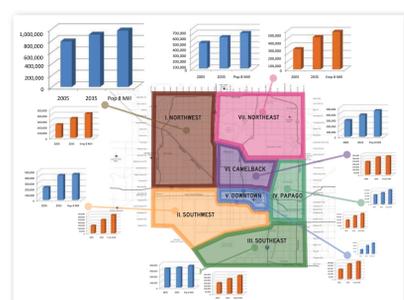
1. Anticipate potential travel demand associated with intense population growth and economic activity.
2. Identify multimodal transportation systems necessary to accommodate forecast mobility needs.
3. Assure necessary rights-of-way are preserved to allow construction of a multimodal transportation network capable of supporting expected growth.



Unlike the previous framework studies, the CPHX study focused on examining the established transportation system already serving a complex and intensely developed urban setting rather than large areas of undeveloped land. The study area is at or anticipating to be at "Buildout" within a shorter planning horizon. Therefore, transportation system planning activities undertaken must be responsive to future social and economic needs by better integration of various physical facilities and services of alternative modes responding to Buildout conditions and travel demands.

## POPULATION & EMPLOYMENT

**What is Buildout?**  
 The CPHX Study focused on the long-range, "Buildout" needs of the study area. "Buildout" refers to the general development of available land at some hypothetical maximum level at an unspecified future date, which is expected to manifest in 40 to 60 years. It is important to note that Buildout does not imply the end of development; it refers to the development potential of known available land in the study area. This equates to approximately eight million people living in the MAG region, with roughly 3 million of them residing in the CPHX study area.



## STAKEHOLDER OUTREACH

The study was guided by the contributions of stakeholders throughout the process. Municipal and agency representatives comprised the study's Planning Partners team, the group responsible for technical review and feedback throughout the process. Planning Partners met 15 times over the course of the project, including two intensive study sessions: a study charrette and a Workshop on the Interstate 10/Interstate 17 "Spine" Corridor. In addition to the work of the Planning Partners, five focus groups were convened at the beginning of the project to foster dialogues on specific topics including: public safety, commercial interests, economic development and downtown development, sustainability and livability, and transit. To augment these topic-specific discussions, seven geographically-based dialogues were hosted to focus on regional connectivity issues. Additionally, individual leadership and stakeholder interviews were held throughout the study with more than two dozen entities to solicit feedback from key agency and stakeholder leadership. In total, the study's database included more than 1,000 stakeholder contacts.

## BIG IDEAS

- Active Traffic Management, Managed Lanes, and High Occupancy Toll Lane (HOT) Strategies
- High Occupancy Vehicle (HOV) Ramps and Park-and-Ride Connectivity
- Improved Efficiency at Freeway Interchanges
- Road Diets and Complete Streets
- Arterial and High-Volume Intersection Strategies
- Last Mile Considerations for Multimodal Connectivity to Activity Centers
- New High Capacity Linkages between the Core and Outlying Areas

## OPPORTUNITIES

At the midpoint of the CPHX study process, the Planning Partners convened for a day-long charrette during which a series of over 300 potential improvement concepts were identified for the CPHX study area. These concepts included strategies to improve freeway, arterial, transit, pedestrian, and bicycle facilities. The following depicts all of the various identified strategies, known as the "universe of opportunities". These strategies were evaluated to determine their overall feasibility and applicability in the CPHX study area. Many of these strategies then become the focus of more detailed study during subsequent phases of the project. A series of technical memorandum were developed to describe those strategies most compatible with the CPHX study vision. An overview of these study work products is provided on the opposite side of this poster.



**Improved Operations & Maintenance**

- Sustainable transportation investments
- Central traffic operations center
- Expand ITS
- Adapted controlled signals
- Signalized pedestrian crossings

**Managed Lanes**

- I-17
- SR-51
- SR 202: I-10 to Loop 202
- Loop 101/Broadway/Southern and Baseline Road ramps

**New Interchanges**

- Bell Rd./Loop 101
- Frank Lloyd Wright/Loop 101
- Greenway/Loop 101
- Rainier/Loop 101
- Loop 202 to S.
- DDI on 7th St. & 7th Ave. at I-10
- Roundabout at Hayden Rd.

**AZ Parkways**

- Avenida de Rio Salado
- Cactus Rd. - Loop 101 E.
- SR-51
- Thunderbird Rd./Cactus Rd.
- Indian School Rd.
- 3-5 mile segments near major intersections with freeways

**High Occupancy Toll (HOT) Lanes**

- I-17
- US-60
- Loop 101 - any additional capacity should be HOT lanes

**Bus Rapid Transit (BRT)**

- Bell Rd. - Scottsdale Airport to Arrowhead Mall
- 59th Ave. - Bell Rd. to I-10
- Baseline Rd.
- Thomas Rd. - Loop 101 to Loop 101
- 44th St. N. of Camelback Rd. & S. to McDowell or Thomas
- 51st Ave.

**Transit**

- Local Circulator system to support regional system
- Complete bus rapid transit
- Improve transit frequencies
- Transit along canal system
- Build hierarchy of transit

**HOV System**

- All freeway to freeway interchanges
- Expanded & connected park-and-ride lots (every 4 miles)
- Direct HOV ramps at activity centers

**Road Diet**

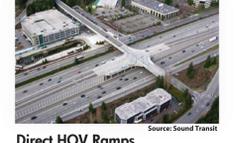
- Central Ave.



**Managed Lanes**  
 Managed lanes include High Occupancy Vehicle (HOV) and Express Lanes where certain lanes are designated for use by a particular class of vehicles (e.g., buses, carpools). Often, lane use control uses dynamic signaling to indicate the operational status of the lane and who may use it. Often, managed lanes strategies can include congestion pricing which allows single-occupant vehicles to use HOV/HOT facilities for a fee. Concept is typically applied to freeway facilities. Managed lanes in the CPHX study area are the subject of MAG's ongoing Managed Lanes Network Development Strategy study.



**High-Occupancy Vehicle (HOV) Lanes**  
 HOV Lanes, sometimes referred to as "Diamond" Lanes, have been created specifically for use by qualifying vehicles. In the Phoenix metropolitan area, vehicles must have 2+ persons, classified as energy efficient, buses, or motorcycles. The lanes are intended to provide fast, reliable travel during peak travel periods when traffic in the general lanes can be slow and congested.



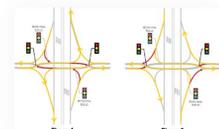
**Direct HOV Ramps**  
 Direct HOV ramps (DHOVs) are separate ingress and egress ramps providing dedicated acceleration and deceleration lanes to/from HOV lanes. This design separates operational maneuvers and provides drivers with a better opportunity to adjust their speed to match that of the traffic stream into which they are merging. They are especially useful when constructed in conjunction with an adjacent park-and-ride lot.



**Light Rail**  
 A rapid transit system operating in a dedicated or exclusive right of way, usually at street level, and is designed for light passenger loads and fast movement. Typical capacity: 12,000 to 19,000 passengers per hour. Trains: Formed of two to four car consisters. Top speed: 65 mph. Cost: up to \$100 million per mile.



**Active Traffic Management for Freeways**  
 Active Traffic Management (ATM) includes real time monitoring of traffic flows. Monitoring includes average speeds, determination of desired best flow characteristics, and adjustment of flow through Dynamic Message Signs (DMSs) and other means. ATM also includes Speed Harmonization, Congestion Prevention, Junction Control, and Adaptive Ramp Metering. ATM can be used to reconfigure lanes, based on real time events, including crashes and road maintenance.



**Diverging Diamond Interchange (DDI)**  
 Approaching the interchange, the off ramp diverges and splits at the crossing minor road. Both directions of traffic on the minor road cross to the opposite side on both sides of the freeway overpass. As no left turns must clear opposing traffic and all movements are discrete, the interchange operates with two phase signals.

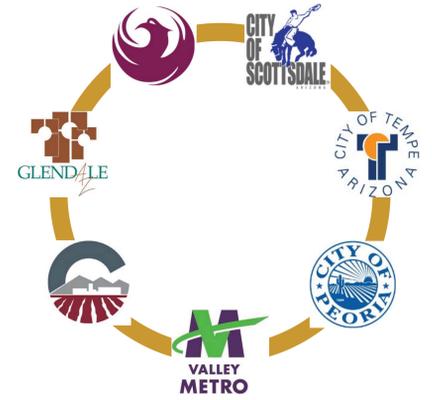
## STUDY TEAM

**WILSON & COMPANY**

In Association with

CH2M Hill  
 Fehr & Peers  
 IBI Group

Jack Lettiere & Associates  
 Partners for Strategic Action



### STUDY WORK PRODUCTS

The CPHX Study involved a collaborative process with study area stakeholders that identified values, big ideas, and potential opportunities for improving the transportation system and services of the core area of the Phoenix metropolitan area. Initial study efforts focused on research and analysis relating to ideas and outcomes evolving from discussions held among stakeholders and feedback obtained during public meetings. The latter stages of the study emphasized development of a series of Technical Memorandums intended to provide an evaluation of the applicability of various improvement strategies. The Technical Memoranda provided a planning-level assessment of the feasibility of the strategies in support of the formulation of MAG's NexGen Regional Transportation Plan (RTP). The RTP process will include further technical evaluation and vetting of the strategies with direct participation of stakeholders and the general public. The following provides a summary of each strategy identified and evaluated.

#### TRANSIT

Transit-supportive policies require the coordination of a broad cross-section of decisionmakers and stakeholders to frame community needs and issues within the context of a complete, user-friendly system of services. A charrette conducted early in the CPHX study was a major contribution to understanding strategies for how the public transit system could support the mobility and accessibility needs of each community and the CPHX study area as a whole. This Technical Memorandum documents ideas generated during the charrette, which complement the previously completed Transit Framework Study. It also discusses potential solutions and approaches that could be considered for implementation. It is intended to support the transit service decision-making process at the agency, community, and regional level with respect to:

- General Strategies
- Transit Service Enhancement Strategies
- Transit Technologies
- Strategies to Improve Public Transit Performance
- Transit System Asset Management
- Transit System/Rider Interface.
- Transit Support Policies.

Subsequent to the charrette, additional planning efforts were conducted to further define transit strategies, including MAG's Sustainable Transportation and Land Use Integration Study (STLUI) and Designing Transit Accessible Communities (DTAC).

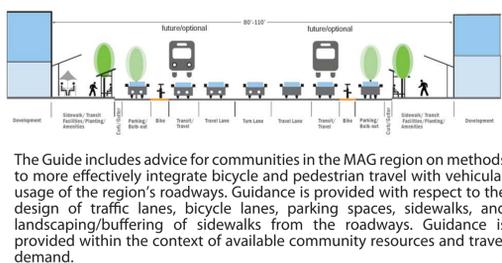
#### AZ SR-30 EXTENSION

SR-30 (formerly Route 801) is identified in the MAG 2010 Update Regional Transportation Plan (RTP) as a freeway connecting the planned Loop 202 (SR-202L) / South Mountain Freeway to the planned Loop 303 (SR-303L) / Estrella Freeway. The Transportation Framework Recommendation developed through the charrette process conducted during the Interstate 10/Hassayampa Valley Roadway Framework Study identified extension of SR-30 to I-17 as a plausible solution to West Valley capacity issues. Subsequently, the City of Phoenix requested MAG examine the extension in consideration of it being a "missing link" in the overall MAG Regional Freeway and Highway Program.

This Technical Memorandum provides a planning-level evaluation of potential routes for extending SR-30 eastward from Loop 202 to I-17 in the vicinity of Durango Curve. It examines potential corridors between Loop 202 and I-17 and design for interchange connections at the two freeways. The Tier 1 evaluation identified alternatives for additional evaluation based on review of potential issues, including: noise, 4(f) impacts, Environmental Justice, property takings, railroad conflicts, takings, landfill impacts, and S. 19th Avenue access. The Tier 2 evaluation resulted in concluding Corridor Alternatives 1A and 2A merited further examination and development — these two corridors represent reasonable options for eventual construction of the SR-30 extension.

#### BICYCLE/PEDESTRIAN AND COMPLETE STREETS

MAG adopted a Complete Streets Guide in 2011. **Complete Streets** is a concept that embraces the principle that roadway facilities should be designed to accommodate all traveler modes and abilities. It is a concept aimed at balancing the needs of motorists (automobiles and motorcycles), bicyclists, pedestrians, persons with travel/mobility challenges, transit vehicles, emergency responders, and goods movement (trucks).



The Guide includes advice for communities in the MAG region on methods to more effectively integrate bicycle and pedestrian travel with vehicular use of the region's roadways. Guidance is provided with respect to the design of traffic lanes, bicycle lanes, parking spaces, sidewalks, and landscaping/buffering of sidewalks from the roadways. Guidance is provided within the context of available community resources and travel demand.

This Technical Memorandum provides a general background document to support evaluation of opportunities or strategies for improving bicycle and pedestrian travel in the CPHX study area. It complements the MAG Guide, focusing on strategies to fully integrate bicyclists and pedestrians into the study area's transportation system through the provisions of safe, secure, and efficient facilities and services supporting daily mobility needs, as well as recreational demand.

#### DIRECT HIGH OCCUPANCY VEHICLE INTERCHANGES

High-occupancy vehicle (HOV) lanes have been constructed on most of the freeways in the CPHX study area. Direct HOV (DHOV) access ramps (also referenced as DARS) allow buses, carpools, vanpools, motorcycles, and other qualifying vehicles (e.g., electric and hybrid) to directly access the HOV lanes in the center of the freeways. DHOVs expedite movements to/from regional park-and-ride facilities. DHOVs improve safety segregating HOV lane traffic from the general purpose lanes and, consequently, reducing the need to weave into and out of the HOV lanes. Improved access conditions reduce congestion and increase travel-time reliability in the HOV lanes and general purpose lanes, particularly during peak travel periods when traffic is heavier.

This Technical Memorandum addresses the potential for adding DHOV access ramps at eleven strategic locations in the study area. Future traffic use would include, initially, transit vehicles, car/vanpools, and other qualifying vehicles only with the potential of providing access for single occupancy vehicles (SOVs) for a fee under the "Managed Lanes" concept.

Eight locations are identified as the best candidates for additional, more detailed study.

#### "THE SPINE"

Interstate 10 (Maricopa Freeway) connecting with Interstate 17 (Black Canyon Freeway) at "The Split" interchange carries much of the traffic flow through the Phoenix metropolitan area. The 35-mile travel corridor formed by these two freeway segments is recognized as "The Spine" of the CPHX study area: it has significant capacity issues, largely resulting from bottlenecks. Corridor studies and draft environmental impact statements (EIS) were prepared for the **The Spine**. Capacity enhancements were recommended that were not consistent with regional objectives and beyond the capacity of regional resources. Therefore, these studies were set aside in favor of additional considerations.

This Technical Memorandum addresses immediate needs, especially bottlenecks causing congested conditions. It examines potential improvements that can be implemented within existing rights-of-way in the near-term consistent with the \$1.47 billion currently programmed by MAG for corridor improvements. Recommended improvements were derived from an all-day Workshop sponsored by MAG to examine the attributes of three alternative improvement scenarios. MAG intends to follow up with a **Spine Corridor Master Plan** that will be based on joint project management with ADOT. The Plan will:

- Identify Corridor Operation Principles
- Involve Coordination among State and Regional Stakeholders
- Frame the Next Environmental and Design Efforts.

#### MAINTENANCE

Executing regular maintenance programs to extract the longest and best use of transportation system assets has proven difficult in most every community. Community leaders facing budgetary constraints are challenged by the need to balance transportation system maintenance requirements against the need for new capacity to accommodate the demands of growth. With the recent economic downturn in 2007, revenue from the Proposition 400 transportation excise tax declined precipitously. This decline in revenues resulted in cuts to all MAG programs, including the maintenance program for the region's freeway system and major arterials. The MAG annual regional maintenance budget is \$49.6 million, which is approximately \$31.2 million less than required to maintain the regional roadway system in "Good Condition."

This Technical Memorandum discusses the implications of deferred maintenance. It introduces to decisionmakers strategies to extend asset service life and mitigate the impact of future replacement costs. It points out that no visible deterioration will occur in the near-term, because the system is still relatively new. But, over the long-term, deferred maintenance will take its toll in reduced service life and higher repair costs.



#### DIVERGING DIAMOND INTERCHANGES

The Diverging Diamond Interchange (DDI) is a variant of the more traditional urban diamond interchange, which has been constructed at many locations on the CPHX study area freeway system. The DDI design directs the two opposing traffic flows on the arterial street to cross over to the opposite side of the roadway through the interchange. This shift of the traffic allows left-turning traffic to travel unopposed to the freeway on-ramp, eliminating a second stop at the other side of the interchange to await a left-turn arrow. Thus, the interchange design eliminates the left-turn phase in the signal control process, allowing for more efficient traffic flow and, thereby, greater intersection capacity.

This Technical Memorandum investigates the feasibility of converting existing diamond interchanges to DDIs at various locations on the study area freeway system. It makes note of the fact that DDIs:

- Better accommodate left-turn movements, particularly where there is a heavy volume of vehicles turning left from the freeway off-ramp
- Improve safety by reducing the number of potential conflict points
- Can be developed using the existing bridge structure.

Eight locations are identified as the best candidates for additional, more detailed study.

#### ACTIVE TRAFFIC MANAGEMENT

The AZTech Strategy Task Force recently developed an "Integrated Corridor Management (ICM) Action Plan" to identify key operational improvements, intelligent transportation system (ITS) needs, and priorities and responsibilities for advancing ICM in the Phoenix region. There was a need to build on the high-level recommendations presented in the ICM Action Plan by identifying additional Active Traffic Management (ATM) enhancements that might be included in a regional ICM program. ATM represents several methods for monitoring and dynamically adjusting traffic flows to manage congestion.

The Technical Memorandum presents a potential methodology (Next Steps) for implementing the ICM Action Plan and identifies several applicable operational concepts and strategies, including:

- Speed Harmonization**, which governs traffic flows through the use of variable message signs (VMSs), dynamic lane assignment, and queue warning messages;
- Hard Shoulder Running**, which involves temporary use of paved shoulders as travel lanes during peak travel periods;
- Junction Interchange Control**, which closes a general purpose travel lane to through traffic to accommodate traffic at the entry or off ramps of a freeway; and
- Managed Lanes**, which allows a non-qualifying vehicle to pay for the use of HOV Lanes.

#### RELATED STUDIES AND NEXT STEPS

Throughout the course of the Central Phoenix Transportation Framework Study, several strategies were identified that potentially could improve the travel experience and safety for people traveling to and through the study area. Many of these strategies already have become the subject of additional detailed study. Related study efforts derived from strategies identified during the course of the CPHX study include:

- Inner Loop Microsimulation Model
- Southeast Corridor Major Investment Study
- US-60/Grand Avenue Corridor Optimization and Access Management (COMPASS) Study
- Managed Lanes Network Development Strategy
- Interstate 10/Interstate 17 "The Spine" Corridor Master Plan
- Downtown Phoenix Core Connections Operations Study/Transportation Master Plan.

Details regarding each of these studies are available on MAG's Website: <https://www.azmag.gov>.

#### FREEWAY SYSTEM PLAN

During the study, a special Workshop was convened to address physical constraints present in the I-10 and I-17 corridors — "The Spine" — that imposed significant limitations and costs on the extent and character of potential future improvements. As a result of the Workshop, a **cap the footprint** concept was defined that established the Arizona Department of Transportation (ADOT) existing physical right-of-way limits of the current freeway system as the "footprint" for improvements in capacity to serve future travel demand in the "Central Core" of the Phoenix metropolitan area.

This Technical Memorandum provides information on the analysis undertaken to examine the feasibility of this strategy (i.e., how would this concept impact existing freeway capacity?). The analysis was based on examination of existing, available right-of-way along study area freeway corridors. Recommendations are presented for maximum right-of-way footprints for each corridor. The Technical Memorandum sets the stage for establishing an overarching policy that facilitates an understanding of future deficiencies and promotes development of transportation improvements that meet future demand within the corridors while adhering to budget constraints.

#### ARTERIALS

During the initial stages of the study, several arterial roadways were identified as being significant with respect to the day-to-day travel interactions between and among study area communities. These roadways were considered to be **strategic regional arterials**, due to the importance of their regional function.

This Technical Memorandum addresses techniques and design treatments for maintaining, even increasing, the capacity of these arterials, as well as the mile road grid as a whole. Applications studied include the feasibility of converting the significant arterials to Arizona Parkways, a roadway classification defined in previous Framework Studies completed by MAG. The potential for grade-separation of high-volume arterial-to-arterial intersections also is addressed.

Many additional strategies identified through the CPHX study will serve to inform MAG's NexGen Regional Transportation Plan, targeted for completion in the Fall of 2014.

